TENDER DOCUMENT

TENDER No: SRO/MKT/TH/518 dated 07.08.2017

FOR

“Construction of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase I - Fire Protection Works for Construction of Hostel block and Research Block with Animal Research Facility, and connected Infrastructure (Composite contract)-Pkg-4 C”.

VOLUME - II

Additional Conditions of Contract
&
Client Documents
&
Technical Specification
&
Drawings
ADDITIONAL CONDITIONS OF CONTRACT (ACC)

1.0 The following Additional Conditions of Contract shall be read in conjunction with General Conditions of Contract. If there are any provisions in these Additional Conditions of Contract, which are at variance with the provisions of General Conditions of Contract, the provisions in these Additional Conditions of Contract shall take precedence.

2.0 Introduction

Consortium of Architect Hafeez Contractor and M/s Iyer and Mahesh, a PMC engaged by RGCB, intends to undertake the Construction of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase I.

3.0 Scope of work:

The project site for the work is available.

The brief scope of work included in this tender shall include (but not limited to) for Construction of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase I – **Fire Protection Works** for Construction of Hostel block and Research Block with Animal Research Facility, and connected Infrastructure (Composite contract)-**Pkg-4 C** (hereinafter referred to as “Works”) as per Technical specifications, Drawings, BOQ, Instructions and Terms and conditions given in Tender Documents. Apart from above, any other services not covered above but required as per direction of EPI / RGCB are deemed to be included in the scope of work. The work is to be carried out on Item rate basis as per bill of quantities and tender conditions.

4.0 Maintenance Period

The maintenance period for the work shall be twelve months after handing over to Client and any defects noticed during the period shall have to be rectified by Contractor at his cost, failing which the action taken for rectification by EPIL RGCB shall be final.

5.0 Order of Precedence

i) NIT
   ii) Memorandum,ACC
   iii) BOQ, Technical Specifications and Drawings
   iv) EPI GCC
   v) Client Documents

6.0 Disqualification

The tenderers may note that they are liable to be disqualified and not considered for the opening of Price Bid if;

a) Representation in the forms, statements and attachments submitted in the pre-qualification document are proved to be incorrect, false and misleading.

b) They have record of poor performance during the past 10 (ten) years such as abandoning the work, rescinding of contract for which the reasons are attributable to the non-performance of the contractor, inordinate delay in completion, consistent history of litigation / arbitration awarded against the contractor or any of its constituents or financial failures due to bankruptcy etc. in their ongoing / past projects.

c) They have submitted incompletely filled in formats without attaching certified supporting documents and credentials to establish their eligibility to participate in the Tender.

d) If the tenderers attempt to influence any member of the selection committee.
EPI reserves its right to take appropriate action including disqualification of tenderer(s) as may be deemed fit and proper by EPI at any time without giving any notice to the contractor in this regard. The decision of EPI in the matter of disqualification shall be final and binding on the Tenderers.

7.0 SPECIFICATIONS

i) All works in general are to be carried out in accordance with the CPWD Specifications for works 2009 vol. I and vol. II, which are detailed in technical specification separately attached with this tender.

ii) This contract shall be governed by the Indian Laws for the time being in force. The contract is confidential and must be strictly confined to the purposes of the contract.

iii) The contractor shall provide everything necessary for the proper execution of the works according to the intent and meaning of the specifications and drawings taken together whether the same may or may not be particularly shown or described therein provided that the same can be reasonably be inferred there from and if the contractor finds any discrepancy in the specifications and drawings and between the drawings, he shall immediately and in writing refer the same to the employer who shall decide which is to be followed.

vi) The work order/LOI will be issued by EPI and handing over of the site and date of commencement of the contract shall be within 10 (ten) days of issue of such letter.

8.0 TAXES AND DUTIES : Sub-clause no. 13.1 of Clause 13.0 of EPI-GCC shall be modified as under. Sub-clauses no. 13.2, 13.3, 13.4 & 13.5 of clause no.13.0 stands good and amended as follows

i) Price Quoted by the bidders are exclusive of GST. GST shall be reimbursed to the bidder only on proof of submission of documentary evidence and ITC appeared in the name of EPI.

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

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

iv) All tendered rates shall be inclusive of all taxes and levies (except GST- Goods and service Tax) payable under respective statutes. However, if any further tax or levy or cess is imposed by Statute, after the last stipulated date for the receipt of tender including extensions if any and the contractor thereupon necessarily and properly pays such taxes/levies/cess, the contractor shall be reimbursed the amount so paid, provided such payments, if any, is not, in the opinion of EPI (whose decision shall be final and binding on the contractor) attributable to delay in execution of work within the control of the contractor.

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

9.0 All men, materials, machinery, tools and plants, infra-structure, resources etc., as required for execution of “Works” shall be provided and arranged by PARTY for their portion of work. The amount/rate quoted in their offer by PARTY to EPI includes all charges, all direct and indirect cost of works, materials, labour, plant & equipment, all taxes (Except GST), duties, levies, royalties, and labour welfare cess etc., all transportation charges including for cartage of issue material, electricity and water charges, site offices expenses, labour camp, bank guarantee charges, insurance charges, EPF/CPF/Statutory contributions, preparation of all required design & detailed engineering and all required drawings etc., other expenses whatsoever, incurred on execution, completion and maintenance of the “Works” as per ‘Tender Documents’ and their own overheads and profit etc. PARTY shall comply with all the requirements laid down as per ‘Tender Documents’ as per terms, conditions, specifications, drawings, documents etc. given in the ‘Tender Documents’ for the completion, handing over, maintenance period etc. for the project. The contractor will not be allowed to take out equipment’s from the site without the written permission of RGCB/ARCHITECT/EPI.

10.0 The rate quoted by the party is inclusive of constructing temporary approach road to site, fencing, etc. as required for completion of work.

11.0 PRICE ESCALATION

No escalation as per Clause 16.0 of GCC of EPI

12.0 Payment against Extra / Deviation items:

Extra/ Deviation items shall be carried out with prior approval of Client/EPI.

13.0 MOBILIZATION ADVANCE – Clause no. 8.0 (8.1, 8.3, 8.4, 8.5, 8.6) of General Conditions of Contract (GCC) is applicable.

Clause no 8.2 of GCC of EPI shall be modified as under:

Recovery of mobilization advance shall be made by the deduction from the contractors bills commencing after first ten per cent of the gross value of the work is executed and paid, on pro-rata percentage basis to the gross value of the work billed beyond 10% in such a way that the entire advance is recovered by the time eighty per cent of the gross value of the contract is executed and paid, together with interest due on the entire outstanding amount up to the date of recovery of the installment.

14.0 WATER & ELECTRICITY – The required water and electricity to be arranged by the tenderer only

15.0 PERFORMANCE GUARANTEE:

In the event of award of “Works”, PARTY shall submit to EPI, Crossed Demand Draft / Bank Guarantee from a Nationalized Bank / Scheduled Bank towards performance guarantee @ 5% (Five Percent Only) of the contract value of the accepted tender within 15 days from the date of LOI shall be valid up to the stipulated date of completion plus 60 days beyond failing which EPI at his discretion may revoke the LOI & forfeit the EMD furnished along with tender. In case the time for completion of work gets enlarged, the contractor shall get the validity of Performance Guarantee extended to cover such enlarged time for completion of work. After recording of the completion certificate for the work by the competent authority, the performance guarantee shall be returned to the contractor, without any interest. However, in
case of contracts involving maintenance of building and services/any other work after construction of same building and services/other work, then 50% of Performance Guarantee shall be retained as Security Deposit. The same shall be returned year wise proportionately.

16.0 RETENTION MONEY - Clause no. 10.0 of GCC shall be modified as under:

A sum at the rate of 2.5% of the gross amount of each running and final bill will be deducted. Such deductions will be made and held by EPI by way of Security Deposit.

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

17.0 Payment Conditions:

Payment condition mentioned in Clause no 37.0, 37.1, 37.2, 37.3 and 37.4 is modified, by considering the sequence of work, as follows with respect to the nature of work.

1) Items having Supply, Installation/erection, testing and commissioning,
   - Supply of item - 70%
   - Installation of item - 20%
   - Testing and Commissioning - 10%

2) All other items having Supply only or installation, testing and commissioning only
   - Supply or Installation of item - 90%
   - Testing and Commissioning - 10%

The Contractor shall become entitled to payment after receipt of corresponding payment(s) from the Client/Owner. Submission of each RA Bill should not be less than 10% of work order value.

18.0 Clause no. 72.1 of GCC stands modified as under:

The PARTY shall be responsible for timely completion of the “Works” within the contractual completion period. Liquidated Damages/Compensation @ 1.5 % per month of delay to be computed on per day basis on the value of incomplete work for delay. Total value shall not exceed 10% of the Contract Value of work or of the Contract Value of the item or group of items of work for which a separate period of completion is originally given.

19.0 Contractor has to submit the schedules of deliverables including material procurement plan for EPI/Architect’s approval. In the event of failure of contractor to adhere to approved procurement schedule. EPI shall purchase the required material on behalf of contractor with its own cost and the cost of procurement including freight, loading, unloading plus EPI overhead charges @10% of the landed cost of material at site shall be debited from contractor with any payable amount or from subsequent RA bill.

20.0 The final bill payment to the PARTY shall be released when PARTY submits Sales Tax / VAT clearance certificates, EPF clearance certificate, all other clearances, approvals, certificates etc. as per agreement of EPI with the client for the “Works” and as per statutory requirement. The party shall have no claim on EPI in case the payments are delayed due to any reason whatsoever.
21.0 The contractor shall strictly comply with the provisions of CPWD safety code annexed hereto. The contractor shall make necessary safety arrangements at site including as mentioned in GCC and indemnify EPI against any consequence of accident at site.

22.0 The PARTY shall be fully responsible to complete the “Works” in workmen like manner to the satisfaction of Client and EPI by maintaining high standard of quality and precision as per ‘Tender documents’, Agreements, Terms & Conditions, Specifications, Drawings etc., within the contractual completion period and within their quoted rates/amount. In case Client reduces or increases scope of work related to PARTY’s portion of work, the same shall be binding on PARTY and the PARTY has to execute the same at rates paid by the Client less EPI's markup.

23.0 Issues related to interpretation and claims, if any, related to PARTY's scope of work, arising out of contract between EPI and Client shall be referred with full justification by PARTY to EPI for settlement with Client including arbitration with Client, if inescapable, and outcome of such a settlement shall be binding on PARTY. EPI at its option may associate the PARTY in the above process of settlement for PARTY’s portion of work. The cost & expenses on arbitration with Client shall be shared by EPI and PARTY in proportion of PARTY's offer and EPI's mark up towards its overheads & profits. In case the award/settlement with the Client is in favour of EPI, ninety percent of the award/settlement amount shall be shared between EPI and PARTY in proportion of PARTY's contract price with EPI and EPI's mark up towards its overheads & profits. The balance ten percent of the award/settlement amount shall be retained by EPI towards its administrative charges. In case the award/settlement is against EPI, the entire damages/counterclaims imposed, if any, shall be borne by PARTY alone and the PARTY shall have no claim whatsoever against, EPI in such a settlement. Further, EPI shall have no liability towards any claim of the PARTY, which is not paid by the Client.

24.0 PARTY shall ensure compliance with all Central, State and Local Laws, Rules, Regulations etc. as applicable or may be applicable during the course of execution, maintenance etc. of the “Works” and shall indemnify EPI against any claim or damages whatsoever on such accounts. The PARTY shall keep EPI indemnified at all times against infringement of any Patent or Intellectual Property rights.

25.0 The party shall plan and execute the “Work” in his scope of work in such a manner that the other works, connected with the “Works” of the party, but not included in Party's scope of work do not get affected / delayed.

26.0 Bidders are advised to visit site and go through the EPI/CLIENT documents before quoting rates however for any query bidders are advise to contact EPI Chennai office/ Site. The work is to be carried out in accordance with technical specifications, drawings and approved make/vendors of client.

27.0 COMPLETION AND TAKING OVER
As soon as the project is finally completed, the Contractor shall inform EPI and EPI shall in turn inform to Architect. Architect shall nominate a Board of Officers for checking/ verification of completed work as per the scope of work for final taking over the project.

28.0 A final certificate of rectification of all defects pointed out by the handing over taking over board detailed by Architect /EPI and / or during defect liability period shall be obtained from the nominated officer of Architect /EPI prior to releasing of the Security deposit by EPI.

29.0 The final bill will be submitted by the contractor within 90 days from the date of acceptance of completion of work accompanied by the following documents:
a) Completion certificate issued by the RGCB/ARCHITECT/EPI specifying the handing over of the work including list of inventories (fittings & fixtures).
b) Computerized stage wise payments.
c) No claim certificate by the contractor.
d) No claim certificate from the sub-agencies / vendors engaged by the contractor.
e) Duly approved by the architect ‘As built’ drawings in required sets.
f) Certified measurements.
g) All operation and maintenance manuals.
h) All statutory approvals from various state / central govt. local bodies, if required for completion & handing over of the work as included in scope of Contractor.
i) Manufacture’s guarantee of various machines / equipments installed as part of works.

30.0 The Tenderers must understand that the items marked in schedule of work are actual items to be executed. Alteration, omission, deduction or addition from / to these items is at the discretion of the employer without effecting the terms of the contract. The rates have to be quoted on the basis of item rate.

31.0 Survey : Layout and Access

The Contractor shall satisfy himself regarding the correctness of the site Layouts, levels etc. as shown in the drawings or given in the specifications. Before starting the work he shall also carry out at his own cost survey of the whole work site jointly with the Department. Discrepancies noticed between Departmental drawing and the joint survey shall be informed in writing to the RGCB/ARCHITECT/EPI and got corrected by the RGCB/ARCHITECT/EPI. Such deviations as may arise out of the joint survey shall not vitiate the provisions of contracts and shall not entitle the Contractor to any extra payment of claim in any way.

After the joint survey a survey plan shall be prepared by the Contractor at his cost and got approved by the RGCB/ARCHITECT/EPI. Reference line and points shall be established by the Contractor at his own cost so as to serve as reference and “Dimension al Checking” of works. He shall prepare and submit a plan in quadruplicate to the E.I.C. showing such reference points with their full description at his cost.

The Contractor shall provide for all arrangements labour, equipment's and materials needed for carrying out survey, setting out, layout checking, inspections measurements, testing at his own cost for which no separate payment will be made.

The Contractor shall also provide proper approach and access to all the works and stores including clearance of sites at his own cost.

32.0 Time of Completion

The entire work as per offer shall be completed within 07 (Seven) months from the date of issue of LOI. The time of completion is firm and final and supersedes any other time mentioned elsewhere in any clause(s) of tender document.

The period of completion given includes the time required for mobilization and testing as well, rectifications, if any, re-testing and completion in all respects to the entire satisfaction of the RGCB/ARCHITECT/EPI including the monsoon season.

The Contractor shall scrupulously adhere to the targets/program as envisaged in his micro-plan of work program by deploying adequate personnel and construction tools and tackles and he shall also supply all materials of his scope of supply in time to achieve the targets set out.
The Contractor shall give every day a report on category-wise labour and equipment deployed along with the progress of work done on previous day. The progress of work shall be proportionate to completion time.

Time is the essence of this contract and the allotted work must be completed within the specified time. Extension of time may be granted in very exceptional circumstances if the work gets delayed due to the reasons beyond the control of the successful bidder. This clause of extension of time will have precedence over any other similar clauses if they are at variance with this clause. There will be penalty for non-completion of the work in time as indicated elsewhere.

In case the successful bidder i.e. the contractor fails to execute the work as per agreed schedule of progress of work and as per specified quality and/or lags behind in activities required for timely completion of work, as determined by EPI/Client, then EPI shall give 15 days’ notice to the contractor in writing to achieve the specified quality and/or deploy adequate resources to the satisfaction of EPI, for timely completion of work. Upon expiry of the notice period, if the contractor fails to achieve specified quality and/or fails to action for timely completion of work, then EPI shall have option to withdraw the remaining work PARTLY or in FULL from the contractor and get the same executed at the risk and cost of the from alternative agencies with 10% EPI Overheads besides encashment of guarantees submitted by the parties to EPI. The decision of EPI in this regard shall be final and binding on the contractor.

The Contractor shall comply with all the provisions of the following statutory acts or any other modifications thereto and the New rules made there under from time to time.

- Indian Factories Act 1948
- Payment of Wages Act 1936
- Minimum Wages Act 1948
- Employers Liability Act 1938
- Apprentices Act 1961
- Workmen’s Compensation Act 1923
- Industrial Disputes Act 1947
- The Maternity Benefits Act 1961
- Contract Labour (Regulation and Abolition) Act 1970
- Employment of Children Act 1933
- Provident Funds and Miscellaneous Provisions Act 1952
- The Employee’s Pension Scheme 1995

Should a report be made by an Inspecting Officer, as defined in the Contract Labour (Regulation and Abolition) Act 1970, the Developer shall have the right to deduct from any money due to the Contractor any sum required, or estimated to be required, for making good the loss(es) suffered by a worker or workers by the reason of non-fulfillment of the Conditions of the Contract relating to the benefits of workers, non-payment of wages or of deduction made from their wages which are not justified by the terms of the Contract or non-observance.

The Contractor shall indemnify the employer against any payments to be made as hereunder and for the observance of the provisions of the aforesaid Acts.

Carrying out part work at risk & cost of contractor:

If contractor:
(i) At any time makes default during currency of work or does not execute any part of the work with due diligence and continues to do so even after a notice in writing of 7 days in this respect from the Architect; / EPI

(ii) Commits default in complying with any of the terms and conditions of the contract and does not remedy it or takes effective steps to remedy it within 7 days even after a notice in writing is given in that behalf by the Architect/ EPI; or Fails to complete the work(s) or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in the notice given in writing in that behalf by the Architect.

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

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

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

EPI shall determine the amount, if any, is recoverable from the contractor for completion of the part work/ part incomplete work of any item(s) taken out of his hands and execute at the risk and cost of the contractor, the liability of contractor on account of loss or damage suffered by EPI because of action under this clause shall not exceed 10% of the tendered value of the work.

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

Any excess expenditure incurred or to be incurred by EPI in completing the part work/ part incomplete work of any item(s) or the excess loss of damages suffered or may be suffered by EPI as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to EPI in law or per as agreement be recovered from any money due to the contractor on any account, and if such money is insufficient, the contractor shall be called upon in writing and shall be liable to pay the same within 30 days.

If the contractor fails to pay the required sum within the aforesaid period of 30 days, EPI shall have the right to sell any or all of the contractors’ unused materials, constructional plant, implements, temporary building at site etc. and adjust the proceeds of sale thereof towards the dues recoverable from the contractor under the contract and if thereafter there remains any balance outstanding, it shall be recovered in accordance with the provisions of the contract.

In the event of above course being adopted by EPI, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advance on any account or with a view to the execution of the work or the performance of the contract.
37.0 **Requirement of Technical Staff for the work**

<table>
<thead>
<tr>
<th>Cost of work (Rs in Crores)</th>
<th>Contract period (Months)</th>
<th>Requirement of Technical Staff</th>
<th>Minimum experience (Years)</th>
<th>Rate of recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.28</td>
<td>07</td>
<td>i) Project Manager with degree in Electrical/ Mechanical or Planning /Quality Control Engineer Degree</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) Junior Engineer Diploma (Electrical/ Mechanical)</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii) Safety Officer</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iv) Supervisors (Diploma Engineering in Electrical/ Mechanical)</td>
<td>1</td>
<td>2 Or 5</td>
</tr>
</tbody>
</table>

Rate of recovery in case of non-compliance of above will be stipulated as above.

39.0 **ARBITRATION: Modification of arbitration's clause no 76.0 of GCC**

General Conditions of Contract (GCC) Sub Clause no.76.1 and 76.3 of Arbitration Clause no.76.0 are amended as given below. Sub Clause no.76.2 will remain the same.

76.0 **ARBITRATION**

76.1 Before resorting to arbitration as per the clause given below, the parties if they so agree may explore the possibility of conciliation as per the provisions of Part III of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015. When such conciliation has failed, the parties shall adopt the following procedure for arbitration:

i) Except where otherwise provided for in the contract, any disputes and differences relating to the meaning of the Specifications, Design, Drawing and Instructions herein before mentioned and as to the quality of workmanship or materials used in the work or as to any other questions, claim, right, matter or things whatsoever in any way arising out of or relating to the Contract, Designs, Drawings, Specifications, Estimates, Instructions, or these conditions or otherwise concerning the works of the execution or failure to execute the same whether arising during the progress of the work or after the completion or abandonment thereof shall be referred to the Sole Arbitrator appointed by the Chairman & Managing Director (CMD) of Engineering Projects (India) Limited (EPI) or any other person discharging the functions of CMD of EPI. The person approached for appointment as Arbitrator shall disclose in writing circumstances, in terms of Sub-Section (1) of Section (12) of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015 as follows:
a) such as the existence either direct or indirect, of any past or present relationship with or interest in any of the parties or in relation to the subject-matter in dispute, whether financial, business, professional or other kind, which is likely to give rise to justifiable doubts as to his independence or impartiality; and

b) which are likely to affect his ability to devote sufficient time to the arbitration and in particular his ability to complete the entire arbitration within a period of twelve months.

The Arbitrator shall be appointed within 30 days of the receipt of letter of invocation of arbitration duly satisfying the requirements of this clause.

i) If the arbitrator so appointed resigns or is unable or unwilling to act due to any reason whatsoever, or dies, the Chairman & Managing Director aforesaid or in his absence the person discharging the duties of the CMD of EPI may appoint a new arbitrator in accordance with these terms and conditions of the contract, to act in his place and the new arbitrator so appointed may proceed from the stage at which it was left by his predecessor.

ii) It is a term of the contract that the party invoking the arbitration shall specify the dispute/differences or questions to be referred to the Arbitrator under this clause together with the amounts claimed in respect of each dispute.

iii) The Arbitrator may proceed with the arbitration ex-parte, if either party, in spite of a notice from the arbitrator, fails to take part in the proceedings.

iv) The work under the contract shall continue as directed by the Engineer-In-Charge, during the arbitration proceedings.

v) Unless otherwise agreed, the venue of arbitration proceedings shall be at the venue given in the ‘Memorandum’ to the ‘Form of Tender’.

vi) The award of the Arbitrator shall be final, conclusive and binding on both the parties.

vii) Subject to the aforesaid, the provisions of the Arbitration and Conciliation Act, 1996 as amended by Arbitration and Conciliation (Amendment) Act, 2015 or any statutory modifications or re-enactment thereof and the Rules made there under and for the time being in force shall apply to the arbitration proceedings and Arbitrator shall publish his Award accordingly.

76.3 JURISDICTION:

The courts in Chennai alone will have jurisdiction to deal with matters arising from the contract.
RAJIV GANDHI CENTRE FOR BIO TECHNOLOGY
POOJAPPURA, THIRUVANANTHAPURAM
(RGCB)

COMPOSITE TENDER

Establishment of RGCB Bio Innovation Center
at Akkulam in Thiruvananthapuram District, Kerala State
Phase I – Construction of Research Block with Animal Research Facility,
Hostel Buildings, Civil & Related MEP works including site development
and connected Infrastructure (Composite Contract)

NIT No : RGCB/C2A/2101/G/2012/01/15-16

TENDER DOCUMENT

VOLUME – 1

CONDITIONS OF CONTRACT
NAME OF WORK: ESTABLISHMENT OF RGCB BIO INNOVATION CENTER AT AKKULAM IN THIRUVANANTHAPURAM DISTRICT, KERALA STATE PHASE. I – CONSTRUCTION OF RESEARCH BLOCK WITH ANIMAL RESEARCH FACILITY, HOSTEL BUILDINGS, CIVIL & RELATED MEP WORKS INCLUDING SITE DEVELOPMENT AND CONNECTED INFRASTRUCTURE (COMPOSITE CONTRACT)

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NOTICE INVITING TENDER

1. Rajiv Gandhi Centre for Biotechnology Thiruvananthapuram invites bids from Public Works Organizations (CPWD/State PWDs), Public Sector Undertakings owned by Central or State Governments or any other Central/ State Government Organizations/ Public Sector Undertakings notified by the Ministry of Urban Development, Government of India to carry out Civil and Electrical works, in ‘Two Envelope System’ for the below mentioned work.

<table>
<thead>
<tr>
<th>NIT NO</th>
<th>Name of Work</th>
<th>PAC</th>
<th>Period of completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGCB/C2A/2101/G/2012/01/15-16</td>
<td>Establishment of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase I – Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil &amp; Related MEP works including site development and connected Infrastructure (Composite Contract)</td>
<td>Rs.56.59 Crores.</td>
<td>18 months</td>
</tr>
</tbody>
</table>

2. Contractors who fulfill the following requirements shall be eligible to apply. (a) Should have satisfactorily completed 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. 23.00 Cr., OR two similar works each costing not less than Rs. 34.00 Cr. OR one similar work costing not less than Rs. 46.00 Cr. And

(ii) One work of any nature (either part of (i) above or a separate one) costing not less than Rs.23.00 Cr with some Central/State Government Department/Central Autonomous Body/State Autonomous Body/ Central Public Sector Undertaking/ State Public Sector Undertaking/City Development Authority/ Municipal Corporation of City formed under any Act by Central/ State Government and published in Central/State Gazette.
Note:

i. Similar work shall mean works of Multi-storeyed Hospital/ Educational or Research Institutional Buildings/ Campuses

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

(a) The Agency should have registration with “Employees Provident Fund Organization of Govt. of India”.

(b) Should have had average annual financial turnover of Rs. 56.59.Cr. on construction works during the last three years ending 31st March 2015.

(c) Should not have incurred any loss in more than two years during the last five years ending 31st March 2015.

(d) Should have a solvency of Rs.23.00Cr.

3. Joint ventures shall not be accepted.

4. Bid documents consisting of plans, specifications, the schedule of quantities of the various types of work to be done and the set of terms and conditions of contract and other necessary documents can be seen in the office of the Controller of Administration, RGCB on working days. Bid documents will be issued from this Office, on payment of Rs.1500 + VAT @4% in the form of non – refundable Demand Draft drawn in favour of Director, RGCB, Payable at Thiruvananthapuram or in cash, on any working day from 19/10/2015 to 18/11/2015 between 10.00 AM and 04.00 PM. Tender documents can also be obtained through post by submitting the request along with DD for Rs 1560/- RGCB will not be responsible for any delay during Postal transit.

5. Tender documents can also be downloaded from our website www.rgcb.res.in. An intimation to this effect to be sent to RGCB by such tenderers through e-mail www.rgcb.res.in. on the date of downloading itself. Tender documents are to be submitted as four separate volumes (Vol I, II, III &IV) in the same manner indicated in the NIT. An amount of Rs.1560/- towards the cost of tender document in the form of Demand Draft to be enclosed along with Volume-I of the tender document failing which the tender is liable to be rejected.

6. Applicant has to deposit Earnest Money of Rs.67Lakhs. In the form of Deposit at call receipt of a schedule bank/fixed deposit receipt of a schedule bank/demand draft of a scheduled bank issued in favour of Director, RGCB along with tender document. A part of Earnest money is acceptable in the form of Bank Guarantee also. In such case, 50% of
earnest money or Rs. 20 lakh whichever is less will have to be deposited in the shape prescribed above and balance in shape of Bank Guarantee issued by a Scheduled Bank.

7. Application supported by prescribed annexures and the financial bid shall be placed in separate sealed envelopes each marked “Eligibility Documents” and "Financial bid" respectively. Both the envelopes shall be placed together in another sealed envelope. The bids will be received up to 2.30 PM on 03/12/2015. The envelopes marked "Eligibility Documents" shall be opened by the Controller of Administration or his Authorized representative in this Office on the same day at 3.30 PM. The time and date of opening of financial bid shall be communicated at a later date.

8. Pre Bid conference shall be held at RGCB at 2.30 PM on 24/11/2015 to clear the doubts of intending tenderers, if any.

9. RGCB 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.

Controller of Administration
Section I

BRIEF SCOPE OF WORK

Name of work: Establishment of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase. I – Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil & Related MEP works including site development and connected Infrastructure (Composite contract)

Rajiv Gandhi Centre for Biotechnology is an autonomous National Institute under Department of Bio technology, Government of India. The Institute is in pursuit of fostering research and Development in the area of Bio technology in the country. The Institute is having its registered office at Poojappura in Thiruvananthapuram.

The infrastructure facilities proposed to be provided in the new Campus under this contract are multi-storeyed buildings to accommodate Research Labs, Animal Research facility, Hostels. Besides civil works the Scope of Work includes Electrification, Air conditioning, Fire protection systems, Acoustics, Campus roads, and Lighting etc.

The present tender mainly consists of the following works.

Civil Works

1. Construction of a multi-storied building as Research Block to accommodate Research Labs along with Animal Research facility

This Block is located on the slope of the hill by the side of a pond. Two floors namely the Lower basement floor is MEP and the Upper basement floor for Animal Research Facility. The Basement floor is located below ground level, but has sufficient free space between the building and the earthwork cutting. Another 4 floors are above ground floor level on all sides. The approximate built up areas are given below.

<table>
<thead>
<tr>
<th>Floor Type</th>
<th>Built Up Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Lower basement floor</td>
<td>1399 m²</td>
</tr>
<tr>
<td>ii. Upper basement floor</td>
<td>1079 m²</td>
</tr>
<tr>
<td>iii. Basement floor</td>
<td>1079 m²</td>
</tr>
<tr>
<td>iv. Ground floor</td>
<td>1112 m²</td>
</tr>
<tr>
<td>v. First floor</td>
<td>1101 m²</td>
</tr>
<tr>
<td>vi. Second floor</td>
<td>998 m²</td>
</tr>
<tr>
<td>vii. Third floor</td>
<td>998 m²</td>
</tr>
<tr>
<td>viii. Terrace floor</td>
<td>268 m²</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8026 m²</strong></td>
</tr>
</tbody>
</table>

2. Hostel Block

This is an eight storied building for accommodating research scholars. The approximate built up area are given below.
i. Ground floor - 593 m²
ii. 1st to 7th floor (Total) - 3413 m²
iii. Terrace floor - 79 m²

**Total** - **4085 m²**

**Electrical works**

Electrification of the Research block and the Hostel Block with necessary H.T & L.T Works, Substations, Lighting/Power outlets, UPS, Networking, Yard Lighting, Communication system and Diesel Generators. The electrical load details are given below

Total connected load for Research Block = 899.24 kW
Total connected load for Hostel Block = 165.86 kW

**HVAC Works**

Air conditioning of the Research Block using modern energy efficient scroll/screw compressors, Air handling units, Water chilling system, Insulated ducts etc. Total Air Conditioning Load = 416TR
SECTION II

INFORMATION & INSTRUCTIONS FOR BIDDERS

1.0 General:

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

1.2 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.

1.3 The bidder should sign each page of the application.

1.4 Overwriting should be avoided. Correction, if any, should be made by neatly crossing out, initialing, dating and rewriting.

1.5 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.

1.6 The bidder may furnish any additional information which he thinks 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.

1.7 Any information furnished by the Agency found to be incorrect either immediately or at a later date, would render it liable to be debarred from tendering/taking up of any work with the Institution.

2.0 Method of application:

2.1 The document should be signed by the Authorized Signatory of the Agency.

2.2 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 Association duly attested by a Public Notary.
3.0 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.

4.0 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.

5.0 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.

6.0 Initial criteria for eligibility
6.1 The Bidder should have satisfactorily 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 the completed work including cost of material supplied by the Government/Client but excluding those supplied free of cost. This should be certified by an officer not below the rank of Executive Engineer/Project Manager or equivalent.

(i) Three similar works each costing not less than Rs.23.00 Cr, OR two similar works each costing not less than Rs. 34.00Cr. OR one similar work costing not less than Rs.46.00 Cr.

(ii) One work of any nature (either part of (i) above or a separate one) costing not less than Rs23.00 Cr. with some Central/State Government/Central Autonomous Body/Central Public Sector Undertaking/State Public Sector Undertaking/City Development Authority/Municipal Corporation of City formed under any Act by Central/State Government and published in Central/State Gazette.

Note:

i) Similar work shall mean works of Multi-storied Hospital/ Educational or Research Institutional Buildings/ Campuses.

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

6.2 At the time of submission of tender, the tenderer shall have to furnish an affidavit as under:

“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 RGCB in future forever. Also, if such a violation comes to the notice of Department before date start of
work, the RGCB shall be free to forfeit the entire amount of Earnest Money Deposit/Performance Guarantee.”

6.3 The bidder should have had average annual financial turn over (gross) of Rs.56.59 Cr. on Civil and related MEP work during the last available three consecutive balance sheets (may range from six to eighteen months) duly audited by Chartered Accountant. Year in which no turnover is shown would also be considered for working out the average.

6.4 The bidder should not have incurred any loss in more than two years during available last five consecutive balance sheets, duly certified and audited by the Chartered Accountant.

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

\[ \text{Bidding Capacity} = \left( \frac{A \times N}{2} \right) - B \]

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 completed works shall be brought to current costing level by enhancing at a simple rate of 7% per annum.
- \( N \) = Number of years prescribed for completion of work for which bids have been invited.
- \( B \) = Value of existing commitments and ongoing works to be completed during the period of completion of work for which bids have been invited.

The Bidding Agency should furnish all the above figures accurately.

6.6 The bidder should have a solvency of Rs. 23.00 Cr. certified by his Bankers.

6.7 The bidder should own construction equipment as per list required for the proper and timely execution of the work. Else, he should certify that he would be able to manage the equipment by hiring etc., and submit the list of firms from whom he proposes to hire the equipment’s.

6.8 The bidder should have sufficient number of Technical and Administrative employees for the proper execution of the contract. The bidder should submit a list of these employees stating clearly how these would be involved in this work.

6.9 The bidder’s performance for each work completed in the last Seven years and works in hand should be certified by an officer not below the rank of Executive Engineer or equivalent and should be obtained in sealed cover.

7.0 Evaluation criteria

7.1 The details submitted by the bidders will be evaluated in the following manner:

7.1.1 The initial criteria prescribed in Para 6.1 to 6.9 above in respect of experience of
similar class of works completed, bidding capacity and financial turn over etc. will first be
scrutinized and the bidder’s eligibility for the work is determined.
7.1.2 The bidders qualifying the initial eligibility criteria above will be evaluated for
following attributes by scoring method on the basis of details furnished by them.

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Financial strength (Form ‘A’ &amp; ‘B’)</td>
<td>20</td>
</tr>
<tr>
<td>(b) Experience in similar nature of work during last seven years (Form ‘C’)</td>
<td>20</td>
</tr>
<tr>
<td>(c) Performance on works (Form ‘E’) – Quality</td>
<td>15</td>
</tr>
<tr>
<td>(d) Performance on works (Form ‘E’) – Time over run</td>
<td>20</td>
</tr>
<tr>
<td>(e) Personnel and Establishment (Form “F”&amp;”G”)</td>
<td>10</td>
</tr>
<tr>
<td>f) Plant &amp; Equipment (Form “H”)</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100 marks</strong></td>
</tr>
</tbody>
</table>

To become eligible for short listing the bidder must secure at least fifty percent marks in each attributes and sixty percent marks in aggregate.
RGCB, however, reserves the right to restrict the list of such qualified contractors to any number deemed suitable by it.
7.2 Even though a bidder may satisfy the above requirements, he would be liable to disqualification if he has:
(a) Made misleading or false representation or deliberately suppressed the information in the forms, statements and enclosures required in the eligibility criteria document,
(b) Record of poor performance such as abandoning work, not properly completing the contract, or financial failures / weaknesses etc.

**8.0 Financial information**
Bidder should furnish the following financial information:

Annual financial statement for the last five year in (Form “A”) and solvency certificate in (Form “B”)

**9.0 Experience in works highlighting experience in similar works**

9.1 Bidder should furnish the following:
(a) List of all works of similar nature successfully completed during the last seven years in (Form “C”).
(b) List of the projects under execution or awarded in (Form “D”).
9.2 Particulars of completed works and performance of the bidder duly authenticated/certified by an officer not below the rank of Executive Engineer or equivalent should be furnished separately for each work completed or in progress in (Form “E”).
9.3 Information in (Form “D”) should be complete and no work should be left out.

10.0 Organization information
Bidder is required to submit the information in respect of his organization in Forms “F” & “G”

11.0 Construction plant and equipment
Bidder should furnish the list of construction plant and equipment including steel shuttering, centering and scaffolding to be used in carrying out the work. (In Form “H”). Details of any other plant & equipment required for the work not included in Form “F” and available with the applicant may also be indicated.

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 Technical Bids, 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 who choose to be present. The bid shall remain valid for a period of 90 days from the date of opening of Technical bids.

14.0 Award criteria
14.1 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.

14.2 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.

15.0 Earnest Money
The Earnest money should be in any one of the following forms.
i. Deposit at call Receipt of a scheduled bank guaranteed by the Reserve Bank of India.
ii. Banker’s cheque of a scheduled Bank.
iii. Demand draft of a scheduled Bank.
iv. Fixed deposit receipt of a scheduled Bank.

A part of earnest money is acceptable in the form of a bank guarantee also. In such cases 50% of EMD or Rs.20.00 lakhs whichever is less will have to be deposited in the shape prescribed above and balance can be accepted in form of Bank guarantee issued by a scheduled Bank. The Bank guarantee submitted as part of earnest money shall be valid for a period of six months or more from the date of submission of the tender.

16. Submission of Tender
The tenders are to be submitted in two separate envelopes, each sealed and clearly identified with envelope number and contents as indicated vide 16.1 below. The two envelopes shall be contained in a large envelope super scribed “ Tender for “Establishment of RGCB Bio Innovation Research Center at Akkulam in Thiruvananthapuram District, Kerala State Phase – I Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil & Related MEP Works including site development and connected Infrastructure (Composite Contract)”

16.1  Tender duly filled in, signed and sealed, should be addressed and hand delivered/sent to the office of the Controller of Administration, RGCB, Thiruvananthapuram, so as to reach before 2.30 PM on 03/12/2015.

16.2  The Tender Document will comprise of the following:
A.  Eligibility Criteria & Conditions of contract - Volume I
B.  Technical Specifications - Volume II
C.  Bill of Quantities - Volume III
D.  Tender Drawings along With soft copy in CD

The Tenderers have to return all the above in 2 Envelopes while submitting the tender after duly filling in, signing and stamping as detailed below.

16.2.1   Envelope - 1
   a)  Volume I of the Tender Document including all certificates/documents regarding the eligibility criteria as per the enclosed formats.
   b)  Earnest Money Deposit of Rs.67 Lakhs
   c)  Certificate regarding satisfying the eligibility criteria in the enclosed format.
   e)  Signed copies of Tender Drawings along with CD containing the Tender Drawings(duly signed by the tenderer with CD marker)

This envelope shall be super scribed” Envelope I – Tender for “Establishment of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase – I Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil & Related MEP Works including site development and connected Infrastructure (Composite Contract)”

16.2.2 Envelope 2

This envelope shall contain only Bill of Quantities (Volume III of Tender Document) duly filled in and signed on each page by the Tenderer. No commercial or technical condition or qualification of any sort shall be indicated by the tenderer in the Envelope No2 and if otherwise the tender shall be liable to be rejected. This envelope shall be super scribed “Envelope No2 –Bill of Quantities”.

17.  Tender shall remain open for acceptance by the RGCB for a period of 90 DAYS from the date of opening of Technical bids which period may be extended by mutual agreement and the Bidder shall not cancel or withdraw the tender during this period.
18. This being an item rate tender only rate quoted shall be considered. Rates are to be quoted by the tenderer in figures and words so that there is no discrepancy in the rates written in figures and words. However if a discrepancy is found the rates which correspond with the amount worked out by the contractor shall be taken as correct. If the amount of an item is not worked out by the contractor or if it does not correspond with the rates written either in figures or in words then the rates quoted by the contractor in words shall be taken as correct. Where the rates quoted by the contractor in figures and in words tally, but the amount is not worked out correctly the rates quoted by the contractor will be taken as correct and not the amount. In the event no rate has been quoted for any item(s) leaving space both in figure(s) word(s) and amount blank it will be presumed that the contractor has included the cost of this/these item(s) in other items and rate for such item(s) will be considered as zero and work will be required to the executed accordingly.

19. In the case of any tender where unit rate of any item/items appear unrealistic such tender will be considered as unbalanced and in case the tenderer is unable to provide satisfactory explanation such tender is liable to be disqualified and rejected.

20. All rates shall be quoted on the tender form. The amount for each item should be worked out and requisite totals given. Special care should be taken to write the rate in figure as well as in words and the amount in figures only.

21. The tender includes in addition to building works all other works such as sanitary and water supply installation, drainage installation, electrical works, air conditioning and firefighting works etc. The tenderer must associate himself with Agencies of appropriate class Competent to carry out these works.

22. Each page of the tender documents should be signed by the person or persons submitting the tender in token of his/her having acquainted himself/themselves with the General conditions of contract, Specifications, Special conditions, Drawings etc. Any tender with any of the documents unsigned shall be liable for rejection.

23. The tender submitted on behalf of a Firm shall be signed by all partners of the Firm or by a partner who has the necessary authority on behalf of the Firm to enter into the proposed contract.

24. The work in general shall be carried out in accordance with the relevant CPWD specifications with up to date correction slips and technical specifications included for non-schedule items.

25. The order of preference in case of any discrepancy in specifications shall be dealt in the order of priority as follows:
   a) Nomenclature of item as per schedule of quantities.
   b) Technical Specifications of the Tender document.
   c) Architectural/Structural drawings and specifications mentioned in drawings.
   d) CPWD specifications for Civil, Electrical etc. as applicable.
   e) Indian standard specifications of BIS.
   f) Manufacturers specifications.
   g) Sound Engineering practice as per direction of the RGCB.
A reference made to any Indian standard specification in these documents, shall imply reference to the latest version of that standard including such revisions/amendments as issued by the Bureau of Indian Standards up to the last date of receipt of tenders. The bidder shall keep at his own cost all such publication of relevant Indian standards applicable to the work at site.

26. The bidder shall study carefully the building drawings, Specification, Schedule of quantities and Conditions of the tender documents to fully appreciate the scope of work before quoting his rates.

27. The earnest money deposit, performance guarantee amount and security deposits will not bear any interest whatsoever.

28. Income tax, Surcharge and cess if any, work contract tax and contribution to construction workers welfare fund etc. will be deducted from the bills and remitted to the respective departments and necessary certificates issued to the contractor. The gross bill value will be considered for deducting the Income tax and work contract taxes. The bidders have to remit the service tax direct to the concerned department if applicable and receipts produced for claiming reimbursement.

29. The rates quoted in the tender shall include all charges for clearing of site before commencement as well as after completion, water and electric consumptions, meters, double scaffolding, centering, boxing, staging, plastering, timbering, pumping water including bailing out, fencing, hoarding plant and equipment, storage sheds watching and lighting by night as well as day including Sundays and holidays temporary electric supply, protection of the public and safety of adjacent roads, streets, cellars, walls buildings and other structure and remove any or all such centering, scaffoldings staging, Shuttering, Shoring etc. as occasions shall require or when ordered to do so and the rates quoted shall be deemed to be for finished work to be measured at site. The rates shall also be firm and shall not be subject to exchange variation, labour condition, fluctuation in rates of freights etc., or any condition whosoever. Bidders must include in their rates, sales tax, contribution to welfare funds, excise duty, octroi, work contract taxes and any other tax or levies applicable.

30. Time allowed for carrying out the work as mentioned in the memorandum shall be strictly observed by the bidder and it shall be reckoned from the 15th day after the date of issue of letter of. The work shall be proceeded with all due diligence on the part of the bidder throughout the stipulated period of the contract (time being deemed to be the essence of the contract).

31. The successful bidder is bound to carry out any item of work necessary for the satisfactory completion of the work even if the items are not included in the schedule of quantities as per the relevant clauses of the contract.

32. The rates quoted by the bidder shall include expenditure for providing water supply required for the work. The contractor shall make his own arrangement for the supply of
potable water, including obtaining water Authority connection for supply of water for labour. All charges for water shall be borne by him. If KWA water is not available and should it become necessary for the contractor to bore wells for obtaining water for construction purposes or to bring water from outside by tankers the owner shall not be liable to pay any charges in connection therewith.

The rate quoted in the tender shall also include electricity consumption charges for power supply. If power is available at site the contractor shall, have to make his own arrangement to obtain power connections and maintain at his own expense lighting arrangements and power supply, and shall pay for the electricity consumed. The owner shall render all possible assistance to the contractor to obtain requisite permission from various authorities, but the responsibility for obtaining the same shall be that of the contractor.

33. The contractor has to deal with KWA for arranging water supply connection. Fee for permanent connection shall be paid by owner.

34. The contractor shall strictly comply with the provisions of CPWD safety code annexed hereto.

Controller of Administration
SECTION III
INFORMATION REGARDING ELIGIBILITY

LETTER OF TRANSMITTAL

From:

To
Controller of Administration, RGCB

Subject: Submission of bids for the work of

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 H 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 solvency certificate and authorize the Controller of Administration to approach the Bank issuing the solvency certificate to confirm the correctness thereof. I/we also authorize Controller of Administration 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 works:

<table>
<thead>
<tr>
<th></th>
<th>Name of Work</th>
<th>Certificate from</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>.......................</td>
<td>.......................</td>
</tr>
</tbody>
</table>

Enclosures:

Date of submission:
FORM ‘A’
FINANCIAL INFORMATION

I. 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).

Years

<table>
<thead>
<tr>
<th>Year</th>
<th>(i) Gross Annual turnover on construction works</th>
<th>(ii) Profit/Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

II. Financial arrangements for carrying out the proposed work.

III. Details of Solvency Certificate from Bankers of the bidder in the prescribed Form “B”.

Signature of Chartered Accountant with Seal

Signature(s) of Bidder(s).

FORM ‘B’
FORM OF BANKERS’ CERTIFICATE

This is to certify that to the best of our knowledge and information that M/s./ Sh…………………………………………………………………………………… having marginally noted address, a customer of our bank are/is respectable and can be treated as good for any engagement upto 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, in sealed cover addressed to tendering authority.
(2) In case of partnership firm, certificate should include names of all partners as recorded with the Bank
FORM ‘C’
DETAILS OF ALL WORKS OF SIMILAR CLASS COMPLETED DURING THE LAST SEVEN YEARS

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Name of Work/project and location</th>
<th>Owner of sponsoring organization</th>
<th>Cost of work in crores of rupees</th>
<th>Date of common cement as per contract</th>
<th>Stipulated date of completion</th>
<th>Actual date of completion</th>
<th>*Litigation arbitration cases pending / in progress with details</th>
<th>Name and address/ telephone number of officer to whom reference may be made</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
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</table>

*Indicate gross amount claimed and amount awarded by the Arbitrator.

Certified that the above list of works is complete and no work has been left out and that the information given is correct to my knowledge and belief.

Signature of Bidder (s)
## FORM‘D’
### PROJECTS UNDER EXECUTION OR AWARDED

<table>
<thead>
<tr>
<th>SL NO</th>
<th>Name of Work/project and location</th>
<th>Owner of sponsoring organization</th>
<th>Cost of work in crores of rupees</th>
<th>Date of common cement as per contract</th>
<th>Stipulated date of completion</th>
<th>Actual date of completion</th>
<th>*Litigation arbitration cases pending /in progress with details</th>
<th>Name and address/ telephone number of officer to whom reference may be made</th>
<th>Remarks</th>
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</thead>
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</table>

Certified that the above list of works is complete and no work has been left out and that the information given is correct to my knowledge and belief.

Signature of Bidder (s)
FORM ‘E’
PERFORMANCE REPORT OF WORKS REFERRED TO IN FORMS “B” & “C”

1. Name of work/project & location
2. Agreement no.
3. Estimated cost
4. Tendered cost
5. Date of start
6. Date of completion

(i) Stipulated date of completion
(ii) Actual date of completion

7. Amount of compensation levied for delayed completion, if any
8. Amount of reduced rate items, if any
9. Performance Report

(1) Quality of work  Very Good/Good/Fair/Poor
(2) Financial soundness Very Good/Good/Fair/Poor
(3) Technical Proficiency Very Good/Good/Fair/Poor
(4) Resourcefulness  Very Good/Good/Fair/Poor
(5) General Behavior  Very Good/Good/Fair/Poor

Dated: Executive Engineer or Equivalent
FORM “F”
STRUCTURE & ORGANISATION

1. Name & address of the bidder
2. Telephone no. /Telex no./Fax no.
3. Organizational status of the bidder (attach copies of original document defining the legal status) (Department/Government Organization/PSU etc.)
4. Particulars of registration with various Government Bodies (attach attested photocopy)

Organization/Place of registration                  Registration No.
  i.
  ii.
  iii.

5. Names and titles of Directors & Officers with designation to be concerned with this work.
6. Designation of individuals authorized to act for the organization
7. Was the bidder ever required to suspend construction for a period of more than six months continuously after he commenced the construction? If so, give the name of the project and reasons of suspension of work.
8. Has the bidder or any constituent partner in case of partnership firm, ever abandoned the awarded work before its completion? If so, give name of the project and reasons for abandonment.

10. Any other information considered necessary but not included above.

Signature of Bidder(s)
**FORM ‘G’**
DETAILS OF TECHNICAL & ADMINISTRATIVE PERSONNEL TO BE EMPLOYED FOR THE WORK

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Designation</th>
<th>Total Number</th>
<th>Number available for this Work</th>
<th>Name</th>
<th>Qualifications</th>
<th>Professional experience and details of Work Carried out</th>
<th>How these would be involved in this</th>
<th>Remarks</th>
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</thead>
<tbody>
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</table>

Signature of Bidder(s)

**FORM ‘H’**
DETAILS OF CONSTRUCTION PLANT AND EQUIPMENT LIKELY TO BE USED IN CARRYING OUT THE WORK.

<table>
<thead>
<tr>
<th>Sl,</th>
<th>Name of Equipment</th>
<th>Nos</th>
<th>Capacity or type</th>
<th>Age</th>
<th>Condition</th>
<th>Ownership status</th>
<th>How these would be involved in this</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Earth moving equipment</td>
<td>1</td>
<td>Excavators (various</td>
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<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of Equipment</th>
<th>Nos</th>
<th>Capacity or type</th>
<th>Age</th>
<th>Condition</th>
<th>Ownership status</th>
<th>How these would be involved in this</th>
<th>Remarks</th>
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<td>4</td>
<td>5</td>
<td>Pre presently owned</td>
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<tr>
<td>Equipment for hoisting &amp; lifting</td>
<td>1. Tower</td>
<td>2. Builder’s hoist</td>
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<tr>
<td>Equipment for concrete work</td>
<td>1. Concrete batching plant</td>
<td>2. Concrete pump</td>
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<td>3. Concrete transit mixer</td>
<td>4. Concrete mixer (Diesel)</td>
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<td>5. Concrete mixer(electrical)</td>
<td>6. Needle vibrator (petol)</td>
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<td>8. Table vibrator(elec/petrol)</td>
<td>Equipment for Building Work</td>
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<td>7. Welding generators</td>
<td>1. Block making machine</td>
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<td>8. Welding transformer</td>
<td>2. Bar bending machine</td>
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<td>10. Cube testing Machine.</td>
<td>3. Bar cutting machine</td>
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<td>11. Steel shuttering</td>
<td>4. Wood thickness planer</td>
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<td>12. Steel scaffolding</td>
<td>5. Drilling machine</td>
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<td>Equipment for Road Work</td>
<td>1. Road rollers</td>
<td>2. Bitumen paver</td>
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<td>Equipment</td>
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<td>3. Hot mix plant</td>
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<td>5. Earth rammer</td>
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<td>6. Vibratory road rollers</td>
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<td>Equipment for Transportation</td>
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<td>Pneumatic equipment</td>
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<td>1. Air compressor (diesel)</td>
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<td>De-watering equipment</td>
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Signature of Authorized Signatory
### Criteria for Technical Evaluation

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial strength</td>
<td>(20 marks)</td>
</tr>
<tr>
<td>(i) Average annual turnover</td>
<td>(i) 60% marks for minimum eligibility criteria</td>
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<tr>
<td></td>
<td>(ii) 100% marks for twice the minimum eligibility criteria or more</td>
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<tr>
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<td>In between (i) &amp; (ii) – on pro-rata basis</td>
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<tr>
<td>(ii) Solvency Certificate</td>
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<tr>
<td>Experience in similar Class of works</td>
<td>(20 marks)</td>
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<tr>
<td></td>
<td>(i) 60% marks for minimum eligibility criteria</td>
</tr>
<tr>
<td></td>
<td>(ii) 100% marks for twice the minimum eligibility criteria or more</td>
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<tr>
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<td>In between (i) &amp; (ii) – on pro-rata basis</td>
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<p>| Performance on (20 marks)     |                                                                            |</p>
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Calculation For Points</th>
<th>Score</th>
<th>Maximum Marks</th>
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</thead>
<tbody>
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<td>1.002.003.00 &gt; 3.50201510</td>
<td>10</td>
<td>20</td>
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<tr>
<td>(i) Without Levy of compensation</td>
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<tr>
<td>(ii) With levy of compensation</td>
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<tr>
<td>(iii) Levy of compensation not decided</td>
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</table>

TOR = AT/ST, where AT = Actual Time; ST = Stipulated Time.

**Note:** Marks for value in between the stages indicated above is to be determined by straightline variation basis.

Performance of works (Quality) (15 marks)

(i) Very Good

(ii) Good

... etc...

Personnel and Establishment (Max. 10 marks)

(i) Graduate Engineer

(ii) Diploma holder Engineer

(iii) Supervisory/Foreman

Plant & Equipment (Max. 15 marks)

3 marks for each

2 marks for each up to Max. 4 marks

1 mark for each up to Max. 3 marks
<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>(i)</td>
<td>Truck/Tippers/Transit mixer 1 mark for each upto Max. 2 marks</td>
</tr>
<tr>
<td>(ii)</td>
<td>Steel shuttering 2 marks for each 800sqm upto maximum 4 marks</td>
</tr>
<tr>
<td>(iii)</td>
<td>Crane 2 marks for each Max. 4 marks</td>
</tr>
<tr>
<td>(vi)</td>
<td>Building Hoist 1 mark for each Max. 2 marks</td>
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<tr>
<td>(v)</td>
<td>Excavator 1 mark for each Max. 2 marks</td>
</tr>
<tr>
<td>(vi)</td>
<td>Batch Mix Plant 2 marks for each Max. 4 marks</td>
</tr>
</tbody>
</table>
FORM OF TENDER

Place:
Date:

To
The Controller of Administration
Rajiv Gandhi Centre for Biotechnology
Poojappura, Thiruvananthapuram – 695 014

Dear Sir,

Having examined the drawings, specifications, designs and schedule of quantities relating to the work specified in the memorandum hereinafter set out and having examined the site of work specified in the memorandum and having acquired the requisite information relating thereto as affecting the tender, I/we hereby offer to execute the work specified in the said memorandum mentioned within the time specified in the said memorandum at the rates mentioned in the attached schedule of quantities and in accordance in all respects with the specifications, design and drawings and instructions in writing referred to in Conditions of contract, General conditions of contract, Special conditions, Articles of agreement and with such materials as are provided for by and in all other respects in accordance with such conditions so far as they may be applicable.

MEMORANDUM

1. (a) Description of work - Establishment of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase. I – Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil & Related MEP works including site development and connected Infrastructure (Composite contract)

(b) Probable amount of contract - Rs. 56.59 Crores.

(c) Earnest Money - Rs. 67 Lakhs

(d) Performance Guarantee - 5% of Tendered Amount

(e) Time allowed for completion of the work - 18 months

(f) Security deposit - 2.5% of tendered amount

2. Should this tender be accepted, I/we hereby agree to abide by and fulfill the terms and provision of the said conditions of contract annexed hereto so far as they may be
applicable or in default thereof to forfeit and pay to RGCB, the amount mentioned in the
said conditions.

3. I/we have deposited a sum of Rs. ................./- as earnest money with the RGCB
which amount is not to bear any interest. Should I/we fail to submit the performance
guarantee and execute the contract agreement when called upon to do so I/we hereby agree
that this sum shall be forfeited to RGCB

4. It is also hereby specifically agreed that this tender will remain firm for a period of 90 days
from the date of opening the Technical bid and that if the tender is withdrawn before that
date the Earnest money deposit given may be forfeited to RGCB.

Yours faithfully

Signature of the Authorized Signatory
RAJIV GANDHI CENTRE FOR BIO TECHNOLOGY
Item Rate Tender & Contract for Works

Name of Work: Establishment of RGCB Bio Innovation Research Center at Akkulam in Thiruvananthapuram District, Kerala State Phase. I – Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil & Related MEP works including site development and connected Infrastructure (Composite contract)

(i) To be submitted by 2.30 PM on 03/12/2015 to Controller of Administration, Rajiv Gandhi Centre of Biotechnology, Poojappura, Thiruvananthapuram 695014.

(ii) To be opened in presence of tenderers who may be present at 3:30 PM on 03/12/2015 in the office of Controller of Administration, Rajiv Gandhi Centre of Biotechnology, Poojappura, Thiruvananthapuram – 695014.

Issued to ……………………………………………………..
Signature of officer issuing the documents ………………………
Designation ………………………………………………………
Date of Issue ………………………………………

………………………………………………………………………..
COMPOSITE TENDER

I/We have read and examined the notice inviting tender, schedule of quantities Specifications applicable, Drawings, 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 within the time specified in Schedule ‘F’ schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions in writing referred to in Clause 11 of the Conditions of contract we agree to keep the tender open for ninety (90) days from the date of opening of technical bid and not to make any modification in its terms and conditions.

A sum of Rs……………/- is hereby forwarded in the form of 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 Director, RGCB or his successors, in office shall without prejudice to any other right or remedy, be at liberty to forfeit 50% the said earnest money absolutely. Further, if I/We fail to commence work as specified, I/We agree that the Director, RGCB or his successors in office shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the said earnest money and the performance guarantee absolutely, otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to 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 General conditions of contract. 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 RGCB in future forever. Also, if such a violation comes to the notice of Department before date of start of work, the RGCB shall be free to forfeit theentire 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 there from to any person other than a person to whom I/We am/are authorized to communicate the same or use the information in any manner prejudicial to the safety of RGCB

Dated: ……………………….

Signature of Witness: Signature of Contractor ………………………

Address: Postal Address:……………………

Occupation:
ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on behalf of the Director, RGCB for a sum of Rs....................
(Rupee..............................................................................................................................
......................)
The letters referred to below shall form part of this contract agreement:-

(a)
(b)
(c)

Signature: .....................

Date: .................................. Controller of Administration
INTEGRITY PACT

To

M/s. ………………………………

Subject: Tender for Establishment of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase. I – Construction of Research Block with Research Facility, Hostel Buildings, Civil & Related MEP works including site development and connected Infrastructure (Composite contract) NIT No. RGCB/C2A/2101/G/2012/01/15-16

Dear Sir,

It is here by declared that RGCB is committed to follow the principle of transparency equity and competitiveness in public procurement.

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

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

Yours faithfully

Controller of Administration
INTEGRITY PACT

To
Controller of Administration
Rajiv Gandhi Centre for Biotechnology
Poojappura, Thiruvananthapuram – 14

Subject: Tender for Establishment of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase. I – Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil & Related MEP works including site development and connected Infrastructure (Composite Contract)

Dear Sir,

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

I/we agree that the Notice Inviting Tender is an invitation to offer made on the condition that I/We will sign the enclosed integrity agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process. I/We acknowledge that THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the Tender.

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

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

Yours faithfully

(Duly authorized signatory of the bidder)
INTEGRITY AGREEMENT

This Integrity Agreement is made at Thiruvananthapuram on this ............. day of ..............2015

BETWEEN

Director, Rajiv Gandhi Centre for Bio technology represented by Controller of Administration, RGCB, Thiruvananthapuram (Hereinafter referred as the ‘Principal/Owner’, which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

(Name and Address of the Individual/firms/Company) through (Details of duly authorized signatory) (Herein after referred to as the “Bidder/Contractor” and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

Preamble

WHEREAS the Principal/Owner has floated the Tender No. ........................./ (hereinafter referred to as “Tender/Bid”) and intends to award, under laid down organizational procedure, contract for Establishment RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase. I - Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil & Related MEP works including site development and connected Infrastructure (Composite contract) hereinafter referred to as the “Contract”.

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

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

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

Article 1: Commitment of the Principal/Owner

1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:
(a) No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

(b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidders(s) confidential/additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the (c) Contract execution.

(d) The Principal/Owner shall endeavor to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

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

1) It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to RGCB/Department all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.

2) The Bidder(s)/Contractor(s) commit himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:

a) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner’s employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.

b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.

c) The Bidder(s)/Contractor(s) will not commit any offence under relevant IPC/PC Act. Further the Bidder(s)/Contract(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details including information contained or transmitted electronically.

d) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly Bidder(s)/Contractor(s) of Indian
Nationality shall disclose names and address of foreign agents/representatives, if any. Either the India agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participate in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.

e) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose (with each tender as per proforma enclosed) any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

3) The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

4) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a willful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to detriment of the RGCB interests.

5) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/her reputation or property to influence their participation in the tendering process).

**Article 3: Consequences of Breach**

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

1) If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days’ notice to the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be forever or for a limited period as decided by the Principal/Owner.

2) Forfeiture of EMD/Performance Guarantee/Security Deposit: If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit
the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Bidder/Contractor.

3) Criminal Liability: If the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employees or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of Indian Penal code (IPC)/Prevention of Corruption Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

Article 4: Previous Transgression
1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.

2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/holiday listing of the Bidder/Contractor as deemed fit by the Principal/Owner.

3) If the Bidder/Contractor can prove that he has resorted/recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

Article 5: Equal Treatment of all Bidders/Contractors/Subcontractors
1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Sub-contractors/sub-vendors.

2) The Principal/Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.

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

Article 6: Duration of the Pact
This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded.

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

Article 7: Other Provisions
1) This Pact is subject to Indian Law, place of performance and jurisdiction is the Headquarters of the Principal/Owner, who has floated the Tender.

2) Changes and supplements need to be made in writing. Side agreements have not been made.
3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.

4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement/Pact, any action taken by the Owner/Principal in accordance with this Integrity Agreement/Pact or interpretation thereof shall not be subject to arbitration.

Article 8: Legal and Prior Rights

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

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above

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

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

WITNESSES:

1. ............................................. (Signature, name and address)

2. ............................................. (Signature, name and address)

Place:
Date:
GENERAL CONDITIONS OF CONTRACT

Definitions

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

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

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

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

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

(iv) **Architect** means Consortium of Architect Hafeez Contractor and M/s Iyer and Mahesh, who has been appointed by the client for Architectural planning/Engineering Design and Project Management.

(v) The **Project Manager** means the Engineering Officer of the Architect, who shall supervise and be in charge of the work.

(vi) **RGCB** means Rajiv Gandhi Centre for Biotechnology, Thiruvananthapuram
(vii) **Accepting Authority** shall mean the authority mentioned in Schedule ‘F’.

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

**Market Rate** shall be the rate as decided by RGCB on the basis of the cost of materials and labour at the site where the work is to be executed plus the percentage mentioned in Schedule ‘F’ to cover all overheads and profits.

**Schedule(s)** referred to in these conditions shall mean the relevant schedule(s) annexed to the tender papers or the standard Schedule of Rates of CPWD mentioned in Schedule ‘F’ hereunder, with the amendments thereto issued up to the date of receipt of the tender.

(ix) **Department** means RGCB.

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

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

(xii) **Date of commencement of work**: The date of commencement of work shall be the date of start as specified in schedule ‘F’ or the first date of handing over of the site, whichever is later, in accordance with the phasing if any, as indicated in the tender document.
include feminine gender and vice versa.

4. Headings and Marginal notes to these General Conditions of Contract shall not be deemed to form part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.

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

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

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

8. The several documents forming the Contract are to be taken as mutually explanatory of one another, detailed drawings being followed in preference to small scale drawing and figured dimensions in preference to scale and special conditions in preference to General Conditions.

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

(i) Description of Schedule of Quantities.

(ii) Particular Specification and Special Condition, if any.

(iii) Drawings.

(iv) CPWD Specifications.

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

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

8.3 Any error in description, quantity or rate in Schedule of Quantities or any omission there from shall not vitiate the Contract or release the Contractor from the execution of the whole or any part of the works comprised therein according to drawings and specifications or from any of his obligations under the contract.

Sign of Contract

9. The successful tenderer/contractor, on acceptance of his tender by the Accepting Authority,

shall, within 15 days from the stipulated date of start of the work, sign the contract consisting of The notice inviting tender, all the documents including drawings, if any, forming the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.
CLAUSES OF CONTRACT

Performance Guarantee

CLAUSE 1 (i) The contractor shall submit an irrevocable Performance Guarantee of 5% (Five percentage) of the tendered amount in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement, (not withstanding and/or without prejudice to any other provisions in the contract) within period specified in Schedule ‘F’ from the date of issue of letter of acceptance. This period can be further extended by the RGCB up to a maximum period as specified in schedule ‘F’ on written request of the contractor stating the reason for delays in procuring the Performance Guarantee, to the satisfaction of RGCB. This guarantee shall be in the form of Cash (in case guarantee amount is less than Rs. 10,000/-) or Deposit at Call receipt of any scheduled bank/Banker’s Cheque of any scheduled bank/Demand Draft of any scheduled bank/Pay Order of any scheduled bank (in case guarantee amount is less than Rs. 1,00,000/-) or RGCB Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the form annexed hereto. In case a fixed deposit receipt of any Bank is furnished by the contractor to the RGCB as part of the performance guarantee and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the RGCB to make good the deficit.

(ii) The Performance Guarantee shall be initially valid up to the stipulated date of completion plus 60 days beyond that. In case the time for completion of work gets enlarged, the contractor shall get the validity of Performance Guarantee extended to cover such enlarged time for completion of work. After recording of the completion certificate for the work by the competent authority, the performance guarantee shall be returned to the contractor, without any interest. However, in case of contracts involving maintenance of building and services/any other work after construction of same building and services/other work, then 50% of Performance Guarantee shall be retained as Security Deposit. The same shall be returned year wise proportionately.

(iii) RGCB shall not make a claim under the performance guarantee except for amounts to which it is entitled under the contract (not withstanding and/or without prejudice to any other
provisions in the contract agreement) in the event of:

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

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

(iv) In the event of the contract being determined or rescinded under provision of any of the Clause/Condition of the agreement, the performance guarantee shall stand forfeited in full and shall be absolutely at the disposal of the RGCB.

Recovery of Security Deposit

CLAUSE 1 A

The person/persons whose tender(s) may be accepted (hereinafter called the contractor) shall permit RGCB at the time of making any payment to him for work done under the contract to deduct a sum at the rate of 2.5% of the gross amount of each running and final bill till the sum deducted will amount to security deposit of 2.5% of the tendered value of the work. Such deductions will be made and held by RGCB by way of Security Deposit

Unless he/they has/have deposited the amount of Security at the rate mentioned above in cash or in the form of Government Securities or fixed deposit receipts. In case a fixed deposit receipt of any Bank is furnished by the contractor to RGCB as part of the security deposit and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to RGCB to make good the deficit.

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

The security deposit as deducted above can be released against bank guarantee issued by a scheduled bank, on its accumulations to a minimum of Rs. 5 lac subject to the condition that amount of such bank guarantee, except last one, shall not be less than Rs. 5 lac. Provided further that the validity of bank guarantee including the one given against the earnest money shall be in conformity with provisions contained in clause 17 which shall be extended from time to time depending upon extension of contract granted under provisions of clause 2 and clause 5.

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

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

Note-3: Note 1 & 2 above shall be applicable for both clause 1 and 1A

**CLAUSE 2**

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

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

(i) Compensation @ 1.5 % per month of delay to be computed on per day basis on the
value of incomplete work

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

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

Incentive for early completion

CLAUSE 2A

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

When Contract can be Determined

CLAUSE 3

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

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

(ii) If the contractor has, without reasonable cause, suspended the progress of the work or has failed to proceed with the work with due diligence so that in the opinion of RGCB (which shall be final and binding) he will be unable to secure completion of the work by the date for completion and continues to do so after a notice in writing of seven days from the Project Manager.

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

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

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

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

(vii) If the contractor had secured the contract with RGCB as a result of wrong tendering or other non-bonafide methods of competitive tendering or commits breach of Integrity Agreement.

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

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

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

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

When the contractor has made himself liable for action under any of the above cases aforesaid, RGCB shall have powers:

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

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

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

CLAUSE 3A

In case, the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work or one month whichever is higher, either party may close the contract. In case contractor wants to close the contract, he shall give notice to RGCB stating the failure on the part of RGCB. In such eventuality, the Performance Guarantee of the contractor shall be refunded within 30 Days: If Performance Guarantee is not released within prescribed time limit, then a simple interest @ 0.25% per month shall be payable on Performance Guarantee amount to the contractor from the date of expiry of prescribed time limit. A compensation for such eventuality, on account of damages etc. shall be payable @ 0.25% of tendered amount subject to maximum limit of Rs. 10 lacs.

Contractor liable to pay Compensation even if action not taken under Clause 3

CLAUSE 4

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

**CLAUSE 5**

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

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

**PROGRAMME CHART**

(i) The Contractor shall prepare an integrated programme chart in MS Project/Primavera software for the execution of work, showing clearly all activities from the start of work to completion, with details of manpower, equipment and machinery required for the fulfilment of the programme within the stipulated period or earlier and submit the same
for approval to the Architect within ten days of award of the contract. A recovery of Rs. 5000/- shall be made on per day basis in case of delay in submission of the above programme.

(ii) The programme chart should include the following:

(a) Descriptive note explaining sequence of the various activities. (b) Network (PERT / CPM / BAR CHART).

(c) Programme for procurement of materials by the contractor.

Programme of procurement of machinery / equipment’s having adequate capacity, commensurate with the quantum of work to be done within the stipulated period, by the contractor. In addition to above, to achieve the progress of Work as per programme, the contractor must bring at site adequate shuttering material required for cement concrete and R.C.C. works etc. for three floors within one month from the date of start of work till the completion of RCC work as per requirement of work. The contractor shall submit shuttering schedule adequate to complete structure work within laid down physical milestone.

(iii) If at any time, it appears to RGCB that the actual progress of work does not conform to the approved programme referred above or after rescheduling of milestones, the contractor shall produce a revised programme within 7 (seven) days, showing the modifications to the approved programme to ensure timely completion of the work. The modified schedule of programme shall be approved by RGCB. A recovery of Rs. 5000/- shall be made on per day basis in case of delay in submission of the modified programme.

(iv) The submission for approval by RGCB of such programme or such particulars shall not relieve the contractor of any of the duties or responsibilities under the contract. This is without prejudice to the right of RGCB to take action against the contractor as per terms and conditions of the agreement.

(v) The contractor shall submit the progress report using MS Project/Primavera software with base line programme referred above for the work done during previous month to the Architect on or before 5th day of each month failing which a recovery Rs. 5000/- shall be made on per day basis in case of delay in submission of the monthly progress report.
5.2 If the work(s) be delayed by:-

(i) force majeure, or

(ii) abnormally bad weather, or

(iii) serious loss or damage by fire, or

(iv) civil commotion, local commotion of workmen, strike or lockout, affecting any of the trades employed on the work, or

(v) delay on the part of other contractors or tradesmen engaged by RGCB in executing work not forming part of the Contract, or

(vi) non-availability of stores, which are the responsibility of RGCB to supply or

(vii) non-availability or break down of tools and Plant to be supplied or supplied by RGCB or

(viii) Any other cause which, in the absolute discretion of RGCB is beyond the Contractor’s control.

then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the authority as indicated in Schedule ‘F’ but shall nevertheless use constantly his best endeavours to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of RGCB to proceed with the works.

5.3 Request for rescheduling of Milestones and extension of time, to be eligible for consideration, shall be made by the Contractor in writing within fourteen days of the happening of the event causing delay on the prescribed form to the authority as indicated in Schedule ‘F’. The Contractor may also, if practicable, indicate in such a request the period for which extension is desired.

5.4 In any such case the authority as indicated in Schedule ‘F’ may give a fair and reasonable extension of time and reschedule the milestones for completion of work. Such extension or rescheduling of the milestones shall be communicated to the Contractor by the authority as indicated in Schedule ‘F’ in writing, within 3 months or 4 weeks of the date of receipt of such request respectively. Non application by the contractor for extension of time/ rescheduling of the milestones shall not be a bar for giving a fair and reasonable extension/ rescheduling of the milestones by the authority as indicated in Schedule ‘F’ and this
shall be binding on the contractor.

**CLAUSE 6**

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

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

All measurements and levels shall be taken jointly by Architect or his authorized representative and by the contractor or his authorized representative from time to time during the progress of the work and such measurements shall be signed and dated by the Project Manager and the contractor or their representatives in token of their acceptance. If the contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties. If for any reason the contractor or his authorized representative is not available and the work of recording measurements is suspended by the Architect or his representative, the Architect and RGCB shall not entertain any claim from contractor for any loss or damages on this account. If the contractor or his authorized representative does not remain present at the time of such measurements after the contractor or his authorized representative has been given a notice in writing three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Project Manager or his representative shall be deemed to be accepted by the Contractor.

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

Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available, then a mutually agreed method shall be followed.
The contractor shall give, not less than seven days’ notice to the Architect or his authorized representative in charge of the work, before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Project Manager or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or the Project Manager’s consent being obtained in writing, the same shall be uncovered at the Contractor’s expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

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

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

**CLAUSE 6A**

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

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

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

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

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

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

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

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

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

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

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

**CLAUSE 6B**

The following percentage of contract rates shall be payable against the stages of work shown herein wherever applicable.

<table>
<thead>
<tr>
<th>SL No</th>
<th>Stage of Work</th>
<th>Machinery &amp; Equipment</th>
<th>All other items</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>After initial inspection (wherever specified) &amp; delivery at site in good condition on pro rata basis</td>
<td>80%</td>
<td>70%</td>
</tr>
</tbody>
</table>
When the major seasonal test cannot be carried out on commissioning of the installation due to any reason not attributable to the contractor, the installation will be handed over to RGCB for beneficial use after completion of successful running in test of 7 days subject to a minimum aggregate of 120 hours. The balance payment shall be released to the contractor on his furnishing a bank guarantee in the specified format from a schedule bank for an equivalent amount. The bank guarantee shall be valid for a period of 6 months. However, it will be extended till the successful completion of the major seasonal test. The bank guarantee shall be independent of the one furnished for performance guarantee.

The following shall be considered major seasonal test for the purpose of the above payment terms:

(a) Air-conditioning - Summer or monsoon
(b) Central heating system - Winter
(c) Cold room/Walk in cooler - Summer

**CLAUSE 7**

No payment shall be made for work, estimated to cost Rs. Twenty thousand or less till after the whole of the work shall have been completed and certificate of completion given. For works estimated to cost over Rs. Twenty thousand, the interim or running account bills shall be submitted by the contractor for the work executed on the basis of such recorded measurements on the format prescribed by RGCB in triplicate on or before the date of every month fixed for the same by RGCB. The contractor shall not be entitled to be paid any such interim payment if the gross work done together with net payment/adjustment of advances for material collected, if any, since the last such payment is less than the amount specified in Schedule ‘F’, in which case the interim bill shall be prepared on the appointed date of the month after the requisite progress is achieved. RGCB shall arrange to have the bill verified by taking or causing to be taken, where necessary, the requisite measurements of the work. In the event of the failure of the contractor to submit the bills,
RGCB shall prepare or cause to be prepared such bills in which event no
claims whatsoever due to delays on payment including that of interest
shall be payable to the contractor. Payment on account of amount
admissible shall be made by RGCB on certification by the Architect for
the sum to which the contractor is considered entitled by way of interim
payment at such rates as decided by RGCB. The amount admissible shall
be paid by 20th working day after the day of presentation of the bill by
the Contractor. In case of delay in payment of intermediate bills after 45
days of submission of bill by the contractor provided the bill submitted by
the contractor found to be in order, a simple interest @ 7.5% per annum
shall be paid to the contractor from the date of expiry of prescribed time
limit which will be compounded on yearly basis as final settlement and
adjustment of accounts or in any way vary or affect the contract.

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

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

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

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

RGCB on the basis of a certificate from the Architect to the effect that the work has been completed up to the level in question make interim advance payments without detailed measurements for work done (other than foundations, items to be covered under finishing items) up to lintel level (including sunshade etc.) and slab level, for each floor working out at 75% of the assessed value. The advance payments so allowed shall be adjusted in the subsequent interim bill by taking detailed measurements thereof as final settlement and adjustment of accounts or in any way vary or affect the contract.

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

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

**CLAUSE 8**

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

**CLAUSE 8A**

When the annual repairs and maintenance of works are carried out, the
splashes and droppings from white washing, colour washing, painting
etc., on walls, floor, windows, etc. shall be removed and the surface
cleaned simultaneously with the completion of these items of work in the
individual rooms, quarters or premises etc. where the work is done:
without waiting for the actual completion of all the other items of work in
the contract. In case the contractor fails to comply with the requirements
of this clause, RGCB shall have the right to get this work done at the cost
of the contractor either departmentally or through any other agency.
Before taking such action, ten days’ notice shall be given in writing to the
contractor.

**CLAUSE 8B**

The contractor shall submit completion plan as required vide General
Specifications for Electrical works (Part-I internal) 2013 and (Part-II
External) 1994 as applicable within thirty days of the completion of the
work.

In case, the contractor fails to submit the completion plan as aforesaid, he
shall be liable to pay a sum equivalent to 2.5% of the value of the work
subject to a ceiling of Rs.15,000 (Rs. Fifteen thousand only) as may be
fixed by RGCB and in this respect the decision of RGCB shall be final
and binding on the contractor.

The contractor shall submit completion plan for water, sewerage and
drainage line plan within thirty days of the completion of the work.
In case, the contractor fails to submit the completion plan as aforesaid, the department will get it done through other agency at his cost and actual expenses incurred plus Rs. 15,000/- for the same shall be recovered from the contractor.

**CLAUSE 9**

The final bill shall be submitted by the contractor in the same manner as specified in interim bills within three months of physical completion of the work or within one month of the date of the final certificate of completion furnished by the Architect whichever is earlier. No further claims shall be made by the contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by RGCB, will, as far as possible be made within a period of 6 months reckoned from the date of receipt of the bill by the Architect complete with account of materials issued by RGCB and dismantled materials.

In case of delay in payment of final bills after prescribed time limit, a simple interest @ 7.5% per annum shall be paid to the contractor from the date of expiry of prescribed time limit which will be compounded on yearly basis, provided the final bill submitted by the contractor found to be in order.

**CLAUSE 9A**

Payments due to the contractor may, if so desired by him, be made to his bank, registered financial, co-operative or thrift societies or recognized financial institutions instead of direct to him provided that the contractor furnishes to RGCB an authorization in the form of a legally valid document such as a power of attorney conferring authority on the bank; registered financial, co-operative or thrift societies or recognized financial institutions to receive payments and (2) his own acceptance of the correctness of the amount made out as being due to him by RGCB or his signature on the bill or other claim preferred against RGCB before settlement of the account or claim by payment to the bank, registered financial, co-operative or thrift societies or recognized financial institutions. While the receipt given by such banks; registered financial, co-operative or thrift societies or recognized financial institutions shall constitute a full and sufficient discharge for the payment, the contractor shall whenever possible present his bills duly receipted and discharged through his bank, registered financial, co-operative or thrift societies or recognized financial institutions.
Nothing herein contained shall operate to create in favour of the bank; registered financial, co-operative or thrift societies or recognized financial institutions any rights or equities vis-à-vis the Director RGCB.

**CLAUSE 10**

Materials supplied by RGCB will supply are shown in Schedule ‘B’ which also stipulates quantum, place of issue and rate(s) to be charged in respect thereof. The contractor shall be bound to procure them from RGCB.

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

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

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

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

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

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

**CLAUSE 10A**

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

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

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

The contractor shall, at his risk and cost, make all arrangements and shall provide all facilities as the Project Manager may require for collecting, and preparing the required number of samples for such tests at such time and to such place or places as may be directed by the Project Manager and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Project Manager or his authorized representative shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance in obtaining the right to such access.
The Architect shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, RGCB shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. RGCB shall also have full powers to require other proper materials to be substituted thereof and in case of default, RGCB may cause the same to be supplied and all costs which may attend such removal and substitution shall be borne by the Contractor.

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

**CLAUSE 10B**

(i) The contractor, on signing an indenture in the form to be specified by RGCB shall be entitled to be paid during the progress of the execution of the work up to 90% of the assessed value of any materials which are in the opinion of the Architect non-perishable, non-fragile and non-combustible and are in accordance with the contract and which have been brought on the site in connection therewith and are adequately stored and/or protected against damage by weather or other causes but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be recovered/deducted from the next payment made under any of the clause or clauses of this contract. Such secured advance shall also be payable on other items of perishable nature, fragile and combustible with the approval of RGCB provided the contractor provides a comprehensive insurance cover for the full cost of such materials. The decision of RGCB shall be final and binding on the contractor in this matter. No secured advance, shall however, be paid on high-risk materials such as ordinary glass, sand, petrol, diesel etc.

(ii) Mobilization advance not exceeding 10% of the tendered value may be given, if requested by the contractor in writing within one month of the order to commence the work. Such advance shall be in two or more instalments to be determined by RGCB at its sole discretion. The first instalment of such advance shall be released by RGCB to the contractor on a request made by the contractor to Architect in this behalf. The second and subsequent instalments shall be released by the Architect only after the contractor furnishes a proof of the satisfactory utilization of the
earlier instalment to the entire satisfaction of the Architect.

Before any instalment of advance is released, the contractor shall execute a Bank Guarantee Bond from Scheduled Bank for the amount equal to 110% of the amount of advance and valid for the contract period. This (Bank Guarantee from Scheduled Bank for the amount equal to 110% of the balance amount of advance) shall be kept renewed from time to time to cover the balance amount and likely period of complete recovery. Provided always that provision of Clause 10 B (ii) shall be applicable only when so provided in ‘Schedule F’.

**Interest & Recovery**

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

(iv) If the circumstances are considered reasonable by RGCB, the period mentioned in (ii) for request by the contractor in writing for grant of mobilization advance may be extended in the discretion of RGCB.

**Payment on Account of Increase in Prices/Wages due to Statutory Order(s)**

CLAUSE 10C

If after submission of the tender, the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied by RGCB in accordance with Clause 10 thereof) and/or wages of labour increases as a direct result of the coming into force of any fresh law, or statutory rule or order (but not due to any changes of rate in sales tax/VAT, Central/State Excise/Custom Duty) beyond the prices/wages prevailing at the time of the last stipulated date of receipt of tenders including extensions, if any, for the work during contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, then the amount of the contract shall accordingly be varied and provided further that any such increase shall be limited to the price/wages prevailing at the time of updated stipulated date of completion considering effect of extra work (extra time to be calculated on pro-rate basis only as cost of extra work x stipulated period/tendered amount).
If after submission of the tender, the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied by RGCB in accordance with Clause 10 thereof) and/or wages of labour as prevailing at the time of last stipulated date of receipt of tender including extensions, if any, is decreased as a direct result of the coming into force of any fresh law or statutory rules or order (but not due to any changes of rate in sales tax/VAT, Central/State Excise/Custom Duty), RGCB shall in respect of materials incorporated in the works (excluding the materials covered under Clause 10CA and not being material supplied by RGCB in accordance with Clause 10 hereof) and/or labour engaged on the execution of the work after the date of coming into force of such law statutory rule or order be entitled to deduct from the dues of the contractor, such amount as shall be equivalent to the difference between the prices of the materials and/or wages as prevailed at the time of the last stipulated date for receipt of tenders including extensions if any for the work and the prices of materials and/or wages of labour on the coming into force of such law, statutory rule or order. This will be applicable for the contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2.

RGCB may call books of account and other relevant documents from the contractor to satisfy himself about reasonability of increase in prices of materials and wages.

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

For this purpose, the labour component of the work executed during period under consideration shall be the percentage as specified in Schedule F, of the value of work done during that period and the increase/decrease in labour shall be considered on the minimum daily wages in rupees of any unskilled adult male mazdoor, fixed under any law, statutory rule or order.

**Clause 10 CC**

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<thead>
<tr>
<th>Payment due to Increase/Decrease in Prices/Wages</th>
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<tr>
<td>If the prices of materials (not being materials supplied or services rendered at fixed prices by the department in accordance with clause 10 thereof) and/or wages of labour required for execution of the work increase, the contractor shall be compensated for such</td>
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increase as per provisions detailed below and the amount of the contract shall accordingly be varied, subject to the condition that such compensation for escalation in prices and wages shall be available only for the work done during the stipulated period of the contract including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2. However, for the work done during the justified period extended as above, the compensation as detailed below will be limited to prices/wages prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on pro-rata basis only as cost of extra work x stipulated period/tendered cost). Such compensation for escalation in the prices of materials and labour, when due, shall be worked out based on the following provisions:

(i) The base date for working out such escalation shall be the last stipulated date of receipt of tenders including extension, if any.

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

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

Then, $M = C+F+I-J$
$W = 0.85 M$

(iii) Components for materials and labour shall be pre-determined for every work and incorporated in the conditions of contract attached to the tender papers included in Schedule ‘F’. The
decision of RGCB in working out such percentage shall be binding on the contractor.

(iv) The compensation for escalation for materials shall be worked out as per the formula given below:

\[ V_m = W \times \frac{X_m}{100} \times \frac{M_l - M_{l0}}{M_l} \]

\( V_m \) = Variation in material cost i.e. increase or decrease in the amount in Rs. to be paid or recovered.

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

\( X_m \) = Component of ‘material expressed as percent of the total value of work.

\( M_l \) = All India Wholesale Price Index for All Commodities for the period under consideration as published by Economic Advisor to Govt. of India, Ministry of Industry & Commerce. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the index prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on prorate basis only as cost of extra work x stipulated period/tendered cost, shall be considered.)

\( M_{l0} \) = All India Wholesale price index for all commodities valued at the last stipulated date of receipt of tender including extension, if any, as published by the economic Advisor, to Govt. of India. Of ministry of Industry and commerce.

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

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

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

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

\[
VL = \frac{W \times (LI - LI_0)}{100 LI_0}
\]

\(VL\) = Variation in labour cost i.e. amount of increase or decrease in rupees to be paid or recovered.

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

\(Y\) = Component of labour expressed as a percentage of the total value of the work.

\(LI\) = Minimum wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as applicable on the last date of the quarter previous to the one under consideration. (In respect of the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, the minimum wage prevailing on the last date of quarter previous to the quarter pertaining to updated stipulated date of Completion considering the effect of extra work (extra time to be calculated on prorate basis only as cost of extra work x stipulated period/tendered cost, shall be considered.)

\(LI_0\) = Minimum daily wage in rupees of an unskilled adult male mazdoor, fixed under any law, statutory rule or order as on the last stipulated date of receipt of tender including extension, if any.

(vii) The following principles will be followed while working out the compensation as per sub- Para (vi) above.
(a) The minimum wage of an unskilled male mazdoor mentioned in sub-Para (vi) above shall be the higher of the wage notified by Government of India, Ministry of Labour and that notified by the local administration both relevant to the place of work and the period of reckoning.

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

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

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

**Note:** Updated stipulated date of completion (period of completion plus extra time for extra work for compensation under clause 10C, 10CC, the factor of 1.25 taken into account for calculating the extra time under clause 12.1 for extra time shall not be considered while calculating the updated stipulated date of completion for this purpose in clause 10C, clause and clause 10CC.

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### CLAUSE 10 D

Dismantled Material RGCB Property

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

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### CLAUSE 11

Work to be Executed in Accordance with

The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and
otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings and instructions as are not included in the standard specifications of Central Public Works Department specified in Schedule ‘F’ or in any Bureau of Indian Standard or any other, published standard or code or, Schedule of Rates or any other printed publication referred to elsewhere in the contract.

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

**CLAUSE 12 :**

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

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

(i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value
(ii) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by RGCB.

### 12.2 Extra Items and Substituted Items

A. In the case of extra item(s) (items that are completely new, and are in addition to the items contained in the contract), the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, for the work and RGCB shall within prescribed time limit of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

In the case of substituted items (items that are taken up with partial substitution or in lieu of items of work in the contract), the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the following para.

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

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

B. In the case of contract items, substituted items, contract cum substituted items, which exceed the limits laid down in schedule F, the contractor may within fifteen days of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities, RGCB shall within prescribed time limit of receipt of the claims
supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

The prescribed time limit for finalising rates for Extra Item(s), Substitute Item(s) and Deviated Quantities of contract items is 60 days.

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

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

**12.5** For the purpose of operation of Schedule “F”, the following works shall be treated as works relating to foundation unless & otherwise defined in the contract:

(i) For buildings/compound walls

   All works up to Plinth level or 1.2 meters (4 feet) above ground level, whichever is lower excluding items of flooring and D.P.C but including base concrete below the floors

(ii) For abutments, piers, retaining walls of culverts and bridges, walls of water reservoirs etc.

   All works up to the bed of floor level

(iii) For retaining walls where floor level is not determinate,

   All works up to 1.2 meters above the average ground level or bed level.

(iv) For reservoirs/tanks (other

   All works up to 1.2 meters above
than overhead reservoir/tanks) the ground level

(v) For Basement

All works up to 1.2m above ground level or up to floor 1 level whichever is lower.

(vi) For Roads

All items of excavation and filling.

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

Foreclosure of contract due to Abandonment or Reduction in Scope of Work

CLAUSE 13

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

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

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

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

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

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

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

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

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

A compensation for such eventuality, on account of damages etc. shall be payable @ 0.5% of cost of work remaining incomplete on date of closure i.e. total stipulated cost of the work less the cost of work actually executed under the contract shall be payable.
CLAUSE 14

If contractor:

(i) At any time makes default during currency of work or does not execute any part of the work with due diligence and continues to do so even after a notice in writing of 7 days in this respect from the Architect; or

(ii) Commits default in complying with any of the terms and conditions of the contract and does not remedy it or takes effective steps to remedy it within 7 days even after a notice in writing is given in that behalf by the Architect; or Fails to complete the work(s) or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in the notice given in writing in that behalf by the Architect.

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

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

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

RGCB shall determine the amount, if any, is recoverable from the contractor for completion of the part work/ part incomplete work of any item(s) taken out of his hands and execute at the risk and cost of the contractor, the liability of contractor on account of loss or damage suffered by RGCB because of action under this clause shall not exceed 10% of the tendered value of the work.

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

Any excess expenditure incurred or to be incurred by RGCB in completing the part work/ part incomplete work of any item(s) or the excess loss of damages suffered or may be suffered by RGCB as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to RGCB in law or per as agreement be recovered from any money due to the contractor on any account, and if such money is insufficient, the contractor shall be called upon in writing and shall be liable to pay the same within 30 days.

If the contractor fails to pay the required sum within the aforesaid period of 30 days, RGCB shall have the right to sell any or all of the contractors' unused materials, constructional plant, implements, temporary building at site etc. and adjust the proceeds of sale thereof towards the dues recoverable from the contractor under the contract and if thereafter there remains any balance outstanding, it shall be recovered in accordance with the provisions of the contract.

In the event of above course being adopted by RGCB, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advance on any account or with a view to the execution of the work or the performance of the contract.

Suspension of Work

CLAUSE 15

(i) The contractor shall, on receipt of the order in writing of the Architect, (whose decision shall be final and binding on the contractor) suspend the progress of the works or any part thereof for such time and in such manner as the Architect may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons:

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

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

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

The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given on that behalf.

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

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

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

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

Action in case Work not done as per Specifications

CLAUSE 16

All works under or in course of execution or executed in pursuance of the contract, shall at all times be open and accessible to the inspection and supervision of the Architect / or any other agency authorized by RGCB and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present for that purpose. Orders given to the Contractor’s agent shall be considered to have the same force as if they had been given to the contractor himself.

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

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

**CLAUSE 17**

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

**Contractor to Supply Tools & Plants etc.**

**CLAUSE 18**

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

**CLAUSE 18 A**

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

**CLAUSE 18 B**

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

19H or under the C.P.W.D. Contractor’s Labour Regulations, or under the
Rules framed by RGCB from time to time for the protection of health and sanitary arrangements for workers employed by C.P.W.D. Contractors, RGCB will recover from the contractor, the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to the rights of RGCB under sub-section(2) of Section 20, and sub-section (4) of Section 21, of the Contract Labour (Regulation and Abolition) Act, 1970, RGCB shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by RGCB to the contractor whether under this contract or otherwise RGCB shall not be bound to contest any claim made against it under sub-section (1) of Section 20, sub-section (4) of Section 21, of the said Act, except on the written request of the contractor and upon his giving to RGCB full security for all costs for which RGCB might become liable in contesting such claim.

CLAUSE 19

The contractor shall obtain a valid licence under the Contract Labour (R&A) Act, 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, before the commencement of the work, and continue to have a valid license until the completion of the work. The contractor shall also abide by the provisions of the Child Labour (Prohibition and Regulation) Act, 1986.

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

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

CLAUSE 19A

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

CLAUSE 19 B

Payment of wages:

(i) The contractor shall pay to labour employed by him either directly or through subcontractors, wages not less than fair wages as defined in the C.P.W.D. Contractor’s Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the contract Labour (Regulation and Abolition)
Central Rules, 1971, wherever applicable.

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

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

(iv) (a) RGCB shall have the right to deduct from the moneys due to the contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfilment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the contract or non-observance of the Regulations.

(b) Under the provision of Minimum Wages (Central) Rules, 1950, the contractor is bound to allow to the labours directly or indirectly employed in the works one day rest for 6 days continuous work and pay wages at the same rate as for duty. In the event of default, RGCB shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labours and pay the same to the persons entitled thereto from any money due to the contractor by RGCB.

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

(vi) The contractor shall indemnify and keep indemnified RGCB against payments to be made under and for the observance of the laws aforesaid and the C.P.W.D. Contractor’s Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors.

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

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

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

CLAUSE 19C

In respect of all labour directly or indirectly employed in the work for the performance of the contractor’s part of this contract, the contractor shall at his own expense arrange for the safety provisions as per the Safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith. In case the contractor fails to make arrangement and provide necessary facilities as aforesaid, he shall be liable to pay a penalty of Rs.200/- for each default and in addition, RGCB shall be at liberty to make arrangement and provide facilities as aforesaid and recover the costs incurred in that behalf from the contractor.

CLAUSE 19 D

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

(1) the number of labourers employed by him on the work,

(2) their working yours

(3) the wages paid to them

(4) the accidents that occurred during the said for night showing the circumstances under which they happened and the extent of damage and injury caused by them, and

(5) The number of female workers who have been allowed maternity benefit according to Clause 19F and the amount paid to them.

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

CLAUSE 19 E

In respect of all labour directly or indirectly employed in the works for the performance of the contractor’s part of this contract, the contractor shall comply with or cause to be complied with all the rules framed by Government of India from time to time for the protection of health and sanitary arrangements for workers employed by contractors.

CLAUSE 19 F

Leave and pay during leave shall be regulated as follows:-

1. Leave :

(i) In the case of delivery - maternity leave not exceeding 8 weeks, 4 weeks up to and including the day of delivery and 4 weeks following that day,

(ii) In the case of miscarriage - up to 3 weeks from the date of miscarriage.

2. Pay :

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

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

3. **Conditions for the grant of Maternity Leave:**

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

4. The contractor shall maintain a register of Maternity (Benefit) in the Prescribed Form as shown in appendix -I and II, and the same shall be kept at the place of work.

**CLAUSE 19 G**

In the event of the contractor(s) committing a default or breach of any of the provisions of Contractor’s Labour Regulations and Model Rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filing any statement under the provisions of the above Regulations and’ Rules which is materially incorrect, he/they shall, without prejudice to any other liability, pay to RGCB a sum not exceeding Rs.200/- for every default, breach or furnishing, making, submitting, filing such materially incorrect statements and in the event of the contractor(s) defaulting continuously in this respect, the penalty may be enhanced to Rs.200/- per day for each day of default subject to a maximum of 5 per cent of the estimated cost of the work put to tender. The decision of RGCB shall be final and binding on the parties.

Should it appear to the Architect that the contractor(s) is/are not properly observing and complying with the provisions of the C.P.W.D. Contractor’s Labour Regulations and Model Rules and the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (R& A) Central Rules 1971, for the protection of health and sanitary arrangements for work-
people employed by the contractor(s) (hereinafter referred as “the said Rules”) the Architect shall have power to give notice in writing to the contractor(s) requiring that the said Rules be complied with and the amenities prescribed therein be provided to the work-people within a reasonable time to be specified in the notice. If the contractor(s) shall fail within the period specified in the notice to comply with and/observe the said Rules and to provide the amenities to the work-people as aforesaid, the Architect shall have the power to provide the amenities hereinbefore mentioned at the cost of the contractor(s). The contractor(s) shall erect, make and maintain at his/their own expense and to approved standards all necessary huts and sanitary arrangements required for his/their work-people on the site in connection with the execution of the works, and if the same shall not have been erected or constructed, according to approved standards, the Architect shall have power to give notice in writing to the contractor(s) requiring that the said huts and sanitary arrangements be remodelled and/or reconstructed according to approved standards, and if the contractor(s) shall fail to remodel or reconstruct such huts and sanitary arrangements according to approved standards within the period specified in the notice, the Architect shall have the power to remodel or reconstruct such huts and sanitary arrangements according to approved standards at the cost of the contractor(s).

CLAUSE 19 H

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

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

(b) The contractor(s) shall in addition construct suitable cooking places having a minimum area of 1.80m x 1.50m (6’x5’) adjacent to the hut for each family.

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

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

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

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

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

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

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

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

(v) Disposal of Excreta - The contractor(s) shall make necessary arrangements for the disposal of excreta from the latrines by trenching or incineration which shall be according to the requirements laid down
by the Local Health Authorities. If trenching or incineration is not allowed, the contractor(s) shall make arrangements for the removal of the excreta through the Municipal Committee/authority and inform it about the number of labourers employed so that arrangements may be made by such Committee/authority for the removal of the excreta. All charges on this account shall be borne by the contractor and paid direct by him to the Municipality/authority. The contractor shall provide one sweeper for every eight seats in case of dry system.

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

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

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

CLAUSE 19 I

The Architect may require the contractor to dismiss or remove from the site of the work any person or persons in the contractors’ employ upon the work who may be incompetent or misconduct himself and the contractor shall forthwith comply with such requirements. In respect of maintenance/repair or renovation works etc. where the labour have an easy access to the individual houses, the contractor shall issue identity cards to the labourers, whether temporary or permanent and he shall be responsible for any untoward action on the part of such labour.

CLAUSE 19J

It shall be the responsibility of the contractor to see that the building under construction is not occupied by anybody unauthorizedly during construction, and is handed over to the RGCB with vacant possession of complete building. If such building though completed is occupied illegally, then RGCB shall have the option to refuse to accept the said building/buildings in that position. Any delay in acceptance on this account will be treated as the delay in completion and for such delay, a levy upto 5% of tendered value of work may be imposed by RGCB whose decision shall be final both with regard to the justification and
quantum and be binding on the contractor.

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

**Employment of skilled/semi-skilled workers**

**CLAUSE 19K**

The contractor shall, at all stages of work, deploy skilled/semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute/Industrial Training Institute/National Institute of Construction Management and Research (NICMAR)/ National Academy of Construction, CIDC or any similar reputed and recognized Institute managed/ certified by State/Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled/semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, it's scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer in charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Project Manager. Failure on the part of contractor to obtain approval of Project Manager or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of RGCB as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding. Provided always, that the provisions of this clause shall not be applicable for works with estimated cost put to tender being less than Rs. 5 Crores.

**Contribution of EPF and ESI**

**CLAUSE 19L**

The ESI and EPF contributions on the part of employer in respect of this contract shall be paid by the contractor. These contributions on the part of the employer paid by the contractor shall be reimbursed by RGCB to the contractor on actual basis. The Contractor shall also comply with the provision of the ‘Employees’ Provident fund and miscellaneous provisional Act 1952 and the schemes framed there under.

**CLAUSE 20**

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

Work not to be sublet. Action in case of insolvency

CLAUSE 21
The contract shall not be assigned or sublet without the written approval of RGCB. And if the contractor shall assign or sublet his contract, or attempt to do so, or become insolvent or commence any insolvency proceedings or make any composition with his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise, shall either directly or indirectly, be given, promised or offered by the contractor, or any of his servants or agent to any public officer or person in the employ of RGCB in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the contract, RGCB shall have power to adopt the course specified in Clause 3 hereof in the interest of RGCB and in the event of such course being adopted, the consequences specified in the said Clause 3 shall ensue. Any subcontractor engaged in the work should have registered with Employees Provident Fund Organisation under Govt. of India and their code number shall be intimated to RGCB. The Sub-Contractors shall also comply with the provision of the ‘Employees’ Provident fund and Miscellaneous Provisional Act 1952 and the schemes framed there under. Please do the needful.

CLAUSE 22
All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of RGCB without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

Changes in firm’s Constitution to be intimated

CLAUSE 23
Where the contractor is a partnership firm, the previous approval in writing of RGCB shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or a Hindu undivided family business concern, such approval as aforesaid shall likewise be obtained before the contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the works hereby undertaken by the contractor. If previous approval as aforesaid is not obtained, the contract shall be deemed to have been assigned in contravention of Clause 21 hereof and the same action may be taken, and the same consequences shall ensue as provided in the said
Clause 21.

**CLAUSE 24**

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

**Settlement of Disputes**

**CLAUSE 25**

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

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

If the Controller of Administration fails to give his instructions or decision in writing within the aforesaid period or if the contractor is dissatisfied with the instructions or decision of the Controller of Administration the contractor may, within 15 days of the receipt of Controller of Administration’s decision, appeal to the Director who shall afford an opportunity to the contractor to be heard, if the latter so desires, and to offer evidence in support of his appeal. The Director shall give his decision within 30 days of receipt of contractor’s appeal. If the contractor is dissatisfied with the decision of the Director, the contractor may within 30 days from the receipt of Director’s decision, appeal before the Dispute Redressal Committee (DRC) along with a list of disputes with amounts claimed in respect of each such dispute and giving reference to the rejection of his disputes by the Director. The Dispute Redressal
Committee (DRC) shall give its decision within a period of 90 days from the receipt of Contractor’s appeal. The constitution of Dispute Redressal Committee (DRC) shall be as indicated in Schedule ‘F’. If the Dispute Redressal Committee (DRC) fails to give his decision within the aforesaid period or any party is dissatisfied with the decision of Dispute Redressal Committee (DRC), then either party may approach the court of law having jurisdiction over Thiruvananthapuram.

**CLAUSE 26**

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

**CLAUSE 27**

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

**CLAUSE 28**

In the case of any class of work for which there is no such specifications as referred to in Clause 11, such work shall be carried out in accordance with the Bureau of Indian Standards Specifications. In case there are no such specifications in Bureau of Indian Standards, the work shall be carried out as per manufacturers’ specifications, if not available then as per District Specifications. In case there are no such specifications as required above, the work shall be carried out in all respects in accordance
with the instructions and requirements of RGCB.

**CLAUSE 29**

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

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

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

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

CLAUSE 29A

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

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

CLAUSE 30

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CLAUSE 31

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

(i) That the water used by the contractor(s) shall be fit for construction purposes to the satisfaction of the Project Manager.

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

CLAUSE 31 A

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

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

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

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

CLAUSE 32

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

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

CLAUSE 33

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

CLAUSE 34 -

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CLAUSE 35

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

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

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

**CLAUSE 36

Contractors Superintendence, Supervision, Technical Staff & Employees**

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

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

All the provisions applicable to the principal technical representative under the Clause will also be applicable to other technical representative(s). The principal technical representative and other technical representative(s) shall be present at the site of work for supervision at all times when any construction activity is in progress and also present himself/themselves, as required, to the Project Manager and/or his designated representative to take instructions. Instructions given to the principal technical representative or other technical representative(s) shall be deemed to have the same force as if these have been given to the contractor. The principal technical representative and other technical representative(s) shall be actually available at site fully
during all stages of execution of work, during recording/checking/test checking of measurements of works and whenever so required by the Project Manager and shall also note down instructions conveyed by the Project Manager or his designated representative(s) in the site order book and shall affix his/their signature in token of noting down the instructions and in token of acceptance of measurements/checked measurements/test checked measurements. The representative(s) shall not look after any other work. Substitutes, duly approved by Project Manager of the work in similar manner as aforesaid shall be provided in event of absence of any of the representative(s) by more than two days.

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

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

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

The Project Manager shall be at liberty to object to and require the contractor to remove from the works any person who in his opinion misconducts himself, or is incompetent or negligent in the performance of his duties or whose employment is otherwise considered by the Project Manager to be undesirable. Such person shall not be employed again at
Levy/Taxes payable by Contractor

CLAUSE 37

(i) Sales Tax/VAT (except Service Tax), Building and other Construction Workers Welfare Cess or any other tax or Cess in respect of this contract shall be payable by the contractor and RGCB shall not entertain any claim whatsoever in this respect. However, in respect of service tax, same shall be paid by the contractor to the concerned department on demand and it will be reimbursed to him by RGCB after satisfying that it has been actually and genuinely paid by the contractor.

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

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

Conditions for reimbursement of levy/taxes if levied after receipt of tenders

CLAUSE 38

(i) All tendered rates shall be inclusive of all taxes and levies (except Service Tax) payable under respective statutes. However, if any further tax or levy or cess is imposed by Statute, after the last stipulated date for the receipt of tender including extensions if any and the contractor thereupon necessarily and properly pays such taxes/levies/cess, the contractor shall be reimbursed the amount so paid, provided such payments, if any, is not, in the opinion of RGCB (whose decision shall be final and binding on the contractor) attributable to delay in execution of work within the control of the contractor.

(ii) The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of RGCB and shall also furnish such other information/document as RGCB may require from time to time.

(iii) The contractor shall, within a period of 30 days of the imposition of
any such further tax or levy or cess, give a written notice thereof to the Architect that the same is given pursuant to this condition, together with all necessary information relating thereto.

**CLAUSE 39**

Without prejudice to any of the rights or remedies under this contract, if the contractor dies, RGCB shall have the option of terminating the contract without compensation to the contractor.

**CLAUSE 40**

The contractor shall not be permitted to tender for works in RGCB if his near relatives are working in RGCB.

**CLAUSE 41**

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

**CLAUSE 42**

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

(a) Quantity of cement & bitumen shall be calculated on the basis of quantity of cement & bitumen required for different items of work as shown in the Schedule of Rates mentioned in Schedule ‘F’. In case any item is executed for which standard constants for the consumption of cement or bitumen are not available in the above mentioned schedule/statement or cannot be derived from the same statement, the
calculation shall be on the basis of standard formula to be laid down by the Architect and approved by RGCB.

(b) Theoretical quantity of steel reinforcement or structural steel sections shall be taken as the quantity required as per design or as authorized by Architect, including authorized lap pages, chairs etc. plus 3% wastage due to cutting into pieces, such theoretical quantity being determined and compared with the actual issues each diameter wise, section wise and category wise separately.

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

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

(ii) Over the theoretical quantities of materials so computed a variation shall be allowed as specified in Schedule ‘F’. The difference in the net quantities of material actually issued to the contractor and the theoretical quantities including such authorized variation, if not returned by the contractor or if not fully reconciled to the satisfaction of the Architect within fifteen days of the issue of written notice by the Architect to this effect shall be recovered at the rates to be decided without prejudice to the provision of the relevant conditions regarding return of materials governing the contract. Decision of RGCB in regard to theoretical quantities of materials, which should have been actually used as per the Annexure of the standard schedule of rates, Shall l be final & binding on the contractor.

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

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

Compensation during warlike situations

CLAUSE 43

The work (whether fully constructed or not) and all materials, machines, tools and plants, scaffolding, temporary buildings and other things connected therewith shall be at the risk of the contractor until the work has been delivered to RGCB and a certificate from the Architect to that
effect obtained. In the event of the work or any materials properly brought to the site for incorporation in the work being damaged or destroyed in consequence of hostilities or warlike operation, the contractor shall when ordered (in writing) by the Architect to remove any debris from the site, collect and properly stack or remove in store all serviceable materials salvaged from the damaged work and shall be paid at the contract rates in accordance with the provision of this agreement for the work of clearing the site of debris, stacking or removal of serviceable material and for reconstruction of all works ordered by the Architect, such payments being in addition to compensation up to the value of the work originally executed before being damaged or destroyed and not paid for. In case of works damaged or destroyed but not already measured and paid for, the compensation shall be assessed by the Architect and approved by RGCB. The contractor shall be paid for the damages/destruction suffered and for restoring the material at the rate based on analysis of rates tendered for in accordance with the provision of the contract. The certificate of the Architect regarding the quality and quantity of materials and the purpose for which they were collected shall be final and binding on all parties to this contract.

Provided always that no compensation shall be payable for any loss in consequence of hostilities or warlike operations (a) unless the contractor had taken all such precautions against air raid as are deemed necessary by the concerned officers for any material etc. not on the site of the work or for any tools, plant, machinery, scaffolding, temporary building and other things not intended for the work.

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

CLAUSE 44

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

**CLAUSE 45**

Security Deposit for the work shall not be refunded till the contractor produces a clearance certificate from the Labour Officer. As soon as the work is virtually completed the contractor shall apply for the clearance certificate to the Labour Officer under intimation to RGCB. RGCB, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the contractor in respect of the work. If no complaint is pending, on record till after 3 months after completion of the work and/or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Security Deposit will be released if otherwise due.
SPECIAL CONDITIONS OF CONTRACT (SCC)

A) CIVIL WORKS AND GENERAL

Definitions and Interpretation

1. In construing these conditions, the specifications, Bill of Quantities and Contract agreement etc. the following words and expression shall have the meaning herein assigned to them except where the subject and context otherwise require.

(a) “Approved” means approved in writing, including subsequent written information of previous verbal approval and “approval” means approval in writing, as aforesaid.

(b) “As directed” means the direction given by the Project Manager/ Architect/Client

(c) “Bill of Quantities” or “Schedule of Quantities” means the schedule and quantities of items, materials and rates, summaries etc. priced and completed and as finally accepted.

(d) “Constructional Plant” means all appliances or things of whatsoever nature required in or about the execution or maintenance of the Works but does not include materials or other things intended to form or forming part of the Works.

(e) “Day” means a calendar day of 24 hours (beginning and ending at 00 hrs and 24 hrs respectively) irrespective of number of hours worked or not worked in that day.

(f) “Week” means seven calendar days without regard to the number of hours worked or not worked in any day in that week.

(g) “Month” means calendar month without regard to the number of days worked or not worked in that month.

(h) “Architect means ‘Consortium of Architect Hafeez Contractor and M/s Iyer and Mahesh’ who has been appointed by the Client for Architectural Planning/Engineering Design and Project Management.

(i) “Department” or “Client” means RGCB TVM.

(j) “Drawings” means the drawings prepared by the Architect and referred to in the tender and specifications and any modification of such drawings and such other drawings, calculations and technical information of a like nature as may, from time to time, be issued.


(l) “Specifications” means the specification included and / or referred to in the Tender document and any modification thereof or addition thereto as may from time to time be issued to the Contractor.

(m) “Materials” means the materials, apparatus, equipment, fittings, fixtures and all such other materials, which are incorporated in the work.

(n) “Permanent Works” means the permanent works to be executed (including Plant) in accordance with the Contract.
(o) “Temporary Works” means all temporary works of every kind required in or about the execution and completion or maintenance of the Works and the remedying of any defects therein.

(p) “Urgent Works” means any urgent works which in the opinion of the Client and or Architect becomes necessary at the time of execution and / or during the progress of work to obviate any risk of accident or failure or to obviate any risk of damage to the structure of services or required to accelerate the progress of the work for which becomes necessary for safety and security or for any other reason the Client and or Architect may find it necessary.

(q) “Notice in writing” or “written notice” shall mean notice in written, typed or printed characters, sent (unless delivered personally or otherwise proved to have been received) by registered post to the site office/ last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post it would have been delivered.

(r) Words imparting the singular only also to include the plural and vice versa where the context requires.

The headings, subheadings and marginal notes (if any) and the catch lines and the Annexure hereto are meant only for convenience of reference and shall not be in any way be taken into account in the interpretation of these presents and the Annexure hereto. The Contractor shall have to carry out and complete the works in every respect in accordance with this contract.

2. Languages & Law

The ruling language in which the Contract and related aspects shall be drawn up shall be English only. Law means- law as applicable to site of work.

3. Specification & drawings

The drawings furnished to the Contractor shall be interpreted and identified by figured dimensions and nomenclature as indicated therein. On no occasion the drawings shall be scaled off and transferred to work.

In all cases where enlarged detailed drawings are given for any component of work, these drawings shall take precedence over those incorporated in general drawing to a comparatively smaller scale.

a) Prior to the execution of the work, the contractor shall check all drawings, specifications and shall immediately report all errors, discrepancies and/or omissions discovered therein and obtain appropriate orders on the same. Any adjustment made by the Contractor without prior approval shall be at his own risk, each description of item in the schedule of quantities shall be read in injunction with the relevant drawings and the specifications and the Contractor’s rate shall be deemed to be for such complete work unless otherwise specified by the Contractor while tendering.
b) Cost of all shop drawings, or form work drawings and details to be furnished by the Contractor shall be deemed to be included in his tendered rates for the work. Accordingly approval to shop drawings or other fabrication drawings shall not be construed as authorizing award of additional work and as long as these belong to common individual scheme governed by specifications for which the Contractor has already quoted, no extra payment on any account will be admissible for all essential components that are to be necessarily executed to complete the work in all respects.

c) Prior to submission for approval, the Contractor shall be responsible for thoroughly checking all drawings to ensure that they comply with the intent and requirements of the contract specifications and that they fit with the overall building layout. Drawing found to be inaccurate or otherwise in error will be returned for correction by the Contractor.

d) The approval of drawing shall not be construed as a complete dimensional check, but will indicate only that the general method of construction and detailing is satisfactory. The Contractor shall be totally responsible for the dimensions and design, safety of the system evolved inclusive of providing interconnected operational accessories adequate enough to accomplish satisfactory completion of work.

e) In case of difference between drawings and specifications, the specifications shall govern. Anything mentioned in the specification and not shown in the drawings or shown on the drawings but not mentioned in the specifications shall be like effect as if shown or mentioned in both.

f) In case of errors, omissions and/or disagreement between drawings and specifications, etc. the following order of precedence shall apply:

i. Between the written or shown description or dimensions in the drawings and the corresponding one in the specification, the former shall be taken as correct.

ii. Between the written description of the item in the specifications and descriptions in the Bill of Quantities of the same item, the latter shall be adopted.

g) The several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguity or discrepancies in conditions or specifications the same shall be explained and adjusted by the Architect. In case the Contractor does not agree with the explanation given by the by the Architect then the matter, on his written notice, will be referred to the Client and his decision shall be final and binding to the contractor.

h) In all cases of omissions and/or doubts or discrepancies in any of the items or specifications, a reference shall be made to the Architect. Elucidation, elaboration or decision of the Architect shall be considered as authentic. The Contractor shall be held responsible for any error that may occur in the work through lack of such reference and precaution.
4. Traffic interference

The Contractor shall conduct his operations so as to interfere as little as possible with the traffic. When interference to traffic is inevitable, notice of such interference shall be given to the Project Manager well in advance (at least 2 days). The Contract shall take all precautionary and other measures, such as providing warning signals, temporary diversions etc., all as directed by the Project Manager. The Contractor shall exercise full care to ensure that no damage is caused by him or his workmen, during the operations, to the existing structures, water supply and power lines etc. The cost of any such damage and risks arising out of this shall be entirely borne by the Contractor.

5. Maintenance Period

The maintenance period for the work shall be twelve months and any defects noticed during the period shall have to be rectified by Contractor at his cost, failing which the action taken for rectification by RGCB shall be final.

6. Scope of Contract

The contract comprises the construction, completion, commissioning/handling over remedying the defect of the works and except in so far as the Contract otherwise stipulates the provision of all labour, materials, constructional plant, machinery temporary works and everything whether of a temporary or permanent nature required in and for such construction, completion and maintenance so far as necessary for providing the same as specified in or reasonably to be inferred from the Contract.

7. Drawings

(a) Tender Drawings

The tender drawings furnished are for Tender Purpose only and are intended as a guide to the Bidder / Contractor and give general layout of buildings and general information of the structures and general positions of utilities, services and equipment's only. Contractor’s quoted rate for any item should not be based on any measurement, quantity, and specification from these drawings. Any claim raised by the contractor in this regard shall not be valid in this contract and shall not be accepted by the Client.

(b) Issue and custody of drawings & specifications

The contractor shall be furnished free of cost three copies of all drawings and all further drawings issued during the progress of the works. The contractor shall keep one copy of all drawings at the works site and the Client / Architect shall at all reasonable time have access to the same.

Before the issue of the final certificate to the contractor, he shall forthwith return all drawings and specifications.

The drawings shall be provided to the Contractor as per the schedule (prepared at the starting of the works during the progress of work and necessarily updated or revised time to time) mutually agreed by the Architect and the Contractor.
From time to time during the course of contract revised drawings may be issued to the Contractor and the Contractor shall ensure that all superseded drawings are removed from site and stored in a lockable cabinet as directed.

The Contractor shall maintain complete up to date Register of drawings to be maintained at site. All drawings shall be properly filed and indexed for ready reference.

The contractor shall ensure that only the valid up to date drawings are used for setting out, construction and preparation of shop drawings etc.

(c) Working Drawings

Working drawings shall mean any of all drawings, required for satisfactory execution of the work except Bar Bending Schedule, shop and fabrication drawings. Three sets of all the working drawings shall be provided to the contractor.

Bar Bending Schedule, shop and fabrication drawings etc. will not be provided. The Contractor shall have to prepare the Bar Bending Schedule, shop and fabrication drawings etc. free of cost, if required for any of the items of work. Five copies of these drawings each including for revision will be submitted to Architect for approval. Before executing the item, shop drawings should be approved by the Architect.

The Contractor shall be entirely responsible for co-ordination of entire work at site including the works carried out and shall ensure that all necessary working drawings are properly prepared & executed by the Contractor.

Review and approval will not extend to means, methods, techniques, sequences or procedures of construction. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

(d) As-Built Drawings (related to working drawings)

“As Built Drawings” shall be provided by Contractor at the time of handing over and shall be prepared by the Contractor at his own cost.

As-built drawings shall be under preparation from the onset of the contract, in order that all minor amendments and discrepancies from the “Working Drawings” are incorporated. To ensure that this requirement is compiled with The Architect shall inspect the works as the Works proceed. The Contractor shall submit 4 sets of “As Built” drawings along with soft copy in CD.

8. Disruption of Progress

(a) The Contractor shall give adequate advance notice to the Project Manager whenever planning or progress of the Works is likely to be delayed or disrupted unless any further drawing or order, including a direction, instruction or approval is received. The notice shall include details of the drawing or order required explaining why and by when it is required and of any delay or disruption likely to be suffered if it is late.
9. Drawings and Instructions

The contractor shall carry out and complete the said work in every respect in accordance with this Contract and with the directions of and to the satisfaction of the Architect.

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

10. Authority and Duties of the Architect

The Architect has been duly authorized by the Client to supervise, test, examine, approve or reject any material and/or works, to order, cancel, alter, modify, any of the materials, items of works within the framework of the contract and as per the technical specifications, drawings and schedule of items. The Architect is further authorized to administer the contract, check, correct, modify, certify and recommend for payment or reject any bill or requests for payment for materials, Items or works. The Architect shall obtain prior approval of RGCJ wherever required.

The duties of Architect are given in this document elsewhere, however main duties are as under:-

(a) Monitor and supervise the work.

(b) Ensure quality of materials and workmanship of the items executed, as per Quality Standards.

(c) Prepare & issue certificate of payment and recommend the same to the Client.

(d) Recommend extension of time.

(e) Process/Obtain approval for execution of extra items/substituted and variation in quantities.

(f) Ensure compliance with the drawings, technical specifications and various requirement of contract Documents.

(g) Recommend changes/modifications in design & drawings if essential during construction as per site requirement.

(h) Ensure that the contractor maintains all documents/test registers etc. in respect of testing of materials/products/items of work as per Quality Assurance Manual.

Post – Construction Phase

• Conduct inspection after confirmation from the client that the project is practically complete.

• Prepare a snag list; advise the contractor to make good the defects within a specific period.
• Upon completion of the remedial works, conduct a final inspection together with the Client and his representatives.

• After all defective works are made good certify to the effect that the project is completed in conformity with the provisions of the contract.

• Issue Certificate of Final Completion

• Submit the required documents to the statutory authorities after completion and obtain NOC for commissioning the facilities/services as required.

• Review AS-BUILT drawings prepared by the Contractor prior to final drafting.

• Conduct periodical site inspection during the defect liability period, report the defects if any to RGCB and simultaneously take action to get the same rectified by the contractor.

11. Contractor’s General Responsibilities

(a) Execution of works:

The Contractor shall, subject to the provisions of the Contract, and with due care and diligence, execute and complete the Works & remedy any defects therein in accordance with the Contract. The Contractor shall provide all labour, including the supervision thereof, materials. Constructional Plant and Machineries and all other things, whether of a temporary or permanent nature, required in and for such execution, completion, maintenance and remedying of any defects, so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract.

The contractor is bound to carry out any items of work necessary for the completion of the job even though such items are not included in the bill of quantities and instructions in respect of such additional items and their quantities will be issued in writing by the Architect.

The contractor shall have to use materials from the makes / manufacturers specified in the list of materials of approved brand and/or manufacture contained in the contract documents and as approved by Architect after due consent by Client. Wherever different pattern/ Design/ Quality of materials with same specification/ make as specified in the contract, is available in the market, Architect in consultation with RGCB will approve the pattern/ Design/ Quality of the material/ item which shall be final and binding on the contractor.

Architect is empowered to cancel an approval of material if it is found subsequently that approved material once brought at site and tested does not meet the requirement as specified in the contract. In such case approval will be accorded for alternate material.

(b) Adequacy, stability and safety:

The Contractor shall take full responsibility for the adequacy, stability and safety of all site operations and methods of construction.

(c) Temporary works and arrangements:
The Contractor shall furnish to the Architect full particulars of all temporary works necessary for the execution of the works. The Architect may comment on the Contractor’s proposals if they consider that modifications should be made. The Contractor shall be solely responsible for the stability and safety of all temporary works. The Architect will indicate the site(s) for such temporary works and the Contractor will have to restrict his requirements to the same. Should it be necessary to shift the temporary works to some other allotted place during the execution of the works, the Contractor shall do so, when informed by the Architect, at his own cost and without delay or demur. Such shifting of temporary works may be in part or in full.

(d) Initial and Final Clearance of site for temporary works:

The Contractor shall be responsible for the clearance of the site of all scrub, debris, rubbish, etc. to be removed off site to a location approved by the Architect. The structures, services and works required to be demolished and removed shall also be removed off site to a location as mentioned above. The Contractor shall obtain necessary permissions and approvals from the local authorities for such disposals. The demolition shall include digging, excavating and removal of substructures, foundations and buried works. The cost of all this shall be borne by the Contractor.

The above is applicable for all site offices, labour camps, and godowns etc., which are not required after the works is fully completed.

(e) Storage, Cleaning and Dewatering

The Contractor shall at all the times during construction keep the Site clean and free from all debris and unwanted materials on a daily basis as per instructions of the Architect.

Storage of materials shall be in an organized manner and in proper compartments as directed by Architect. Storage on suspended floors shall not be permitted unless specifically approved in writing by the Architect for specific materials in specific locations and in approved manner. Architect shall be furnished with load details, if requested, before seeking approval for storage.

Regular cleaning operations shall be undertaken to remove all dust, debris, waste materials etc. A cleaning schedule shall be maintained.

Contractor shall make his own arrangement for storage of those materials, which can be accommodated at site. Contractor shall be fully responsible for safe custody of the same. Materials shall be considered as “Delivered at Site” only after the physical presence of materials at site are verified by the Architect. Stores elsewhere shall not be eligible for being considered as “Delivered at Site.”

Contractor shall be responsible to keep entire site free from water due to water coming from any source at any level and shall protect all materials and works from being damaged by the water from any source. Contractor shall make proper arrangements for drainage prior to use of water for curing, testing, cleaning etc.
Any expenditure incurred by the Contractor in fulfillment of his obligations under this sub-clause shall be deemed to have been included in the Contract Sum.

(f) Coordination of builders work required for services and Installation of equipment’s:
The Contractor shall co-ordinate the requirements for openings/cutouts/inserts/ fixtures for internal and external services installations in accordance with the requirements of the relevant drawings.

The Contractor’s attention is also drawn to the fact that all openings/chases, etc. shall be left in the building work as it proceeds and not cut-out subsequently except in so far as may be necessary due to subsequent authorized instructions. The Contractor shall therefore obtain necessary builders work details in such order and in such time as to enable them to be checked and approved by the Architect before the actual construction is planned to take place.

12. Operation & Storage Areas

All operations of the Contractor shall be confined to areas authorized by Architect and the storage of materials shall be over sites specifically indicated by the Architect. The Contractor shall be obliged to keep the premises in hygienic conditions by proper drainage of the areas, provided with suitable approaches, throughout the period of contract. He shall rectify all damages caused to any RGCB property within the area thus allotted. He shall be responsible to clear all vegetation at site at his own cost.

13. Transportation of Equipment and materials

It shall be the Contractor’s responsibility to transport all equipment and materials to the jobsite at his own expense. The Contractor shall use only established roadways or construct and use such temporary roadways as may be necessary and approved by the Architect. When it is necessary to cross curbing’s or sidewalks, protection against damage shall be provided by the Contractor. Any damage caused to roads, curbs, sidewalks etc., shall be repaired by the Contractor at his own expense.

14. Inspection

The work shall be carried out under the directions of the Architect subject to inspection by RGCB Authorities to ensure strict compliance with the terms, specifications and conditions of the contract. Any failure on the part of the Architect or his representative during the progress of inspection of work to discover any defective work or to reject materials not up to standards shall not be deemed to have been accepted and should not be construed as waived. Any defects noticed either during the period of construction or after the completion up to a period of 12 months from the date issue of certificate of completion, the Contractor is liable to carry out all repairs/rectifications at his/their own cost to the satisfaction of RGCB. Further in the event of the Contractor using substandard/inferior quality of materials which at future date is not susceptible to replacement, for structural reasons or otherwise and if concurrence is given for retention of such structure, RGCB will have necessary authority to recover a proportionate sum decided as per its discretion. In case the structure with the use of substandard or inferior material cannot be retained in the work as per the opinion of the
Architect, portion or portions of such structure/work shall be dismantled and replaced new by the Contractor at his own cost. Partial or entire occupancy of the premises shall not be construed as the acceptance of the work or materials incorporated in the work. No changes whatsoever to any provision of the specification shall be made without written authorization from the Architect/Client.

15. Schedule of Quantities

Schedule of probable quantities in respect of the work are liable to alterations, omissions, deductions or additions.

16. Tender Rates/Statutory Deductions

Statutory deductions, where, in pursuance to statutes of Government, becomes obligatory to RGCB, the same would be deducted at the rates specified under the said act, from the amount payable to Contractor as per the relevant acts applicable for the contracted work, as amended from time to time.

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

17. Watching & Lighting

The Contractor shall throughout the execution and completion of the Works and the remedying of the site and the Works and the remedying of any defects therein have full regard for the safety of all persons entitled to be on the site and keep the site and the Works in an orderly state appropriate to the avoidance of danger to such persons and in connection with the Works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or required by the Architect, or by any duly constituted authority, for the execution and for the protection of the Work, and/or for the safety and convenience of the public or others and take all reasonable steps to protect the environment on and off the site and to avoid damage or nuisance to person or property of the public or others resulting from pollution, noise and other causes as a consequence of his methods of operation.

18. Care of Works

From the commencement to the certified completion of the whole of works, the contractor shall take full responsibility for the care thereof and of all temporary works and in case any damage loss or injury shall happen to the works or to any part thereof or to any temporary works from any cause whatsoever save and except the expected risks as defined in the relevant clauses.

The contractor shall at his own cost repair and make good the same so that on completion, the works shall be in good order and condition and conformity to every respect with the requirements of the contract and Architect’s instructions. The contractor shall also be liable for any damage to the works occasioned by him including his subcontractors in the course of any operations carried out by him. The contractor shall indemnify the Employer from all risks on this account.
19. Force Majeure

(a) Force Majeure

i) Any failure or delay in the performance by either party hereto of its obligations under his Contract shall not constitute a breach thereof or give rise to any claims for damages if, and to the extent that it is caused by occurrences beyond the control of the party affected, namely, acts of God, floods, explosions, wars, riots, storms, earthquakes, insurrection, epidemic or other natural disasters. The party so affected shall continue to take all actions reasonably within its power to comply as far as possible with its obligations under this Contract. The affected party shall promptly notify the other party after the occurrence of the relevant event and shall use every reasonable effort to minimize the effects of such event and act in all good faith with due care and diligence.

ii) In the event of the effect of force majeure continuing beyond the period of One hundred and eighty (180) days, the parties shall mutually decide whether or not to terminate this Contract. In the event of termination of contract the contractor shall be paid for the work done and which has been accepted and certified by the Architect and shall not assert any additional claims against the Client.

20. Contractor’s Superintendence

(a) The contractor shall be solely responsible for the means, methods, techniques sequence and procedure of construction. The Contractor shall be responsible to see the completed work complies accurately with the Contract Document.

The Contractor shall give or provide all necessary superintendence during the execution of the Works.

(b) Contractor’s Technical Representative for Execution & Coordination of Works

The Contractor shall have on site all times during working hours throughout the course of the Contract at least one Competent Technical representative who shall be empowered to make decisions binding on the Contractor in respect of all matters likely to arise in connection with the execution & coordination of the works at the site and shall keep the Architect informed at all times about the name and designation of such representative. Any direction, explanations, instructions or notices given by the Architect/Client to such representative shall be held to be given to the Contractor. In case of absence of Technical Representative from the site other alternative representative must be available at site with same powers.

The curriculum vitae (CV) of key personnel proposed to be deployed at site for the entire duration is also required to be submitted.

The contractor under normal circumstances would not be allowed to replace the key personnel during the execution of the contract. However, for any reasons, due to unavoidable circumstances if it becomes necessary in the interest of the project to replace any key personnel, the contractor must submit the CV of the new personnel (having similar qualification and experience) to the Architect for approval.

(c) Contractor’s Employees
The Contractor shall provide and employ Engineering staff/Technical Assistants on the site, in connection with the execution/completion of works and remedying any defects therein. The Engineering staff / Technical Assistants shall be appropriately qualified, skilled and experienced in their respective disciplines/trades, for proper supervision, ensuring quality, and output of the work they are required to supervise, and also such skilled, semi-skilled and unskilled labour as are necessary for the proper and timely execution, completion of work and remedying any defects in the works. No child labour shall be employed on the work.

(d) Removal of Contractor’s Employees

The Contractor shall on the direction of the Architect/ Client immediately dismiss from the works any person employed thereon by him who may, in the opinion of the Architect/ Client be incompetent or misconduct himself and such person shall not be again employed on the works without the permission of the Architect/ Client.

(e) Unauthorized Persons

No unauthorized persons are allowed on the site. The Contractor shall instruct all such persons to keep out and shall take steps to prevent trespassing. However the contractor will make sure to provide free access at any time to Architect/RGCB to the site and other working places.

21. Compliance with Statutes, Regulations, etc.

The contractor shall conform to the provisions of any statute, ordinance, law, act of the legislature relating to the works, and to the regulations an by-laws of any local or other duly constituted authority and of any water, electric supply and other companies and/or authorities with whose systems the structure is proposed to be connected. The Contractor shall keep the Client indemnified against all fines or penalties or liability of every kind for breach of any such statutory ordinance, law act of the legislation, regulations, and byelaws as aforesaid.

The contractor shall before making any variations from the drawings or specifications that may be necessitated by so regulations give to the Architect written notice, specifying the variation proposed to be made and the reasons for making it and apply for instructions thereon. The contractor will not execute any work without written permission from the Architect.

The contractor shall bring to the attention of the Architect all notices required for execution by the said acts, regulations or bye-laws to be given to any authority and pay to such authority, or to any public office all fees that may be properly chargeable in respect of the works, and lodge the receipts with RGCB.

22. Setting out

The contractor shall be responsible for the true and proper setting-out of the Works in relation to original points, lines and levels or reference issued by Architect in drawing or in writing and for the correctness, subject as above mentioned, of the position, levels, dimensions and alignment of all parts of works and for the provision of all necessary instruments, appliances and labour in connection therewith. If, at any time during the progress of the works, and
during defects liability period, any error shall appear or arise in the position, levels, dimensions or alignment of any part of the Works, the Contractor, on being required to do by the Architect and / or Client or his authorized representative shall at his own cost, rectify such error to the satisfaction of the Architect and RGCB. The checking of any setting out or of any line or level by the Architectshall not in any way relieve the Contractor of his responsibility for the correctness thereof. The Contractor shall carefully protect and preserve the benchmarks; sight-rails, pegs and other things used in setting-out the Works. Any rectification works required should be done by the Contractor at his own cost.

23. Quality of Materials, Workmanship and Tests

(a) All materials and workmanship shall be the best of the respective kinds described in the Contract and shall be subjected from time to time to mandatory tests at the place of manufacture or fabrication or on the Site or at an approved testing laboratory. The source of supply and / or manufacturing within/ outsideIndia may be inspected by the Client / any representative as nominated by the client.

The contractor shall upon the instruction of the Architect’s representative furnish him with documentation to prove that the materials & goods comply with the requirements of contract and for requirement stated above. The Architectmay issue instruction in regard to removal of material from site or any work, if these are not in accordance with the contract. The contractor shall provide such assistance instruments, machinery, labour and materials as are normally required for examining, measuring, sampling and testing and material or part of work before incorporation in the works for testing as may be selected and required by the Architect.

Client may carry out Third Party Quality Assurance/Audit by an independent agency/ individual/firm/institute at any time. The agency will be permitted and offered all support related to site inspection by the contractor. Improvements/changes suggested therein will be carried out without any extra cost.

(b) Samples

i) All samples of adequate numbers, sizes, shades & pattern as per specification shall be supplied by the contractor without any extra charge. Contractor shall submit Samples to the Architect for approval. If certain items proposed to be used are of such nature that samples cannot be presented or prepared at the site, detailed literature / test certificate of the same shall be provided to the satisfaction of the Architect and RGCB. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalogue numbers and the use for which intended and other details as the Architect may require to review the submittals for the limited purposes required by paragraph (d) below. The numbers of each Sample to be submitted will be as specified in the Specifications, or as shall be specified by the Architect. All approved samples shall be properly marked with signature of the Architectand shall be available at the site for inspection at any time. The sample room will be made and maintained with all the samples approved till the end of warranty period / defect liability period.
ii) Submittal Procedures

(a) Before submitting each Sample, Contractor shall have determined and verified all materials with respect to intended use, fabrication, shipping, handling, storage, assembling and installation pertaining to the performance of the Work. It shall be Contractor’s sole responsibility in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programmes incidental thereto.

(b) Each submittal will bear a specific written indication that Contractor has satisfied Contractor’s obligation under the Contract Documents with respect to Contractor’s review and approval of that submittal.

(c) At the time of each submission, contractor shall give Architects specific written notice of such variations if any that the sample submitted may have from the requirements of the contract document, such notice to be separate from the submittal and in addition shall cause a specific notation to be made on each sample submitted for review and approval of each such variation

iii) Review and Approval: Sample shall be reviewed and approved only to determine if the items covered by the submittals will, after installation or incorporation in the work, conform to the information given in the contract documents and be compatible with the design concept of the completed project functioning as a whole as indicated by the contract documents, drawings etc.

iv) Review and approval will not extend to means, methods, techniques, sequences or procedures of construction. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. Contractor shall make corrections required by the Architect and submit as required new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for and by Architect on previous submittals.

v) Above referred review and approval of Samples shall not relieve the Contractor from the responsibility for any variation from the requirements of the Contract Document unless the Contractor has in writing called Architect’s attention to each such variation at the time of submission as specified above and received written approval of each such variation by specific written notation thereof incorporated in or accompanying the Sample approval; nor will any approval by the Architect and RGCB relieve the Contractor from the responsibility for complying with the requirements of contract.

vi) Only when the samples are approved by the Architect, the contractor shall proceed with the procurement and installation of the particular material / equipment. The approved samples shall be signed by the Architect for identification and shall be kept on record at site office until the completion and acceptance of the work and shall be available at the site for inspection / comparison at any time. The contractor shall keep with him a duplicate of such samples to enable him to process the matter.
vii) For items of works where the samples are to be made at the site, the same procedure shall be followed. All such samples shall be prepared at a place where it can be left undisturbed until the completion of the project.

viii) The Architect shall communicate the comments/ approval to the Contractor to the samples at his earliest convenience. Any delay that might occur in approving of the samples for reasons of its not meeting with the specifications or other discrepancies, inadequacy in furnishing samples of best qualities from various manufacturers and such other aspects causing delay on the approval of the materials / equipment’s etc. shall be to the account of the contractor. In this respect the decision of the Architect / Client shall be the final.

ix) On delivery of the supplies of materials / equipment’s for permanent works at the site, the contractor shall specifically arrange to get the supply inspected by the Architect and compared with the approved sample and his specific approval obtained before using the same in the work.

(c) Cost of Tests

The testing charges shall be borne by the Contractor intended by or provided for the Contract or as found necessary by the Architect for ascertaining whether the quality of materials intended to be used by the Contractor in the Works is acceptable, whether any finished or partially finished work is appropriate for the purposes which it was intended to fulfill. The cost of making samples, transportation etc. shall also be borne by the Contractor.

(d) Standards and codes

The Contractor shall at his cost provide one set of approved standards and codes to which the proposed materials, items and works to be executed shall conform. Such a set shall be handed over to the client and the Architect for ready reference. All materials, items and works, when submitted for approval shall have reference to Tender Specifications and drawings and of clauses of relevant standard codes for acceptance criteria.

(e) Testing facilities

The Contractor shall, at his own cost, provide testing facilities at site as stipulated in the Contract document.

In respect of tests carried out in other approved laboratories, as stipulated in the contract document / as directed by the Architect, the Contractor shall arrange for taking samples, testing etc. The charges/testing fee will be borne by the Contractor.

f) The contractor shall prepare Quality Control Manual duly considering the above and the Quality Control document of the Architect and get it approved by the client for compliance.

24. Government Labour Laws

The contractor has to follow strictly the Government labour acts, which are in force at present and all necessary arrangements for labour will have to be made by the Contractor.
25. Obtaining Information related to Execution of work

No claim by the contractor for additional payment will be entertained which in consequent upon failure on his part to obtain correct information as to any matter affecting the execution of the works, nor will any misunderstanding or the obtaining of incorrect information or the failure to obtain information relieve him from any risks or from the entire responsibility for the fulfillment of the contract.

26. Access for Inspection

Persons nominated by client and Architect and their respective representatives shall at all reasonable times have free access to work and/or to the workshops, factories or other places where materials are lying or from which they are being obtained and the Contractor shall extend necessary service to Client and Architect and their representatives every facility necessary for checking measurements, inspection and examination and test of the materials and workmanship.

27. Examination of Work before covering up

(a) No part of the works shall be covered up or put out of view without the approval of the Architect and the contractor shall afford full opportunity for the Architect to examine and measure any work which is about to be covered up or put out of view and to examine foundations before permanent work is placed thereon. The contractor shall give due notice to the Architect whenever any such work or foundation is or ready or about to be ready for examination and the Architect shall attend the same.

(b) Uncovering and making openings

The contractor shall uncover any part or parts of the works or make openings in or through the same as the Architect may from time to time direct and shall reinstate to make good such part or parts to the satisfaction of the Architect. No extra payment will be paid for this.

28. Assignment

The contractor shall not, without the prior consent of RGCB assign the Contract or any part thereof, or any benefit or interest therein or there under, otherwise than by:

A change in favour of the Contractor’s bankers of any moneys due or to become due under the Contract, or Assignment to the Contractor’s insurers (in case where the insurers have discharged the Contractor’s loss or liability) of the Contractor’s right to obtain relief against any other party liable.

The Contractor shall not sub-contract the whole of the Works. The Contractor shall not subcontract any part of the Works without the prior consent of the Client, except where otherwise provided by the Contract. Any such consent shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any Subcontractor, his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents, servants or workmen. Such
Permission may be granted only for the specialized works etc. and the decision of the Client shall be final in this regard.

29. Claims
The contractor shall send to the Architect and RGCB once in every month an account giving particulars as complete and fully detailed as required for any claim for additional payments, to which the contractor may consider himself entitled and of all extra or additional / substituted work ordered by the Architect /Client which he has executed during the preceding month subject to provisions under relevant clauses of the contract hereof.

30. Variations
(a) The Architect with the prior approval of the Competent Authority in determining revised quantity, form or quality shall make and variation in the form, quality or quantity of the works or any part thereof that may necessary and for that purpose or if for any other reason it shall, in his opinion be desirable, he shall with the prior approval of the Client order the contractor to do and the contractor shall do any of the following, subject to the provisions of other contract conditions.
   i) Increase or decrease the quantity of any work included in the contract
   ii) Omit any such work
   iii) Change the character or quality or kind of any such work
   iv) Change the levels, lines, positions and dimensions of any part of the works.
   v) Execute additional work of any kind necessary for the completion of the works.
   vi) Change any specified sequence or timing of construction of any part of the work.

No such variation shall in any way vitiate or invalidate the contract, but the cost, if any, of all such variations shall be taken in account for payment to the contractor as an addition or adjustment to the amount of the contract sum. Provided that where the issue of instruction to vary the works is necessitated by some default or breach by the contractor or for which he is responsible, any additional cost attributable to such default or breach shall be borne by the contractor.

(b) The contractor shall make no such variations without the concurrence of Architect/ Client

31. Inspection and Testing
(a) Inspection & Testing during manufacture
The Architect/Client shall be entitled during manufacture to inspect, examine and test on the contractor’s premises during working hours the materials and workmanship and check the progress of manufacture of all fabrication materials to be supplied under the contract, and if part of the said materials is being manufactured on other premises the contractor shall obtain for the Architect/Client permission to inspect, examine and test as if the said plant were being manufactured on the contractors premises. Such inspection, examination or testing if made shall not relieve the contractor from any obligation under the contract.
(b) Facilities for Testing at Manufacturer’s Works

Where the contract provides for tests on the premises of the contractor or of any sub-contractor the contractor shall provide such assistance, labour, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such tests efficiently.

(c) Certificate of Testing

As and when fabrication materials shall pass the tests referred in this clause, the Architect shall furnish to the contractor a certificate in writing to that effect.

(d) Rejection

If as a result of such inspection, examination or test of the works (other than a Test on Completion) the Architect shall decide that such material is defective or not in accordance, with the contract he shall notify the contractor accordingly in writing his objection and reasons thereof. The contractor shall make good the defect or ensure that the material complies with the specifications. Thereafter, if required, the tests shall be repeated under the same terms and conditions till satisfactory results are obtained.

(e) Inspection Reports

The contractor shall provide the Architect with five copies of reports of all inspection and tests.

32. Virtual Completion Certificate

When the whole of the Works have been substantially and virtually completed and have satisfactorily passed any final test that may be prescribed by the Contract and is fit for occupation / use:-

(a) The Contractor shall give a notice to that effect to the Architect accompanied by an undertaking to finish any outstanding work during the Defects Liability Period. Such notice and undertaking shall be in writing and shall be deemed to be a request by the Contractor.

(b) The Architect shall review whether the works are completed in such a condition so as to be put to its proper or other intended final use and / or occupied without any short comings and no major or minor items of works are remaining which in the opinion of the Architect will cause undue difficulties in satisfactory use/ occupation of the buildings.

33. Defects after completion

(a) General

Any defect, shrinkage, settlement or other faults which if appearing within the “Defects Liability Period” arising due to poor quality of materials or workmanship, shall upon the direction in writing of the Client/ Architect and within such reasonable time as shall be specified therein, be attended and made good by the contractor, at his own cost. In case of default the Client may employ and pay other persons to make good such defects, shrinkage, settlements or other faults and all damages, loss and expenses consequent thereon or
Incidental thereto shall be made good and borne by the contractor and such damage, loss and expenses shall be recoverable from the bills due or may be deducted from any money that may become due to the contractor, or may in lieu of such amending and making good by the contractor deduct from any sum due to the contractor, the amount to be determined by the Client.

(b) Cost of Execution of Work of Repair, etc.

All such works shall be carried out by the Contractor at his own expense if the necessity thereof shall, in the opinion of the Client, be due to the use of materials or workmanship not in accordance with the Contract, or due to neglect or failure on the part of the Contractor to comply with any obligation, expressed or implied, on the Contractor’s part under the Contract.

(c) Contractor’s personnel to be at site

During the defects liability period the contractor shall retain at least one of his authorized representative at site along with required tradesmen.

34. Approval and acceptance

(a) Provisional Acceptance

The work shall be deemed to have been provisionally accepted after fulfillment of the following by the Contractor.

i). Submitting As-Built Drawings, Catalogues, Brochures, and Data Sheets, manuals in the form as directed by Architect/RGCB

ii). Obtaining Certificate of Completion from the Architect

(b) Certificate of Final Completion

The contract shall not be considered as completed until a Certificate of Final Completion shall have been issued by the Architect stating that the Works have been completed to their satisfaction and remedying / rectifying of defects have been satisfactorily performed.

35. Works by Other Agencies

The Client and Architect reserves the right to use premises and any portion of the site for the execution of any work not included in this contract which it may desire to have carried out by other persons simultaneously, and the contractor shall allow reasonable facilities for the execution of such work, but shall not be required to provide any plant or material for the execution of such work except by special arrangement with the employer. Such work shall be carried out in such manner as not to impede the progress of the works included in the contract and the contractor shall not be responsible for any damage or delay which may happen to or occasioned by such work.

36. Insurance Policies

(a) Contractor shall take “Contractor’s All Risk Policy” and Third Party Insurance or other insurance policies in the joint name of the Contractor and Client and keep it valid against all loss or damages to the Works, Materials, Equipment, Persons and Properties from
whatever cause arising for which he is responsible under the terms of the Contract, other than the expected risks, and in such manner that the Client and Contractor are covered for the period as stipulated for entire duration including the Defects Liability Period and for any loss or damage occasioned by the Contractor in the course of any operations carried out by him for the purpose of complying with the obligations.

(b) In the event of the Insurance Policies are taken and kept valid by the contractor, whenever claims need to be made for any matter or thing in respect of the insurance covered under the Insurance Policies, it shall be the responsibility of the Contractor to lodge such claims and to follow up and obtain the payments for the claims from the Insurance Companies. Should the Client suffers any losses and or damages in connection with the works and the Contractor is unable or unwilling to get such losses and or damages reimbursed by the insurance companies, the Client shall recover the amounts in respect of such losses and or damages from the Contractor by way of deductions made from any money that may be payable or that may become payable to the Contractor.

(c) Irrespective of whether the Insurance Policies referred under sub-clause above are taken by the Contractor or not and whether the Policies are kept valid or not notwithstanding anything stated in the sub-clause as above of this clause, the Contractor shall indemnify the Client from all the compensations and claims that may arise due to loss and damages to the works, materials, equipment, persons and properties on account of Contractor’s operations at site during the period and also Defects Liability period and the Contractor shall be responsible, liable and bound to the Client to compensate or make good or replace the loss or damage arising out of any event whatsoever as directed by the Client.

37. Dues not paid by the Contractor

The contractor shall pay all dues or fees to statutory authorities and Electricity and Water supply authorities etc. wherever required within the due period and indemnify the Client from any claims or compensations or penalties or damages arising out of non-payment of any such dues or fees. However, in case some dues or fees are not paid by him / and or claims for compensations or penalties etc. are raised by the Statutory authorities, the Client may deposit the required amount for any or all of the above and recover or deduct the same from any money payable to the contractor by the Client or any other means available to the Client.

38. Specifications

The various works indicated in the schedule shall be carried out strictly in accordance with the detailed specification whether actually mentioned or not. Where specifications are not available in this document, such work shall be carried out strictly in accordance with CPWD specification and if there are no details in CPWD specification book then it shall be executed as per Bureau of Indian Standard specification. In case there is no such specification in Bureau of Indian Standards the work shall be carried out in all respects in accordance with the instructions and requirement of the Architect.
39. Urgent Repairs

If, by reason of any accident, or failure, or other event occurring to or in connection with the works, or any part thereof, either during the execution of the works, or during the Defects Liability period any remedial or other work or repair, shall, in the opinion of the Client be urgently necessary for the safety of the Works and the Contractor is unable or unwilling at once to do such work or repair, the Client may employ and pay other persons to carry out such work or repair as the case may be and Client may consider necessary. If the work or repair so done by the other agency is the work which, in the opinion of the Architect/Client the Contractor was liable to do at his own expense under the Contract, all expenses incurred by Other agency in doing so shall be recoverable from the Contractor by the Client, or may be deducted by the Client from any sum due or which may become due to the Contractor.

40. Boreholes & Exploratory Excavation

If, at any time during the execution of the Works, the Architect/Client shall require the Contractor to make boreholes or to carry out exploratory excavation, such requirement shall be ordered in writing and shall be deemed to be an additional item ordered under the provisions unless a provisional sum in respect of such anticipated work shall have been included in the schedule of items.

41. Fossils, Etc.

All fossils, coins, articles of value or antiquity and structures and other remains or things of geological or archaeological interest discovered on the site of the works shall be the property of RGCB.

42. Plant Temporary Works & Materials

(a) Plant, Temporary Works etc. Exclusive use for the Works

All Constructional Plant, Temporary Works and materials provided by the Contractor shall, when brought on to the Site, be deemed to be exclusively intended for the execution of the Works and the Contractor shall not remove the same or any part thereof except for the purpose of moving it from one part of the Site to another, without the consent, in writing of the Architect, which shall not be unreasonably withheld.

(b) Removal of Plant etc.

Upon completion of the Works, the Contractor shall remove from the Site all the said Constructional Plant and Temporary Works remaining thereon and any unused materials provided by the Contractor, within 10 days of obtaining the completion certificate.

43. Operations and Maintenance Manual

The Contractor shall also provide and submit to the CLIENT two copies in a durable plastic case of the operating and Maintenance Instruction Manuals as may be applicable for the works. The arrangement of these manuals shall be as follows:

    SECTION A: Index
SECTION B: Full set of Indexed Photographs showing all salient features of the Project.

SECTION C: Description and details of materials, items and fittings and fixtures used for the project along with Catalogues & Addresses of the Suppliers.

SECTION D: Planned maintenance instruction and dates for order replacements.

SECTION E: List of recommended Spare parts of consumables.

SECTION F: List of “As-Built” Drawings (related to Working/Shop drawings)

Until the Drawings, prints, transparencies and manuals referred to above have been received and approved by the Architect the Contract shall not be considered as complete and payment of sum will be withheld until such drawings, etc. have been submitted to and approved by the Architect/Client and the cost of providing such records including proper submission thereof is deemed to be included in the Contract Sum quoted by the Contractor.

44. Reports by Contractor

(a) The contractor shall maintain daily weather record. Any other inclemency in weather shall be recorded.

(b) The Contractor shall file daily category-wise labour report. The report shall indicate scheduled requirement against actual strength.

(c) The Contractor shall prepare Weekly Reports of planned and actual progress of work and subsequent week’s scheduled work. These will also include material procurement status. These reports shall be submitted to the Architect & shall be reviewed in Review / Co-ordination Meetings.

(d) The Contractor shall submit Monthly Progress Report as per format approved by Architect/Client.

(e) The Contractor, as directed by the Architect/Client shall prepare other Progress Charts and Schedules as may be required.

45. Office Accommodation for Contractor, Engineers and other staff/ other facilities

(i) The Contractor shall provide and maintain necessary office(s), workshops, stores, sanitary facilities, canteens etc. for themselves and their staff at site with the approval of the Architect. A suitable layout for this shall be made and got approved by the Architect.

(ii) The Contractor shall install and maintain telephones/ fax facility with required extensions and computers having latest configuration and internet facility at his own cost and shall pay all the bills for the calls/charges and maintenance.

46. Labour Camp

The Contractor has to make their own arrangements for providing accommodation and other facilities for the laborers nearer to the site.

47. Miscellaneous

(a) Monthly Progress Photographs
The Contractor shall arrange at his own cost to maintain a progress record of the works by taking postcard size colour photographs (preferably digitized photographs) minimum 6 Nos. or more per month or fortnight as directed by the Architect during the construction stages and after completion and shall supply one set to the Client and one set to the Architect at no extra cost. The Contractor will be required to submit monthly reports on the progress of his work as per the format approved by the Architect.

(b) Safety Regulations

Contractor shall be fully responsible for the safety of his Employees/Visitors/Contract Labour/Sub-Contractors Labour. The Contractor shall provide first-aid box readily available at site. The Contractor shall provide all safety measures as per labour safety rules applicable.

(c) Labour Laws

The Contractor shall strictly adhere to all labour laws prevailing in the region. The contractor shall make timely payment of wages of his labour and the wages paid to the labour shall be equal to or more than the minimum wage prevailing at the time of payment. The Contractor shall comply with all applicable labour legislation.

(d) By-Laws of Statutory Authorities

The Contractor and his labour shall not violate municipal/sanitation/health or any other byelaws.

(e) Tax Deduction at Source

Taxes and surcharge as applicable shall be deducted from the amount paid to the Contractor towards the value of the work done.

(f) General Lighting and Securities

The Contractor shall, throughout the execution, completion and remedying of the defects, provide and maintain at his own cost all lights, guards, fencing, warning signs and watching, when and where necessary or recommended by the Architect or by any duly constituted authority for the protection, of the works or for the safety and convenience of the public or others.

(g) Technical Examination

The Client shall have the right to cause Audit and Technical Examination of the works. The bills of the contractor including all supporting vouchers, abstracts, etc. to be made as per payments of the final bill and if as a result of such Audit and Technical Examination any sum is found to have been overpaid in respect of any work done, the contractor shall be liable to refund the amount of overpayment and it shall be lawful for the CLIENT to recover the same from the security deposit or Performance Security of the contractor or from any dues payable to the contractor. If it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him, the amount of such under payment shall be duly paid.
In the case of any audit examination and recovery consequent on the same the contractor shall be given an opportunity to explain his case and the decision of the Client shall be final.

In the case of Technical Audit, consequent on which there is a recovery from the contractor, recovery should be made with orders of the Accepting authority whose decision shall be final. All action under this clause should be initiated and intimated to the contractor within the period of twelve months from the date of completion.

(h) Site Order book

For the purpose of quick communication between Architect and the Contractor / his representative, site order book shall be maintained at site as described below:

Any communication, relating to the works may be conveyed through recording in the site order book. Such a communication from Architect/RGCB to the Contractor shall be deemed to have been adequately served in terms of the contract. The site order book shall have machine numbered pages and shall be carefully maintained and preserved by the Project Manager.

(i) Pre-construction anti-termite treatment shall be carried out in co-ordination with the building work and shall be executed in such a manner that the civil works are not hampered or delayed by the anti-termite treatment. The waterproof treatment shall be of type and specifications as given in the schedule of quantities. The treatment against water-proofing of basement, roofs, water retaining areas and termite infestation shall be and remain fully effective for a period of not less than 10(Ten) years to be reckoned from the date of expiring of the Defect Liability period, prescribed in the contract. At any time during the said guarantee period if the client or his representative finds any defects in the said treatment or any evidence of re-infestation, dampness, leakage in any part of buildings or structure and notifies the contractor of the same, the contractor shall be liable to rectify the defect or give re-treatment and shall commence the work or such rectification or re-treatment within seven days from the date of issue of such letter to him. If the contractor fails to commence such work within the stipulated period, the client or his representativedeeming the same done by another agency at the Contractor’s cost and risk and the decision of RGCB for the cost payable by the contractor shall be final and binding upon him. Re-treatment if required shall be attended to and carried out by the Contractor within seven days of the notice from the client or his representative. Water proofing and anti-termite treatment shall be got done through approved / specialized agencies only with prior approval of the client or his representative. During the execution of work, if any damage shall occur to the treatment already done, either due to rain or any other circumstances, the same shall be rectified and made good to the entire satisfaction of the client or his representative by the contractor at his costs and risks.

(j) Marine plywood or steel plates of minimum thickness as approved by Architect shall be used for formwork. The shuttering plates shall be cleaned and oiled after every repetition and shall be used. The number of repetitions allowed for plywood and steel shuttering shall be depending upon the condition of shuttering surface after each use and the decision of
Architect in this regard shall be final and binding on the contractor. No claim whatsoever on this account shall be admissible.

(k) RECORDS OF CONSUMPTION OF CEMENT & STEEL - For the purpose of keeping a record of cement and steel received at site and consumed in works, the contractor shall maintain records in the form approved by the Architect, showing columns like quantity received and used in work and balance in hand etc. The contractor’s representative and Architect’s representative shall sign this register daily.

(l) The contractor shall prepare and finalize a’ Quality Assurance Programme’ within 15 days from letter of acceptance Architect shall also carryout quality audit and quality surveillance of systems and procedures of Contractor’s quality control activities. The Quality Assurance Programme of Contractor shall generally cover the following:
   a) Procedure for selection and approval of material sources.
   b) Type, frequency, sampling and procedure of tests at site and laboratories.
   c) Work instruction for various stages of work.
   d) Formats for carrying out various tests.
   e) Checklist for Construction Practices.

(m) The instruction/ approvals given by the Architect to contractor shall hold good if not objected by the client. In case instructions and approvals are given by client, the same shall supersede the instruction of Architect. In all cases decision of the Client shall be final and binding on the contractor.
B) PLUMBING WORKS

1. Contractor should take proper care in cutting pipes and other materials issued by the owner to use at site of work so that wastage will be within permissible limit. In case the wastage is found more than permissible limit due to negligence omission carelessness from the contractor or any workers employed by him, necessary recovery will be effected from the contractor’s bills.

2. The contractor shall execute the work in consultation with the site in charge and all other agencies and persons engaged at the site.

3. Concealed piping work shall be done in consultation with civil contractor / site in charge before plastering work is done.

4. All work’s involving cutting and breaking of walls and slabs etc. should be done before plastering work in done.

5. Contractor should take proper care in handling all kinds of fittings issued to him and if any breakage, shortage is found due to carelessness, omission negligence from the part of contractor on his employees or by theft the cost of fittings found broken, damaged or stolen will be recovered from the contractor.

6. All plumbing works shall be pressure tested for all kinds of leakage etc, before plastering work is done to the satisfaction of Architect.

7. Care shall be taken while making holes drilling cutting etc, to avoid damage to plumbing and electrical lines and other cables lines etc.

8. The contractor shall provide safety devices to all the persons working at dangerous position employed by him at the site.

9. The contractor shall obtain sanction from concerned authority for taking water connection from KWA main line.

10. The contractor shall obtain Consent to establish and Consent to operate from Kerala State Pollution Control Board. The treated waste water shall conform to the parameters specified by KPCB for reuse for Flushing.
C) ELECTRICAL WORKS

1. The sub-work of internal EI/External EI/SITC of Substation works/SITC of Diesel Generator works etc. shall be carried out by the main contractor only through CPWD registered / enlisted Contractor of appropriate Class.

2. If the main contractor fails to associate agency / agencies for execution of minor components of work within a reasonable time and furnish complete details or furnishes details of ineligible agencies even after the tenderer is given due opportunity, the entire scope of such component of works shall be withdrawn from the tender and the same shall be got executed by RGCB at the risk and cost of the main contractor.

3. The materials shall be procured only from the manufacturers and their authorized dealers and documentary proof for such procurement and supply shall be produced by the contractor.

4. The department reserves the right to send such materials to the manufacturers/authorized test laboratory to verify the genuineness and quality of the product.

5. The contractor is advised to visit the site before quoting for this tender to apprise himself about the site environments and other conditions. Drawings and specifications are enclosed with the tender which shall be scrupulously followed in the execution.

6. The work shall be progressed in tune with the civil work. As such, the contractor/agency engaged for electrical works shall work in close coordination with casting of the slabs, erection of the walls etc. as reqd. No claim of the contractor shall be entertained by the department for the idle labour.

7. The conduit shall be laid in the RCC slab before their concreting and in walls before plastering and in MS / Al. channels. The actual run of conduit and size of the boxes are to be marked on drawing by the contractor and got approved from the Architect before erection at site.

8. Earthing shall be done in the presence of the Project Engineer of the Architect or his authorized representatives.

9. The contractor shall be responsible for any damage caused to the building or electrical installations during the execution of the work. Damage, if any shall have to be made good by the contractor at his own cost failing which the same shall be got rectified and made good at the risk and cost of the contractor.

10. The work shall be carried out in engineering like manner of best practices and bad workmanship shall be rejected summarily. For redoing the job, no claim of the contractor shall be entertained.

11. The site shall be cleared of, Melba, debris caused by working at site without any extra cost to RGCB.

12. The contractor or his authorized representative shall sign the site order book and comply with the remarks entered therein by the representative of the Architects and RGCB.
13. Wherever make of material is not mentioned the contractor shall quote clearly the make in his tender.

14. The contractor will ensure that all the skilled persons engaged / deployed for executing the electrical work process the wireman license issued by approved authorities. Consequences arising due to the default of the contractor to comply with this condition would be contractor’s responsibility only.

15. All the DB’s switchgears shall have identification marking on them written in white paint. Nothing extra shall be paid on this account.

16. Earthing points with studs are to be provided on each of the switch boards /DB’s.

17. All hardware, fastening material via, nuts, bolts, washers and screw etc. to be used on work shall be of Zinc / cadmium plated or as per CPWD Specification.

18. All the material should be ISI marked wherever not specified, if ISI marked material is not available it should be conforming to BIS specification amended upto date, however, approved make of the materials only to be used in the work as per agreement.

19. The contractor shall have to furnish the insulation test report, earth report, along with all required details of electrical load on the prescribed proforma for the electric connection from KSEB or as desired by them.

20. The contractor shall submit the completion certificate and completion plan as per Clause 1.26 of General Specifications for Electrical Works Part-I, Internal 2013.

21. All concealed works and earthing shall have to be done in the presence of the Architect or his authorized representative.

22. The chases in walls shall be done by chase cutting machines, for which contractor shall arrange adequate numbers of chase cutting machines (Chase Cutters) for cutting chases in walls etc. for laying of conduits.

23. The contractor will have to arrange for insulation and other tests as per rules in the presence of the representative of the Architect as and when required by him and submit the test report in triplicate before the work can considered as complete.

24. The contractor shall be responsible for the safe custody of the electrical installation in the building, including fitting and fixtures till the installations are handed over to the department. He should make his own arrangement for proper watch and ward at his risk and cost. No claim will be entertained on this account.

25. The work is to be carried out in workman like manner and generally in accordance with the plans. However the contractor will be bound to carry out the work with minor deviation over the plan supplied if desired by the Architect of the work.

26. All chases holes recesses etc. shall be done to the original finish by the contractor as required without any additional cost.
27. All the boxes for fixing accessories such as switches / sockets regulators etc. will be good quality and the size shall be got approved from the Architect or his authorized representative and the boxes shall be recessed in the wall.

28. All the junction boxes used should be covered in front with 3 mm thick Hylam sheet.

29. After completion of the work, the contractor shall remove all the dust and dirt and keep the building in a clean condition.

30. Rate should be inclusive of all taxes and duties as levied by Govt. from time to time.

31. All the wires above 1.5 Sq. mm must be terminated to the boards/MCB’s etc. through suitable lugs by crimping for which no extra payment will be made.

32. Proper sleeving should be provided to the bare earth conductor in switch boxes and also to the bare conductor used for inter switch looping inside the switch boxes for which no extra payment will be made.

33. The contractor to lay conduits and switch boxes in the brick work before start of plastering by civil department. Also fish wire must be drawn in conduit works for which no extra payment will be made.

34. Loose wire inside the boxes, wherever required shall be provided along with MCBDB for which no extra payments shall be made to the contractor.

35. All metal boxes, boards, frames etc. are to be provided with anti-rust primer before erection.

36. Work to be executed in accordance with Specifications, Drawings, and Orders etc.

The contractor shall execute the whole and every part of the work in the most substantial and workman like manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design drawings and instruction given by the Employer/ Architect. The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works, and provide all labour and materials, tools and plants including for measurement and supervision of all works and structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these is specified or is reasonably inferred from the contract. The contractor shall take full responsibility for adequacy suitability and safety of all the works and methods of construction.

37. Measurement and Billing

The contract is for the completed work to be paid for according to the actual quantities at the rate agreed upon in the tender schedule of rates & probable quantities. All measurements shall be taken jointly by the Engineer/Consultant of the Architect and authorized representative of the contractor from time to time during the progress of work and such measurements are recorded in the measurement book by the former and dated signature obtained from the latter in token of his acceptance. The contractor shall without extra charge provide all assistance with every appliance, labour and other things necessary for
measurement. The measurements shall be done in accordance with the procedure followed in Central PWD. A Senior Engineer of the Architect/Consultant shall check all the measurements recorded in the measurement books. The contractor has to obtain the quantities of items of work done from the consultant and prepare the bill based on the agreed rates. The bills shall be checked and duly certified by the Architect for making payment by RGCB as per the terms of payment schedule.

38. The contractor shall bring the sample of all approved makes of the materials listed in the Tender to the Architect and shall use the material as per the sample approved by the Architect. Sample of approved materials must be kept at site for inspection/comparison with materials used in the work by senior officers. All materials shall be delivered with manufactures test certificates and technical catalogues, instructions manuals, wiring diagram etc. as required.

39. All HT works shall be executed as per IE rules, KSEB rules, KSEI rules and BIS.

40. Diesel Generator installation should be carried out in accordance with IE rules, CPCB –II rule, KSEB rules, KSEI rules and BIS.

41. Whatever be the make or specification given in the schedule or technical specification, the sample that is approved by the architect and RGCB alone should be used. No extra cost on this account is payable.

D) HVAC WORKS

1. The air conditioning compressors offered multiple shall have COP more than 4.9.

2. Computer selection of the chillers has to be furnished by the original manufactures. Manipulated selections will be violation of tender.

3. Overall Chiller efficiency offered shall have COP ≥ 4.9 for 150 TR Chiller.

4. Power consumption details shall be furnished conforming to ARI-2000– 550-598 but however the following data may be followed.

   Condenser water inlet and outlet temperatures = 90°F, 97.5°F
   Chilled water inlet and outlet temperatures = 55°F, 45°F
   Chiller fouling factor = 0.00025/0.0001

5. The above power consumption shall be tested and test certificate shall be furnished.

6. The work shall be carried out strictly in accordance with the time schedule and other instructions given by the owner taking care to cause minimum amount of noise and other nuisance at the site.

7. Security of all materials stored at site shall be the sole responsibility of the bidder.

8. All items shall be by OEMs only and no labeled products quoted will be accepted. The OEMs should have a service setup in south India as well.

9. All pumps / motor need to be high energy efficient and have efficiency of 80% or above.
10. All AHUs will be given only one power input cable. Any looping should be done by OEM in case of multiple motors in one AHU

11. All mandatory and statute sanction orders and approvals from the electrical inspectorate and KSEB shall be obtained by the contractor before energizing the system.

12. All ceiling suspended AHUs to have access door.

(E) FIRE PROTECTION WORKS

1. The installation of Fire hydrant, Fire Sprinkler and Detection system shall conform to norms as per National Building Code 2005- Part IV

2. The Contractor shall prepare shop drawings, material submittals and get the same approved by the Architect before execution of works.

3. The contractor shall obtain initial and final NOC for the Firefighting system from local authorities like State Fire Department and liaison work with department.

4. The Contractor shall obtain statutory approval for energizing electrical items included in the tender from the electrical inspectorate.

5. The Contractor shall commission the system after erection and testing of the works. This may be done in the presence of authorized Fire authority personnel.
ADDITIONAL CONDITIONS

A. GENERAL AND CIVIL WORKS

1. Unless otherwise provided in the Schedule of quantities 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. Other agencies doing work related with this project will also simultaneously execute the 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 other agencies conduits for Electrical wiring/cables will be laid in a way that they leave enough space for concreting and do not adversely affect the structural members. Nothing extra over the agreement rates shall be paid for the same.

3. The contractor shall be bound to follow all restrictions/instructions with regard to safety/security and nothing extra shall be payable on this account.

4. (a) The Construction works will be carried out in the manner complying in all respects with the requirements of relevant byelaws of the local body under the jurisdiction of which the work is to be executed or as directed by the Architect of RGCB and nothing extra will be paid on this account.

(b) The contractor shall comply with proper and legal orders and directions of the Local or Public authority or Municipality and abide by their rules and regulations and pay all fees and charges, which he may be liable.

5. Any cement slurry added over base surface (or) for continuation of concreting for better bond is deemed to have been built in the items and nothing extra shall be payable (or) extra cement considered in consumption on this account.

6. All drawings issued for the work shall at all times be properly co-related before executing any item of work.

Samples of various materials required for testing shall be provided free of charge by the contractor. Testing charges shall be borne by the department. However, if material does not conform to the relevant codes/specifications, the testing charges shall be borne by the contractor. All other expenditure required to be incurred for taking the samples; conveyance, packing etc. shall be borne by the contractor himself.

7. All drawings issued for the work shall at all times be properly co-related before executing any item of work.

8. For the purpose of recording measurements and preparing running account bills, the abbreviated nomenclatures indicated in the publications “Abbreviated nomenclature of item of DSR-2014” with up to date correction slips 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 other relevant specifications.
(b) In the case of items for which abbreviated nomenclature is not available in the above cited publication and also in case of extra and substituted items of works for which abbreviated nomenclature is not provided in the agreement, the full nomenclature of the items shall be reproduced in the measurement books and bill forms for running account bill.

The full nomenclature of the items shall be adopted in preparing abstract of final bill form in the measurement book and also in the bill form for final bill.

9 The following procedure shall be followed in case of removal of rejected/sub-standard materials from the site of work.

Whenever any material brought by the contractor to the site of work is rejected, entry thereof should invariably be made in the site order book under the signature of the Project Manager giving approximate quantity of such materials. As soon as the material is removed, a certificate to that effect may be recorded by the Project Manager against the original entry, giving the date of removal and mode of removal i.e. whether by truck, carts or by manual labour. If removal is by truck, the registration number of the truck should be recorded.

10. Conditions for Cement (Grey Cement)

i) The contractor shall procure 43 grade ordinary Portland Cement/Portland Pozzolano Cement (PPC) as required in the work, from reputed manufacturers of cement such as ACC, Ultra tech, Vikram, Shree Cement, Ambuja, Jaypee Cement, Century Cement, J. K. Cement India Cement, Malabar Cement or from any other reputed cement Manufacturer having a production capacity not less than one million tonnes per annum as approved by RGCB.

The contractors may also submit a list of names of cement manufacturers which they propose to use in the works whose name shall be got approved from the Architect. Supply of cement shall be taken 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 relevant BIS codes. In case test results indicate that the cement arranged by the contractor does not conform to the relevant BIS codes, the same shall stand rejected and shall be removed from the site by the contractor at his own cost within a week’s time of written order from the Architect to do so.

ii) PPC (Portland Pozzolana Cement) if used in RCC structures is to be regulated in accordance with the circular issued by the Directorate General of Works CPWD vide No.CDO/SE(RR)/Fly Ash (Main)/102 dt.09.04.2009.

iii) If necessitated due to low water/binder ratio, required workability shall be achieved by use of chloride free chemical admixtures conforming to IS: 9103. The compatibility of chemical admixtures and super plasticizers with each set OPC, fly ash and/or PPC received from different sources shall be ensured by trials.

iv) The cement shall be brought at site in bulk supply of approximately 50 tonnes or as decided by the Project Manager.
v) The cement godown of the capacity to store a minimum of 2000 bags of cement shall be constructed by the contractor at the site of work for which no extra payment shall be made. Double lock provision shall be made to the door of the cement godown. The keys of one lock shall remain with the Project Manager or his authorized representative and the keys of the other lock shall remain with the contractor. The contractor shall be responsible for the watch and ward and safety of the cement godown. The contractor shall facilitate the inspection of the cement godown by the Project Manager at any time.

vi) The cement shall be got tested by Project Manager and shall be used on work only after satisfactory test results have been received. The contractor shall supply free of charge the cement required for testing. The cost of tests shall be borne by the contractor.

vii) Damaged cement shall be removed from site immediately by the contractor on receipt of notice in writing from the Project Manager. If he does not do so within three days of receipt of such notice, the Project Manager shall get it removed at the cost of the contractor.

viii) The actual issue and consumption of cement on work shall be regulated and proper accounts maintained. The theoretical consumption of Cement shall be worked out and regulated as per procedure laid out elsewhere in the contract.

(ix) The cement brought to site and the cement remaining unused after completion of the work shall not be removed from the site without the written permission of the Project Manager.

(x) Cement should be kept in godowns properly and register should be maintained to record receipts as well as consumption.

11. Conditions for Steel

i) The contractor shall procure TMT bars of grade prescribed in the drawings/Specifications, 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.

In case of non-availability of steel from primary producers the NIT approving authority may permit use of TMT reinforcement bars procured from steel producers having integrated steel plants (ISPs) using iron ore as the basic raw material for production of crude steel which is further rolled into finished shapes in-house.

In case of non-availability of steel from Primary Producer as well as ISPs then the RGCB may also permit use of TMT reinforcement bars procured from secondary producers.

In such cases following action is to be taken.

a) The grade of the steel such as Fe 500D or other grade to be procured is to be specified as per BIS 1786 -2008

b) The secondary producers must have valid BIS license to produce HYSD bars conforming to IS 1786:2008. In addition to BIS license, the secondary producer must have valid license from either of the firms Tempcore, Thermex, Evcon Turbo & Turbo Quench to produce TMT Bars.
c) The TMT bars procured from primary producers and Integrated Steel Plants (ISP) shall conform to manufacture’s specifications.

d) TMT bars procured either from primary producers or secondary producers, the specifications shall meet the provisions of relevant BIS codes.

ii) The contractor shall have to obtain and furnish test certificates to the Architect in respect of all supplies of steel brought by him to the site of work.

iii) Samples shall also be taken and got tested by the Architect as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the contractor does not conform to the specifications as defined under para 1(d) and 1(e) above the same shall stand rejected, and it shall be removed from the site of work by the contractor at his cost within a week time on written orders to do so.

iv) The steel reinforcement shall be brought to the site in bulk supply of ten tones or more as decided by the Architect.

v) The steel reinforcement shall be stored by the contractor at site of work in such a way as to prevent distortion and corrosion and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.

vi) For checking nominal mass, tensile strength, bend test, re-bend test etc. specimen of sufficient length shall be cut from each size of the bar at random at frequency not less than that specified below:

<table>
<thead>
<tr>
<th>Size of bar</th>
<th>For consignment below 100 tonnes</th>
<th>For consignment above 100 tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 10mm dia. bars</td>
<td>One sample for each 25 tonnes or part thereof</td>
<td>One sample for each 40 tonnes or part thereof</td>
</tr>
<tr>
<td>10mm to16mm dia bars</td>
<td>One sample for each 35 tonnes or part thereof</td>
<td>One sample for each 45 tonnes or part thereof</td>
</tr>
<tr>
<td>Over 16mm dia bars</td>
<td>One sample for each 45 tonnes or part thereof</td>
<td>One sample for each 50 tonnes or part thereof</td>
</tr>
</tbody>
</table>

vii) The contractor shall supply free of charge the steel required for testing. The cost of tests shall be borne by the contractor.

viii) In case contractor is permitted to use TMT reinforcement bars procured from ISPs or secondary producers then:

The rate for providing & laying TMT reinforcement bars as quoted by the contractor in the tender shall be reduced by an amount worked out based on the difference in cost between the TMT/produced by primary steel producers and that by secondary producers allowing 15% overheads and profit.
ix. The actual issue and consumption of steel on the work shall be regulated and proper accounts maintained the theoretical consumption of steel shall be worked out as per procedure laid out elsewhere in the contract.

B. ELECTRICAL AND HVAC WORKS.

1. Internal EI/External EI/SITC of Substation works/SITC of Diesel Generator works etc. shall be carried out by the main contractor only through CPWD registered / enlisted Contractor of appropriate Class.

2. Materials/Equipment’s shall be procured only from approved manufacturers or their authorized dealers and documentary proof for such procurement and supply shall be produced by the contractor.

3. RGCB reserves the right to get the materials tested to verify the genuineness/ quality of the product as per the terms provided elsewhere in the contract.

4. The contractor is advised to visit the site before quoting to apprise himself about the site environments and other conditions. Drawings and specifications enclosed with the tender shall be scrupulously followed.

5. Electrical works shall be progressed in coordination with the civil works. The agency for electrical works shall work in close coordination with casting of the slabs, erection of the walls etc. as reqd. No claim of the contractor shall be entertained by the department for the idle labour.

6. Conduits shall be laid in the RCC slab before concreting and in walls before plastering. The actual run of conduit and size of the boxes are to be marked on the drawings by the contractor and got approved from the Architect before erection at site.

7. Earthing shall be done in the presence of the Project Engineer or his authorized representatives.

8. The contractor shall be responsible for any damage caused to the building or electrical installations during the execution of the work. Damage, if any shall have to be made good by the contractor at his own cost failing which the same shall be got rectified and made good at the risk and cost of the contractor.

9. Works shall be carried out in engineering like manner of best practices .Bad workmanship shall be rejected summarily. For redoing the job, no claim of the contractor shall be entertained.

10. The site shall be cleared of, malba, debris etc. caused by working at site without any extra cost to RGCB.

11. The contractor or his authorized representative shall sign the Site order book and comply with the remarks entered therein by the representative of the Architect/ RGCB.

12. The contractor will ensure that all the skilled persons engaged / deployed for executing the electrical work poses appropriate license issued by approved authorities.
Consequences arising due to the default of the contractor to comply with this condition would be contractor’s responsibility only.

13. All the DBs, switchgears etc. shall have identification marking on them written in white paint. Nothing extra shall be paid on this account.

14. Earthing points with studs are to be provided on each of the switch boards /DBs.

15. All hardware, fastening material via, nuts, bolts, washers screw etc. to be used on work shall be of Zinc / cadmium plated or as per CPWD Specifications.

16. The contractor shall have to furnish the insulation test report, earth report, along with all required details of electrical load on the prescribed proforma for the electric connection from KSEB.

17. The contractor shall submit the completion certificate and completion plan as per Clause 1.26 of General Specifications for Electrical Works (Part-I, Internal) 2013.

18. All concealed works and earthing shall have to be done in the presence of the Architect or his authorized representative.

19. The chases in walls shall be done by chase cutting machines, for which contractor shall arrange adequate numbers of chase cutting machines (Chase Cutters)

20. The contractor will have to arrange for insulation and other tests as per rules in the presence of the representative of the Architect as and when required and submit the test report in triplicate before the work can be considered as completed.

21. The contractor shall be responsible for the safe custody of the electrical installation in the building, including fittings and fixtures till the installations are handed over RGCB. He should make his own arrangement for proper watch and ward at his risk and cost. No claim will be entertained on this account.

22. The work is to be carried out in workman like manner and generally in accordance with the plans.

23. All chases/ holes/ recesses etc. shall be finished to the original finish by the contractor as required without any additional cost.

24. All the boxes for fixing accessories such as switches / sockets regulators etc. will be as per approved samples and the sizes shall be got approved from the Architect or his authorized representative. The boxes shall be recessed in the walls.

25. All the junction boxes used should be covered in front with 3 mm thick Hylam sheet.

26. All the wires above 1.5 Sq. mm must be terminated to the boards/MCBs etc. through suitable lugs by crimping for which no extra payment will be made.

27. Proper sleeving should be provided to the bare earth conductor in switch boxes and also to the bare conductor used for inter switch looping inside the switch boxes for which no extra payment will be made.
28. The contractor to lay conduits and switch boxes in the brick work before start of plastering. Also fish wire must be drawn in conduit works for which no extra payment will be made.

29. Loose wire inside the boxes, wherever required shall be provided along with MCBDB for which no extra payments shall be made.

30. All metal boxes, boards, frames etc. are to be provided with anti-rust primer before erection.

31. All HT works shall be executed as per IE rules, KSEB rules, KSEI rules and BIS codes

32. Diesel Generator installation should be carried out in accordance with IE rules, CPCB – II rule, KSEB rules, KSEI rules and BIS codes.

33. MODE OF MEASUREMENT FOR HVAC WORKS

The following system of measurement shall be followed in respect of items given below.

**Sheet Metal Work**

a) Ducting:
   
   i. All sheet metal ducting work will be measured in terms of final sheet area installed in SQ. METERS.
   
   ii. No measurement of vanes, splitters, duct dampers, deflectors, access doors, etc. which are required to be installed in the ductwork shall form part of the ductwork.
   
   iii. Duct fittings such as bends, elbows, tap-offs, collars, transformation pieces etc. shall be treated as ordinary duct pieces with their length measured along their centerline.
   
   iv. No duct supports, stiffening, members, etc. shall be measured separately. All such supports/hangers shall form part of ductwork.
   
   v. Equipment connections such as canvas/asbestos/Rexene shall be deemed to be part of the ductwork and no separate measurement will be allowed.

b) Grilles:

All grilles will be measured in terms of effective area (e.g. 600mm x 150mm grille will be measured as 0.09 Sq. Meter

   c) Diffusers:

Diffusers will be measured in terms of diameter of each diffuser in centimeters.

   d) Dampers

   i) All duct dampers shall form part of ductwork; no separate measurement will be made for duct dampers.

   ii) Fire dampers will be measured in terms of effective area in Sq. metre.

   e) Insulation

1) Ducting Insulation
i) Ducting insulation will be measured on the basis of duct area and not based on insulation thickness.

Example: Measurement 25 mm thick insulation on 600 mm x 300 mm duct 1 metre length. [0.600 + 0.300] 2 x 1 metre = 1.800 Sq.m.

ii) No special measurement shall be made for insulation of bends, transformation pieces, tap offs, elbows etc. All such insulation shall be treated as standard duct insulation.

iii) Insulation item shall include all accessories and finishes as specified. No separate measurement will be made for such items.

2) Piping Insulation

i) Piping insulation shall be measured in linear lengths for each size of pipe.

Example: 50mm dia. pipe insulation (25 mm thick) - 6 meters.

ii) No separate measurement of insulation shall be made for fittings such as bends, elbows, reducers, expanders, tees, crosses, flanges, etc. All such insulation shall be linear in meters measured along the centerline of piping.

iii) All accessories and finishes connected with insulation work shall be deemed to form part of insulation and no separate measurement will be made for such items.

iv) Insulation of valves will be measured as a unit for a particular size of valve.

Example: 50 mm dia. valve insulation (25 mm thick) - 1 No.

3) Equipment Insulation

No measurement for insulation of any equipment will be made. Insulation of equipment shall be deemed to form part of the equipment.

34. SHOP DRAWINGS

Before proceeding with the work, the contractor shall submit for approval the general layout and assembly drawings and such additional assembly and sub assembly detail drawings as are necessary to demonstrate fully that all parts of the apparatus to be furnished will confirm to the specifications. Soon after the acceptance of the tender the contractor shall furnish six prints of layout, assembly and erection drawings for approval. If any modification is proposed by the owner/his assignee, six further prints of the modified drawings shall be submitted. No modification shall be made in a drawing after it has been approved by the owner/his assignee without prior consent. All drawings necessary for assembly erection, maintenance, repair and operation of the equipment shall be furnished. Different parts shall be suitably numbered for identification and ordering of spare parts. Approval of the owner of the drawings will not relieve the contractor of any part of his obligations to meet all the requirements of the correctness of his drawings. The contractor shall be responsible for and will pay for all alterations of the works due to discrepancies or omission in the tender and other particulars supplied by him whether such drawings have been approved by the owner/his assignee or not. After approval of the drawings the contractor shall furnish a set of tracing of the contractor drawings. Six copies of the approved drawings and manuals shall be
submitted for use by the owner /his assignee before and during erection. Subsequently operation and maintenance of the plant shall also be furnished after approval of the contractor drawings. The contractor shall furnish and install in the machine room a neatly typed set of operating instructions securely framed and glazed. The contractor shall also supply one set of tools free of cost required for routing and special maintenance work. The contractor shall submit 2 sets of representations as “as is built drawings” and also in floppies for owners record.

A) ISSUE OF DRAWINGS:

Construction drawings will be issued to the Contractor progressively during the contract period and the Contractor shall arrange for the execution of the works and the procurement of materials accordingly. The Contractor shall give adequate notice in writing to the Architect or his representative of any further drawings or specifications that may be required for the execution of the works or otherwise under the contract.

B) RATES QUOTED FOR FINISHED WORK:

The rates quoted in the tender by the Contractor must be for the finished work as per the drawings and specifications.
PROFORMA OF SCHEDULES

SCHEDULE ‘A’
Schedule of quantities : Attached as per Vol III of the Tender documents

SCHEDULE ‘B’
Schedule of materials to be issued to the contractor : No materials are proposed to be issued to the Contractor by RGCB.

SCHEDULE ‘C’
Tools and plants to be hired to the contractor : No Tools & Plants are proposed to be hired to the Contractor by RGCB.

SCHEDULE ‘D’
Extra schedule for specific requirements/document for the work, if any : N I L

SCHEDULE ‘E’
Reference to General Conditions of contract : GCC of Contract Page 39 to 105

Name of work : Establishment of RGCB Bio Innovation Research Center at Akkulam in Thiruvananthapuram District, Kerala State Phase. I – Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil & Related MEP works including site development and connected Infrastructure (Composite contract)

Estimated cost of work : Rs.56.59 Crores
Earnest Money : Rs. 67 Lakhs
Performance Guarantee : 5 % of tendered value
Security Deposit : 2.50 % of tendered value
SCHEDULE ‘F’

GENERAL RULES & DIRECTIONS

Definitions:

Officer inviting tender : Controller of Administration RGCB

Architect : Consortium of Architect Hafeez Contractor and M/s Iyer and Mahesh, who has been appointed by the client for Architectural planning/ Engineering, Design and Project Management

Accepting Authority : Controller of Administration, RGCB

Percentage on cost of materials and Labour to cover all overheads and Profits : 15%

Standard Schedule of Rates : DSR’ 2014

Department/Owner : Rajiv Gandhi Centre for Biotechnology under Department of Biotechnology Government of India.

APPLICABILITY OF GENERAL CONDITIONS OF CONTRACT

Clause 1

(i) Time allowed for submission of Performance Guarantee from the date of issue of letter of acceptance : 10 (Ten) days

(ii) Maximum allowable extension beyond the period provided in (i) above with late fee 0.1% per day of Performance Guarantee amount beyond the period provided in (i) above : 10 Days

Clause 2 Authority for fixing compensation under clause 2 : Director, RGCB

Clause 2A Incentive for early completion Applicable
Clause 5

(i) Number of days from the date of issue of letter of acceptance for reckoning date of start 7 days

(ii) Time allowed for execution of work 18 Months

(iii) Milestones To be finalized on Award of Work

Authority to decide:

(i) Extension of time Controller of Administration

(ii) Rescheduling of mile stones Controller of Administration

Clause 6, 6A

Clause applicable - (6 or 6A) 6A

Clause 7

Gross work to be done together with net payment /adjustment of advances for material collected, if any, since last such payment for being eligible to interim payment Rs. 350.00 lakhs

Clause 10A

Materials to be provided by the Contractor Applicable

List of testing equipment to be provided by the contractor at site lab

For Civil Works

1. Balances
   
   i. 7kg. to 10kg. Capacity, semi –self indicating type – accuracy 10 gm.

   ii. 500 gm. Capacity, semi –self indicating type – accuracy 1 gm.


2. Ovens – electrically operated, thermostatically controlled upto 110o C – Sensitivity 1oC.

3. Sieves: as per Is 460 -1962
i. I.S. Sieves -450mm internal dia, of sizes 100mm, 63 mm, 50mm, 40mm, 25mm, 20mm, 12.5mm, 10.mm, 6.3mm, 4.75mm, complete with lid and pan.

ii. I.S. Sieves – 200MM internal dia (brass frame) consisting of 2.36mm, 1.18mm, 600 microns, 425 microns, 300 microns, 212 microns, 150 microns, 90 microns, 75 microns, with lid and pan.

4. Sieve shaker capable of 200 mm and 300mm dia sieves, manually operated with timing switch assembly.

5. Equipment for slump test – Slump cone, steel plate, tamping rod, steel scale, scoop.

6. Dial gauges, 25 mm travel -0.01mm/division least count – 2

7. 100 tonnes compression testing machine, electrical –cum manually operated.


i. 300 mm x 250 mm 40 mm – 2nos

ii. Circular plates of 250 mm dia – 2 nos

11. Cube Mould – as per requirement.

Note: The above list is indicative and is bare minimum. However contractors are advised to provide Laboratory Testing Equipments in required number so that Quality of work does not suffer due to shortage of Equipment.

For Electrical Works

1. Ammeter/tong tester
2. Volt meter
3. Watt meter
4. Power factor meter
5. Frequency meter
6. Energy meter
7. Insulation megger (all voltages)
8. Earth tester
9. Trivactor meter
10 flux meter
11. Tach0 meter
12. Rubber gloves
13. Multimeter
14. Lux meter
15. Sound level meter
16. Network cable tester
17. Screw gauge
18. Vernier calipers
For HVAC works

1. AMMETER/TONG TESTER
2. VOLTMETER
3. INSULATION MEGGER (All voltages)
4. TACHOMETER
5. RUBBER GLOVES
6. MULTIMETER
7. SOUND LEVEL METER
8. SCREW GAUGE
9. VERNIER CALIPER
10. WET BULB THERMOMETER
11. DRY BULB THERMOMETER
12. PRESSURE GAUGE

<table>
<thead>
<tr>
<th>Clause 10B (i) &amp; 10B (ii)</th>
<th>Secured advance and mobilization advance</th>
<th>Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clause 10B (iii)</td>
<td>Interest and recovery</td>
<td>Applicable</td>
</tr>
<tr>
<td>Clause 10C</td>
<td>Payment on account of increase in prices due to statutory orders</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Clause 10CC</td>
<td>Payment due to increase/decrease/prices/wages excluding materials covered under Clause 10CA</td>
<td>Applicable</td>
</tr>
</tbody>
</table>

Component of Materials Expressed as percent of total value of work

| Xm | 75% |

Component of Labour Expressed as percent of total value of work

| Y | 25% |

For Civil

CPWD Specifications 2009 volume - I & II with corrections slips

Up-to-date of dropping of tender and Technical specifications included for non-schedule items of work.

Electrical

CPWD General Specification
<table>
<thead>
<tr>
<th>Clause 12</th>
<th>Deviation/variation extent and pricing</th>
<th>Applicable (To be Treated as original work)</th>
</tr>
</thead>
</table>

**Clause 12.2. & 12.3**

Deviation limit beyond which clauses 12.2 & 12.3 shall apply

1. Foundations (including earth work) - 100%
2. Superstructure - 30%

**Clause 16**

Competent Authority for deciding reduced rates.

Controller of Administration RGCB

**Clause 18**

List of mandatory machinery, tools & plants to be deployed by the contractor at site.

**For Civil works**

**Earth work equipment**
1. Excavator & Loader (Poclain - 1, JCB - 2)
2. Tipper/Dumper (3 Ton - 5)
3. Earth Compactor
4. Mechanical Earth Rammers

**Other equipment’s**
1. Pump(diesel) - 2 Nos.
2. Pump(electric) - 1 No.
3. Survey Instruments
<table>
<thead>
<tr>
<th>Equipment for concrete work</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Automatic Batching Plant (30 cum/hour) - 1 No.</td>
<td></td>
</tr>
<tr>
<td>ii. Concrete Pump - 1 No. (30 cum/hour)</td>
<td></td>
</tr>
<tr>
<td>iii. Transit mixer 6cum Capacity - 2 Nos.</td>
<td></td>
</tr>
<tr>
<td>iv. Diesel mixer with Weigh batcher - 1 No.</td>
<td></td>
</tr>
<tr>
<td>v. Electrical mixer with Weigh batcher - 1 No.</td>
<td></td>
</tr>
<tr>
<td>vi. Needle Vibrator 25 mm needle - 2 Nos.</td>
<td></td>
</tr>
<tr>
<td>40 mm needle - 3 Nos.</td>
<td></td>
</tr>
<tr>
<td>60 mm needle - 2 Nos.</td>
<td></td>
</tr>
<tr>
<td>80 mm needle - 1 No.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Equipment for hoisting &amp; lifting</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Tower Crane-20mtr–1No.</td>
<td></td>
</tr>
<tr>
<td>ii. Hydra crane/ Other cranes -1 No.</td>
<td></td>
</tr>
<tr>
<td>iii. Builders hoist -2 Nos.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power equipment’s</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i. Diesel generators 50 KVA capacity - 1 No.</td>
<td></td>
</tr>
<tr>
<td>ii. Jack hammer Withcompressor - 1 No.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For Electrical works</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Welding plants</td>
<td></td>
</tr>
<tr>
<td>2. Wall cutter</td>
<td></td>
</tr>
<tr>
<td>3. Crimping tools</td>
<td></td>
</tr>
<tr>
<td>4. Screw driver all sizes</td>
<td></td>
</tr>
<tr>
<td>5. Plier all types</td>
<td></td>
</tr>
<tr>
<td>6. Cable insulation remover</td>
<td></td>
</tr>
<tr>
<td>7. Hacksaw</td>
<td></td>
</tr>
<tr>
<td>8. Chisel</td>
<td></td>
</tr>
<tr>
<td>9. Power drill</td>
<td></td>
</tr>
<tr>
<td>10. Wire drawing spring</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Minimum Qualification of Technical Representative</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Degree in Engineering</td>
</tr>
<tr>
<td>2</td>
<td>Degree in Engineering</td>
</tr>
<tr>
<td>3</td>
<td>Degree in Engineering</td>
</tr>
</tbody>
</table>
Assistant Engineers retired from Government services and holding Diploma in Engineering will be treated at par with Graduate Engineers.

Diploma holder with minimum 10 year 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 requirements of graduate engineers.

**Clause 42**

<table>
<thead>
<tr>
<th>Return of materials/ Theoretical Consumption of Cement, Steel and Bitumen</th>
<th>Applicable for the items of cement, steel and bitumen brought by the contractor.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) (a) Schedule/statement for determining theoretical quantity of Cement, Steel &amp; bitumen on the basis of Delhi Schedule of Rates 2014 printed by C.P.W.D</td>
<td></td>
</tr>
<tr>
<td>ii. Variations permissible on the theoretical quantities</td>
<td></td>
</tr>
<tr>
<td>(a) Cement - 2%plus/minus</td>
<td></td>
</tr>
<tr>
<td>(b) Bitumen- 2.5% plus &amp; Nil on minus side.</td>
<td></td>
</tr>
<tr>
<td>(c) Steel Reinforcement and structural steel Sections for each diameter, section and category - 2%plus/minus</td>
<td></td>
</tr>
</tbody>
</table>
SAFETY CODE

1. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and hand-hold shall be provided on the ladder and the ladder shall be given an inclination not steeper than ¼ to 1(¼ horizontal and 1 vertical.)

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

3. Working platforms, gangways and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 m (12ft.) above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (2) above.

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

5. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. (30ft.) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. (11½") for ladder up to and including 3 m. (10 ft.) in length. For longer ladders, this width should be increased at least ¼" for each additional 30 cm. (1 foot) of length. Uniform step spacing of not more than 30 cm shall be kept. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit; action or proceedings to any such person or which may, with the consent of the contractor, be paid to compensate any claim by any such person.

6. (a) Excavation and Trenching - All trenches 1.2 m. (4ft.) or more in depth, shall at all times be supplied with at least one ladder for each 30 m. (100 ft.) in length or fraction thereof, Ladder shall extend from bottom of the trench to at least 90 cm. (3ft.) above the surface of the ground. The sides of the trenches which are 1.5 m. (5ft.) or more in depth shall be stepped back to give suitable slope or securely held by
timber bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 m. (5ft.) of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances, undermining or undercutting shall be done.

(b) Safety Measures for digging bore holes:-

(i). If the bore well is successful, it should be safely capped to avoid caving and collapse of the bore well. The failed and the abandoned ones should be completely refilled to avoid caving and collapse;

(ii). During drilling, Sign boards should be erected near the site with the address of the drilling contractor and the Architect

(iii). Suitable fencing should be erected around the well during the drilling and after the installation of the rig on the point of drilling, flags shall be put 50m around the point of drilling to avoid entry of people;

(iv). After drilling the bore well, a cement platform (0.50m x 0.50m x 1.20m) 0.60m above ground level and 0.60m below ground level should be constructed around the well casing;

(v). After the completion of the bore well, the contractor should cap the bore well properly by welding steel plate, cover the bore well with the drilled wet soil and fix thorny shrubs over the soil. This should be done even while repairing the pump;

(vi). After the bore well is drilled the entire site should be brought to the ground level.

7. Demolition - Before any demolition work is commenced and also during the progress of the work,

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

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

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

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

(i) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.
(ii) Those engaged in white washing and mixing or stacking of cement bags or any material which is injurious to the eyes shall be provided with protective goggles.

(iii) Those engaged in welding works shall be provided with welder’s protective eye shields.

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

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

(a) Entry for workers into the line shall not be allowed except under supervision of the Project Manager or any other higher officer.

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

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

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

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

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

(g) No smoking or open flames shall be allowed near the blocked manhole being cleaned. The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.

(h) Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Architect may decide the time up to which a worker may be allowed to work continuously inside the manhole.

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

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

The workers engaged for cleaning the manholes/sewers should be properly trained before allowing to work in the manhole.
The workers shall be provided with Gumboots or non-sparking shoes bump helmets and gloves non sparking tools safety lights and gas masks and portable air blowers (when necessary). They must be supplied with barrier cream for anointing the limbs before working inside the sewer lines.

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

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

The extents to which these precautions are to be taken depend on individual situation but the decision of the Architect regarding the steps to be taken in this regard in an individual case will be final.

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

(a) No paint containing lead or lead products shall be used except in the form of paste or ready-made paint.

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

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

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

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

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

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

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

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

(vi) Suitable arrangement shall be made to prevent clothing put off during working hours being spoiled by painting materials.

(vii) Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by medical man appointed by competent authority of RGCB.
(viii) RGCB may require, when necessary medical examination of workers.

(ix) Instructions with regard to special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

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

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

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

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

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

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

(iv) In case of departmental machines, the safe working load shall be notified by the Architect. As regards contractor’s machines the contractors shall notify the safe working load of the machine to the Architect whenever he brings any machinery to site of work and get it verified by the Architect concerned.

12. Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load. Adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided. The worker should not wear any rings, watches and carry keys or other materials which are good conductors of electricity.
13. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.

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

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

16. Notwithstanding the above clauses from (1) to (15), there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

SAFETY CODE FOR AIR CONDITIONING

All conditions applicable with required modification for Air conditioning works as per IS code 660 - Safety Code for Mechanical Refrigeration IS code 659 - Safety Code for Air conditioning IS code 3016 - Code of Practice for Fire precautions in Welding and cutting operations IS code 818 - Code of practice to safety and health requirements in electrical and gas welding cutting operations IS code 5216 - Code for safety procedure and practice in Electrical works IS code 3696 - Safety code for scaffolds and ladders.

ADDITIONAL SAFETY CODE FOR HVAC WORKS

1. A portable single ladder more than 8 mtrs. In length will not be allowed for the execution of the work. The width between the side rails shall not be less than 30 cms. (Clear) and the distance between two adjacent rungs shall not be more than 30 cms. It is compulsory that an extra mazdoor should be engaged for holding the ladder whenever the ladder is used.

2. It is compulsory that the contractor should maintain in a readily accessible place the first aid appliance, including supply of sterilized dressings and cotton wool.

3. It is the contractor’s responsibility to take the injured person immediately to a public hospital without loss of time.

4. It is compulsory that the excavated material shall not be placed within 1.5 mtrs. of the edge of the trench or half of the depth of the trench, whichever is more. All trenches and excavations shall be provided with adequate fencing and lighting arrangement by the contractor.

5. Scaffolding should be provided for workmen for all works that cannot be safely done from the ground.

6. It is compulsory that the floor, roof or other parts of the structures, should not be overloaded with debris or materials, which will invite danger to the workmen.
7. Welders engaged in welding shall be provided with welders' protective eye-shields and gloves.

8. It is compulsory that painters should be provided with facemask for painting whenever spray painting has to be done.

9. The workers employed for mixing and handling materials, such as asphalt, cement mortar, concrete or lime mortar, shall be provided with protective footwear and rubber hand gloves.

10. In hoisting machines and tackles including their attachments, anchorage and supports for erection of equipment shall be in perfect condition.

11. The ropes used for hoisting materials shall be durable quality and strength.

12. Safe-guards for Environmental Protection shall be the responsibility of the contractor during the continuance of the contract. He shall be duty bound to look after the affairs of the site, finished or semi-finished works, his worksite, office, store, etc. in a neat and tidy manner. He shall provide strong fire protection measures for the same. He shall prohibit the entry of outsiders and trespassers into the area of operation. Guns, pistols, etc. shall be totally prohibited in the area. Inflammable materials shall not be allowed to be put to use except if strictly needed for the purpose of the work only. To ensure effective enforcement of the rules and regulations relating to environmental safeguards, the arrangements made by the engineer or any other officer entrusted by competent authority in this regard. The cost, if any for enforcing the environmental safeguards must be borne by the contractor and will not be reimbursed.
MODEL RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS

1. APPLICATION

These rules shall apply to all buildings and construction works in charge of Central Public Works Department/RGCB in which twenty or more workers are ordinarily employed or are proposed to be employed in any day during the period during which the contract work is in progress.

2. DEFINITION

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

3. FIRST-AID FACILITIES

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

(ii) The first-aid box shall be distinctly marked with a red cross on white background and shall contain the following equipment:

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

1. 12 small sterilized dressings.
2. 6 medium size sterilized dressings.
3. 6 large size sterilized dressings.
4. 6 large size sterilized burn dressings.
5. 6 (15 gms.) packets sterilized cotton wool.
6. 1 (60 ml.) bottle containing two per cent alcoholic solution iodine.
7. 1 (60 ml.) bottle containing Sal volatile having the dose and mode of administration indicated on the label.
8. 1 roll of adhesive plaster.
9. 1 snake bite lancet.
10. 1 (30 gms.) bottle of potassium permanganate crystals.
11. 1 pair scissors.
12. 1 copy of the first-aid leaflet issued by the Director General Factory Advice Service and Labour Institutes/Government of India.
13. A bottle containing 100 tablets (each of 5 gms.) of aspirin.
15. A bottle of suitable surgical antiseptic solution.

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

(iv) Nothing except the prescribed contents shall be kept in the First-aid box.

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

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

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

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

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

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

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

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

5. WASHING FACILITIES

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

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

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

6. LATRINES AND URINALS

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

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

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

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

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

(iv) Construction of latrines: The inside walls shall be constructed of masonry or some suitable heat-resisting nonabsorbent materials and shall be cement washed inside and outside at least once a year, Latrines shall not be of a standard lower than borehole system.
(iv) (a) Where workers of both sexes are employed, there shall be displayed outside each
block of latrine and urinal, a notice in the language understood by the majority
of the workers “For Men only” or “For Women Only” as the case may be.

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

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

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

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

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

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

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

7. PROVISION OF SHELTER DURING REST

At every place there shall be provided, free of cost, four suitable sheds, two for meals and
the other two for rest separately for the use of men and women labour. The height of each
shelter shall not be less than 3 meters (10 ft.) from the floor level to the lowest part of the
roof. These shall be kept clean and the space provided shall be on the basis of 0.6 sq.m. (6
sft) per head.

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

8. CRECHES

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

(ii) The rooms shall be provided with suitable and sufficient openings for light and ventilation.

There shall be adequate provision of sweepers to keep the places clean.

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

(iv) The contractor shall provide one ayaa to look after the children in the crèche when the number of women workers does not exceed 50 and two when the numbers of women workers exceed 50.

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

9. CANTEENS

(i) In every work place where the work regarding the employment of contract labour is likely to continue for six months and where in contract labours numbering one hundred or more are ordinarily employed, an adequate canteen shall be provided by the contractor for the use of such contract labour.

(ii) The canteen shall be maintained by the contractor in an efficient manner.

(iii) The canteen shall consist of at least a dining hall, kitchen, store room, pantry and washing places separately for workers and utensils.

(iv) The canteen shall be sufficiently lighted at all times when any person has access to it.

(v) The floor shall be made of smooth and impervious materials and inside walls shall be lime-washed or colour washed at least once in each year.

Provided that the inside walls of the kitchen shall be lime-washed every four months.

(vi) The premises of the canteen shall be maintained in a clean and sanitary condition.

(vii) Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.

(viii) Suitable arrangements shall be made for the collection and disposal of garbage.

(ix) The dining hall shall accommodate at a time 30 per cent of the contract labour working at a time.

(x) The floor area of the dining hall, excluding the area occupied by the service counter and any furniture except tables and chairs shall not be less than one square metre (10 sft) per diner to be accommodated as prescribed in sub-Rule 9.
(xi) (a) A portion of the dining hall and service counter shall be partitioned off and reserved for women workers in proportion to their number.

(b) Washing places for women shall be separate and screened to secure privacy.

(xii) Sufficient tables stools, chair or benches shall be available for the number of diners to be accommodated as prescribed in sub-Rule 9.

(xiii) (a) 1. There shall be provided and maintained sufficient utensils crockery, furniture and any other equipment’s necessary for the efficient running of the canteen.

2. The furniture utensils and other equipment shall be maintained in a clean and hygienic condition.

(b) 1. Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.

2. A service counter, if provided, shall have top of smooth and impervious

3. Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipment’s.

(xiv) The food stuffs and other items to be served in the canteen shall be in conformity with the normal habits of the contract labour.

(xv) The charges for food stuffs, beverages and any other items served in the canteen shall be based on ‘No profit, No loss’ and shall be conspicuously displayed in the canteen.

(xvi) In arriving at the price of foodstuffs, and other article served in the canteen, the following items shall not be taken into consideration as expenditure namely:-

(a) The rent of land and building.

(b) The depreciation and maintenance charges for the building and equipment are provided for the canteen.

(c) The cost of purchase, repairs and replacement of equipment’s including furniture, crockery, cutlery and utensils.

(d) The water charges and other charges incurred for lighting and ventilation.

(e) The interest and amounts spent on the provision and maintenance of equipment’s provided for the canteen.

(xvii) The accounts pertaining to the canteen shall be audited once every 12 months by registered accountants and auditors.

10. ANTI-MALARIAL PRECAUTIONS

The contractor shall at his own expense, conform to all anti-malarial instructions given to him by the Architect including the filling up of any borrow pits which may have been dug by him.

11. The above rules shall be incorporated in the contracts and in notices inviting tenders and shall form an integral part of the contracts.
12. AMENDMENTS

Government may, from time to time, add to or amend these rules and issue directions - it may consider necessary for the purpose of removing any difficulty which may arise in the administration thereof.
CONTRACTOR’S LABOUR REGULATIONS

1. SHORT TITLE
These regulations may be called the C.P.W.D./PWD (DA) Contractors Labour Regulations.

2. DEFINITIONS

i) Workman means any person employed by RGCB or its contractor directly or indirectly through a subcontractor with or without the knowledge of RGCB to do any skilled, semiskilled or unskilled manual, supervisory, technical or clerical work for hire or reward, whether the terms of employment are expressed or implied but does not include any person:
   a) Who is employed mainly in a managerial or administrative capacity: or
   b) Who, being employed in a supervisory capacity draws wages exceeding five hundred rupees per mensem or exercises either by the nature of the duties attached to the office or by reason of powers vested in him, functions mainly of managerial nature: or
   c) Who is an out worker, that is to say, person to whom any article or materials are given out by or on behalf of the principal employers to be made up cleaned, washed, altered, ornamental finished, repaired adopted or otherwise processed for sale for the purpose of the trade or business of the principal employers and the process is to be carried out either in the home of the out worker or in some other premises, not being premises under the control and management of the principal employer.

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

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

Contractors shall include every person who undertakes to produce a given result other mere supply of goods or articles of manufacture through contract labour or who supplies labour for any work and includes a subcontractor.

Wages shall have the same meaning as defined in the Payment of Wages Act.

Normally working hours of an adult employee should not exceed 9 hours a day. The shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more hours on any day.

When an adult worker is made to work for more than 9 hours on any day or for more than in any week, he shall be paid over time for the extra hours put in by him at double the rate of wages.

a) Every worker shall be given a weekly holiday normally on a Sunday, in accordance provisions of the Minimum Wages (Central) Rules 1960 as amended from time Irrespective of whether such worker is governed by the Minimum Wages Act or
b) Where the minimum wages prescribed by the Government under the Minimum Wages Act are not inclusive of the wages for the weekly day of rest, the worker shall be entitled to rest day wages at the rate applicable to the next preceding day provided he has worked under the same contractor for a continuous period of not less than 6 days.

c) Where a contractor is permitted by the Project Manager to allow a worker to work on a normal weekly holiday, he shall grant a substituted holiday to him for the whole day on one of the five days immediately before or after the normal weekly holiday and pay wages to such worker for the work performed on the normal weekly holiday at overtime rate.

4. DISPLAY OF NOTICE REGARDING WAGES ETC.
The contractor shall before he commences his work on contract, display and correctly maintain and continue to display and correctly maintain in a clear and legible condition in conspicuous places on the work, notices in English and in the local Indian languages spoken by the majority of the workers giving the minimum rates of wages fixed under Minimum Wages Act, the actual wages being paid, the hours of work for which such wage are earned, wages periods, dates of payments of wages and other relevant information as per Appendix ‘III’.

5. PAYMENT OF WAGES
i) The contractor shall fix wage periods in respect of which wages shall be payable.
ii) No wage period shall exceed one month.
iii) The wages of every person employed as contract labour in an establishment or by a contractor where less than one thousand such persons are employed shall be paid before the expiry of seventh day and in other cases before the expiry of tenth day after the last day of the wage period in respect of which the wages are payable.
iv) Where the employment of any worker is terminated by or on behalf of the contractor the wages earned by him shall be paid before the expiry of the second working day from the date on which his employment is terminated.
v) All payment of wages shall be made on a working day at the work premises and during the working time and on a date notified in advance and in case the work is completed before the expiry of the wage period, final payment shall be made within 48 hours of the last working day.
v) Wages due to every worker shall be paid to him direct or to other person authorized by him in this behalf.
vii) All wages shall be paid in current coin and currency or in both.
viii) Wages shall be paid without any deductions of any kind except those specified by the Central Government by general or special order in this behalf or permissible under the Payment of Wages Act 1956.
ix) A notice showing the wages period and the place and time of disbursement of wages shall be displayed at the place of work and a copy sent by the contractor to the Architect/RGCB under acknowledgment.

x) It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the Project Manager or any other authorized representative of the Architect who will be required to be present at the place and time of disbursement of wages by the contractor to workmen.

xi) The contractor shall obtain from the Project Manager or any other authorized representative of the Architect as the case may be, a certificate under his signature at the end of the entries in the “Register of Wages” or the “Wage-cum-Muster Roll” as the case may be in the following form:-

“Certified that the amount shown in column No .................has been paid to the workman concerned in my presence on ................. at .................“

6. FINES AND DEDUCTIONS WHICH MAY BE MADE FROM WAGES

The wages of a worker shall be paid to him without any deduction of any kind except the following:-

(a) Fines

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

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

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

(e) Any other deduction which the Central Government may from time to time allow.

(ii) No fines should be imposed on any worker save in respect of such acts and omissions on his part as have been approved of by the Chief Labour Commissioner.

Note: - An approved list of Acts and Omissions for which fines can be imposed is enclosed at Appendix-X

(iii) No fine shall be imposed on a worker and no deduction for damage or loss shall be made from his wages until the worker has been given an opportunity of showing cause against such fines or deductions.

(iv) The total amount of fine which may be imposed in any one wage period on a worker shall not exceed an amount equal to three paise in a rupee of the total wages, payable to him in respect of that wage period.

(v) No fine imposed on any worker shall be recovered from him by instalment, or after the expiry of sixty days from the date on which it was imposed.

(vi) Every fine shall be deemed to have been imposed on the day of the act or omission in respect of which it was imposed.
7. LABOUR RECORDS
   (i) The contractor shall maintain a **Register of persons employed** on work on contract in Form XIII of the CL (R&A) Central Rules 1971 (Appendix IV).
   (ii) The contractor shall maintain a **Muster Roll** register in respect of all workmen employed by him on the work under Contract in Form XVI of the CL (R&A) Rules 1971 (Appendix V).
   (iii) The contractor shall maintain a **Wage Register** in respect of all workmen employed by him on the work under contract in Form XVII of the CL (R&A) Rules 1971 (Appendix VI).
   (iv) **Register of accident** - The contractor shall maintain a register of accidents in such form as may be convenient at the work place but the same shall include the following particulars:
      a) Full particulars of the labourers who met with accident.
      b) Rate of Wages.
      c) Sex
      d) Age
      e) Nature of accident and cause of accident. f) Time and date of accident.
      g) Date and time when admitted in Hospital, h) Date of discharge from the Hospital.
      i) Period of treatment and result of treatment.
      j) Percentage of loss of earning capacity and disability as assessed by Medical Officer.
      k) Claim required to be paid under Workmen’s Compensation Act.
      l) Date of payment of compensation.
      m) Amount paid with details of the person to whom the same was paid.
      n) Authority by whom the compensation was assessed.
      o) Remarks
   v) The contractor shall maintain a **Register of Fines** in the Form XII of the CL (R&A) Rules 1971 (Appendix-XI)
   vi) The contractor shall display in a good condition and in a conspicuous place of work the approved list of acts and omissions for which fines can be imposed (Appendix-X)
   vi) The contractor shall maintain a **Register of deductions for damage or loss** in Form XX of the CL (R&A) Rules 1971 (Appendix-XII)
   vii) The contractor shall maintain a **Register of Advances** in Form XXIII of the CL (R&A) Rules 1971 (Appendix-XIII)
   viii) The contractor shall maintain a **Register of Overtime** in Form XXIII of the CL (R&A) Rules 1971 (Appendix-XIV)

8. ATTENDANCE CARD-CUM-WAGE SLIP
   i) The contractor shall issue an **Attendance card-cum-wage slip** to each workman employed by him in the specimen form at (Appendix-VII)
   ii) The card shall be valid for each wage period.
   iii) The contractor shall mark the attendance of each workman on the card twice each day, once at the commencement of the day and again after the rest interval, before he actually starts work.
iv) The card shall remain in possession of the worker during the wage period under reference.

v) The contractor shall complete the wage slip portion on the reverse of the card at least a day prior to the disbursement of wages in respect of the wage period under reference.

vi) The contractor shall obtain the signature or thumb impression of the worker on the wage slip at the time of disbursement of wages and retain the card with himself.

9. EMPLOYMENT CARD

The contractor shall issue an Employment Card in Form XIV of the CL (R&A) Central Rules 1971 to each worker within three days of the employment of the worker (Appendix-VIII).

10. SERVICE CERTIFICATE

On termination of employment for any reason whatsoever the contractor shall issue to the workman whose services have been terminated, a Service certificate in Form XV of the CL (R&A) Central Rules 1971 (Appendix-IX)

11. PRESERVATION OF LABOUR RECORDS

All records required to be maintained under Regulations Nos. 6 & 7 shall be preserved in original for a period of three years from the date of last entries made in them and shall be made available for inspection by the Architect or Labour Officer or any other officers authorized by RGCB.

12. POWER OF LABOUR OFFICER TO MAKE INVESTIGATIONS OR ENQUIRY

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

13. REPORT OF LABOUR OFFICER

The Labour Officer or other persons authorized as aforesaid shall submit a report of result of his investigation or enquiry to RGCB indicating the extent, if any, to which the default has been committed with a note that necessary deductions from the contractor’s bill are made and the wages and other dues be paid to the labourers concerned. In case an appeal is made by the contractor under Clause 13 of these regulations, actual payment to labourers will be made by RGCB after its decision on such appeal.

i) RGCB shall arrange payments to the labour concerned within 45 days from the receipt of the report from the Labour Officer

14. APPEAL AGAINST THE DECISION OF LABOUR OFFICER

Any person aggrieved by the decision and recommendations of the Labour Officer or other person so authorized may appeal against such decision RGCB within 30 days from the date of decision, forwarding simultaneously a copy of his appeal to the Architect but subject to such appeal, the decision of RGCB shall be final and binding upon the contractor.
15. PROHIBITION REGARDING REPRESENTATION THROUGH LAWYER

i) A workman shall be entitled to be represented in any investigation or enquiry under these regulations by:-
   a) An officer of a registered trade union of which he is a member.
   b) An officer of a federation of trade unions to which the trade union referred to in clause (a) is affiliated.
   c) Where the employer is not a member of any registered trade union, by an officer of a registered trade union, connected with the industry in which the worker is employed or by any other workman employed in the industry in which the worker is employed.

ii) An employer shall be entitled to be represented in any investigation or enquiry under these regulations by:-
   a) An officer of an association of employers of which he is a member.
   b) An officer of a federation of associations of employers to which association referred to in clause (a) is affiliated.
   c) Where the employers is not a member of any association of employers, by an officer of association of employer connected with the industry in which the employer is engaged or by any other employer, engaged in the industry in which the employer is engaged.

(iii) No party shall be entitled to be represented by a legal practitioner in any investigation or enquiry under these regulations.

16. INSPECTION OF BOOKS AND SLIPS

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

17. SUBMISSIONS OF RETURNS

The contractor shall submit periodical returns as may be specified from time to time.

18. AMENDMENTS

The Central Government may from time to time add to or amend the regulations and on any question as to the application/Interpretation or effect of those regulations the decision RGCB shall be final.
REGISTER OF MATERNITY BENEFITS (Clause 19 F)

Name and address of the contractor

Name and location of the work

<table>
<thead>
<tr>
<th>Name of the employee</th>
<th>Father's/ husband's name</th>
<th>Nature of employment</th>
<th>Period of actual employment</th>
<th>Date on which notice confinement given</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
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</table>

Date on which maternity leave commenced and ended

<table>
<thead>
<tr>
<th>Date of delivery/ miscarriage</th>
<th>In case of delivery</th>
<th>In case of miscarriage</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>7</td>
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</table>

Leave pay paid to the employee

<table>
<thead>
<tr>
<th>In case of delivery</th>
<th>In case of miscarriage</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of leave pay</td>
<td>Amount paid</td>
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<tr>
<td></td>
<td>Rate of leave pay</td>
<td>Amount paid</td>
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<tr>
<td>11</td>
<td>12</td>
<td>13</td>
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</tbody>
</table>
SPECIMEN FORM OF THE REGISTER, REGARDING MATERNITY BENEFIT ADMISSIBLE TO THE CONTRACTOR’S LABOUR IN CENTRAL PUBLIC WORKS DEPARTMENT WORKS

Name and address of the contractor..................................................................................................................................................
Name and location of the work...........................................................................................................................................................

1. Name of the woman and her husband’s name.
2. Designation.
3. Date of appointment.
4. Date with months and years in which she is employed.
5. Date of discharge/dismissal, if any.
6. Date of production of certificates in respect of pregnancy.
7. Date on which the woman informs about the expected delivery.
8. Date of delivery/miscarriage/death
10. Date with the amount of maternity/death benefit paid in advance of expected delivery.
11. Date with amount of subsequent payment of maternity benefit.
12. Name of the person nominated by the woman to receive the payment of the Maternity benefit after her death.
13. If the woman dies, the date of her death, the name of the person to whom maternity benefit amount was paid, the month thereof and the date of payment.
14. Signature of the contractor authenticating entries in the register.
15. Remarks column for the use of Inspecting Officer.
Labour Board

Name of work : ..............................................................

Name of Contractor : ..........................................................

Address of Contractor : ......................................................

Name and address of C.P.W.D. Division: ..........................................

Name of C.P.W.D. Labour Officer : ..............................................

Address of C.P.W.D. Labour Officer : ...........................................

Name of Labour Enforcement Officer : ............................................

Address of Labour Enforcement Officer: ...........................................

<table>
<thead>
<tr>
<th>SI. No.</th>
<th>Category</th>
<th>Minimum wage fixed</th>
<th>Actual wage paid</th>
<th>Number present</th>
<th>Remarks</th>
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Weekly holiday : ..............................................................

Wage period : .................................................................

Date of payment of wages : ....................................................

Working hours : .................................................................

Rest interval : .................................................................
Register of Workmen Employed by Contractor

<table>
<thead>
<tr>
<th>S.I. No</th>
<th>Name and Surname of workman</th>
<th>Age and Sex</th>
<th>Father’s/Husband’s name</th>
<th>Nature of employment/designation</th>
<th>Permanent home address of the workman (Village and Tehsil, Taluk and Local address)</th>
<th>Date of commencement of employment</th>
<th>Signature or thumb impression of the workman</th>
<th>Date of termination of employment</th>
<th>Reasons for terminations</th>
<th>Remarks</th>
</tr>
</thead>
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</tbody>
</table>
Mustar Roll

Name and Address of contractor: ……………………………………………………………………………………………………………………………

Name and address of establishment under which contract is carried on: …………………………………………………………………………..

Nature and location of work: ……………………………………………………………………………………………………………………………

Name and address of Principal Employer: ………………………………………….. For the month of fortnight: ……………………………

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of workman</th>
<th>Sex</th>
<th>Fathers Signatures &amp; Name</th>
<th>Data’s</th>
<th>Remarks</th>
</tr>
</thead>
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</tbody>
</table>


# Register of Wages

Name and address of contractor

Name and address of establishment under which Contract is carried on

Nature and location of work

Name and address of Principal Employer

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of workman</th>
<th>Serial No. in the register of workman</th>
<th>Designation / nature of work done</th>
<th>No. of days worked</th>
<th>Units of work done</th>
<th>Daily rate of wages/piece rate</th>
<th>Basic wages</th>
<th>Dearness allowances</th>
<th>Overtime</th>
<th>Other cash payments (Indicate nature)</th>
<th>Total</th>
<th>Deductions if any (indicate nature)</th>
<th>Net amount paid</th>
<th>Signature or thumb impression of the workman</th>
<th>Initial of contractor or his representative</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
Wage Card

Name and address of contractor : ……………………… Date of Issue : ………………………

Name and location of work : ……………………… Designation : ………………………

Name of workman : ……………………… Month/Fortnight : ………………………

Rate of Wages : ………………………

|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Morning Rate |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Evening Amount |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

Received from : ……………………………………………..the sum of Rs. : …………………………… on account of my wages

Initial
Wages Slip

Name and address of contractor........................................................................................................

Name and Father's/Husband's name of workman........................................................................

Nature and location of work.............................................................................................................

For the Week/Fortnight/Month ending..........................................................................................

1. No. of days worked.....................................................................................................................

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

3. Rate of daily wages/piece rate ..............................................................................................

4. Amount of overtime wages.....................................................................................................

5. Gross wages payable................................................................................................................

6. Deduction, if any......................................................................................................................

7. Net amount of wages paid.......................................................................................................
Employment Card

Name and address of contractor: .................................................................

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

Name of work and location of work: ...........................................................

Name and address of Principal Employer: ...................................................

1. Name of the workman: ...........................................................................

2. SI. No. in the register of workman employed: ............................................

3. Nature of employment/designation: ..........................................................

4. Wage rate (with particulars of unit in case of piece work): ....................... 

5. Wage period: ..........................................................................................

6. Tenure of employment: .......................................................................... 

7. Remarks:: ............................................................................................ 

Signature of contractor
Service Certificate

Name and address of contractor: .................................................................

Nature and location of work: .................................................................

Name and address of workman: ..............................................................

Age or date of birth: ............................................................................

Identification marks: ............................................................................

Father's/Husband's name: .................................................................

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

Name and address of Principal Employer: .............................................

<table>
<thead>
<tr>
<th>SL. No</th>
<th>Total Period for which employed</th>
<th>Nature of Work Done</th>
<th>Rate of wages (with particulars of unit in case of piece) work)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>From 2 To 3</td>
<td>4</td>
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</table>
List of Acts and Omissions for which fines can be Imposed

In accordance with rule 7(v) of the CPWD Contractor’s Labour Regulations to be displayed prominently at the site of work both in English and local Language.

1. Willful insubordination or disobedience, whether alone or in combination with other.
2. Theft fraud or dishonesty in connection with the contractors beside a business or property of RGCB.
3. Taking or giving bribes or any illegal gratifications
4. Habitual late attendance.
5. Drunkenness lighting, riotous or disorderly or indifferent behavior
6. Habitual negligence.
7. Smothing near or around the area where combustible or other materials are locked
8. Habitual indiscipline.
9. Causing damage to work in the progress or to property of RGCB or of the contractor.
10. Sleeping on duty.
11. Malingering or slowing down work.
12. Giving of false information regarding name, age father’s name, etc.
13. Habitual loss of wage cards supplied by the employers.
14. Unauthorized use of employer’s property of manufacturing or making of unauthorized particles at the work place.
15. Bad workmanship in construction and maintenance by skilled workers which is not approved by the Department and for which the contractors are compelled to undertake rectifications.
16. Making false complaints and/or misleading statements.
17. Engaging on trade within the premises of the establishments.
18. Any unauthorized divulgence of business affairs of the employees.
19. Collection or canvassing for the collection of any money within the premises of an establishment unless authorized by the employer.
20. Holding meeting inside the premises without previous sanction of the employers.
21. Threatening or intimidating any workman or employer during the working hours within the premises.
# Register of Fines

Name and address of contractor:

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

<table>
<thead>
<tr>
<th>SI. No.</th>
<th>Name of workman</th>
<th>Father’s/ Husband’s name</th>
<th>Designation/ nature of employment</th>
<th>Act/Omission for which fine imposed</th>
<th>Date of Offence</th>
<th>Whether workman showed cause against fine</th>
<th>Name of person in whose presence employee’s explanation was heard</th>
<th>Wage period and wages payable</th>
<th>Amount of fine imposed</th>
<th>Date on which fine realized</th>
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</tbody>
</table>
# Register of Deduction for Damage or Loss

Name and address of contractor: .............................................................................................................

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

Nature and location of work: ..........................................................................................................................

Name and address of Principal Employer: ....................................................................................................

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of Workman</th>
<th>Father’s/Husband name</th>
<th>Designation/nature of employment</th>
<th>Particulars of damage or loss</th>
<th>Date of damage or loss</th>
<th>Whether workman showed cause against deduction</th>
<th>name of person in whose presence employee’s explanation was heard</th>
<th>Amount of deduction imposed</th>
<th>No. of installments</th>
<th>Date of recovery</th>
<th>First installment</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>13</td>
</tr>
</tbody>
</table>
Register of Advances

Name and address of contractor : ...........................................................................................................

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

Nature and location of work : ..................................................................................................................

Name and address of Principal Employer : .............................................................................................

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of workman</th>
<th>Father’s/ Husband name</th>
<th>Designation / Nature of employment</th>
<th>Wage Period and wages payable</th>
<th>Date and amount of advance given</th>
<th>Purpose(s) for which advance made</th>
<th>Number of installments by which advance to be repaid</th>
<th>Date and amount of each installment repaid</th>
<th>Date and which last installment was repaid</th>
<th>Remarks</th>
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Register of Overtime

Name and address of contractor : …………………………………………………………………………………………………………………

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

Nature and location of work: ………………………………………………………………………………………………………………………

Name and address of Principal Employer: ………………………………………………………………………………………………………

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<th>Sl. No.</th>
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<th>Father’s/Husband’s name</th>
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<th>Date on which Overtime worked</th>
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FORMATS

FORM OF EARNEST MONEY (BANK GUARANTEE)

WHEREAS, contractor............... (Name of contractor) (Hereinafter called "the contractor") has submitted his tender dated........... (Date) for the construction of .................................... (Name of work) (Hereinafter called "the Tender")

KNOW ALL PEOPLE by these presents that we .................................. (Name of bank) having our registered office at ............... (Hereinafter called "the Bank") are bound unto Controller of Administration, RGCB (hereinafter called "the RGCB") in the sum of Rs..................... (Rs. in words .................................................) for which payment well and truly to be made to the said RGCB the Bank binds itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this................. Day of................. 20…

THE CONDITIONS of this obligation are:

(1) If after tender opening the Contractor withdraws, his tender during the period of validity of tender (including extended validity of tender) specified in the Form of Tender;

(2) If the contractor having been notified of the acceptance of his tender by RGCB:
   (a) Fails or refuses to execute the Form of Agreement in accordance with the Instructions to contractor, if required; OR
   (b) Fails or refuses to furnish the Performance Guarantee, in accordance with the provisions of tender document and Instructions to contractor, OR
   (c) Fails or refuses to start the work, in accordance with the provisions of the contract and Instructions to contractor, OR

We undertake to pay to the Rajiv Gandhi Center for Biotechnology either up to the above amount or part thereof upon receipt of its first written demand, without the RGCB having to substantiate its demand, provided that in its demand the RGCB will note that the amount claimed by it is due to it owing to the occurrence of one or any of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including.*............ 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 RGCB, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee should reach the Bank not later than the above date.

Date: ......................... SIGNATURE OF THE BANK

SEAL

Witness: .................

(SIGNATURE NAME & ADDRESS)

*Date to be worked out on the basis of validity period of 3 months from last date of receipt of tender.
Bank Guarantee Bond

In consideration of the Director, RGCB (hereinafter called “RGCB”) having offered to accept the terms and conditions of the proposed agreement between …………………………………. and ………………………………………… (hereinafter called “the said Contractor(s)”) for the work ……………………………………. (hereinafter called “the said agreement”) having agreed to production of an irrevocable Bank Guarantee for Rs. ……………………. (Rupees…………………………………only) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement.

1. We, ……………………………….. (hereinafter referred to as “the Bank”) hereby undertake to pay to RGCB an amount not exceeding Rs. ……………………. (Rupees………………. Only) on demand by the RGCB.

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

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

4. We, ……………………………….. (indicate the name of the Bank) further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of RGCB under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till the Architect 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.

5. We, ……………………………….. (indicate the name of the Bank) further agree with RGCB that the RGCB shall have the fullest liberty without our consent and without affecting in any manner our obligation 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 RGCB against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our
liability by reason of any such variation, or extension being granted to the said Contractor(s) or for any forbearance, act of omission on the part of RGCB or any indulgence by RGCB to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

7. We, ……………………………. (indicate the name of the Bank) lastly undertake not to revoke this guarantee except with the previous consent of RGCB in writing.

8. This guarantee shall be valid up to ……………………………………unless extended on demand by RGCB.

Notwithstanding anything mentioned above, our liability against this guarantee is restricted to Rs. ……………. (Rupees …………………………………………) 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 ……………………for………………….(indicate the name of the Bank)
Sample Guarantee Bond on Stamp Paper for Anti Termite Treatment

This agreement made this .................... Day of ........... two thousand ................... between M/s.............. herein after called the Guarantor of the one part and Rajiv Gandhi Centre for Bio technology (hereinafter called RGCB) of the other part.

Whereas this agreement is supplementary to the contract (hereinafter called the Contract) dated .................... made between the Guarantor of the one part and RGCB of the other part, whereby the Contractor, inter alia, undertook to render the buildings and structures in the said Contract recited, completely termite-proof.

And whereas the Guarantor agreed to give a guarantee to the effect that the said structure with remain termite-proof for ten years to be reckoned from the date after the maintenance period prescribed in the contract expires.

During this period of guarantee the Guarantor shall make good all defects and for that matter, shall replace at his risk and cost such wooden members as may be damaged by termites, and in case of any other defect being found he shall render the building termite-proof at his cost to the satisfaction of the Engineer-in charge, and shall commence the works of such rectification within seven days from date of issuing notice from the Architect calling upon him to rectify the defects, failing which the work shall be got done by RGCB by some other Contractor at the Guarantor’s cost and risk, and in the later case the decision of RGCB as to the cost recoverable from the Guarantor shall be final and binding.

That if the Guarantor fails to execute the anti-termite treatment or commits breaches hereunder then the Guarantor will indemnify RGCB and its successors against all loss, damage, cost, expense or otherwise which may be incurred by him by reason of any default on the part of the Guarantor in performance and observance of this supplemental agreement. As to the amount of loss and/or damage and/or cost incurred by RGCB, the decision of RGCB will be final and binding on the parties.

In witness whereof these presents have been executed by the Obligor .................... and by .............................. for and on behalf of the Rajiv Gandhi Centre for Bio technology on the day, month and year first above written.

Signed, sealed and delivered by OBLIGOR in the presence of –

1.
2.

Signed for and on behalf of THE Rajiv Gandhi Centre for Biotechnology by 
……………………….. in the presence of

1.

2.
FORM OF WATER PROOFING WORK GUARANTEE BOND ON STAMPE PAPER

This agreement made this………………day of two thousand…………………… between M/s……………………… (herein after called the Guarantor of the one part) and the Rajiv Gandhi Centre for Bio technology (hereinafter called the RGCB) of the other part.

Whereas this agreement is supplementary to the contract (hereinafter called the Contract) dated…………. Made between the Guarantor of the one part and RGCB of the other part, whereby the contractor inter alia, undertook to render the Buildings and structures in the said contract recited completely water and leak proof.

And whereas the Guarantor agreed to give a guarantee to the effect that the said structure will remain waterproof for ten years to be reckoned from the date after the maintenance period prescribed in the contract expires.

During this period of guarantee the Guarantor shall make good all defects and for that matter, shall replace at his risk and cost such members as may be damaged by water and in case of any other defect being found he shall render the building waterproof at his cost to the satisfaction of the Architect and shall commence the works of such rectification within seven days from the date of issuing notice from the Architect calling upon him to rectify the defects failing which the work shall be got done by RGCB by some other contractor at the Guarantor’s cost and risk and in the latter case the decision of the Architect as to the cost, recoverable from the Guarantor shall be final and binding.

That if the Guarantor fails to execute the waterproofing or commits breaches hereunder then the Guarantor will indemnify RGCB against all loss, damage, cost, expense or otherwise which may be incurred by it, by reason of any default on the part of the Guarantor in performance and observance of this supplemental agreement. As to the amount of loss and/or damage and/or cost incurred by the RGCB the decision. RGCB will be final and binding on the parties.

In witness whereof of these presents have been executed by the Obligor…………………… and by…………………. For and on behalf of the Rajiv Gandhi Centre for Bio technology on the day, month and year first above written

SIGNED, SEALED and delivered by OBLIGOR in presence of :

1.
2.

SIGNED for and on behalf of THE RGCB by ..................... in the presence of :

1.

2.
DECLARATION

I/We declare that I/We possess a copy of standard specification as published by CPWD for Civil/Mechanical/Electrical/AC/Fire protection works.

I/We * also declare that I/We * have perused in detail and examined closely the specifications and I/We * agree to be bound by and comply with all such specifications.

I/We * declare that the work will be carried out as per the specifications in tender document. The items of work not covered in the specifications said above will be carried out as per the specifications in the relevant CPWD specifications, and if not covered in such specifications the work will be carried out as in the relevant specifications of Bureau of Indian Standard, and if not covered in any of the above, the work will be carried out as directed in writing by the Architect.

I/We * declare that the rates quoted by me/us are on the basis of the above.

Date: ___________________________ Signature of Contractor with Stamp

*Strike out whichever is not applicable
RAJIV GANDHI CENTRE FOR BIO TECHNOLOGY
POOJAPPURA, THIRUVANANTHAPURAM
(RGCB)

COMPOSITE TENDER

Establishment of RGCB Bio Innovation Center
at Akkulam in Thiruvananthapuram District, Kerala State
Phase. I – Construction of Research Block with Animal Research Facility,
Hostel Buildings, Civil & Related MEP works including site development
and connected Infrastructure (Composite Contract)

TENDER DOCUMENT

VOLUME – II

TECHNICAL SPECIFICATIONS
**Name of work**: Establishment of RGCB Bio Innovation Center at Akkulam in Thiruvananthapuram District, Kerala State Phase I – Construction of Research Block with Animal Research Facility, Hostel Buildings, Civil & Related MEP works including site development and connected Infrastructure (Composite Contract)

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SECTION. A – CIVIL WORKS

Technical Specification for Non DSR items

1.0  DOORS (PRESS METAL DOORS)

This specification covers the design, supply of materials fabrication and installation of factory made special type of approved make of steel. Fire doors of 2 Hrs. fire rating (FD- 2hr) with all accessories including supply and fixing of hardware’s.

Codes and Standards

All standards and specifications acts and codes of practice referred to shall be the latest editions including all applicable amendments and revisions.

List of certain important Indian standards and codes of practice applicable is given below.

I.S 277- Galvanized steel sheet (plain and corrugated) of G.P.L grade with z120 coating

IS O 9001-2000 certified manufacturer

IS 3614- metallic and non-metallic fire check doors

Resistance test and part – 2 performance criteria

All metal work shall be free from defects impairing strength durability and appearance and shall be of best quality for purpose specified made with the structured properties to withstand strains/stress to which they shall normally be subjected to. All fittings shall be of high quality and as per approved specifications. The contractor shall strictly follow at all stages of work the stipulations contained in the Indian Standard safety code by ensuring the safety of men and materials.

Any approvals, instructions permission checking etc. whatsoever by the Owner/ Architect shall not absolve the contractor of his responsibility and obligation regarding adequacy, correctness, safety, strength, quality workmanship etc.

Hollow metal fire door (2hrs. fire rating) with honey comb shall of approved quality and tested as per IS 3614.

Door frame materials shall be manufactured from16 gauge galvanized steel sheets complying with latest I.S.277 code or its equivalent with zinc coating mill phosphatizing.

Frames to have factory finish pre-punched holes to receive specific hardware and iron mongery and the frames to be provided with hinge plates 3mm thick pre drilled to receive hinges for screw
mounted fixing all cut outs including huge plates strike plates to have mortar guard covers from inside to prevent cement dust ingress into cut outs at the time of grouting.

Frames to have rubber silencer strike jamb for single shutter frames.

Door frames to be suitably cleaned with solvents and etch primer and top coats to be applied. The door frames to be primered in zinc phosphate stoving primer (35 microns CFT) and furnished with thermo setting paint (35 microns DFT) of approved colour and make as specified.

The fire door shutter to be manufactured from 18 microns galvanized sheets, conforming to latest IS 277 code and press framed to 46 mm thick double skin hollow door with lock seam joint at style edges shutters to have no visible screw fasteners on either side. Internal reinforcement to be provided at top and bottom and style edges for desired fire rating.

The Shutter to be provided with honeycomb Kraft paper core to be bounded to this inner faces of this shutter.

The door shutter preparations are – The shutters are to be factory prepared with Pre-punched cut outs & reinforcements to receive iron mongery as per their final finish hardware schedule. The shutter should have Pre-drilled hinge plates with hung guard covers. Shutters with locks to have concealed lock box with lock fixing brackets and Pre-tapped holes.

For shutter with door closer reinforcement pads are to be provided at appropriate location as per the manufacturer’s specification. All iron mongery preparation should have adequate reinforcement for flushes fixing at site.

Vision Panel for Fire Rated Door is to be provided with Borosilicate clear toughened glass of 6mm thick up to 2hrs fire rating. Glass to be fixed with clip as frames for square and rectangular vision panels with no visible screws.

The shutters are to be well cleaned with solvents and etch premiered for receiving top coats.

Shutters are to be applied with primer ie. Zinc phosphate stoving primer (35 microns DFT) and to be finished with thermo setting paint (35 microns DFT) of approved shade and make.

**For Storage**

All knocked down frames shall be stacked flat and shutters vertically on wooden runners and suitably covered as per the instructions of manufacturer to prevent rust and damage.
Door Frame Fixing

The door frames should be assembled adjacent to the place of installation as the frames are not designed for transporting in an assembled condition. After assembly it is to be ensured that all threaded preparations are covered from the back of the frame using self-adhesive strip to prevent penetration of mortar back-fill into screw threads. The head member shall be assembled and secured using M8 x 20 long plated bolts together with nuts spring and flat washers.

The assembled frame shall be kept in position within the opening by means of bracing. In order to correctly position the frames against finished floor level or equalize on adjustable floor anchors where specified, shim shall be used under jambs. The frame shall be checked for squareness, alignment, twists etc. with carpenters level & plumb.

A tie rod shall be fixed to the frame during installation to ensure the correct dimension between the frame rebated and the same may be removed after installation.

Where a 2nd fix application is required a shim detail is suggested to take up gap between frame & existing opening.

Existing Masonry Wall Openings – Metal Expansion Shields

- Brace, position, level etc.
- Mark all position of fixings on wall
- Remove frame and drill, wait to appropriate specified size
- Fit rod anchor shells metals expansion bolts into the wall
- Fit jamb spacers bracket into back of frame profile
- Reposition frame back into opening and realign
- Lightly screw CSK HD machine screws into shells, shim behind frame
- Slowly tighten screw continually checking plumb, square etc. Finally ensure frames are not deformed as tightened
- After fixing the frame shall be grouted with cement mortar 1:3 or plaster of Paris or Gypsum powder as approved. Gap between frame & wall to be closed by cement pointing using cement mortar 1:3
- Back full frame through holes provided and insert nylon plugs.
**For Door Shutter Fixing**

Fix all the hardware to the door shutter like hinges, flush bolts, mortice locks, door closer, door stoppers, handles etc. with appropriate screws & bolts.

The shutter is to be then fixed to the frame which is already installed. Align the shutter to match the hardware to the cut outs in the frame. Tighten the hinge screws.

Application of fire/ smoke UL 10C/UL 1784 (2001) classified seal (for smoke check if specifically required)

Clean door jamb rebate surfaces of all dust, oil, etc. Affix self-adhesive Fire/smoke seal on the door frame rebates as indicated by the manufacturer on hinge jambs, strike jambs, head, member & sill.

**2.0 ALUMINIUM LOUVER**

Individual in vertical configuration with bearing on both ends to make them freely movable due to natural wind pressure and velocity in the area. The code names of the blades are AF600 with profile size of 600 x 100 mm & thickness of 0.90mm. Excluded heavy section of Aluminium alloy – 3 parts press locked together weight of the profile is 8.42 Kg/m length. End caps & Axles are to be provided to make the blades movable & two end caps will be delivered with an axle set containing a stainless steel axle, rings, plate screws & related accessories. The thickness of aluminium plate is 3mm & the thickness of aluminium pipe shall be 50mm. Two end caps of 3mm thick per blade & Axles are to be used to make the blades movable.

**3.0 WATER PROOFING OF RETAINING WALL/ LIFT PIT**

Water proofing with single component solvent based bitumen primer with a coverage of 5-6 sq.m per litre and allowed to dry completely. The waterproofing membrane is 4 mm thick, pre applied HDPE waterproofing membrane comprising of a complex cell mesh bonded to a polyethylene membrane which allows poured concrete to interlock with the membrane forming a tenacious mechanical bond conforming to waterproofing protection to grade 2,3& 4 defined is B.S 8102: 1990. The material should resist hydrostatic pressure up to 70m head of water as per A.S.TM D 5385 and should possess peak tensile strength ASTM D412 of 116 N/mm2 and pressure resistance ASTM E 154 of 672 N the cost inclusive all materials labour, transportation etc. Site cleaning surface preparation including washing and clearing corner treatment in the lift
pit with and application of materials is to also include in the process. Ponding lift pit with water and testing of water seepage is also to be conducted to the satisfaction of the Architect

Properties of the Membrane

Membrane Thickness - 4 to 5 mm
Tensile strength (peak) - ASTM D412 - 116 N/mm²c
Elongation (Peak) - ASTM 412 - 648 %
Puncture pressure - ASTM E 154 – 672 N
Peal adhesion of mortar - BS 4254- 74 N/ 25mm Wide strip
Shear strength of joints
Selvedge - 377 N/ 50 mm wide strip
Detail strip - 506 N

Hydrostatic pressure resistance up to 70m

Head of water as per ASTM D 5385.

Membrane - No leak after one hour
Selvedge - No leak after one hour
Detail strip - No leak after one hour

4.0 WATERPROOFING OVERHEAD WATER TANK AND SUMP

Providing and applying polymer modified mortar to all internal floor and wall of water tank and sump up to the required height 12 to 15 mm thick, cement mortar 1:4 with WPM 405, SBR based multipurpose concentrated liquid polymer additive at dosage of 1 liter per bag of 50 Kg cement to be mixed.

The concrete surface for which the waterproofing is to be done is to be prepared by leveling, removing the loose particles of concrete & debris etc. and by flushing with clean water and allow the surface to dry.

The mix of cement mortar 1:4 admixed with WPM 405, S.B.R based concentrated liquid polymer additive at the above dosage is applied over wet binding coat of W.P.M.405 with water cement ratio as per specification. All corners of wall and floor to be finished rounded shape. The
additive mixed should consist of a liquid polymer component white colour and mixed as per the manufactures specification.

Providing and applying W.P.M 200 (Hydropoxy 200) in 2 components, water based epoxy polyamide un pigmented sealer one coat @ coverage 5 Sq.m per liter. Then apply W.P.M 300 and W.P.M 200.Water based epoxy with a coverage of 3 Sq.m per liter by brush application. Allow the surface to dry well and apply second coat of W.P.M 300 and allow this coat also to dry completely as per the manufactures specification.

5.0 JOINTS IN BUILDINGS

Expansion joints are used to allow for expansion and contraction of concrete during the curing period and during service to permit dimensional changes in concrete due to load, to separate, areas or members that could be affected by any such dimensional changes and allow relative movements or displacements due to expansion and contraction, differential foundation movements. Obviously expansion joints can also function as a construction joints.

Expansion joints are made by providing a space for the full cross section between abutting cast in place structural units by the use of filler strips of the required thickness or by leaving a gap, when pre-cast units are positioned. Expansion joints are starting from the foundation level.

Providing and fixing pre moulded Dura board of desired thickness of 210mm having a minimum density of 95 Kg/m3 for slab, non-staining, with less than 1 % water absorption and compression recovery of 93%.

Laying Procedure

In an Expansion joint Dura Board to be fixed in position to substrate using either a double sided adhesive foam tape or synthetic rubber based adhesive. When forming expansion joints with Dura Board HD 100 in insitu concrete, joint sealing slots to be readily formed in the following manner.

- Before installing, simply cut off a strip of the required depth. Pin the strip back on, using two-inch nails at intervals. Then install the filler flush with the finished surface.
- Prior to sealing, the top strip can then be pulled easily from the joint to provide an uncontaminated sealing slot ready for preparation and sealing. Elastomeric sealants will not bond with DURABOARD HD 100.
Laying Procedure – For pavements having thickness more than 150 MM. Cut DURABOARD HD100 of required size & provide markings for Dowel Bars & fix it in position by hammering the DURABOARD HD 100 gently through the

The DURA Board HD 100 to have the following properties.

- Accepts temperature cycle with minimal load transfer
- Bitumen free
- Non-absorbent closed cell & Non-staining
- Resilient & does not distort under normal load from wet concrete
- Chemical resistance: Inert to most dilute acids and alkalis, resistant to oil and hydrocarbons

**JOINTS IN BUILDINGS FOR RESEARCH BLOCK**

During earthquake, ground shaking takes place and the building as a whole shakes, vibrates & oscillates and if there is not sufficient gap between two blocks of a building, they will pound against each other and structural damages can happen on individual blocks.

To prevent these structural damages due to pounding of buildings, sufficient gap between blocks is necessary; this gap depends on the structural stiffness & rigidity of the structural system of each block & height of the building.

There is provision to calculate the drift occurring between blocks as per clause 7.11.1, 7.11.2 & 7.11.3 of IS 1893/2002 (criteria for earthquake resistance design of structures) & based on this the drift is calculated from computer analysis due to earthquake of the structural systems of each building, (This works out to 200mm).

The separation of Blocks might also be necessary due to the length of the building or its change of orientation and alignment between the blocks. There is also the possibility of thermal expansion which is a function of the length of the buildings, coefficient of thermal expansion besides the variation or change in ambient temperature of the locality.

In IS 1893/2000 (earthquake resistant design of structures) as per clause 7.11.3 there is provision for separation between adjacent units of a buildings to avoid damaging contact when two units deflect towards each other.

There is specific provision to enhance the drift by multiplying with the response reduction factor (R) adopted for the building in the earthquake analysis, when there is difference in height & same height between buildings.
Guidance regarding the details for this item is available in the Hand book of Concrete Engineering edited by Mark Fintel and in IS 3414-1968 (Code of Practice for Design and Installation of Joints in Buildings). A sketch is prepared based on the details from the two documents mentioned above, after ascertaining the value of drift (200mm) calculated from the computer analysis of the structure.

The material used to provide the gap between the separations is Compressible Filler Board.

6.0 EPOXY FLOORING

Product description – It is a high performance, epoxy resin flooring system over solvent free epoxy primer.

R 3E- Solvent free epoxy primer to be use.

R. 25 CE -High performance epoxy resin flooring system supplied in four parts, premeasured pack for ease of onsite mixing and use. The cured resins form a pigmented smooth, tough layer, which can be easily cleaned. The properties are as follows:

1. Period for achieving initial hardness - 24 hours
2. Full curing period - 7 days
3. Compressive strength - 70 N/mm²
4. Flexural strength - 31 N/mm²
5. Tensile strength - 23 N/mm²

Main features and benefits of the system

Primer - Seal substrate and act as an adhesive barrier coating for use with epoxy floor System

Epoxy floor

1. Hard Wearing – Durable with low maintenance cost
2. Resistant to wide range of chemical and liquids
3. Seamless – easy cleaned to maintain high standards of hygiene
4. Available in range of color
5. Self-smoothing properties provide a flat high glossy finish

Treatment Methodology

Scope - Internal floor areas
Substrata - Concrete
The following are the sub strata requirements prior to do the epoxy flooring

1. Damp proof membrane shall be provided below the concrete floor in order to prevent dampness
2. New concrete flooring must be allowed to cure for 28 days and shall be in dry condition
3. The base should be hard and strong
4. The base should be free from any cracking
5. If any cracks even in construction joints it should be filled and grouted
6. Flatness of the base should be checked for level to ensure that the specified thickness of treatment can be applied over the whole area.
7. All expansion and movement joints should be properly cut and maintained for terminations
8. Weak and damaged concrete must be removed and replaced

Surface Preparation.

The entire floor surface shall be cleaned and all dirt, dust and other contaminants shall be removed completely. All smooth surfaces shall be roughened by grinding to provide mechanical key for subsequent application. Finally, before the application of all treatment, the surface shall be cleaned by means of vacuum cleaner.

Primer

The mixing and application of the primer R 3 E is as follows:-

- Stir thoroughly the individual components of R 3 E. Add PART B into the PART A and mix using slow speed heavy duty drilling machine fixed with mixing paddle to get homogeneous mix. The mix will have 20 minutes of pot life.

- Mixed material should be spread over the floor, using a brush or short / medium pile roller. One or more coats may be needed to ensure that a uniform coating is achieved and to compensate for differences in surface porosity. Allow the applied surface to dry completely

Epoxy Flooring

- The individual components of the R 25 CE should be thoroughly stirred before being mixed together. The entire contents of the hardener (component B) should be poured into the resin container (component A) and the two materials mixed thoroughly for at least 2 minutes using a heavy duty slow speed drill and spiral paddle. Some of the mixed
components should be reintroduced back into the hardener container in order to activate any residue and then poured back into the larger mixing vessel and re-mixed for 1 min.

- The entire mixed contents should be poured into a larger mixing vessel to incorporate the filler component. Mixing of all 3 components should continue until a consistent homogenous mix is achieved.

- One or more packs may be mixed simultaneously to ensure a quick rate of installation.

- The mixed R 25 CE material should be applied to the prepared and primed surface immediately using a notch trowel or depth set rake to achieve the required thickness. The surface shall be gently rolled with a spiked roller to release entrapped air in mixing process and also to blend out any trowel marks.

- The work area should be protected during the installation process and during the initial curing time to ensure that no debris can contaminate the surface of the resin, as this will lead to unwanted blemishes in the hardened, cured surface.

7.0 ALEXA / DORMA – DOOR FRAME AND GLASS

Alexa/Dorma Aluminium door frame and glass assemblies alexa at 44 (single action door frame) and Alexa At -50 free standing connecting door frame.

The above two frames have been tuned to fit Dorma glass fittings are standard fittings for a rebate depth of 24mm are used are the single acting door frames At 44 and At 50 the standard finishes are aluminium silver EV1(101) and aluminium similar satin stainless steel (113)

The door frames are prepared for site assembly. All fittings are separately to be ordered a pointed out Alexa At -50 is free standing connecting door frame and for combination with fixed glass sidelights and over panels for 8 to 10 mm glass in the door area glass side lights and over panels are always prepared for 10mm glass shutter . The maximum door wait shall be 45 up to 65 kg

Wall connections in AT44 and MR 28 frame profiles can be used for the floor wall and ceiling joints extending across the side lights. The standard finishes are aluminium silver EV (101) and aluminium similar satin stainless steel C31 (113).

Wall connecting frame system MR -28 comprising a frame profile (series drilled) a clamping profile and 2 contact rubber extrusions (P.V.C transparent). These decorative and elegant frame solutions are suitable for both indoor & outdoor applications and are characterized by their remarkable easy installation. The view face width is just 28mm in connection with AT 50 only. Suitable for glass thickness of 10mm. No load transfer by the profiles can be readily removed and re installed else- where.
8.0 ANTITERMITE TREATMENT

General

Pre-construction anti-termite treatment is a process in which soil treatment is applicable to a building in early stages of its construction. The purpose of anti-termite treatment is to provide the building with a chemical barrier against the sub-terrene termites.

Anti-termite treatment being a specialized job, calls for thorough knowledge of the chemicals, soils, termite to be dealt with and the environmental conditions, in order to give effective treatment and lasting protection to the property undergoing treatment should be got executed through specialized agencies only.

The specialized agency should be preferably a member of the Indian Pest Control Association and shall have sufficient experience of carrying out similar works of magnitude envisaged in this lender

The contractor has to be watchful of the various stages of sub-structure works and arrange to carry out the soil treatment in time after proper co-ordination.

Scope

The scope of preconstruction anti termite treatment covers the soil treatment with approved chemicals in water emulsion in foundation trenches for columns, plinth beams, pile caps, brick walls, service trenches, lift pits, steps, ramps etc. in top surfaces of plinth filling, at junction of walls and floor, in expansion joints etc. in stages as detailed in this specifications and drawings. Unless otherwise stipulated, the anti-termite treatment will be carried out as per I.S .6313 (part (i) 1971 and/or as per direction of the Architect.

Site Preparation

In order to ensure uniform distribution of the chemical emulsion and to assist penetration, the following site preparation shall be carried out:

A) Remove all trees, stumps, logs or roots from the building site,

B) Remove all concrete form work if left anywhere, leveling pegs, timber off-cuts and other builder's debris from the area to be treated.

C) If the soil to be treated is sandy or porous, preliminary moistening will be required it tills capillary space. in soil in order to prevent the loss of emulsion through piping or excessive percolations.
D) If, the event of water logging of foundation, the water shall be pumped out before
application of chemical emulsion and it should be applied only when the Soil
is absorbent.

E) On clays and other heavy soils where penetration is likely to be slow and on sloping sites,
where run-off of the treating solution is likely to occur, the surface of the soil should be
scarified to a depth of 75mm. at least.

F) All sub-Floor leveling and grading. Should be completed, all cutting, trenches and
excavations should be completed with backfilling in place, borrowed fill must be free
from organic debris and shall be well compacted. If this is not done supplementary should
be made to complete the barrier.

Chemical to be used

The chemical to be used shall be as per the item description in the Schedule of quantities mixed
with water to prepare an emulsion of 0.5% concentration. The effectiveness of chemical depends
upon the choice of the chemical, the dosage adopted and the thoroughness of application. The
chemical solutions or emulsion required to be dispersed uniformly in the soil and to the required
strength so as to form an effective chemical barrier which is lethal and repellent to termites.

Mode and rate of application:

The chemical emulsion will be applied uniformly by sprayers at the prescribed rates as detailed
below in all the stages of the treatment.

Treatment in Foundation Trenches:

In case of normal wall load bearing structures, column pits, wall trenches and basement, the
treatment shall be @ 5 (five) ltrs/sq. m. of surface area of the bottom and sides to a height of at
least 300mm. After the foundation work, the sides shall be treated @ 15 (fifteen) liters/sq. m. of
vertical surface of substructure on each side.

After the plinth filling is done, treatment shall be done by roding the earth at 150mm. centres
close to wall surface and spraying the chemical with the above dose i.e. 15 (fifteen) ltrs/sqm. In
case of framed structure, the treatment shall start at a depth of 500mm, below ground level. From
this depth the backfill around the columns, beams and RCC basement walls shall be treated @
15. (fifteen) ltrs/sqm. Of the vertical surface and @ 5 (five) ltrs/sq. m, for the horizontal surface
at the bottom in the trenches/pits.
Treatment on Top Surfaces of Plinth Filling:

The top surface of the filled earth within plinth walls shall be treated with chemical emulsion at the rate of 5 (five) litres/sqm. Of the surface are before sub-base to floor is laid. If filled earth has been well rammed and the surface does not allow the emulsion to seep through, holes up to 50 to 75mm. deep at 150mm. centres both ways shall be made with crow bars on the surface to facilitate saturation of the soil with the emulsion.

Treatment at junction of Walls and Floors:

Special care shall be taken to establish continuity of the vertical chemical barrier on the inner wall surfaces from the finished ground level (or from level where the treatment had stopped) up to the level of the filled earth surface. To achieve this a small channel 30x30 mm shall be made at all the junctions of wall/column with floor (before laying sub-grade) and rod holes made in the channel up to the finished ground level at 150mm apart and the iron rod moved backward and forward to break the earth and chemical emulsion poured along the channel @ 15 (fifteen) litres (or at recommended quantity) per sqm. Of the vertical wall/ column surfaces so as to soak the soil right up to the bottom. The soil shall be tamped back in to place after this operation.

Treatment for Expansion Joints:

The soil beneath the expansion joints shall receive special attention when treatment under 2.5.1 above is in progress. This treatment shall be supplemented by treating through the expansion joint after sub-grade has been laid at the rate of 2(two) litres per metre length of expansion joint.

Precautions during Treatment:

a) Utmost care shall be taken to see that the chemical barrier is complete and continuous. Each part of the area shall receive the prescribed dosage of chemical emulsion

b) The treatment should not be carried out when it is raining or when the soil is wet with rain or sub-soil water.

c) Once formed, the treated soil barrier shall not be disturbed. If by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore the continuity and completeness of the barrier system.
Precautions for Health hazards and Safety measures

All the chemicals mentioned above are poisonous and hazardous to health. These chemicals can have an adverse effect upon health when absorbed through the skin, inhaled as vapours or spray mist or swallowed. Persons handling or using these chemicals should be warned of these dangers and advised that absorption through the skin is the most likely source of accidental poisoning. They should be cautioned to observe carefully the safety precautions given in 2.7.2 to 2.7.5 particularly when handling these chemical in the form of concentrates.

These chemicals are usually brought to the site in the form of emulsifiable concentrates. The containers should be clearly labeled and should be stored carefully so that children and pets cannot get at them. They should be kept securely closed.

Particular care should be taken to prevent skin contact with concentrates. Prolonged exposure to dilute emulsions should also avoided. Workers should wear clean clothing and should wash thoroughly with soap and water especially before eating and smoking. In the event of severe contamination, clothing should be removed at once and the skin washed with soap and water. If chemicals splash in to the eyes they shall be flushed with plenty of soap and water and immediate medical attention should be sought.

The concentrates are oil solutions and present a fire hazard owing to the use of petroleum solvents. Flames should not be allowed during mixing.

Care should be taken in the application of chemicals / soil-toxicants to see that they are not allowed to contaminate wells or springs which serve as source of drinking water.

Guarantee :

The contractor has to furnish the guarantee for 10(ten) years from the date of completion of work, stating that in case of reappearance of termites within the building area due to defective materials or workmanship or due to any other reasons, the contractor will carry out necessary post constructional treatment to keep the entire area free from termite, once again, without any extra cost to RGCB during the guarantee period.

Mode of Measurement:

The payment will be made on the basis of plinth area measurement at ground floor only for all the stages of treatment in sqm, correct to two places of decimals. Rate includes the cost of materials, labour and all tools, plants, sprayers etc required for complete operation.
9.0 LOOP PILE CARPET TILES

- **Loop pile** carpet tiles of 100% Polyamide 6 Solution Dyed Aqualon, 540 GSM pile weight, 6.4mm total height, 50 cm x 50 cm tile size, Back2back secondary backing made of Modified bitumen enhanced with a thermoplastic elastomer, reinforced with a glass fibre fleece covered with 100% PES fleece. 10% recycled content included (approved brands: Modulyss, Bentley Prince Street or equivalent).

- **Loop pile** carpet tiles of 100% Polyamide 6 Solution Dyed Aqualon, 500 GSM pile weight, 5.8mm total height, 50 cm x 50 cm tile size, Back2back secondary backing made of Modified bitumen enhanced with a thermoplastic elastomer, reinforced with a glass fibre fleece covered with 100% PES fleece. 10% recycled content included (approved brands: Modulyss, Bentley Prince Street or equivalent).

- **Loop pile** carpet tiles of 92% Polyamide 6 Solution dyed Aqualon + 8% Polyamide Space dyed, 540 GSM pile weight, 6.4mm total height, 50 cm x 50 cm tile size, Back2back secondary backing made of Modified bitumen enhanced with a thermoplastic elastomer, reinforced with a glass fibre fleece covered with 100% PES fleece. 10% recycled content included (approved brands: Modulyss, Bentley Prince Street or equivalent).

- **Loop pile** carpet tiles of 100% PA6 Solution Dyed Aqualon, 540 GSM pile weight, 6.4mm total height, 50 cm x 50 cm tile size, Back2back secondary backing made of Modified bitumen enhanced with a thermoplastic elastomer, reinforced with a glass fibre fleece covered with 100% PES fleece. 10% recycled content included (approved brands: Modulyss, Bentley Prince Street or equivalent).
SECTION. B – PLUMBING WORKS

PIPING – PREPARATION

Pipes and tubes shall be cut perpendicular to the axis, with approved cutting tools, the ends reamed and burrs removed.

Scale and dirt, on inside and outside and weld splatter shall be removed before assembly.

Piping connections to equipment shall be made with flanges or unions.

PIPING – SPACING AND LOCATION

Piping shall be installed in such a way that conserves building space and not interfering with the use of space.

Exposed piping shall be installed parallel or at right angles to the building walls, except where otherwise shown on the Contract drawings.

Minimum clearances shall be provided between piping covered by this section and those of other trades.

Adequate clearance shall be provided around piping for installation of insulation and access to valves and fittings.

Piping shall be grouped at common elevations wherever possible.

Piping shall be installed in such a way that allows for expansion and contraction without stressing pipe joints or connected equipment.

Access doors shall be provided where valves and fittings are not exposed. Size and location of access doors shall be coordinated with the Civil Work.

PIPE FITTINGS

Tapered reducer fittings shall be installed where changes in pipe sizes occur. Use of site fabricated fittings or bushings shall not be permitted.

Tapered, factory manufactured reducer fittings (eccentric type at suction and concentric type at discharge) shall be installed at pump connections. Eccentric reducer fittings shall be installed with level crown.

Factory manufactured fittings shall be installed where changes in pipe direction occur. Bending or forming of piping shall not be permitted without the written permission of the Architect.

Test – tees shall be installed in soil, waste, vent and rainwater pipe risers at minimum 450 mm (18 inch) above the ground floor level, at every alternate level and at other locations as shown on the Contract Drawings.
SLOPES AND INVERTS

Invert elevations shall be established and drainage pipes sloped to one percent minimum unless otherwise stated. The gradients that are shown on the Drawings shall be maintained.

Elevations of buried piping, outside the building, shall be established to ensure not less than 900mm (3ft) of cover, especially in areas subject to traffic loading.

The crown (or suffix) levels of the pipes shall be matched when joining horizontal drainage pipes of differing sizes, as far as possible. This shall apply to stepped reducers in drainage piping and connections in manholes (saddle joints in drainage mains excluded).

PROTECTION DURING CONSTRUCTION

Ends of piping shall be kept closed with factory manufactured plugs or blind flanges with integral indicating flange, to prevent entry of foreign matter, during the progress of the work such plugs or flanges shall be removed on completion of the work.

Water supply piping outlets in wet areas shall be kept closed with threaded (PVC) pipe stub with one end crimped or closed otherwise until the time of installing the outlet fittings.

The piping surface shall be protected from splashes of cement, plaster, paint and similar construction materials.

The piping shall be blown out using dry compressed air, prior to testing.

SETTING OUT FOR EXTERNAL SERVICES

The existing ground shall be cleared along the line of piping, particularly at all manholes, building connections and other appurtenances.

Sight rails shall be set in position, using a surveyor’s level and properly established temporary bench marks alongside the work. The practice of transferring level by means of a straight edge and spirit level shall not be allowed.

Where long lengths of slightly sloping sewers are to be laid in trenches, sight rails should be fixed across the trench at intervals of at least 20m at a height equal to the length of the boning rod to be used above the required invert level of the drain or sewer at the point where sight rail is fixed. There shall at no time be less than three sight rails in position on each length of sewer or drain under construction at any one gradient.
Deviations from given levels may not be greater than +2cm and in gradients not greater than 1/20 of given gradient.

LAYERING OF EXTERNAL PIPING

Pipes shall be laid and connected at the required depth in straight line and true to the gradient on an even foundation, over the full length of the barrel, with the sockets facing up the gradient.

When jointing pipes, a mark shall be made to check the position of the end of the barrel in view of the flexibility of the joint. A gap 5 to 10 mm shall be left between the end of the pipes. When pipes are laid in curves, the pipes may not be bent sideways until the connection has been made.

Piping shall be kept free of earth, dirt and extraneous matter and every pipe shall be cleaned after installation by special cleaning tools approved by the Architect to inspect the pipelines at any time during construction.

No pipe shall be laid when, in the opinion of the Architect, conditions are unsuitable.

ENCASEMENT FOR EXTERNAL PIPING

Foundation of cement concrete shall be provided under the pipes, hunching with similar concrete up to half the diameter of the barrel; in weak soils, as required.

Pipes laid in areas subject to traffic loading shall be encased with concrete, as stated below. Pipes with 1000 to 4000mm earth cover need not be encased. Hunching and encasing of pipes shall be done in two stages, after completion of tests.

1. Concrete bed of 50mm thickness shall be cast to scheduled slopes and levels.
2. Blocks of concrete (100mm thick and length equal to the external diameter of the pipe) shall be fixed on the bed with cement and sand mortar (1:3).
3. Hunching or encasing concrete shall be cast from one side of the pipe only, vibrating until it is raised on the opposite side by 50mm over the bottom of the pipe.
4. Expansion joints shall be made in the protective concrete with fiber board or other suitable filling material.

BACKDROPS TO MANHOLES

Drop connections shall be executed at the inlet to sewage manhole, when the drop exceeds 600mm.
These shall be constructed vertically adjacent to the external face of the manhole shaft in order to reach the level inside the manhole.

VALVES

Valves shall be installed with stem upright or horizontal, not inverted; except with the written permission of the Architect for each location.

Valves shall be same size as pipeline, except where shown otherwise on the Contract Drawings.

Valves with flanged ends shall be used in valve pits and when directly buried, irrespective of size.

Ball and gate valves shall be used for shutoff and to isolate equipment part of systems or risers. Full bore ball valves shall be used for water storage tank, drain and for isolation purposes in gravity fed systems (which are not subjected to shock conditions).

Appropriate valves gland packing, sealing and gasket materials shall be selected for the temperature and pressure encountered.

SUPPORTS AND HANGERS FOR PIPING

Horizontal cast iron piping shall be supported independently of other piping.

Sports shall be provided for fittings grouped together in horizontal runs, as appropriate.

Piping shall be anchored at horizontal changes in direction, at clean outs and at start or horizontal lines.

Floor clamps shall be provided at every floor and offset clamps below the branch take off joint in vertical risers.

SUPPORTS AND HANGERS FOR PVC PIPING

Horizontal piping shall be supported as scheduled below:

<table>
<thead>
<tr>
<th>Pipe size</th>
<th>Maximum spacing</th>
<th>Hanger Rod Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP to 25mm nom. dial</td>
<td>1.2m</td>
<td>8mm (5/16”)</td>
</tr>
<tr>
<td>32 to 50mm nom. dial</td>
<td>1.5m</td>
<td>10mm (3/8”)</td>
</tr>
<tr>
<td>65 to 75 mm nom. dial</td>
<td>1.8 m</td>
<td>10mm (3/8”)</td>
</tr>
<tr>
<td>100 to 150mm nom. dial.</td>
<td>2.4m</td>
<td>12mm (1/2”)</td>
</tr>
</tbody>
</table>

Risers of all sizes shall be supported at one quarter (1/4) points of floor to floor height support to spacing of 2.0 m shall not be exceeded.
SLEEVES

Sleeves shall be set in position in form work and additional reinforcement provided around sleeves. Where sleeves in concrete structural elements are omitted due to error, the required openings shall be cored only after obtaining written permission of the Architect.

Sleeves with puddle flanges resting on the concrete surface shall be placed and the sleeves fixed in position by non-shrink grout. Cutting of hole by chiseling shall not be permitted.

All sleeves in wet areas shall be projected by at least 50mm (2inch) above the finish floor level.

Sleeves shall be erected in the form work, perpendicular to the wall face and rigidly to resist displacement during pouring of concrete.

Sleeves shall be large enough to allow for movement of pipe due to expansion or contraction.

PUDDLE FLANGES

Puddle flanges shall be erected in the form work perpendicular to the wall face and rigidly to resist displacement during pouring of concrete.

Verticality of the flange faces and alignment of bolt holes with connecting equipment (valves etc.) shall be checked and ensured.

Openings in the form work, around puddle flanges, shall be sealed so as to avoid leakage (and resultant honey combing) and undesirable formation of concrete.

Alignment of puddle flanges shall be checked (and adjusted if necessary) immediately after pouring of concrete.

EXCAVATION TO BE TAKEN TO PROPER DEPTH

Trenches shall be excavated in all condition of soil and to such a depth that sewers shall be set as described in the several clauses relating thereto and so that the inverts may be at the levels given on the section. In bad ground, the Architect may order the contractor to excavated to a greater depth than shown in the drawings and fill up the excavation to the level of the sewer with concrete; sand, gravel or other materials. For such work the contractor shall be paid extra at the rates laid down such works in the schedule, if the extra work was ordered by the Architect in writing. But if the contractor should excavate the trench to greater depth than is required without a specific order to that effect in
writing of the Architect, the extra depth shall have to be filled up with concrete at the contractor's own cost to the requirements and satisfaction of the Architect.

**REFILLING**

After the sewer or other work has been laid and proved to be water-tight, the trench or other excavation shall be refilled. Utmost care shall be taken in doing this, so that no damage shall be caused to the sewer and other permanent works. Filling the trenches up to 50cm above the crown of the sewer shall consist of the finest selected materials placed carefully and consolidated. After this has been laid, the trench and other excavation, each layer being watered and consolidated.

**CONTRACTOR SHALL RESTORE SETTLEMENT AND DAMAGES**

The contractor shall at his own cost make good promptly, during the whole period the work are in hand, any settlement that may occur in the surfaces of roads, berms, footpaths, gardens, open spaces etc., whether public or private caused by his trenches or his other excavations and he shall be liable for any accidents caused thereby. He also shall, at his own expense and charge repair and make good any damage done to buildings and other properties.

**DISPOSAL OF SURPLUS MATERIALS**

The contractor shall at his own cost dispose as directed all surplus excavated materials not required to be used on the work.

**SHORING**

The contractor shall at all times support efficiently the sides of trenches and other excavations by suitable timbering, piling, sheeting etc. Trenches shall be close timbered in loose or sandy strata and below the surface of the sub-soil water table.

All timbering, sheeting and piling with their wailings and supports shall be of adequate dimensions and strength and fully braced and strutted so that there is no risk of collapse or subsidence of the walls of trenches. The contractor shall be held accountable and responsible for the sufficiency of all timbering, bracing, sheeting and piling used for all damages to persons and property resulting from the improper quality, strength, placing, maintenance or removing of the same.
BAILING OUT WATER

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

PROTECTION OF EXISTING SERVICES

All pipes, water mains, cables etc. met in the course of excavation shall be carefully protected and supported.

CONCRETING

All pipes at shallow road crossings and made –up ground shall be laid on a bed of 6”(150mm) concrete with one part of cement, four parts of sand and eight parts of stone metal of ¾”(20mm) or smaller gauge properly consolidated. Concrete shall be laid to full width of trench and also in haunches.

CONSTRUCTION ACROSS ROADS

All work across roads shall be carried out as per the directions of the Architect.

WATER SUPPLY

UPVC PRESSURE PIPES AND FITTINGS

LAYING AND FIXING

Pipes are to be cut to size and threaded with standard GI threading die. Pipes and fittings shall be jointed using Teflon tape as thread sealant. Pipes and fittings can be tightened by hand also to achieve leak –proof joint. Pipes shall be fixed by means of holder bat clamps keeping them 12mm off walls for easy maintenance. Pipes running on roof slabs shall be suitably supported blocks and to be projected from ultra violet radiation

TESTING

Pipes shall be tested to a hydrostatic pressure of 10 kg/sq cm and pressure shall be maintained for at least eight hours without appreciable drop in pressure. In addition to sectional testing of water supply pipes, the contractor shall test the whole of the installation to the entire satisfaction of the Architect.
PVCPIPES

LAYING AND JOINTING

For PVC pipes, pasted joints are preferred. The socket length should be 1 1/2 times the outer diameter for size above 110mm diameter. The surface to be glued should be thoroughly scoured with dry cloth and preferably chamfered to 30°. Solvent cement is to be applied evenly with a brush outside surface of the spigot of one pipe and to the inside surface of the socket of the other. The spigot end should then be inserted immediately into the socket should be wiped out at once with a clean dry cloth. Jointing should be carried out quickly, taking not more than one minute to completed joint should not be disturbed for at least 5 minutes. Gluing should be avoided in rainy or foggy weather to avoid water contamination of the solvent cement. Pipes should be supported at a distance of 1.20 m for vertical runs with appropriate MS clips and support blocks or wooden plugs fixed on walls, floors or ceiling. Holder bat clamps are to be used to keep pipes 12mm clear off walls.

TESTING

Pipes should be tested to a hydrostatic test pressure of 3.5kg/sq cm in sections of lengths. Pressure should be maintained for 8 hours without appreciable drop. In addition to sectional testing of pipes, the contractor shall test the entire installation to the entire satisfaction of the Engineer.

CHLORINATED POLY VINYL CHLORIDE PIPES (CPVC PIPES)

The pipe may cut to the required lengths using circular tubing cutters, Ratchet type cutters or chop saws. The cuts shall be square. Burrs and fillings shall be removed from outside and inside the pipes using a chamfering tool.

For jointing CPVC pipes special solvent cement is required. The surfaces are to be dry before solvent cement shall not be allowed puddle in the fitting and pipe assembly. The pipe may then be rotated to one quarter to half turn while inserting into the fitting socket. When the pipe end is seated it may hold in place for ten seconds to allow the joint to set. Teflon tape may be used as thread sealant.

Water testing to a pressure of 10kg/cm2 may be carried out for CPVC piping system. Air testing shall not be done.
VALVES AND PRESSURE GAUGES.

Pressure gauges shall have not less than 115mm dia, 10mm BSP full threads, brass body siphon and gauge cock of 10mm size. Dial gauges shall be adequate for pressure encountered and specified (0-15 kg/sq cm). Valves shall comply with IS:780 (Class I) for CI sluice valves and IS: 778 for GM valves and tested and approved by the Municipal Corporation.

BALL COCKS

Ball cocks used for storage tanks shall be high pressure brass/ gun metal ball cocks with brass lever road and PVC floats.

SANITARY SYSTEM

PVC SWR PIPES AND FITTING

LAYING

PVC Pipes shall be laid under floors, in suspended ceiling, in sunk slabs or on walls either buried or exposed as the case may be as shown on drawings. The minimum thickness of the fittings shall be 32mm. Fittings shall be injection molded type with rubber ring socket. Exposed pipes and fitting shall be capable of withstanding sun-rays without any cracks or de-colorization.

JOINTING

Jointing of pipes to fittings shall be done as per manufacturer’s instructions/recommendation.

TESTING

PVC pipe and fittings shall be tested for three meters of water head. Openings of pipes shall be sealed for the section to be tested. Water pressure shall be maintained for maximum of one hour. The Engineer shall examine carefully all the joints for leakage.
SECTION. C – ELECTRICAL WORKS

Technical Specification for Non DSR items

I. SPECIFICATION AND TECHNICAL PARTICULARS FOR UPS

1.1 Scope

The present special contract specifications constitute a call for best offers for the supply of Uninterruptible Power System(s) (hereinafter referred to as UPS) rated at 3X80 kVA in parallel redundant configuration, featuring Maintenance Free Sealed Lead Acid batteries housed in one or more external racks/cubicles and providing a minimum autonomy of 15 minutes.

The present specifications contain minimum requirements. All offers must be completed strictly in accordance therewith, either by confirming data or by filling in the spaces provided, where requirements are not met. Any deviations or exceptions to the minimum requirements must appear in the offer. Where no exceptions are shown, the requirements of the present specifications will be considered as accepted.

A redundant system can be created by connecting 3 complete units of the same type in parallel. This parallel redundant configuration shall have redundant batteries and a decentralized bypass. The load is shared amongst the units connected in parallel. Units with a central control module and/or central static bypass are not accepted.

2.0 RELEVANT REFERENCE STANDARDS

The choice of materials and components, engineering developments and the construction of the equipment must comply with current directives and standards.

The UPS will have a CE mark as specified by Directives 73/23, 93/68, 89/336, 92/31 and 93/68.

The UPS will be designed and produced according to the following specifications:

- IEC/EN 62040-1-1 "General and safety requirements for UPS used in operator access areas."
- EN 62040-2 “Electromagnetic compatibility (EMC) requirements”
- IEC/EN 62040-3 “Performance requirements and test methods”

3.0 DESCRIPTION OF SUPPLY

The purpose of the enclosed specification is to define minimum design, construction and testing criteria relating to the supply of Uninterruptible Power Systems (UPS).
3.1 Design Specifications

The Uninterruptible Power System (UPS) will include the following operational components:

- Full IGBT Rectifier/battery charger
- IGBT Inverter
- Maintenance bypass switch
- Static switch
- Batteries.

3.2 IGBT Rectifier/Battery charger

The IGBT Rectifier/Battery charger will have an input isolating switch and a PWM digital vector control system (DSP based) which, in addition to normal functions (AC/DC conversion), will automatically correct the input power factor to a value > 0.99 and limit the harmonic rejection to the mains at a THD<sub>i</sub> value < 3% at full output load, and a THDi value < 5% for any other condition.

For the battery charger function, this converter will include built-in fuses and a control circuit for the voltage and battery recharging current. The ripple current to the batteries will be less than 0.05 C<sub>10</sub>. A microprocessor control function will perform the following operations:

- Test the battery by automatically performing a partial battery discharge at weekly intervals or at intervals defined by the user
- Adjust battery float voltage as a function of ambient temperature
- Calculate the remaining battery autonomy time during discharge
- Automatically compensate battery shutdown voltage as a function of the time for prolonged discharges.

3.3 IGBT Inverter

The IGBT inverter will have a PWM digital vector control system (DSP based), capable of converting DC voltage from the IGBT rectifier or battery into AC voltage. A rated output filter will create an output voltage sinusoidal envelope.

The control circuit, in addition to normal functions, will automatically adjust nominal output power in accordance with ambient temperature.
Inverter should be able to deliver full active power at Unity power factor (KVA=KW)

3.3.1 **UPS compatibility to Load Power factor**

UPS should support the full Power factor range (Lagging & leading) of load without any deration in power rating.

![Power factor diagram](image)

3.4 **Static bypass switch**

The static bypass switch will feature a separate power input and will consist of the following:

- Static switches (SCR type), which can support overloads and short circuits downstream of the UPS.
- A back-feed detection circuit as specified by IEC/EN 62040-1-1, clause 5.1.4.
- A bypass and maintenance bypass input isolating switch with auxiliary indicator contact.
- An output load switch.

The control logic will be handled by digital algorithms (using vector control techniques), similar to those used for the rectifier and the inverter. The static bypass shall be equipped with a back-feed protection device compliant with clause 5.1.4 of IEC/EN 62040-1-1; and a relay signal contact for the control of the external back-feed isolator to be installed on the bypass line upstream from the UPS.

3.5 **Batteries**

The VRLA, WET or NiCd batteries will feature an enclosure made of self-extinguishing material.

The batteries will be housed in one or more racks/ cubicles and will be protected by fuses located on each pole and via a dedicated switch.
Batteries will have an operating life of 10 years and, in the event of total failure of the mains power source, will guarantee the supply of nominal UPS output power for a minimum autonomy of 15 minutes.

4.0 OPERATING MODES

This section describes the different operating modes of the Uninterruptible Power System.

The UPS, using the above-mentioned digital vectorial control (DSP system), will be able to operate both in double conversion and digital interactive modes.

The operating mode may be factory set by the manufacturer during testing or by the customer using the appropriate diagnostic and control software.

The IGBT inverter will be synchronised with the bypass line so that the load can be transferred from the inverter (conditioned line) to the bypass supply (direct line) and vice versa without any break in the supply to the load.

In all operating modes, the battery charger will provide the power necessary to keep the battery fully charged.

4.1 Double conversion operation

In this operating mode, under normal service conditions, the load will always be supplied from the inverter, guaranteeing maximum protection for the load.

Upon failure or reduction of the primary AC source, the load will be supplied by the battery through the inverter. During this phase, power will be drawn from the battery. Visible and audible signals will alert the user to this operating state. The remaining autonomy time will be calculated by a diagnostic algorithm.

Upon return of the primary AC source to within tolerance limits, the Uninterruptible Power System will recommence operating in normal mode.

In the event of an inverter overload, manual stop or failure or temporary overload downstream of the UPS, the load will be automatically transferred to the bypass supply source without interruption.

In the event of an overload with an unsuitable supply, the Uninterruptible Power System will not transfer the load but will continue to supply it from the inverter for a period of time dependent upon the extent of the overload and the characteristics of the UPS.

The user will be alerted of these anomalous operating conditions via the alarm.
4.2 Digital interactive mode

In this operating mode, under normal service conditions, the load will always be supplied from the direct line through the bypass static switch. The quality of the direct line will be monitored constantly using algorithms operated in real time by the DSP control system.

If the direct line is outside the permitted tolerances, the load will be automatically transferred to the conditioned line (inverter) without interruption.

In the absence of power supply to the direct and conditioned lines, the battery will supply power to the loads through the inverter. During this phase, power will be drawn from the battery and the battery charge will be reduced. Visible and audible signals will alert the user to this operating state. The remaining autonomy time will be calculated by a diagnostic algorithm.

When the quality and reliability of the direct line return within permitted limits, the UPS will automatically start supplying the load from the direct line.

4.3 Maintenance bypass switch

The UPS will be equipped with a bypass switch capable of transferring the load to the bypass supply without interruption so as to enable the UPS to be switched off and isolated for maintenance operations. The supply to the load will be maintained.

4.4 Controls and diagnostics

The controls for the electronic power supply modules will guarantee the following:

- A three-phase power supply which is ideal for the load
- Controlled battery recharging
- Minimum harmonic rejection to the upstream mains power supply (THDi<3% at full load, THDi<5% in any other condition).

The UPS will feature a digital vector control based on a DSP (Digital Signal Processor).

The special DSP algorithms must be designed to ensure rapid and flexible processing of the detected data, allowing rapid generation of controlled variables. It must also be possible to run the control for the electronic inverter devices in real time to:

- Improve short-circuit behaviour (300% I_n for 10 ms, 150% I_n up to 5 s)
- Have a synchronised (precise phase) angle between UPS output and bypass network, in the event of mains voltage distortion
- Highly flexible parallel operation.

5.0 Microprocessor control and diagnostics

Operation and control of the UPS should be provided through the use of microprocessor-controlled logic. Indications, measurements and alarms, together with battery autonomy, will be shown on a graphic liquid crystal display (LCD). The procedures for start up, shutdown and manual transfer of the load to and from bypass will be explained in clear step-by-step sequences on the LCD display.

Warning/fault: this page contains information regarding various anomalies concerning power converters such as the bypass, rectifier, inverter and booster/charger. In addition to this there is also warning and fault information relating to the battery and the load.

Events log: displays the date and time of important UPS events, alarms and other warnings.

Measurements: this page holds the full set of measurements for each functional block (rectifier, bypass, booster/charger, batteries, inverter and load).

Battery: displays the battery status/values including temperature, cell voltage, capacity and run time as well as commands for allowing the user to configure battery testing.

Tools: this page allows users to customize the settings of the LCD display and to select the desired language, choosing between 15 languages.

5.1 Controls

The UPS will be provided with the following controls:

- Inverter start
- Inverter stop
- Reset faults
- Buzzer/mute alarm

5.2 Measurements

The UPS will provide the measurements (voltage, current and frequency) for every single internal functional block and this information will be directly accessible on the display, via the measurements button.
5.3 Signals and alarms

The UPS must provide signals and alarms for every single functional block. These signals must be directly accessible via the display, by clicking the warning and fault button.

The UPS will also:

- Clearly display, upon mains failure, the remaining battery autonomy which will be a function of battery status and charge (discharge curve, degradation, operating temperature, etc)
- Have three serial RS232 ports for compatibility and communications with special peripheral units and for remote connections
- Be able to support remote graphic measurement and signalling software
- Be able to interface with a network monitoring system using SNMP slot-in cards
- Provide a telemonitoring function (see description under section 6.0 "Telemonitoring")

A voltage-free input will also be provided to disable the static switches and all power converters (EPO) in case of emergency.

Programmable I/O contacts (at least 4 voltage-free outputs and 2 inputs).

6.0 TELEMONITORING

This section defines the requirements of the system for remote monitoring and control from the Service Centre.

6.1 Monitoring and control from service centre

The system will be capable of analysing UPS operation and electrical supply in order to identify faults and thus prevent the occurrence of conditions likely to damage the equipment protected by the UPS.

The system will guarantee single or parallel UPS surveillance, 24 hours a day for 365 days a year by authorised technical personnel operating remotely. The system will provide a detailed, preventive analysis of connected UPS, without any of the disruption associated with an on-site visit.

The telemonitoring system will offer the following main features:

- Continuous monitoring and control of the performance of end-user UPS
- Bi-directional communications between end-user UPS, Authorised Service Centre and its authorised field service engineers
- Automatic location of Service Engineers in the event of anomalous UPS functioning (even at night and during public holidays)
- Possibility of using graphic software for remote in-depth analysis and control
- Periodic reports on UPS performance with advice from Service Centre engineers.

### 7.0 UNINTERRUPTIBLE POWER SYSTEM TECHNICAL DATA

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit of measure</th>
<th>Specification data</th>
<th>Supplier's data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7.1 Input characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal voltage</td>
<td>(V)</td>
<td>400 V three-phase + N</td>
<td>320 V ÷ 460 V</td>
</tr>
<tr>
<td>Tolerance on voltage</td>
<td>(%)</td>
<td>320 V ÷ 460 V</td>
<td></td>
</tr>
<tr>
<td>Nominal frequency (60 Hz selectable)</td>
<td>(Hz)</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Tolerance on frequency</td>
<td>(%)</td>
<td>± 10</td>
<td></td>
</tr>
<tr>
<td>Input power factor @ nominal voltage</td>
<td>(%)</td>
<td>&gt; 0.99</td>
<td></td>
</tr>
<tr>
<td>Total harmonic distortion (THDi) @ full load</td>
<td>(%)</td>
<td>&lt; 3</td>
<td></td>
</tr>
<tr>
<td>Total harmonic distortion (THDi) in all other conditions</td>
<td>(%)</td>
<td>&lt; 5</td>
<td></td>
</tr>
<tr>
<td>Walk in/Soft start</td>
<td>(Sec)</td>
<td>10 (1 to 90)</td>
<td></td>
</tr>
<tr>
<td>Rectifier Hold OFF (Sec)</td>
<td>(Sec)</td>
<td>10 (1 to 180 selectable)</td>
<td></td>
</tr>
<tr>
<td><strong>7.2 Inverter output characteristics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal voltage (380/415 selectable)</td>
<td>(V)</td>
<td>400 three-phase + N</td>
<td></td>
</tr>
<tr>
<td>Nominal frequency (60 Hz selectable)</td>
<td>(Hz)</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Nominal power @ 40°C</td>
<td>(kVA)</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Nominal Power @ 40°C</td>
<td>(kW)</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Automatic adjustment of nominal output power as a function of temperature</td>
<td>(%)</td>
<td>@ 25°C = 110%</td>
<td></td>
</tr>
<tr>
<td>Stability in dynamic conditions for 100% load step variations</td>
<td>(%)</td>
<td>Complies with IEC/EN 62040-3, Class 1 (VFI, SS, 111)</td>
<td></td>
</tr>
<tr>
<td>Load crest factor without derating</td>
<td></td>
<td>3:1</td>
<td></td>
</tr>
<tr>
<td>Output voltage distortion with 100% linear load</td>
<td>(%)</td>
<td>&lt; 1</td>
<td></td>
</tr>
<tr>
<td>Output voltage distortion with non-linear load as specified by IEC/EN 62040-3</td>
<td>(%)</td>
<td>&lt; 3</td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Unit of measure</td>
<td>Specification data</td>
<td>Supplier's data</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-----------------</td>
<td>--------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Output frequency stability with internal clock</td>
<td>(%)</td>
<td>± 0.1</td>
<td></td>
</tr>
<tr>
<td>Frequency slew rate</td>
<td>(Hz/sec)</td>
<td>&lt; 1</td>
<td></td>
</tr>
<tr>
<td>Permitted overload: for 10 minutes</td>
<td>(%)</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>for 60 seconds</td>
<td>(%)</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Short circuit current:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300% I&lt;sub&gt;n&lt;/sub&gt;</td>
<td>(ms)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>150% I&lt;sub&gt;n&lt;/sub&gt;</td>
<td>(s)</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

### 7.3 Characteristics of electronic static changeover switch

Nominal voltage (380/415 selectable) (V) 400
Tolerance on voltage (± 5 ± 15 selectable) (%) ±10
Nominal frequency (60 Hz selectable) (Hz) 50
Tolerance on frequency (± 2 ± 3 ± 4 selectable) (%) ± 1
Permitted overload:
- for 10 minutes (%) 125
- for 1 minute (%) 150
- for 600 milliseconds (%) 700
- for 100 milliseconds (%) 1000

### 7.4 UPS characteristics

Maximum UPS cabinet dimensions WxHxD (mm)
Noise level measured @ 1 meter and @ 100% load according to ISO 3746 (dBA) 70-72 dBA
AC/AC efficiency – double conversion mode @ 100% load (%) >95
Efficiency in digital interactive mode @ 100% load (%) 98
EMC compatibility as per EN 62040-2 Class C3
Degree of protection IP 20
Frame colour RAL…

The constructional and functional characteristics of UPS must be in line with the state-of-the-art technology in this field.

The supplying company must be able to provide proof that it is ISO 9001-2000 and ISO 14001 certified for design and manufacturing and for the provision of services.

The UPS will be guaranteed for one year during which time the Supplier will provide technical assistance.

The offer must include:

- a draft maintenance contract providing for 24 hour service with guaranteed minimum service call response time of 4 hours (references are required)
- the addresses of all Service Centers, divided according to geographical areas, and the number of engineers working for each center
• Indication of main telemonitoring installations in operation.

8.0 MISCELLANEOUS PROVISIONS

This section defines details of services, activities and means necessary to complete the supply of the Uninterruptible Power System.

8.1 Documentation

All technical documents issued by the Supplier, in particular the user handbook and the installation, maintenance and troubleshooting guides must be in English.

8.2 Spare parts

The Supplier may include a list of recommended spare parts in the offer for at least two and/or five years.

8.3 Packaging

The Supplier will ensure that all equipment is suitably packaged.

8.4 Shipment

The Supplier will ensure that the equipment is shipped to the specified address on the agreed date.

8.5 Commissioning

Commissioning costs will be payable by the Supplier who will be responsible for the work done and the personnel involved.

Technical personnel will be trained to meet the requirements of current work safety standards.

8.6 Service hot line

The Supplier will indicate the service centre nearest to the place of installation of the equipment supplied under the contract.

The service centre indicated must be able to provide routine maintenance services and must be able to respond to urgent calls at the terms and conditions specified by the Buyer.

II. SPECIFICATION AND TECHNICAL PARTICULARS FOR PLC BASED SYNCHRONIZATION SYSTEM

The system is for the synchronization of 2 Diesel Generators. A single and sophisticated system for generator Synchronization and AMF functionality of the transformer is considered.
The load dependent switching of the breakers is done by the PLC. The necessary electrical interlocks of the DG switchgear with the mains power and for the various feeders is done using the PLC. DG synchronization system to ensure more efficient running of DG’s as well as less fuel consumption per unit of running DG’s is considered. Generator Synchronising and protection module of approved make is to be used for the application. 2 nos. of synchronization modules are considered for the operation. One synchronization module per Generator is required. An Operator Display module for the visualization of the Process parameters on the PLC Panel itself is required. PC is to be connected to PLC over bus network. Bus is the Industrial network, which offers a high-speed data communication at a speed of 12 MBPS which ensures very smooth and trouble free data communication between different process elements. The system starts the DG’s automatically on the event of power failure or any unhealthy power condition on the mains power supply persists more than 5 seconds, such as: A. Failure of any of the phases B. Under voltage conditions (10% below normal voltage of 415V AC) C. Failure of any of the transformers or tripping of transformer protective relay. On failure of Grid supply, the mains ACB will be switched off and first DG, selected either depending on the average load for the last 15 minutes before the power failure or as per the pre-programmed sequence the Master DG will come immediately in line. The sequence and master DG’s can be altered any time later through the SCADA or Display. The transfer of the loads takes place only when the generator output reaches 90% of its rated voltage and frequency.

III. SPECIFICATION AND TECHNICAL PARTICULARS FOR CABLE MANAGEMENT SYSTEM

Wall trunking with cover shall be made up of Lead free Polyvinylchloride material as per EN 50085-2-1 and shall be ROHS complied. The trunking shall have smooth surface finish without sharp edges and Burrs. The trunking shall have IP 30 Protection against access to hazardous parts and shall be non-flame propagating. Wall trunking channels shall be made of lead free polyvinyl chloride with ROHS compliance. With a standard length of 2 meter, size 108.50mm height x 60 mm depth (or higher) suitable for fix any make switches and sockets. The system must have a base perforation so as to allow installation in the wall. The WDK 60110 cover must have slide external locking; and with 4 cover clips each in every 2 meter length for a better locking with base trunk. The trunking shall have all accessories like internal corner cover, external corner cover, T intersection cover,
flat angle cover etc for complete cable management. The wall trunking shall be of Cream in colour and the standard size of the wall trunking shall be of dimensions mentioned below.

IV. SPECIFICATIONS FOR 415V AUTOMATIC POWER FACTOR CORRECTION CAPACITOR BANKS AND CAPACITORS WITH HARMONIC SUPPRESSION FILTER

4.1 POWER FACTOR CAPACITORS – 270 kVAR & 190 kVAR

Following shall be the specifications of capacitors used in the banks:

1. Rated Voltage (V) : 415
2. Rated frequency (Hz) : 50
3. Construction : 2 layer film + foil
4. Guaranteed maximum reduction in kVAR rating after the following periods from the date of commissioning:
   a. One Year : 2%
   b. Two Years : 5%
5. Guaranteed maximum loss in watts per kVAR : 0.8 to 1W per kVAR
6. Container material for capacitor in bank : Fully metal treated, powder coated hermetically sealed sheet steel housing
7. Impregnate : Non-PCB non-hazardous
8. Earthing terminals : 2 No, to be provided
9. Permissible over-voltage : 10%
10. Permissible over-current : 30%
11. Reference Standard : IS: 2834
12. Reactor : 7% harmonic block reactor needs to be provided in series with each Individual capacitor bank. It shall be designed for low temperature rise and low flux density. It shall be of high linearity.
4.2 APPROVAL AND CERTIFICATION

The banks and capacitors shall have CPRI test certificates.

4.2.1 APPROVAL BY ELECTRICAL INSPECTORATE

The bank shall be manufactured to comply with the requirements of the Electrical Inspectorate of the State. The Contractor shall be responsible to get the approval of the Electrical Inspectorate for the equipment and components supplied.

Following drawings and details shall be furnished:
  a. Front view of the bank with arrangement of all compartments, compartment doors, handles, knobs, push buttons, indicating lamps and other components.
  b. Typical cross sections of the bank to show the arrangement of bus bars, capacitors, fuses, contractors, interconnections and cable terminating facility with sizes of bus bars. Interconnections and clearances.
  c. Drawings of bus bars with clearances and support details.
  d. Ventilation arrangement inclusive of fan, if provided, with control arrangement.
  e. Schematic wiring drawings of power, control, metering and protection circuits.

4.2.2 DRAWINGS

The Contractor shall prepare and furnish to the Employer detailed drawings of the bank and its parts with all the required information within fifteen days of the letter of intent. The manufacture shall be taken up only after receipt of the approved drawings from the Employer. The Contractor shall take action in this matter in such a manner that the process of submission of drawings and details and their approval by Employer are completed in time to adhere to the stipulated delivery period.

The drawings and details to be furnished for Employer’s approval shall include the following:
  a. Front view, plan, end views and sectional views of the bank to clearly show all details relating to arrangement of various components, interconnections, clearances, etc.
  b. Schematic wiring diagrams of the main and auxiliary circuits.
  c. Bill of materials giving details of designation, make, type, ratings, etc of the various pieces of equipment mounted on the bank.
4.2.3 TESTS

All standard tests as specified in relevant Indian Standards shall be carried out by the manufacture on the bank and its parts. These tests are to be carried out in the presence of the representative of the Employer and detailed test reports are to be furnished to the Employer.

Following tests shall be carried out:

a. Verification of the bank as per the approved drawings.

b. Visual inspection of bank for compliance with specifications, workmanship, etc.

c. Operational tests on all the Switchgear.

d. Operational and accuracy tests on the protective gear such as relays, annunciation system, indicating lamps, etc. by injecting the required voltage/current into the circuits.

e. Insulation resistance measurements of power circuits.

f. Insulation resistance measurements of control circuits.

g. High voltage test using 2.5 kV for one minute between each pole and earth.

h. Insulation resistance measurements under items (c) and (d) are to be carried out after high voltage test also.

Test results shall be recorded and furnished to Client/Consultant.

4.2.4 INSPECTION

The Contractor shall intimate the Employer sufficiently in advance of the readiness of the bank for inspection and testing. The Contractor shall provide all required facilities to the Employer to carry out the inspection and witnessing of tests to the satisfaction of the latter.

4.2.5 SERVICE CONDITIONS

Equipment supplied shall be suitable for continuous operation under the conditions specified. If any further detail relating to service conditions is required the Contractor shall specifically request for such detail to the Employer.

4.2.6 APFC RELAY

APFC Relay shall be microprocessor controlled type and shall have automatic C/k ratio selection with step status indications and digital display of power factor. The controller shall provide protection by switching off the system when the harmonic distortion level increases.
specific levels. APFC relay shall be capable of being programmed to disconnect capacitor steps in the event of harmonic overload exceeding pre-set limits

4.2.7 GENERAL CONSTRUCTION

The bank consists of power factor capacitors connected to a common bus through individual sets of fuses and contactors. Each capacitor is to be switched in and out by means of its contactor. Only air-break contactors of double-break construction rated for uninterrupted duty as defined in IS: 2959 shall be used. The contractor shall have adequate number of auxiliary contacts. The operating coil voltage shall be 415V, 50Hz, AC unless otherwise specified. The contactor shall be of adequate duty classification. Every contactor shall have a minimum of 2 Nos. “NO” and 2 Nos. “NC” auxiliary contacts available for wiring control circuits. Each contactor shall be provided with ON and OFF indicating lamps.

The bank shall be of sheet-steel, totally enclosed, dust tight, vermin-proof, flush dead front, modular and fully compartmentalized construction. There shall be an independent compartment for each capacitor with its set of fuses and contactor. The indicating lamps and push buttons shall be provided by the side of the compartment door. Adequate shrouding shall be provided to prevent accidental contacts with parts which may remain live when the door is in open position. Each compartment has an independently interlocked door with padlocking facility. The bank shall be easily extensible at both ends.

The bank shall be complete with an integral base framework of adequate design and construction so that the board can be directly mounted using suitable foundation/anchoring bolts. Bolt holes shall be provided in the bottom framework for the foundation bolts.

It shall be suitable for functioning efficiently and continuously under the service conditions specified.

4.2.8 ENCLOSURE

The enclosures of the bank shall be made of cold rolled sheet steel up to 2.5mm thickness above which thickness hot-rolled steel may be used. The enclosure shall be of floor-mounting, free-standing and self-supporting type construction.

The enclosure shall be so designed and constructed as to prevent the entry of dust, water, insects and vermin. All doors, detachable cover, plates etc shall be provided with effective gaskets. The covers shall be provided with fasteners which would ensure tight closing of the covers by
properly compressing the gaskets. Ventilating louvers, if provided shall be provided with fine brass wire mesh screens.

The enclosures may be of double-front construction where access will be available into the bank both from front and rear. All handles, knobs, pushbuttons, indicating lamps, annunciations, meters and relays of switchgear shall be mounted in the front of the bank.

Every compartment in the bank shall be totally segregated from other compartments by sheet enclosure on all sides with insulating bushes for entry and exit of power and control wiring and interconnections.

Suitably inscribed plastic /bakelite designation labels shall be fixed on the compartment doors.

Bus bar chambers shall be provided with screwed covers. Cables alleys meters and relay compartments and switchgear compartments shall be provided with hinged doors which shall be closed tight by means of captive screws with moulded plastic knobs. All the hinges shall be concealed type.

The covers and doors shall be properly stiffened by means of ribs or other stiffeners against wobbling.

The minimum thickness of cold-rolled sheet steel used for the fabrication of the bank shall be 2mm. The folded sections forming the base and vertical framework shall be fabricated out of steel having a minimum thickness of 3mm. Comparatively large covers and doors shall be fabricated using 3mm thick sheet steel.

The structure of the enclosure shall be strong and rigid and shall not suffer any distortion during transport, handling or erection. The different parts of the enclosure shall be able to withstand without any shake or vibration, the static and dynamic loading of various equipment installed in the enclosure. The bank shall be stable under all the required conditions of loading and operation. Adequate lifting hooks shall be provided.

The height of enclosure shall be the same throughout the bank.

The metalwork of the enclosure shall be fabricated to good quality finish with the surface level and smooth without any flaw. The corners shall be rounded.

The metalwork of the enclosure shall be fabricated in a shop with adequate facilities such as power-operated guillotine shears, press brakes, presses, powder-coating plant, etc. The metal work shall be powder coated after treatment.
All fabricated steel parts of the enclosure and framework shall be subjected to the following treatment before powder coating:

a. Degreasing using hot alkaline solution

b. Rinsing with cold water to remove all traces of alkaline solution.

c. Pickling using dilute sulphuric acid and pickling inhibitors to remove oxide, scale and rust formation

d. Rinsing with cold water to remove all traces of acidic solution.

e. Phosphate using zinc phosphate solution.

f. Rinsing with cold water to remove all traces of phosphate solution.

g. Passivating by rinsing in de-oxalate solution to neutralise traces of salts.

h. Drying with compressed air

V. TECHNICAL SPECIFICATIONS OF EXTERNAL LPS, STRUCTURAL EARTHING AND EQUIPOTENTIAL BONDING FOR BUILDINGS

APPLICABLE STANDARDS

IEC 62305: Protection against lightning

IEC 62305 -1 ; Protection against lightning: General principles

IEC 62305 -2 ; Protection against lightning: Risk management

IEC 62305 -3 ; Protection against lightning: Physical damage to structures and life hazard

IEC 62305 -4; Protection against lightning: Electrical and electronic systems within structures


5.1 FOUNDATION EARTHING:

Foundation earthing comprises conductors which are installed in the foundation below ground. The mesh size of the foundation earthing shall be 10m x 10m installed in the clean concrete layer at the bottom of the foundation. The mesh shall be firmly connected to the steel of the concrete with clamp (Type: 250/A-FT, Art no :5313015) in each 1 meter.
The conductor of foundation earthing shall be galvanised solid tape with area cross section of 90 sq mm with 3mm min thickness (30x3 mm). The conductor shall be continuous at least 60 meter.

A separate dedicated GI strip shall be run on the columns and must be connected to the steel reinforced steel available in the columns. The conductor shall be ultimately connected to the mesh of the foundation earthing. The upper end of the dedicated conductor in the column must be connected to the roof air termination system.

Using the dedicated conductor in the beams and columns will ensure the electrical continuity between all steel conductors, thus reducing the effects of the lightning current.

The reinforced steel available inside the concrete shall be used for earth termination system and equipotential bonding for electrical system. All the rooms must have an extended local equipotential bonding point extended from the structural earthing. The component must be stainless steel (205/BM10-VA, Art No: 5420016)
The stainless steel bonding point from the structure must be connected to the local equipotential bonding bar which can accommodate at least 5 flat strips (1802/5-VA, Art no: 5015854)

5.2 AIRTERMINATION SYSTEM

The Airtermination system in the roof shall be according to Lightning protection Level (LPL) 2 with a mesh size of 10mx10m. The airtermination conductor shall be 8mm Aluminum round conductor. The conductor must be placed on top of plastic conductor holders (Type: 165/MBG) in each one meter. The airtermination system must be connected to the extended strip comes out from the columns.

5.3 EQUIPOTENTIAL BONDING AND SURGE PROTECTION DEVICE

All the non live services such as metallic pipes should be connected directly to the equipotential bonding bar. Line wires shall be connected to equipotential bonding system as mentioned below.
Type of Network – 3 phase, 4 wire.

5.4 MAINS INCOMING PANEL (EB INCOMER AND DG INCOMER)

First Stage Protection at the LT panel of the power supply system

CLASS B/CLASS I (ACCORDING TO IEC 61643)

3 numbers of lightning arrester for the connection between Phase and Neutral and one number of lightning arrester between Neutral and Earth with optical indication for Line to neutral Lightning surge arrester with the following ratings and optical indication for Line to neutral SPDs

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Parameters</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Line to Neutral</td>
</tr>
<tr>
<td>1.</td>
<td>Type</td>
<td>Encapsulated/Non-exhausting Spark Gap</td>
</tr>
<tr>
<td>2.</td>
<td>Nominal Voltage, Un</td>
<td>230V, 50/60 Hz</td>
</tr>
<tr>
<td>3.</td>
<td>Maximum Continuous operating Voltage Uc</td>
<td>320 V</td>
</tr>
<tr>
<td>4.</td>
<td>Lightning Impulse Current</td>
<td>50 kA(10/350 μsec)</td>
</tr>
<tr>
<td>5.</td>
<td>Voltage Protection Level, Up</td>
<td>1.3 kV</td>
</tr>
<tr>
<td>6.</td>
<td>Response Time</td>
<td>&lt; 100 nano seconds</td>
</tr>
<tr>
<td>11.</td>
<td>Local Indication</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Visual Indication of the arrester (Line to Neutral)

Healthy condition : Green Colour

Faulty condition : Red Colour

5.5 DISTRIBUTION BOARDS (UPS I/P PANELS, FLOOR DBS)

Class B+C/Class I+II (according to IEC 61643)

3 numbers of pluggable type surge arrester with inbuilt thermal disconnector & provision for inbuilt indication for defective arresters to connect between Line and Neutral and one number arrester Spark Gap type to connect between Neutral and Earth of following ratings including base element & pluggable arresters.
### Sl.No | Parameters | Specifications
---|---|---
| | | Line to Neutral | Neutral to Earth
---|---|---|---
1. | Type | Single MOV with built in thermal fuse | Spark Gap Encapsulated / Non-exhausting
2. | Nominal Voltage, Un | 230V, 50/60 Hz | 320 Volt | 255 Volt
3. | Maximum Continuous Operating Voltage, Uc | ≥ 320 Volt | 255 Volt
4. | Nominal Discharge Current I_n | 30 KA(8/20 μsec) | 50 KA(8/20 μsec)
5. | Maximum Discharge Current I_max | 50 KA (8/20 μsec) | 25 KA(10/350 μsec) | 25 KA(10/350 μsec)
6. | Lightning Impulse Current | 7 KA(10/350 μsec) | 25 KA(10/350 μsec)
7. | Voltage Protection Level | ≤ 1300 volts | ≤ 1200 Volt
8. | Response Time | < 25 nano seconds | < 100 nano seconds

**Visual Indication of the flag in the surge arrester (Line to Neutral)**

Healthy condition : Green Colour

Faulty condition : Red Colour

#### 5.6 SUB DISTRIBUTION BOARDS (UPS O/P PANELS, ESSENTIAL WALL DBS, SERVER ROOM DBS, UTILITY DBS, APFC PANELS)

Class C/Class II (according to IEC 61643)

3 numbers of pluggable type surge arrester with inbuilt thermal disconnector & provision for inbuilt indication for defective arresters to connect between Line and Neutral and one number arrester Spark Gap type to connect between Neutral and Earth of following ratings including base element & pluggable arresters.

### Sl.No | Parameters | Specifications
---|---|---
| | | Line to Neutral | Neutral to Earth
---|---|---|---
1. | Type | Single MOV with built in thermal fuse | Spark Gap Encapsulated / Non-exhausting
2. | Nominal Voltage, Un | 230V, 50/60 Hz | 320 Volt | 255 Volt
3. | Maximum Continuous Operating Voltage, Uc | ≥ 320 Volt | 255 Volt
4. | Nominal Discharge Current I_n | 20 KA(8/20 μsec) | 50 KA(8/20 μsec)
<table>
<thead>
<tr>
<th></th>
<th>Maximum Discharge Current $I_{\text{max}}$</th>
<th>40 KA</th>
<th>50 KA (8/20 μsec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>Voltage Protection Level</td>
<td>&lt; 1400 Volts</td>
<td>&lt; 1200 Volts</td>
</tr>
<tr>
<td>6.</td>
<td>Response Time</td>
<td>&lt; 25 nano seconds</td>
<td>&lt; 100 nano seconds</td>
</tr>
</tbody>
</table>

Visual Indication of the flag in the surge arrester (Line to Neutral)

Healthy condition : Green Colour
Faulty condition  : Red Colour

Connection diagram for SPD for 3 phase 4 wire

Note: In US, SPD is called as TVSS- Transient Voltage Surge Suppressor. BUT, IEEE also changed the name to SPD in 2009 April. Now, throughout the world, the common name is SPD.
SECTION. D – HVAC WORKS

DETAILS TO BE FILLED UP BY THE TENDERER BEFORE SUBMISSION OF TENDER

The following data shall be furnished along with the Tender:

Compressor

1. Manufacturer
2. Model
3. Overall dimensions
4. Size of foundation
5. Size of foundation
6. Refrigerant
7. Test pressure (Max) (Kgs. / sq.M.)
8. Maximum revolutions per minute
9. Minimum revolutions per minute for proper lubrication
10. Type of capacity control
11. No. of steps of capacity control
12. Capacity and bhp of the m/c at suction & condensing temperatures (Specify the temperatures)
13. Crank case heaters.
   i) Whether provided
   ii) Power rating (W)
14. Type of drive arrangement
15. No. Of belts in case of V- belt drive
16. Whether oil pump is provided
17. Type of oil pump.
18. IKW and BHP per ton @ 100%, 75%, 50% as per ARI 2000 –550-598 conditions as specified. And IPLV (Tender without this details will be rejected.)

Condenser/chiller

1. Manufacturer
2. Shell dia. (mm)
3. Type of fins in tubes
4. No. of passes
5. Water flow (L.P.M.)
6. Water velocity (MPSO)
7. Pressure Drop
8. Condensing Temperature
9. Tube material
10. Tube outside diameter (mm)
11. Tube thickness (mm)
12. Tube length (mm)
13. No. of Tubes
14. Tube surface, inside (sq.m)
15. Tube surface outside (sq.m)
16. Water temperature
   i) Entering (0C)
   ii) Leaving (0C)

Air handling units
a. Manufacturer
b. Type of fan
c. Fan speed (R.P.M.)
d. No. of fans.
e. Fan wheel diameter (mm)
f. Drive arrangement
g. No. of belts in case of belts drive
h. Material and thickness of fan wheel and blades.
i. Materials and thickness of housing.
j. Fan outlet area. (Sq. M)
k. Outlet velocity. (M.P.M.)
l. Total air quantity (Cfm./Min.)
m. Static pressure at outlet. (mm. of water )
n. Whether statically and dynamically balanced
o. Type of bear
p. B.H.P. Consumed
q. H.P. of the motor

Cooling coil

a. Manufacturer
b. Type
c. Material of Tubes
d. Material of fins
e. Tube diameter
f. Tube thickness
g. Fin thickness
h. Method of boding of fins
i. No. of fins/cm.
j. No. of raw deep
k. Total tube surface outside (Sq.M)
l. Test pressure
m. Coil face area
n. Flow/Rate of water/Refrigerant (kgs/min or L.P.M.)
o. Volume of water/Refrigerant through tube (M.P.S.)
p. No. of circuits
q. Pressure drop in coil (Kgs/sq.cm or mm of water)

Air filters

a. Manufacturer
b. Type of filters
c. Filter medium  
d. Material of frame work and its thickness (mm)  
e. Face area (Sq.M)  
f. Face velocity across filters  
g. Pressure drop across filters (mm of water) 

**Electric strip heaters**  
a. Manufacturer  
b. Type  
c. Material of sheath  
d. Power rating (KW)  
e. Surface temperature of the element when tests in still air at 20°C ambient.

**VENTILATION FANS**  
a. Manufacturer  
b. Type of fan  
c. Fan speed (R.P.M.)  
d. No. of fans.  
e. Fan wheel diameter (mm)  
f. Drive arrangement  
g. No. of belts in case of belts drive  
h. Material and thickness of fan wheel and blades.  
i. Materials and thickness of housing.  
j. Fan outlet area. (Sq. M)  
k. Outlet velocity. (M.P.M.)  
l. Total air quantity (Cfm./Min.)  
m. Static pressure at outlet. (mm. of water)  
n. Whether statically and dynamically balanced  
o. Type of bear
p. B.H.P. Consumed
q. H.P. of the motor

**TREATED FRESH AIR FANS**

a. Manufacturer
b. Type of fan
c. Fan speed (R.P.M.)
d. No. of fans.
e. Fan wheel diameter (mm)
f. Drive arrangement
g. No. of belts in case of belts drive
h. Material and thickness of fan wheel and blades.
i. Materials and thickness of housing.
j. Fan outlet area. (Sq. M)
k. Outlet velocity. (M.P.M.)
l. Total air quantity (Cfm./Min.)
m. Static pressure at outlet. (mm. of water )
n. Whether statically and dynamically balanced
o. Type of bear
p. B.H.P. Consumed
q. H.P. of the motor

**Pumps**
a. Manufacturer
b. Type
c. Overall dimensions
d. Weight (Kgs)
e. Size of foundations (mm)
f. Material
i) Pumps casing

ii) impeller

iii) shaft

iv) shaft sleeve

v) base plate

g. Type of bearing

h. Type and material of steel

i. Speed (R.P.M.)

j. Head (Mtr)

K. Efficiency.

l. Performance curves (Whether enclosed with the tender)

**Chilled Water Piping**

a. Manufacturer

b. Overall dimensions

c. Thickness of pipe

d. Thickness of insulation

e. Thickness of jacket

f. Material - pipe

g. Material – insulation

h. Material – Jacket

i. Density of insulation

**Condenser Water Piping**

a. Manufacturer

b. Overall dimensions

c. Thickness of pipe

d. Material - pipe

**Electrical motors (give separate particulars for each application)**

a. Manufacturer

b. Type and frame references

c. Rated output (KW)
d. Range of working voltage (V)
e. Rated frequency
f. Full load current (Amphs)
g. Rated speed (RPM)
h. Class of insulation
i. Efficiency and power factor at the following loadings: 100%, 75%, 50%, 20%, of rated full load.
j. Type of bearings

**Motor starters (give separate particulars for each application)**

a. Manufacturer
b. Type and frame references
c. Rating
d. Whether the following protections are provided
   i) Overload
      ii) Under voltage
      iii) Single phase protection (for three phase motor starters)
Switch board
   a. Manufacturer
   b. Type
   c. Rated normal current (amps)
   d. short circuit rating (MVA)
   e. Whether the following are provided
      i) O/L trip
      ii) E/F trip
      iii) Under voltage trip
   f. Iron clad switch gears
   g. Make of H.R.C./ MCCB/ MCB fuse provided

Controls
   a. Make and type of thermostats.
   b. Make and type of humidistats.
   c. Make and type of damper motor.
   d. Make and type of other control components.
   e. Make and type of expansion valve.
   f. Make and type of solenoid valve.
   g. Make and type of two way mixing valve.
   h. Make and type of motorized valve.
   i. Make and type of solenoid valve.
   j. Make and type of butterfly valves.
   k. Make and type of balancing valves.
   l. Make and type of suction guide.
   m. Make and type of pressure gauge.
   n. Make and type of dial thermometer
   o. Make and type of differential pressure switch
   p. make & type of air vent
   q. make & type of flexible connector

Pressurization system
   a. Manufacturer
   b. Type
   c. Overall dimensions
d. Weight (Kgs)
e. Size of foundations (mm)
f. Tank size
g. Motor details –
h. Controls details –
i. Power supply details -

**Ducting**

a. Material
b. Manufacturer
c. Whether ducting is as per I.S. 655

**Grills & diffuser**

a. Material
b. Manufacturer

**Fire damper**

a. Material
b. Manufacturer

**Insulation (for each application)**

a. Manufacturer.
b. Material and density
c. 'K' Value at 10 (C°) mean temperature
d. Thickness.

**SPLIT UNITS**

a. Manufacturer
b. Length (mm)
c. Width (mm)
d. Height (mm)
e. Weight (kg)
f. Nominal capacity
g. Actual capacity at selected discharge and suction temp.
h. No. of Refrigeration circuits.
The scope of work is to provide air-conditioning system for the Research Block.

As given below in the building complex details and basis of design the total air-conditioning requirements considered for various floor works out to 421 TR. Provision is made for 3 X 150 TR Water cooled chiller considering 90% diversity with one chiller 50% stand by. The details of connected items are more described in the schedule of equipments.

**Brief of Equipment Schedule**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHILLER</td>
<td>3 X 150 TR water cooled chiller</td>
</tr>
<tr>
<td>CHILLED WATER PRIMARY PUMPS</td>
<td>4 Nos.</td>
</tr>
<tr>
<td>CHILLED WATER SECONDARY PUMPS</td>
<td>4 Nos.</td>
</tr>
<tr>
<td>CHILLED WATER CONDENSER PUMPS</td>
<td>4 Nos.</td>
</tr>
<tr>
<td>Cooling tower</td>
<td>3 Nos.</td>
</tr>
<tr>
<td>AHU</td>
<td>Lot</td>
</tr>
<tr>
<td>CHILLED WATER PIPING</td>
<td>Lot</td>
</tr>
<tr>
<td>CONDENSER WATER PIPING</td>
<td>Lot</td>
</tr>
<tr>
<td>SHEET METAL WORK</td>
<td>Lot</td>
</tr>
<tr>
<td>VENTILATION SYSTEM</td>
<td>For toilets, equipment rooms etc.</td>
</tr>
<tr>
<td>ELECTRICAL</td>
<td>Lot</td>
</tr>
</tbody>
</table>
Technical data:

Tenderers are required to submit technical data documents as per the format. The data proposal sheets are enclosed. The tenderer shall fill in all the data required.

### BASIS OF DESIGN

The complete air conditioning system has been designed taking into account the following parameters.

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>RGCB - RESEARCH BLOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outside design condition</td>
<td>- 35 ° C DB, 27.77 ° C WB</td>
</tr>
<tr>
<td>Inside design condition</td>
<td>- 22 ° C +/- 1.1 ° C, RH 55 +/- 5%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AREA DESCRIPTION</th>
<th>AREA SQ.FT</th>
<th>OCCUPANCY</th>
<th>NO. OF AIR CH.</th>
<th>Equipment load/Temp/Humidity</th>
<th>TR</th>
<th>Working Time</th>
<th>AIR QTY</th>
<th>UNIT PROPOSED</th>
<th>Fresh air CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOWER BASEMENT FLOOR</td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td>BMS Room</td>
<td>200</td>
<td>2</td>
<td>5 cfm/person+ 0.06 cfm/sq.</td>
<td>1.5 TR</td>
<td>600</td>
<td>1.5 TR FCU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Total AC Area</td>
<td>200 Sq.ft.</td>
<td>Total Tonnage</td>
<td>1.5 TR</td>
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<tr>
<td>UPPER BASEMENT FLOOR</td>
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</tr>
<tr>
<td>1</td>
<td>Zone 1- Administration</td>
<td>1470</td>
<td>20</td>
<td>10 cfm/person+ 0.18 cfm/sq., 1 Air change</td>
<td>3 KW (Lab load, PC Load)</td>
<td>9.0 TR</td>
<td>3600</td>
<td>9 TR Double skin ceiling suspended AHU</td>
<td>321 cfm</td>
</tr>
<tr>
<td>2</td>
<td>Zone 2- Clean Corridor &amp; Sterile Area</td>
<td>1495</td>
<td>3</td>
<td>• 10 cfm/person+ 0.18 cfm/sq., • Room air changes 12-15, • 3 KW Equipment load (15% of heat dissipation of auto-clave heater load, • 20°C- 23°C, • 50% RH, 70% Recirculation &amp; 30% Exhaust, • Highest positive pressure</td>
<td>16 TR</td>
<td>24 Hrs</td>
<td>4100</td>
<td>16 TR Double skin floor mounted AHU with fine filter, Hepa filter, 8 KW Heater, Mixing Box</td>
<td>1,308 cfm</td>
</tr>
<tr>
<td>Zone</td>
<td>Description</td>
<td>No. of Rooms</td>
<td>No. of Rooms</td>
<td>AC Area Sq.ft.</td>
<td>Total Tonnage TR</td>
<td>Cfm/TR</td>
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<tr>
<td>3</td>
<td>Zone 3 - Animal Rooms &amp; Procedure</td>
<td>1355</td>
<td>7</td>
<td>60</td>
<td>16 TR</td>
<td>1,185</td>
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<tr>
<td></td>
<td>Rooms</td>
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<td>• Total number of Rats = 360 x 7</td>
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<td></td>
<td>rooms = 2520 Nos @ 28 Kcal/Day,</td>
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<td>• 10 cfm/person + 0.18 cfm/sq.</td>
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<td>• Room air changes 12-15</td>
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<td></td>
<td>• 2 KW Equipment load</td>
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<td>• 20ºC-23ºC</td>
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<td>• 50% RH, 70%</td>
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<td>Recirculation &amp; 30% Exhaust</td>
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<td></td>
<td>• Pressure less than Zone 2</td>
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<tr>
<td>4</td>
<td>Zone 4 - Cleaning Area</td>
<td>1670</td>
<td>3</td>
<td>60</td>
<td>22 TR</td>
<td>1,461</td>
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<td>• Total number of Rats = 180 x 2</td>
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<td>rooms = 360 Nos @ 28 Kcal/Day</td>
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<td>• 2 KW Equipment load</td>
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<td>• 50% RH</td>
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<td>• 70% Recirculation &amp; 30%</td>
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<td>Exhaust</td>
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<td>• Pressure less than Zone 3</td>
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<tr>
<td>5</td>
<td>Zone 5 - Contaminated - BSL 3</td>
<td>360</td>
<td>2</td>
<td>60</td>
<td>12 TR</td>
<td>1,181</td>
<td></td>
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<tr>
<td></td>
<td>Level room</td>
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<td>• 20ºC-23ºC, 50% RH, 100%</td>
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<td>Exhaust</td>
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<td>• 2 Nos. changing room</td>
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<td>• Laminar Flow system</td>
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<td>6</td>
<td>Lobby -03</td>
<td>440</td>
<td>10</td>
<td>7.5</td>
<td>3 TR</td>
<td>5,456</td>
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<td></td>
<td></td>
<td></td>
<td>cfm/person +</td>
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<td>0.12 cfm/sq.</td>
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<td>Conference</td>
<td>440</td>
<td>16</td>
<td>7.5</td>
<td>4 TR</td>
<td>0 cfm</td>
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<td>cfm/person +</td>
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<td></td>
<td>0.12 cfm/sq.</td>
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<tr>
<td>Total</td>
<td>AC Area =</td>
<td>7,230</td>
<td></td>
<td></td>
<td>80.0 TR</td>
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<td>Total Tonnage =</td>
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<td></td>
<td></td>
<td></td>
<td>5,456</td>
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<td></td>
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<td></td>
<td>TR</td>
<td>0 cfm</td>
<td></td>
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<tr>
<td>No.</td>
<td>Location</td>
<td>Area</td>
<td>Capacity</td>
<td>Air Change</td>
<td>Cooling Load</td>
<td>Hours</td>
<td>TR</td>
<td>Assumptions</td>
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<tr>
<td>1</td>
<td>Central Instrumentation Facilities</td>
<td>1470</td>
<td>15</td>
<td>10 cfm/Person + 0.18 cfm/sq.</td>
<td>5 KW Assumed considering 10% to 20% Heat dissipation</td>
<td>10.0 TR</td>
<td>24 Hrs</td>
<td>4000 TR Double skin floor mounted AHU with Mixing Box, Fine filter</td>
<td>643 cfm</td>
</tr>
<tr>
<td>2</td>
<td>Library</td>
<td>1455</td>
<td>25</td>
<td>7.5 cfm/Person + 0.12 cfm/sq.</td>
<td>10.0 TR</td>
<td>4000 TR Double skin floor mounted AHU with Mixing Box</td>
<td>318 cfm</td>
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<td>3</td>
<td>Lecture Hall</td>
<td>1400</td>
<td>100</td>
<td>7.5 cfm/Person + 0.06 cfm/sq. Ft</td>
<td>14.0 TR</td>
<td>5600 TR Double skin floor mounted AHU with Mixing Box</td>
<td>584 cfm</td>
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<tr>
<td>4</td>
<td>Bio Informatics / Computer centre</td>
<td>850</td>
<td>25</td>
<td>10 cfm/Person + 0.12 cfm/sq. Ft</td>
<td>5 KW Assumed considering 10% to 20% Heat dissipation &amp; PC Loads</td>
<td>8.0 TR</td>
<td>24 Hrs</td>
<td>3200 TR Double skin ceiling suspended AHU with Mixing Box</td>
<td>372 cfm</td>
</tr>
<tr>
<td>5</td>
<td>Admin &amp; Office</td>
<td>850</td>
<td>25</td>
<td>5 cfm/Person + 0.06 cfm/sq. Ft</td>
<td>3 KW Equ. Load considering PC Load</td>
<td>7.0 TR</td>
<td>2800</td>
<td>14 TR Double skin floor mounted AHU with Mixing Box</td>
<td>186 cfm</td>
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<td>6</td>
<td>Corridor</td>
<td>940</td>
<td>10</td>
<td>5 cfm/Person + 0.06 cfm/sq. Ft</td>
<td>6.0 TR</td>
<td>2400 TR Double skin floor mounted AHU with Mixing Box</td>
<td>206 cfm</td>
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<td>7</td>
<td>Lobby -03</td>
<td>440</td>
<td>10</td>
<td>7.5 cfm/Person + 0.12 cfm/sq.</td>
<td>3.0 TR</td>
<td>1200 TR Cassette</td>
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<td>8</td>
<td>Conference</td>
<td>440</td>
<td>16</td>
<td>7.5 cfm/Person +</td>
<td>4.0 TR</td>
<td>1600 TR Cassette</td>
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<tr>
<td>Total AC Area (Sq.ft.)</td>
<td>Total Tonnage =</td>
<td>TR</td>
<td>1,333 cfm</td>
<td>975 cfm</td>
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<tr>
<td><strong>GROUND FLOOR</strong></td>
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<tr>
<td>1</td>
<td>Tissue Culture -1</td>
<td>200</td>
<td>4</td>
<td>10 cfm/person + 0.18 cfm/sq.</td>
<td>24 Hrs, 23 °C at Day time &amp; 28°C at Night</td>
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<td></td>
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<td></td>
<td>3 Air change</td>
<td>3.5 TR</td>
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<td></td>
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<td></td>
<td></td>
<td>2 KW Assumed considering 10% to 20% Heat dissipation</td>
<td>1400</td>
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<tr>
<td>2</td>
<td>Tissue Culture -2</td>
<td>200</td>
<td>4</td>
<td>10 cfm/person + 0.18 cfm/sq.</td>
<td>24 Hrs, 23 °C at Day time &amp; 28°C at Night</td>
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<td>3 Air change</td>
<td>3.5 TR</td>
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<td>2 KW Assumed considering 10% to 20% Heat dissipation</td>
<td>1400</td>
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<tr>
<td>3</td>
<td>Tissue Culture -3</td>
<td>200</td>
<td>4</td>
<td>10 cfm/person + 0.18 cfm/sq.</td>
<td>24 Hrs, 23 °C at Day time &amp; 28°C at Night</td>
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<td>3 Air change</td>
<td>3.5 TR</td>
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<td>2 KW Assumed considering 10% to 20% Heat dissipation</td>
<td>1400</td>
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<tr>
<td>4</td>
<td>Tissue Culture -4</td>
<td>200</td>
<td>4</td>
<td>10 cfm/person + 0.18 cfm/sq.</td>
<td>24 Hrs, 23 °C at Day time &amp; 28°C at Night</td>
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<td>3 Air change</td>
<td>3.5 TR</td>
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<td>2 KW Assumed considering 10% to 20% Heat dissipation</td>
<td>1400</td>
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<tr>
<td>5</td>
<td>Staff Room</td>
<td>115</td>
<td>3</td>
<td>5 cfm/person + 0.06 cfm/sq. Ft</td>
<td>24 Hrs</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>1.0 TR</td>
<td>400</td>
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<td></td>
<td></td>
<td>1 TR Cassette</td>
<td>75 cfm</td>
<td></td>
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<tr>
<td></td>
<td>Dark Room</td>
<td>115</td>
<td>3</td>
<td>5 cfm/pers son+ 0.06 cfm/sq. Ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>75 cfm</td>
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<tr>
<td>7</td>
<td>Bacterial Hood</td>
<td>200</td>
<td>4</td>
<td>10 cfm/pers on+ 0.18 cfm/sq., 2 Air change</td>
<td>3.5 TR</td>
<td>24 Hrs, 23 °C at Day time &amp; 28°C at Nigh t</td>
<td>1400</td>
<td>3.5 TR Cassette</td>
<td>87 cfm</td>
</tr>
<tr>
<td>8</td>
<td>Common Instrumentation</td>
<td>355</td>
<td>3</td>
<td>10 cfm/pers on+ 0.18 cfm/sq., 3 Air change</td>
<td>4.0 TR</td>
<td>24 Hrs, 23 °C at Day time &amp; 28°C at Nigh t</td>
<td>1600</td>
<td>2 x 2 TR Cassette</td>
<td>233 cfm</td>
</tr>
<tr>
<td>9</td>
<td>Office / Scientist cabin 1</td>
<td>110</td>
<td>2</td>
<td>5 cfm/pers on+ 0.06 cfm/sq. Ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>10</td>
<td>Office / Scientist cabin 2</td>
<td>110</td>
<td>2</td>
<td>5 cfm/pers on+ 0.06 cfm/sq. Ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>11</td>
<td>Office / Scientist cabin 3</td>
<td>110</td>
<td>2</td>
<td>5 cfm/pers on+ 0.06 cfm/sq. Ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>12</td>
<td>Office / Scientist cabin 4</td>
<td>110</td>
<td>2</td>
<td>5 cfm/pers on+ 0.06 cfm/sq. Ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>13</td>
<td>Common Lab</td>
<td>4270</td>
<td>40</td>
<td>10 cfm/pers on+ 0.18 cfm/sq., 2 Air change</td>
<td>15 KW Assumed considering 10% to 20% Heat dissipation</td>
<td>32. 0 TR</td>
<td>24 Hrs, 23 °C at Day time &amp; 28°C</td>
<td>1280</td>
<td>2 x 25 TR Double skin Floor mounte d AHU with</td>
</tr>
<tr>
<td>Room</td>
<td>Area</td>
<td>AC Area</td>
<td>AC Area per Person</td>
<td>Air Change</td>
<td>Max. Hrs</td>
<td>TR</td>
<td>Tonnage</td>
<td>TR</td>
<td>Tonnage</td>
</tr>
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</tr>
<tr>
<td><strong>Lobby -09</strong></td>
<td>540</td>
<td>7,205</td>
<td>13.75</td>
<td>4.0</td>
<td>1600</td>
<td>4</td>
<td>4 TR Cassette</td>
<td></td>
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<tr>
<td><strong>Meeting room</strong></td>
<td>215</td>
<td>8</td>
<td>5.3</td>
<td>2.0</td>
<td>800</td>
<td>2</td>
<td>2 TR Cassette</td>
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<td><strong>General Managers Room</strong></td>
<td>155</td>
<td>3</td>
<td>5.0</td>
<td>1.2</td>
<td>480</td>
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<td>TR Cassette</td>
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<td><strong>Total AC Area</strong></td>
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<td>7,205</td>
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<td>Total Tonnage = 66.7 TR</td>
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<td><strong>FIRST FLOOR</strong></td>
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<tr>
<td><strong>Tissue Culture -1</strong></td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>24</td>
<td>3.5</td>
<td>TR Double skin ceiling suspend ed AHU with fine filter, 1.5KW Heater</td>
<td></td>
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</tr>
<tr>
<td><strong>Tissue Culture -2</strong></td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>24</td>
<td>3.5</td>
<td>TR Double skin ceiling suspend ed AHU with fine filter, 1.5KW Heater</td>
<td></td>
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</tr>
<tr>
<td><strong>Tissue Culture -3</strong></td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>2</td>
<td>24</td>
<td>3.5</td>
<td>TR Double skin ceiling suspend ed AHU with fine filter, 1.5KW Heater</td>
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<tr>
<td>4</td>
<td>Tissue Culture -4</td>
<td>200</td>
<td>4</td>
<td>10 cfm/person+ 0.18 cfm/sq. ft</td>
<td>3 Air change</td>
<td>2.0 KW Assumed considering 10% to 20% Heat dissipation</td>
<td>3.5 TR</td>
<td>24 Hrs, 23°C at Day time &amp; 28°C at Night</td>
<td>1400</td>
</tr>
<tr>
<td>5</td>
<td>Staff Room</td>
<td>115</td>
<td>3</td>
<td>5 cfm/person+ 0.06 cfm/sq. ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>75 cfm</td>
</tr>
<tr>
<td>6</td>
<td>Dark Room</td>
<td>115</td>
<td>3</td>
<td>5 cfm/person+ 0.06 cfm/sq. ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>75 cfm</td>
</tr>
<tr>
<td>7</td>
<td>Bacterial Hood</td>
<td>200</td>
<td>4</td>
<td>10 cfm/person+ 0.18 cfm/sq. ft</td>
<td>3 Air change</td>
<td>3.5 TR</td>
<td>24 Hrs, 23°C at Day time &amp; 28°C at Night</td>
<td>1400</td>
<td>3.5 TR Cassette</td>
</tr>
<tr>
<td>8</td>
<td>Common Instrumentation</td>
<td>355</td>
<td>3</td>
<td>10 cfm/person+ 0.18 cfm/sq. ft</td>
<td>3 Air change</td>
<td>4.0 TR</td>
<td>24 Hrs, 23°C at Day time &amp; 28°C at Night</td>
<td>1600</td>
<td>2 x 2 TR Cassette</td>
</tr>
<tr>
<td>9</td>
<td>Office / Scientist cabin 1</td>
<td>110</td>
<td>2</td>
<td>5 cfm/person+ 0.06 cfm/sq. ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>10</td>
<td>Office / Scientist cabin 2</td>
<td>110</td>
<td>2</td>
<td>5 cfm/person+</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>Room Type</td>
<td>Area (Sq.ft)</td>
<td>Person(s)</td>
<td>Cfm/person</td>
<td>Cfm/sq.ft</td>
<td>TR</td>
<td>Hours</td>
<td>Tonnage</td>
<td>Cassette Type</td>
<td>Cfm</td>
</tr>
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<td>---------------------------------</td>
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</tr>
<tr>
<td>Office/Scientist Cabin 3</td>
<td>110</td>
<td>2</td>
<td>5</td>
<td>0.06</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
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<td>110</td>
<td>2</td>
<td>5</td>
<td>0.06</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>Common Lab</td>
<td>4270</td>
<td>40</td>
<td>10</td>
<td>0.18</td>
<td>3.2 TR</td>
<td>600 Hrs</td>
<td>1280 TR</td>
<td>Double skin mounted AHU with fine filter (75% stand by), 9KW Heater</td>
<td>934 cfm</td>
</tr>
<tr>
<td>Lobby -03</td>
<td>225</td>
<td>5</td>
<td>7.5</td>
<td>0.12</td>
<td>1.5 TR</td>
<td>600</td>
<td>1.5 TR Cassette</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directors Room</td>
<td>230</td>
<td>4</td>
<td>5</td>
<td>0.06</td>
<td>1.6 TR</td>
<td>640</td>
<td>2 TR Cassette</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conference</td>
<td>440</td>
<td>16</td>
<td>7.5</td>
<td>0.12</td>
<td>4.0 TR</td>
<td>1600</td>
<td>4 TR Cassette</td>
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</tr>
<tr>
<td><strong>Total AC Area</strong></td>
<td>7,190</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>66 TR</td>
<td>1,697 TR</td>
<td>1,263 cfm</td>
<td></td>
</tr>
</tbody>
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**TYPICAL FLOOR (SECOND & THIRD FLOOR)**

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Area (Sq.ft)</th>
<th>Person(s)</th>
<th>Cfm/person</th>
<th>Cfm/sq.ft</th>
<th>TR</th>
<th>Hours</th>
<th>Tonnage</th>
<th>Cassette Type</th>
<th>Cfm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tissue Culture -1</td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>0.18</td>
<td>3.5 TR</td>
<td>24 Hrs, 23°C at Day time &amp; 28°C</td>
<td>1400</td>
<td>4 TR Double skin ceiling suspend ed AHU with fine filter (75% stand by), 9KW Heater</td>
<td>131 cfm</td>
</tr>
<tr>
<td>No.</td>
<td>Room Type</td>
<td>No. of Rooms</td>
<td>No. of Persons</td>
<td>Person+ CFM</td>
<td>CFM/sq. Ft</td>
<td>Assumed Heat Dissipation</td>
<td>TR</td>
<td>Hours</td>
<td>Ambient Temperature</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------</td>
<td>--------------</td>
<td>----------------</td>
<td>-------------</td>
<td>------------</td>
<td>--------------------------</td>
<td>----</td>
<td>-------</td>
<td>---------------------</td>
</tr>
<tr>
<td>2</td>
<td>Tissue Culture -2</td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>0.18</td>
<td>10% to 20%</td>
<td>3.5</td>
<td>TR</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>Tissue Culture -3</td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>0.18</td>
<td>10% to 20%</td>
<td>3.5</td>
<td>TR</td>
<td>24</td>
</tr>
<tr>
<td>4</td>
<td>Tissue Culture -4</td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>0.18</td>
<td>10% to 20%</td>
<td>3.5</td>
<td>TR</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>Staff Room</td>
<td>115</td>
<td>3</td>
<td>5</td>
<td>0.06</td>
<td></td>
<td>1.0</td>
<td>TR</td>
<td>24</td>
</tr>
<tr>
<td>6</td>
<td>Dark Room</td>
<td>115</td>
<td>3</td>
<td>5</td>
<td>0.06</td>
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<td>1.0</td>
<td>TR</td>
<td>24</td>
</tr>
<tr>
<td>7</td>
<td>Bacterial Hood</td>
<td>200</td>
<td>4</td>
<td>10</td>
<td>0.18</td>
<td></td>
<td>3.5</td>
<td>TR</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Common Instrumentation</td>
<td>355</td>
<td>3</td>
<td>10 cfm/per son+ 0.18 cfm/sq. , 3 Air change</td>
<td>4.0 TR</td>
<td>24 Hrs, 23°C at Day time &amp; 28°C at Night</td>
<td>1600</td>
<td>2 x 2 TR Cassette</td>
<td>233 cfm</td>
</tr>
<tr>
<td>---</td>
<td>------------------------</td>
<td>-----</td>
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<td>-----------------------------------------------</td>
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<td>-------------------------------------------</td>
<td>------</td>
<td>------------------</td>
<td>--------</td>
</tr>
<tr>
<td>9</td>
<td>Office / Scientist cabin 1</td>
<td>110</td>
<td>2</td>
<td>5 cfm/per son+ 0.06 cfm/sq. Ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>10</td>
<td>Office / Scientist cabin 2</td>
<td>110</td>
<td>2</td>
<td>5 cfm/per son+ 0.06 cfm/sq. Ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>11</td>
<td>Office / Scientist cabin 3</td>
<td>110</td>
<td>2</td>
<td>5 cfm/per son+ 0.06 cfm/sq. Ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>12</td>
<td>Office / Scientist cabin 4</td>
<td>110</td>
<td>2</td>
<td>5 cfm/per son+ 0.06 cfm/sq. Ft</td>
<td>1.0 TR</td>
<td>24 Hrs</td>
<td>400</td>
<td>1 TR Cassette</td>
<td>24 cfm</td>
</tr>
<tr>
<td>13</td>
<td>Common Lab</td>
<td>4270</td>
<td>40</td>
<td>10 cfm/per son+ 0.18 cfm/sq. , 2 Air change</td>
<td>32.0 TR</td>
<td>24 Hrs, 23°C at Day time &amp; 28°C at Night</td>
<td>1280</td>
<td>2 x 25 TR Double skin Floor mounted AHU with fine filter (75% stand by), 9KW Heater</td>
<td>934 cfm</td>
</tr>
<tr>
<td>1</td>
<td>Lobby -09</td>
<td>540</td>
<td>10</td>
<td>7.5 cfm/per son+ 0.12 cfm/sq.</td>
<td>4.0 TR</td>
<td>1600</td>
<td>4 TR Cassette</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>Meeting room</td>
<td>General Managers Room</td>
<td>3rd Floor</td>
<td>Terrace Floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>--------------</td>
<td>-----------------------</td>
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<td>---------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>215</td>
<td>155</td>
<td>155</td>
<td>440</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>2.0</td>
<td>1.2</td>
<td>3.0</td>
<td>8.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>800</td>
<td>480</td>
<td>1200</td>
<td>3200</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 TR</td>
<td>1.5 TR</td>
<td>3 TR</td>
<td>2 X 4 TR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total AC Area** = 7,205 Sq.ft.
**Total Tonnage** = 66.7 TR
**1,697 cfm**
**1,263 cfm**

**Total AC Area for 2 floors** = 14,410 Sq.ft.
**Total Tonnage** = 133.4 TR

**TERRACE FLOOR**

<table>
<thead>
<tr>
<th>Floor</th>
<th>Mainlobby</th>
<th>Lunch Room</th>
<th>Total AC Area</th>
<th>Total Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>440</td>
<td>920</td>
<td>1,360 Sq.ft.</td>
<td>11.0 TR</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.0</td>
<td>8.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1200</td>
<td>3200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Total AC Area** = 1,360 Sq.ft.
**Total Tonnage** = 11.0 TR

**TOTAL AC AREA** = 45,440 Sq.ft.
**TOTAL TONNAGE** = 421.2 TR

**PLANT PROPOSED with 90% Diversity**

3 x 150 TR Water cooled screw chiller (1 chiller 50% stand by)

**TFA WITH HEAT RECOVERY WHEEL**

<table>
<thead>
<tr>
<th>Floor</th>
<th>Supply CFM</th>
<th>Return CFM</th>
<th>Unit Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5,456 Cfm</td>
<td>3,729 Cfm</td>
<td>TFA WITH 5500 CFM Supply fan, 3750 cfm Return fan</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>TFA LEFT SIDE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floor</th>
<th>Supply CFM</th>
<th>Return CFM</th>
<th>Unit Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basement floor</td>
<td>1,333 Cfm</td>
<td>1,199 Cfm</td>
<td>TFA WITH 8200 CFM Supply fan, 7300 cfm Return fan</td>
</tr>
<tr>
<td>Ground floor</td>
<td>1,697 Cfm</td>
<td>1,527 Cfm</td>
<td></td>
</tr>
<tr>
<td>First floor</td>
<td>1,697 Cfm</td>
<td>1,527 Cfm</td>
<td></td>
</tr>
<tr>
<td>Second floor</td>
<td>1,697 Cfm</td>
<td>1,527 Cfm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Third Floor</td>
<td>HEAT RECOVERY WHEEL CFM</td>
<td>Supply CFM</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>--------------------------</td>
<td>------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1,697 Cfm</td>
<td>8,120 Cfm</td>
</tr>
<tr>
<td>3 Floor</td>
<td>TFA RIGHT SIDE</td>
<td>Basement floor</td>
<td>975 Cfm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ground floor</td>
<td>1,263 Cfm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First floor</td>
<td>1,263 Cfm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second floor</td>
<td>1,263 Cfm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Third Floor</td>
<td>1,263 Cfm</td>
</tr>
<tr>
<td></td>
<td>HEAT RECOVERY WHEEL CFM</td>
<td>Basement floor</td>
<td>975 Cfm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ground floor</td>
<td>1,263 Cfm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>First floor</td>
<td>1,263 Cfm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Second floor</td>
<td>1,263 Cfm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Third Floor</td>
<td>1,263 Cfm</td>
</tr>
<tr>
<td></td>
<td>VENTILATION SYSTEMS</td>
<td>LOWER BASEMENT FLOOR</td>
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<td></td>
<td>SL NO</td>
<td>DESCRIPTION</td>
<td>AREA SQ.FT</td>
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<tr>
<td></td>
<td>1</td>
<td>PHE &amp; Fire plant room</td>
<td>79.0 Sq.mt.</td>
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<tr>
<td></td>
<td>2</td>
<td>AC Plant room</td>
<td>132.0 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Electrical Plant room</td>
<td>132.0 Sq.mt.</td>
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<tr>
<td></td>
<td>UPPER BASEMENT FLOOR</td>
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<tr>
<td></td>
<td>1</td>
<td>Dirty Wash</td>
<td>60.0 Sq.mt.</td>
</tr>
<tr>
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<td>Toilet near lobby 1</td>
<td>2.5 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Main Toilet</td>
<td>30.0 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>BASEMENT FLOOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Toilet near lobby 1</td>
<td>2.5 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Main Toilet</td>
<td>30.0 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>GROUND FLOOR</td>
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</tr>
<tr>
<td></td>
<td>1</td>
<td>Toilet near lobby 1</td>
<td>2.5 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Main Toilet</td>
<td>30.0 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Non ac area 01</td>
<td>49.0 Sq.mt.</td>
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<tr>
<td></td>
<td>FIRST FLOOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Toilet near lobby 1</td>
<td>2.5 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Main Toilet</td>
<td>30.0 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Non ac area 01</td>
<td>49.0 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>SECOND FLOOR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Toilet near lobby 1</td>
<td>2.5 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Main Toilet</td>
<td>30.0 Sq.mt.</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Non ac area 01</td>
<td>49.0 Sq.mt.</td>
</tr>
<tr>
<td>Floor</td>
<td>Area Description</td>
<td>Area (Sq.mt.)</td>
<td>Air Conditioning</td>
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<tr>
<td>------------</td>
<td>-----------------------------</td>
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<td>------------------</td>
</tr>
<tr>
<td>THIRD FLOOR</td>
<td>Toilet near lobby 1</td>
<td>2.5</td>
<td>15 A C</td>
</tr>
<tr>
<td></td>
<td>Main Toilet</td>
<td>30.0</td>
<td>15 A C</td>
</tr>
<tr>
<td></td>
<td>Non ac area 01</td>
<td>49.0</td>
<td>20 A C</td>
</tr>
<tr>
<td>TERRACE FLOOR</td>
<td>Toilet near Lunch room</td>
<td>2.5</td>
<td>15 A C</td>
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**EQUIPMENT SCHEDULE**

1 - SCREW WATER CHILLING PACKAGES

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
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<tbody>
<tr>
<td>Capacity (in TR)</td>
<td>as per schedule of quantities</td>
</tr>
<tr>
<td>Type of Compressor</td>
<td>Screw</td>
</tr>
<tr>
<td>Capacity control</td>
<td>100% to 20%</td>
</tr>
<tr>
<td><strong>EVAPORATOR</strong></td>
<td></td>
</tr>
<tr>
<td>Ent. Water temp</td>
<td>55 Deg F</td>
</tr>
<tr>
<td>Leaving water temp</td>
<td>45 Deg F</td>
</tr>
<tr>
<td>Chilled water flow rate</td>
<td>2.4 Usgpm/ TR</td>
</tr>
<tr>
<td>Pressure drops</td>
<td>Max. 10 mtr.</td>
</tr>
<tr>
<td>Fouling factor</td>
<td>0.0001 ARI standards 550/590-98</td>
</tr>
<tr>
<td><strong>CONDENSER</strong></td>
<td></td>
</tr>
<tr>
<td>Ent. Water temp</td>
<td>90 Deg F</td>
</tr>
<tr>
<td>Leaving water temp</td>
<td>97.5 Deg F</td>
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<tr>
<td>Condenser water flow. Rate</td>
<td>4 Usgpm/ TR</td>
</tr>
<tr>
<td>Pressures drop</td>
<td>Max. 10 mtr.</td>
</tr>
<tr>
<td>Fouling factor</td>
<td>0.00025 ARI standards 550/590</td>
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<tr>
<td><strong>ELECTRICAL</strong></td>
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</tr>
<tr>
<td>Motor output rating</td>
<td>As per supplier's specifications</td>
</tr>
<tr>
<td>Motor input rating</td>
<td>-Do-</td>
</tr>
<tr>
<td>Starting method (soft starting)</td>
<td>-Do-</td>
</tr>
<tr>
<td>Starting current</td>
<td>-Do-</td>
</tr>
<tr>
<td>System parameters</td>
<td>-Do-</td>
</tr>
<tr>
<td><strong>MISCELLANEOUS</strong></td>
<td></td>
</tr>
<tr>
<td>Control Panel</td>
<td>Microprocessor control panel</td>
</tr>
<tr>
<td>Safety devices</td>
<td>-Do-</td>
</tr>
<tr>
<td>Meters/Instruments</td>
<td>Microprocessor Control Panel</td>
</tr>
<tr>
<td>First charge refg./oil</td>
<td>-YES-</td>
</tr>
<tr>
<td>Refrigerant piping &amp; Valves</td>
<td>-YES-</td>
</tr>
<tr>
<td>Mounting frame/base frame/Skid base</td>
<td>-YES-</td>
</tr>
<tr>
<td>Anti-vibration device</td>
<td>-YES-</td>
</tr>
<tr>
<td>Pressure gauges</td>
<td>-YES-</td>
</tr>
</tbody>
</table>
Differential Flow switches | At inlet of condenser/chiller
---|---
Thermometers | At inlet and outlet of Condenser/chiller

**2 - CONDENSER WATER PUMPSETS**

<table>
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<tr>
<th>Item</th>
<th>Specification</th>
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<tr>
<td>Type</td>
<td>as per schedule of quantities</td>
</tr>
<tr>
<td>Capacity</td>
<td>[4 Usgpm/ TR]</td>
</tr>
<tr>
<td>Net optg. head</td>
<td>as per schedule of quantities</td>
</tr>
<tr>
<td>Speed</td>
<td>as per schedule of quantities</td>
</tr>
<tr>
<td>Motor rating</td>
<td>As per drawing</td>
</tr>
<tr>
<td>Type of motor</td>
<td>TEFC sq. cage induction motor</td>
</tr>
<tr>
<td>Type of starter</td>
<td>Fully automatic star/delta with single phasing prevention</td>
</tr>
<tr>
<td>Accessories</td>
<td>Common base frame Anti-vibration pads</td>
</tr>
<tr>
<td>Special feature</td>
<td>Bronze impeller</td>
</tr>
</tbody>
</table>

**3 - CHILLED WATER PUMPSETS (PRIMARY)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>as per schedule of quantities</td>
</tr>
<tr>
<td>Capacity</td>
<td>[2.4 Usgpm/ TR]</td>
</tr>
<tr>
<td>Net optg. head</td>
<td>[45 feet]</td>
</tr>
<tr>
<td>Speed</td>
<td>[1450 RPM]</td>
</tr>
<tr>
<td>Motor rating</td>
<td>As per drawing</td>
</tr>
<tr>
<td>Type of motor</td>
<td>TEFC sq. cage induction motor</td>
</tr>
<tr>
<td>Type of starter</td>
<td>Variable speed drive with single phasing prevention.</td>
</tr>
<tr>
<td>Accessories</td>
<td>Common base frame, Anti-Vibration pads</td>
</tr>
<tr>
<td>Special feature</td>
<td>Bronze impeller</td>
</tr>
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</table>
### 4 - CHILLED WATER PUMPSETS (SECONDARY)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
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<tbody>
<tr>
<td>Type</td>
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<td>Capacity</td>
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<td>Net optg.head</td>
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<tr>
<td>Speed</td>
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<tr>
<td>Motor rating</td>
<td>As per drawing</td>
</tr>
<tr>
<td>Type of motor</td>
<td>TEFC sq. cage induction motor</td>
</tr>
<tr>
<td>Type of starter</td>
<td>Variable speed drive with single phasing prevention.</td>
</tr>
<tr>
<td>Accessories</td>
<td>Common base frame, Anti-Vibration pads, Bronze impeller</td>
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### 5 - COOLING TOWER

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>as per schedule of quantities</td>
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<tr>
<td>Capacity</td>
<td>As per Schedule of quantities</td>
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<tr>
<td>Flow rate</td>
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<tr>
<td>Ent. Water temperature</td>
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<tr>
<td>Leaving water temperature</td>
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<tr>
<td>Ambient wet bulb temp</td>
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<tr>
<td>Fan type</td>
<td>Axial flow type</td>
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<tr>
<td>Fan motor HP</td>
<td>As per drawing</td>
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<tr>
<td>Type of motor</td>
<td>TEFC sq. cage weather proof induction motor</td>
</tr>
<tr>
<td>Starter type</td>
<td>Star-Delta starter with single phasing prevention</td>
</tr>
<tr>
<td>Fill type</td>
<td>Multi layer of PVC</td>
</tr>
<tr>
<td>Connections</td>
<td>Water inlet</td>
</tr>
<tr>
<td>{All connections water outlet}</td>
<td>Make-up &amp; quick fill Overflow drain</td>
</tr>
<tr>
<td>Flanged with companion flanges}</td>
<td>Automatic sprinkler system with spark head &amp; pipes</td>
</tr>
<tr>
<td>Water distribution arrangement</td>
<td>Galvanized supporting frame</td>
</tr>
</tbody>
</table>
Galvanized steel ladder
Galvanized fan guard/bird screen
Air inlet screen (galvanism)
Drift eliminator
FRP Water basin
Float valve for make-up
Motor frame assembly

6–OTHER ITEMS

A .PIVES  - CONDENSOR WATER/CHILLEDWATER/ DRAIN

| TYPE | G. I. class ‘B’ |
| TYPE OF CONNECTIONS: | *GI ERW piping welded by Resistance elec. welding. |

* GI companion flanges for Valves equipment, etc.
Flanges to be drilled as per requirement.

Outdoor piping shall have welded GI flanges at every 18 metre intervals.

SUPPORTS
Overhead pipe supports with GI hangers suspended from ceiling for sizes up to 75mm & pipe structure supports for large sizes.
Underground piping shall be supported with concrete or masonry blocks on bed concrete base.

Vertical risers shall be supported with GI
Painted brackets grouted to the walls with concrete.

PAINTING

All piping to be painted with Anti corrosive epoxy paint as per ISI colour coding.

B. VALVES

GATE VALVES

QUALITY

As per BIS.

MATERIALS OF CONSTRUCTION:

BODY

Cast iron for sizes above 65mm

SEAT

Gun-metal/Bronze

BUTTERFLY / BALL VALVE/
DOUBLE REGULATING VALVE

QUALITY

As per BIS.

MATERIALS OF CONSTRUCTION:

BODY

Cast iron for sizes above 65mm

SEAT

Gun-metal/Bronze

NON-RETURN VALVE

QUALITY

As per BIS.

MATERIALS OF CONSTRUCTION:

SEAT

Bronze

BALANCING VALVES

TYPE

Globe valve with flow measuring facility.

C. PLANT CONTROLS & INSTRUMENTS:

PRESSURE GAUGES

TYPE

Borden type with "U" tube & gauge cock.

THERMOMETERS

TYPE

Dial type for Plant & Industrial type
D. GSS DUCTING:
QUALITY As per BIS.
FABRICATION As per IS 655
HANGERS GI full threaded rod
SUPPORT & ANGLE FASTENERS two coat with zinc coat primer and finished with enamel paint
GRILLES & DIFFUSERS Aluminum Powder Coated

E. INSULATION
PIPING () Expanded polystyrene( Fire retardant quality )
TYPE Moulded Pipe sections
DENSITY Minimum 24kg/cubic meter.
THICKNESS 50 mm

TREATMENT FOR INSULATION
(a) INDOOR 125 Micron polythene sheet, fire resistant Hessian, chicken wire mesh, bitumen, 12mm plaster.

(b) OUTDOOR Same as above but with additional coat of one layer 6mm plaster, layers of vapor barrier mastic with rp tissue & a final two layers of bitumen coated tarfelt.

© DRAIN PIPING 25 MM polystyrene with same specification as for indoor piping

F. INSULATION DUCTING:
MATERIAL Nitrile Rubber
TYPE Slabs
DENSITY Not less than 24 kg/cubic metre
THICKNESS As per S.O.Q.
TREATMENT 30 SWG Aluminium sheet finish as per specs.

G. AIR HANDLING UNITS:
MATERIAL Pre plasticized sheet/powder coated, extruded aluminum penta post framework,
TYPE Double skin/ sectionalized construction
TREATMENT
A coat of bitumen, insulation using 30 SWG aluminium sheet cover with straps, bolts & nuts or sandwich type panels.

H. ELECTRICAL ITEMS
PANEL –
TYPE
Factory fabricated, powder coated cubicle type dust – vermin proof as per KSEI standards.

APPLICABLE CODES:
The latest edition of the following codes, standards and regulations shall be applicable for this work.

(a) Piping: IS 1239 part I and II, IS 3589
(c) Duct work: ISS 655 (Latest Edition)
(d) Ducting - SMACNA : Sheet Metal and Air Conditioning Contractors' National Association
(e) Sheet metal ducts – BIS 655
(f) Test code for centrifugal fan – BIS 4894
(g) Test code for air moving devices – AMCA 210
(h) Propeller AC Ventilation fan – BIS 2312
(i) Filter – BSS 6450 part 1
(j) V belts for industrial purpose – BIS 2494
(k) V Grooved pulley – BIS 3142
(l) Code for practice for industrial ventilation – BIS – 3103
(m) Specs for Galvanised steel sheets- BIS 277
(n) Motors – BIS 324/325
(o) Piping 1239 Part 1 & 2 – BIS 3601
(p) Welding steel pipes – IS 3589
Drawings:

The tender drawings furnished are essentially diagrammatic and depict general arrangement and approximate locations of the equipment. The intent of these drawings is to aid the Contractor to acquaint himself of the general nature and extend of the work involved and these drawings are not intended to be used for construction. The Contractor shall prepare detailed piping, ducting. Equipment layouts along with shop drawing giving details of fixing arrangements, foundations, etc. as required for the above work shall be submitted along with detailed selection charts and catalogs of equipments for approval of the Architect as per the time schedule/program. The contractor shall commence the work only after the shop drawings are approved by the Architect.

Equipment:

All the equipment offered shall be brand new from the factory. The Contractor shall submit for approval a list of equipment he intends to use along with the detailed selection charts, catalogs, etc. before ordering of equipment. Any equipment or machine ordered or installed without the approval of owner shall be at Contractor's risk and shall be removed and replaced as directed, without additional expense to the owner.

Precautions:

All the equipment shall be so designed as to prevent rusting, corrosion and deterioration, the design of equipment shall be such that moisture, dust, vermin, etc. shall not find access to interior parts and components. All moving parts shall be provided with suitable cages to prevent accidental contact.

Operation and Maintenance:

Four complete sets of operating & maintenance instructions for every equipment and component shall be furnished properly bound. The Contractor shall depute, for a period of ten working days, a competent engineer or manufacture's representative to instruct employer Engineers/ Representatives in the operation and maintenance of air conditioning system.
WATER COOLED SCREW CHILLER

Type

Water cooled screw type chilling machines of latest design manufactured in India/abroad shall be supplied. The criteria for selection shall be overall performance and economy of operation. The approved makes of Screw chilling machines shall be as follows

Capacity

Capacity As per Schedule of quantities (Actual under design operating conditions and fouling factors).

Components

The screw water-chilling machine shall comprise of the following major components, which shall be generally as per the supplier’s standard of manufacture:

a) Semi Sealed/Sealed compressor and drive motor.

b) Water Cooled Condenser.

c) Chiller.

d) Microprocessor based Control panel.

e) Refrigerant piping.

f) Solid State Starter (Soft starter, part winding, double delta, star delta).

All the components shall be totally factory assembled, skid mounted and shall be ready for installation and rigging.

Compressor :

Construction features of the compressor shall be as per manufacture’s standard/principals standard. A detailed technical literature shall be supplied for scrutiny of constructional features of compressors along with the technical bids. Compressors shall semi sealed or sealed type working on R134a. The lubrication system shall be force feed type and shall comprise of necessary pump, filters with bypass and relief valves, pressure and control valves. Electrically operated oil heaters shall be built in thermostat suitable for specific power supply. Heaters shall be automatically actuated when the compressor is stopped by means of auxiliary contracts, and indicating light and push button switch for testing the continuity of the heater element shall be provided with compressor. Shaft steel
shall be positive acting type in order to prevent leakage of refrigerant of air during compressor operation and idle period.

**Compressor motor:**

The drive motor shall be totally enclosed two pole squirrel cage, induction motor (cooled by refrigerant for hermetic machines). In case of refrigerant cooled motor, the contracted capacity shall be accomplished without any additional input energy or refrigeration charge. Motor hp/kw suggested is only for guidance. Refrigerant cooled motors for hermetic machines shall be specially treated to prevent reaction of refrigerant/oil/moisture with the winding insulation.

**Starter:**

Fully automatic starter as per schedule of equipment in accordance with the supplier's standard.

**Shaft-seal:**

This is required only for open type compressor.

**Capacity control:**

Automatic capacity control device to modulate load from 100% down to 20% with electronic temperature controller, control device for advance operation, temperature sensor in chilled water circuit, etc.

**Condenser:**

**Water-cooled condenser:**

a) Horizontal shell-and-tube with MS shell and copper tubes finned or specially treated.

b) Individually replaceable tube design.

c) Baffle plate to distribute refrigerant and also to prevent high velocity impingement on the tubes.

d) Accessories:

   Pressure relief valve.

   Purge collection chamber.

   Operable water heads for cleaning of tubes.

   Flanged connections for water-inlet & outlet.
Test pressure on waterside 15-kg/sq.cm. Refrigerant side test pressure shall be twice the working pressure.

**Chillers:**

a) Horizontal shell-and-tube type with MS shell & copper tubes.

b) Liquid distribution systems consisting of distributor though at the length of the shell and perforated distributor plate.

c) Multi-mesh screen to prevent liquid carry-over to the compressor located above the tube-bundle.

d) Accessories:

Water boxes at the chiller ends to provide required No. Of passes.

Flanged connections for chilled water inlet and outlet.

e) Test pressure on water side 15 kg/sq cm.

**Refrigerant, refrigerant piping & oil:**

The refrigerant shall be R-134A.

Piping shall be of factory installed refrigerant piping with filler-drier, controls, etc. Required as per standard of manufacturer shall be installed. The first charge of refrigerant and oil shall be carried out.

**Miscellaneous:**

a) **Purge system**

   Continuous purge system with automatic purging of non-condensable gases/refrigerant.

b) **Refrigerant flow control:**

   This shall be provided.

c) **Safety devices & control panel:**

The unit shall be provided with a control panel comprising of meters/indicators (Generally as per the supplier's standard of manufacture) the following safety devices shall also be incorporated:

a) 0-500 Voltmeter with selector switch.

b) 0-600 amp. With 3 Nos. CTs & selector switch.
c) Hours meter.
d) Lube oil heater signal/lamp.
e) Power signal lamp.
f) Set running signal lamp.
g) Purge unit operation running signal lamp.
h) Condenser high pressure trip lamp.
i) Evaporator low pressure trip lamp.
j) Chilled water low temperature trip lamp.
k) Low chilled water flow trip lamp.
l) Low condenser water flow trip lamp.
m) Lube oil failure trip lamp.
n) Lube oil high tempr. lamp
o) Motor overload trip lamp.
p) Start/stop/remote/reset switch.
q) Purge unit operation switch (auto/manual/stop).
r) Capacity control switch (auto/manual/stop.)
s) High condenser pressure cut-out.
t) Low evaporator pressure cut-out.
u) Chilled water low temperature cut-out.
v) Lube-oil low pressure cut-out.
w) Condenser water suspension cut-out.
x) Chilled water suspension cut-out.
y) Motor winding high temperature cut out or motor over-current cut-out.
z) Time delay mechanism.

These controls shall shut-off the unit and provide audio-visual alarm/signal to the operator. The signal lamps shall be on control panel.

**d) Thermometers & pressure gauges:**

Pr. gauges Oil pressure, condensing pressure, evaporating pressure.

Thermometer  Lube oil thermometer.

**e) Instruments** (Generally as per the standard of the supplier)

  a) Auxiliary relays.
  b) Temperature controller.
c) Thermal relay and contractor for oil pump.
d) Alarm buzzer or indication lamps.
e) Fuses for voltmeter etc.

f) **Vibration isolator** (Generally as per the standard of the supplier)
   a) Corrugated ribbed rubber pads to provide sufficient deflection to minimize vibration.
   b) Base plates.

g) **Insulation**

Chiller & refrigerant suction line insulation as per standards of manufacturer.

h) **Tools**

Standard & special tools for operation & maintenance. A list of such tools shall be furnished along with the technical bids.

**Installation**

The screw chiller package shall be installed as per recommendations of the manufacturer. The rate quoted shall include all materials/labor/tools etc. as required for completion of the installation, testing & commissioning.

**Charging of the unit :**

The refrigerant piping & system shall be tested for any leakage and rectified. The system shall be vacuumized and vacuum maintained for required period of time as per standard practice or as directed by the Architect. The refrigerant shall be charged to the required capacity. The contractor shall set all the controls, safeties and inter-locks properly before starting the unit.

**Testing:**

Performance test of the chiller package shall be carried out and the test results along with computations shall be submitted for scrutiny. The computed results shall tally with specified ratings, otherwise test will be declared unsuccessful.
DOUBLE SKIN AIR HANDLING UNITS

Types:

Air handling unit shall be state-of-the-art design, original factory manufactured, powder coated, sectionalized design of penta post construction with removable standard panels, double skin with sandwich insulation of fire retardant quality and shall not emit toxic gases under fire conditions.

Components:

AHU shall be provided with the following:

a) Fan Section
b) Coil section
c) Filter section
d) Drain pan.

b) Construction features:

Construction features/specifications of sectionalized AHUs shall generally be as per the standard of the manufacturer. The tenderer shall submit detailed tech. specs. and leaflets of AHU offered by them along with a letter of commitment from the original manufacturer as to the compliance of their own specs. in actual practice. The minimum requirements for such AHUs shall be as given below:

a) AHU shall be made of Aluminium sheets or CRCA sheet steel, formed, reinforced and powder coated. Thickness of the sheets for cabinet shall be 0.63 mm for outer skin and 0.63 mm for inner skin. Drain pan shall be of 1.8 mm thickness.

b) The panel thickness shall be 40mm injected with poly urethane foam insulation having density of 42 kg/m3 and having thermal conductivity of 0.022W/m K.

c) It shall be possible to interchange panels of AHU to suit site conditions.

d) The plug fan section shall have suitable for static pressure of 40 mm and shall be statically and dynamically balanced.

e) Coil section shall be of cartridge type with easily removable cooling coil made of copper tube & aluminium fins properly bonded. The coil face area and no. of rows shall be able to
meet the duty specified. Computerized coil selections shall be furnished along with technical bid documents. No. of fins per cm shall not be less than 4.

f) Pre-filter section shall have washable HDPE/ Synthetic media filters of 48 mm thickness, 90% efficiency down to 20 microns and the filter face area shall be so selected as to limit the air velocity across the filter 100 mt/sec.

g) Drain pan shall also be insulated as (b) above and shall be provided with threaded pipe connections at both ends.

h) Drive package shall compromise of TEFC sq. cage motor, v-belts and pulley, motor mounting arrangement, drive guard etc. Drive motor shall preferably be factory installed and aligned. The drive motor shall be installed on an adjustable base.

i) VFD

j) Sectionalized AHU’S shall be accompanied by original factory certificate incorporating the following if required:

i. Balancing of fan (Static & Dynamic)

ii. Pneumatic testing of cooling coil

iii. Galvanizing of the casing

iv. Static pressure at rated cfm.

Accessories:

Air handling units shall be provided with the following accessories:

a. Automatic starter (DOL/STAR-DELTA) for driving motor. Motor of above 7.5 HP shall have STARDELTA starter.

b. Single phasing preventer.

b. Industrial type thermometers with metal guard and thermo well screwed to thermometer pockets at inlet/outlet of the cooling coil,

d. Pressure gauge with U tube abd gauge cock at inlet and outlet of the cooling coil.

e. Anti/vibration isolation arrangement using 2 x 12 mm

f. Provision for installing 2 way mixing/magnetic valve’ in chilled water connection if specifically called for in the schedule.

g. Air tight door for side and bottom access for coil/fan inspection or open able side panels.
Cooling coil:

The fins shall be of aluminium and shall have integral spacing collars. The tubes shall be mechanically/hydraulically expanded to provide uniform and permanent fin-tube bonding. The return bends shall be deformed and brazed to the tubes. A 6mm (1/4") FPT plugged vent/drain shall be provided on each nozzle connection. Coil shall be circuited to provide on each nozzle connection. Coil shall be circuited to provide for design water velocity in tubes w/o exceeding the total water pr. drop as per standards All coils shall have same end connections, regardless of no. of rows deep. Complete coil, including headers, connections, return bends, shall be tested.

Fan drive motor, etc.

Fan blowers shall be Plug fans designed for discharging the required quantity of air at the specified extl. Static pressure. The blower shall be supported on steel shaft of suitable design. The fan shaft shall be corrosion resistant. Fan wheels/blowers and shafts shall be designed for continuous operation at max. rated speed and motor horsepower. Fan bearings shall be leaked-in, ball-type, self-aligning rubber/steel pillow block or flange type, mounted & located conveniently for re-lubrication.

Drive motor shall be TEFC sq.cage induction motor of rated speed of 1450 rpm. The motor shall have class "B" insulation. The drive package shall comprise of V-belts, pulleys, adjustable mountings plate for motor, drive guard, etc. The drive motor rating shall be as per equipment schedule or 125%of sum of fan bhp. The starters shall incorporate, thermal overload and under voltage protection. Starters shall also have in built single phasing preventors.

Installation

AHUs shall be installed as shown in the drawings. The unit shall be installed on anti vibration mount of adequate size. The operation of AHUs shall be smooth and shall not transmit undue vibration to the structure (90% vibration isolation desired).

Testing

Air handling units shall be tested for their design performance and test results shall be computed and submitted for scrutiny. If the computed results are not found to be satisfactory, further tests shall be conducted.
COOLING TOWERS

A. General:

SITC factory-assembled, induced draft, counter/ cross flow cooling tower with vertical air discharge, conforming in all aspects to the specifications, schedules and as shown on the plans.

- Thermal Capacity: The cooling towers shall have capacity as per SOQ. Additionally, the thermal performance shall be certified by the Cooling Technology Institute in accordance with CTI Certification Standard STD-201. The cooling tower(s) shall comply with the energy efficiency requirements of ASHRAE Standard 90.1.

- Corrosion Resistant Construction (standard): Unless otherwise noted in this specification, all casing panels shall be FRP and structural members shall be constructed of heavy-gauge hot-dip galvanized steel.

- Quality Assurance: The cooling tower manufacturer shall have a Management System certified by an accredited registrar as complying with the requirements of ISO9001:2000 to ensure consistent quality of products and services. Manufacturers that are not ISO9001 Certified shall not be acceptable.

- Wind Loads: When supported as recommended, the unit shall be suitable for applications requiring equipment anchorage to resist wind loads for that particular area.

B. Construction Details

- Structure: The cooling tower shall be constructed with a sturdy structural frame designed to transmit all wind, seismic and mechanical loads to the equipment anchorage.

- Casing Panels: Casing panels shall be constructed of corrosion and UV-resistant fiberglass reinforced polyester (FRP) to minimize maintenance requirements and prolonged equipment life.

- Cold Water Basin: The cold water basin shall be constructed of fiberglass reinforced polyester (FRP). Basin shall include a depressed center section with drain/clean-out connection. The basin area under the fill shall be sloped toward the depressed center section to facilitate cleaning. Standard basin accessories shall include a PVC make-up valve with large diameter plastic float for easy adjustment of the operating water level.

- Water Outlet: The water outlet connection shall be beveled for welding and grooved for mechanical coupling or bolt hole circle designed to accept an ASME Class 150 flat face
flange. The outlet shall be provided with large-area lift out strainers with perforated openings sized smaller than the water distribution nozzles and an anti-vortexing device to prevent air entrainment.

- Water Distribution System: The hot water distribution basins shall be the open gravity type for easy cleaning, and constructed of FRP. The basins must be accessible from outside the unit and serviceable during tower operation. Basin weirs and plastic metering orifices shall be provided to assure even distribution of the water over the fill.

- Cooling Tower should be designed for minimizing water loss, like drift loss and splash loss.

C. Mechanical Equipment

- Fan: Fan shall be heavy-duty, axial flow with aluminum alloy blades selected to provide optimum cooling tower thermal performance with minimal sound levels.

- Bearings: Fan and shaft shall be supported by heavy-duty, self-aligning, grease-packed ball bearings with moisture proof seals and integral slinger collars.

- Fan Drive: The fan shall be driven by a one-piece, multi-groove, solid back V-type power band with taper lock sheaves designed for 150% of the motor nameplate horsepower. The power band shall be constructed of neoprene reinforced polyester cord and be specifically designed for cooling tower service.

- Sheaves: Fan and motor sheave shall be fabricated from corrosion-resistant materials to minimize maintenance and ensure maximum drive and power band operating life.

- Fan Motor: Fan motor shall be totally enclosed air over (TEAO), reversible, squirrel cage, ball bearing type designed specifically for cooling tower service. The motor shall be furnished with special moisture protection on windings, shafts and bearings and labeled appropriately for cooling tower duty.

- Variable frequency drives for the fan motors which operates on temperature shall be provided.

D. Fill and Drift Eliminators

The fill and integral drift eliminators shall be formed from self-extinguishing (per ASTM-568) polyvinyl chloride (PVC) having a flame spread rating of 5 per ASTM E84 and shall be impervious to rot, decay, fungus and biological attack. The fill shall be manufactured, tested
and rated by the cooling tower manufacturer and shall be elevated above the cold water floor to facilitate cleaning.

E. Access Door

Access door shall be provided for access into the plenum section.

F. Sound

Sound Level: To maintain the quality of the local environment, the maximum sound pressure levels (dB) from the cooling tower operating at full fan speed shall not exceed 85 dB in free field condition

G. Accessories

- **Vibration Cutout Switch:** Provide a mechanical local reset vibration switch. The mechanical vibration cutout switch will be guaranteed to trip at a point so as not to cause damage to the cooling tower.

- **Ladder & Handrails:** A hot-dip galvanized steel ladder shall be provided for access to the fan deck. The handrails shall also be provided.

- **Internal Platform:** An internal walkway and an internal platform shall be provided for inspection and maintenance. Other components of the cooling tower, i.e. basin and fill/drift eliminators, shall not be considered an internal working surface.

**PUMPS**

**Construction:**

Pumps shall be as per I.S 1520/1960 and shall be of the following construction:

1. Casing  
   Cast Iron/Cast Steel
2. Impeller  
   Bronze
3. Shaft  
   High Tensile Steel
4. Bearings  
   Heavy Duty Ball/ Roller Bearings
5. Base Plat  
   Cast Iron/ Fabricated M.S
6. Flanges  
   To I.S.S 1536/1960
7. Packing  
   Graphited Asbestos
8. Maximum Speed  
   1450 R.P.M
9. Driver  
   TEFC Motor
10. Starter  
   As per Schedule of Equipment
Driver ratings shown are only tentative and Tenderers shall select their drivers at least 5% in excess of the maximum B.H.P of the pump plus transmission losses, if any

**Accessories and Fittings:**

The following accessories shall be provided with each pump among other standard accessories required

a) Coupling guard  
b) Lubrication fittings and seal piping  
c) Test and / or air vent

**Installation**

Pumps shall be installed as per manufacturer's recommendations. Pump set shall be mounted on concrete block, which in turn is mounted on machinery isolation cork or any other equivalent vibration isolation fittings. The PCC base will be made by the Owner and the foundation shall be provided as per the drawings and specifications by the contractor and the isolation pads shall also be supplied by the contractor. The contractor shall ensure that the foundation bolts are correctly embedded.

Pumps sets shall preferably be factory aligned. However, necessary site alignment shall be done by competent persons. Before the foundation bolts are grouted and the couplings bolted, the bed plate levels and the alignment results shall be submitted to the Engineer.

**Testing:**

The contractor shall submit the performance curves of the pumps supplied by them. They shall also check the capacity and total head requirements of each pump to match piping and equipment layout.

On completion of the entire installation, pumps shall be tested, for their discharge head, rate of flow and B.H.P and test results shall be furnished as per section-'TEST READINGS'.. Test results shall correspond to the performance curves.

The contractor shall furnish the required testing instruments and arrange for their connection as required.

**Painting:**

s, accessories and fittings shall be given two coats of approved finishing paint.
The pumps shall be factory painted, after complete installation and testing, touch-up painting shall be done if required.

**Variable Speed drives for Pumps**

A. **Adjustable Frequency Drive**

1. The adjustable frequency drive(s) shall be pulse width modulation (PWM) type, microprocessor controlled design.

2. The AFD, including all factory installed options, shall have UL & CSA approval.

3. Enclosure shall be wall mounted or free standing depending on amp rating. A Hand –off-auto switch and speed potentiometer shall be functional via AFD keypad.

4. AFD shall utilize a diode bridge rectifier to convert three phase AC to a fixed DC voltage. Power factor shall be remain above 0.98 regardless of speed or load. AFDs employing power factor correction capacitors shall not be acceptable.

5. Insulated Gate by- Polar Transistors shall be used in the inverter section to convert the fixed DC voltage to three phase, adjustable frequency, and AC output. An internal line reactor shall be provided to lower harmonic distortion of the power line to increase the fundamental power factor.

6. Input Voltage shall be AC 450 V +/- 10% 3 ph 50 Hz

7. Minimum Input / Output capabilities ( AI , DI , AO, DO )

C. **Pump Logic Controller**

1. The controller shall be specifically designed for variable speed pumping applications.

2. The controller shall function to a proven program that safeguards against damaging hydraulic conditions including:
   
   a) Motor overload
   b) Pump flow surges
   c) Hunting
   d) End of curve protection

The pump logic controller, through a factory pre-programmed algorithm, shall be capable of protecting the pumps from hydraulic damage due to operation beyond their published end – of – curve. This feature requires an optional flow meter for activation.
3. The pump logic controller shall be capable of staging de-staging pumps based on efficiency optimization program to provide the lowest KW draw. This optimization program requires an optional flow meter, KW meter, and system differential pressure sensor for activation.

4. The pump logic controller shall be capable of accepting analog inputs from zone sensor/transmitters indicated on the plans. The controller shall scan each analog input a minimum of once every 500 milliseconds. It shall then select the analog signal that has deviated the greatest amount from its set point. This selected signal shall be used as the common feedback input for a hydraulic stabilization function to minimize hunting. Each input signal shall be capable of maintaining a different set point value.

5. The pump controller shall be capable of controlling 3 Pumps in parallel.

6. The controller shall be field expandable to control up to 6 pumps in parallel and accept up to 16 analog inputs. This modification shall consist of nothing more than the addition of analog input modules and shall not require the use of special tools or factory reprogramming.

7. The hydraulic stabilization program shall utilize a proportional-integral-derivative control function. The proportional, integral and derivative values shall be user adjustable over an infinite range.

8. The pump logic controller shall be self-prompting. All messages shall be displayed in plain English. The operator interface shall have following features:
   
   a) Multi-fault memory and recall
   
   b) On-screen help functions
   
   c) LED pilot lights and switches
   
   d) Soft-touch membrane keypad switches

9. The readout shall be four lines of forty 0.50” brightly-fit fluorescent characters capable of displaying the following values:
   
   a) Flow in GPM
   
   b) Pressure in PSIG
   
   c) Differential pressure in PSIG
   
   d) Temperature in degree F or C
   
   e) Differential Temperature in degrees F or C
WATER PIPING

Chilled water & Condenser Water piping:

All pipes & fittings shall be brand new and shall be of approved make. The material and type of piping shall be as given here under:

<table>
<thead>
<tr>
<th>Pipe size (mm)</th>
<th>Class of Material</th>
<th>Joints &amp; Fittings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 65</td>
<td>Mild steel pipes as Per IS: 1239</td>
<td>Screwed fittings, unions &amp; screwed flanges.</td>
</tr>
<tr>
<td>Up to 150</td>
<td>-do-</td>
<td>Welded fittings, slip on flanges</td>
</tr>
<tr>
<td>200 &amp; above</td>
<td>Pipes as per IS: 3589</td>
<td>Welded fittings, slip on flanges, etc.</td>
</tr>
</tbody>
</table>

All fittings for piping with welded joints shall be welded as per welding standards. Fittings for screwed piping shall be of malleable iron. The fittings shall have the same pressure rating as that of piping. Valves of 75mm dia. and above shall be as per IS: 780, with cast iron body with flanged connection and nonrising spindles. Spindle, valve seat, wedge nut, etc shall be of gun metal or bronze. For piping of 50 mm dia. and below GM valves with screwed connection may be used. The valves shall be suitable for a test pressure as per equipment schedule.

Globe/balancing valves shall be installed for controlling flow of water on discharge side condensers, chillers and water coil outlets. Globe valves shall conform to relevant BIS in all respects.

Flanges:

Flanges wherever used shall conform to the requirements of latest edition of BIS. The flanges shall be of forged steel. Generally slip-on flanges shall be used for pipe sizes 75mm and above. or smaller pipes, screwed flanges shall be incorporated. Supply of flanges shall include bolts, nuts, washers and sealing materials.

Check valves (Non-return valves)

Check valves shall be provided at locations shown on drawings of and wherever required. Check valves up to 65mm size shall be of gun metal with screwed female ends. Valves of 65mm and above shall be of CI with flanged ends. Check valves shall be supplied, if specially called for & agreed to.
**Butterfly valve**

Butterfly valve shall perform the function of isolating valves. Butterfly valve shall cast iron body with black nitrile seat. All butterfly valves shall be provided with locking devices. Valve above 300 mm dia shall be gear driven.

**Two way type Pressure Independent Balancing cum Modulating flow control valve**

Supply, installation, testing and commissioning of Pressure independent type 2 way modulating flow control valves in a single Unit of Valve. PN 16 Rating. DN 15 to DN 32 Brass Body Ext. Threaded DN 40 & DN 50 Cast Iron Body, Ext. Threaded DN 65 to DN 100 Cast Iron body, Flanged Ends Connection Duly mounted with a BMS compactable Modulating actuator IP54 Type suitable for 24V AC for AHU / FCU as per specification

**SPECIFICATIONS**

The self-balancing flow control valves that are pressure independent, two-way, modulating to accept Input signals from the control system. Each Air Handling Unit / Fan Coil Unit shall be provided with 2Way Pressure Independent Balancing Cum Control Valve with Integrated in a single Body with Globe Type in Construction. FCU Valves Should be Provided with Spring Return Function Actuators Only. Regarding Control - Valve should be equipped with electronic modulating actuator which can accept either “4(0)-20 mA / 2(0)-10 V DC signals. Operating voltage for actuator shall be 24V AC. Delta p controller should ensure 100% valve authority at all loads (part load Actuator shall be able to work against maximum closing pressure of 6 Bar at full load). With feedback signal to Control system.

**Balancing** – Each Valve should have steeples adjustable maximum flow limitation as per the designed flow rate of coils. Balancing should be done only in Valve not in actuator so that at any given condition of failure balancing is not lost and easily accessible. All Valve actuator are microprocessor based with self calibrating feature. Valve should be of linear control characteristics with stepless Characteristics.

**GENERAL SPECIFICATIONS**

1. Pressure Independent Balancing Cum Control Valve Shall be Provided/Installed at each Outlet of Cooling Coil Unit., AHU & FCU

2. Pressure Controller Device should maintain the Pressure irrespective of Fluctuation with the help of Diaphragm self adjusting type and should not be in contact with each other.

3. Control valve shall accurately control the flow, with help of Modulating Actuator
4. Valve actuator housing shall be rated to IP 54. Control/Dip Switch Setting should be easy to Manual Access to avoid Manual Contact to directly with Integrated IC Circuit of the system.

5. Flow regulation unit shall consist of stainless steel Material 316.

6. All Valve Sizes should have a Testing Port Device for verifying accuracy of flow performance with respective of Differential Pressure.

7. Valve should be Globe Type in Construction and not with cylinder type cartridge. Globe construction valves are accepted as the most accurate characteristics valves. (i.e. they very closely follow the graphs made for valve opening and flow characteristics.)

8. The Valve + Actuator must have ability to undertake both Logarithmic Control Characteristics and Linear Control Characteristics. This ensures compatibility for both Water/Air and Water/Water Heat Exchange.

9. Only Liner characteristics should not be acceptable as with this valve + actuator characteristic, the resultant energy characteristic will not remain linear and this shall lead to improper control leading to overflow/underflow phenomenon.

10. Balancing & Control : Balancing should be accomplished by the Diaphragm and Control should be taken care by Actuator receiving signals from Room Thermostats or BMS.

11. Actuator should not play a part in balancing process. This will ensure that even an operational issue in the actuator will not lead to loss of Balancing.

Valve Actuator housing shall made of non Corrosive Material.

12. Valve actuator housing shall be rated to IP 54 Protection (Weather Proof: Dust & Water Protected).

13. Flow Setting (Commissioning) for the Pressure Independent Valves should be simple and fool proof.

   Flow setting (commissioning)
   
   • Should not involve opening of the actuator.
   
   • Should not need compulsory involvement of high end technicians.
   
   • Should avoid direct Manual Contact with Integrated Circuit (IC) of the actuators.
Strainers:

Pot strainers or Y strainers with cast iron or MS body shall be designed for test pressure specified for valves. Each strainer shall be provided with removable cover and brass screen. The screen shall be of brass sheet, having perforations, to provide a minimum net free area of 4 times the cross section area of piping connected to the strainer. Strainers shall be provided with threaded sockets or flanges depending up on the pipe size. Strainers shall be provided on suction of each pump. Strainers shall be provided with drain plug.

Installation

Piping shall be installed only after thoroughly cleaning and painting with one primer coat of red oxide paint. Pipes shall be cut square and free suspended from stands, clamps, hangers as specified and required. The pipe supports or hangers as specified and required. The pipe supports or hangers shall be designed to withstand combined weight of pipe, pipe fittings, fluid in pipe and insulation. Pipe supports shall be of steel and coated with rust preventing paint and finished with two coats black enamel paint. "Vibration Isolation” hangers shall be installed close to the source of vibration. The supports designed to minimize vibrations shall be heavy enough to damp out vibrations and shall have relatively wide bearing surface to avoid swivel action. The following spacing are recommended for pipe supports.

<table>
<thead>
<tr>
<th>Pipe (MM)</th>
<th>Spacing (MTR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 25</td>
<td>2.0 to 2.2 meter</td>
</tr>
<tr>
<td>32 to 65</td>
<td>2.4 to 2.7 meter</td>
</tr>
<tr>
<td>75 to 125</td>
<td>2.7 to 3.0 meter</td>
</tr>
<tr>
<td>150 &amp; above</td>
<td>3.0 to 3.6 meter</td>
</tr>
</tbody>
</table>

Pipe supports shall be spaced at a maximum interval of 1.5 mtrs at heavy fittings and valves. Wherever piping passes through walls, pipe sleeves of diameter 50mm larger than that of piping shall be provided. Pipe sleeves shall be of steel or cast iron pipe. Sleeves shall not be installed in structural members except where indicated, or approved. Where pipes pass through fire walls/fire partition, a seal of asbestos rope, mineral wool or any other non-combustible material shall be used for packing the sleeve. Where off-sets have to be laid 45 degree elbows shall be preferably used. Wherever "Tees" are installed, they should be installed such the "Bull heading" is prevented. Vertical pipe risers shall be installed straight and true to the plumb. All connections to and from the water headers shall be through shoe connections in the direction of flow of water. The risers shall be fixed parallel to walls and
columns. The risers shall be provided with two support at each floor when passing from floor to floor. Supports for insulated pipes shall not be in direct contact with the pipe. Further, supports shall be arranged and fixed in such a way that undue pressure is not exerted on the insulation. The outlets required for passage of various pipes are shown in the drawings. The contractor should carefully examine the same and point out any discrepancies or deviations. Tee off connection shall be through reducing tees. Wherever tees cannot be installed, a direct connection may be provided with shoe connection in the direction of flow. No restriction shall be imposed to water flow in the header. Reducers wherever used in horizontal runs of piping shall be eccentric type, to provide for free drainage wherever required. In other locations, concentric reducers may be used.

**Flanges & Union**

Flanges and unions shall be provided in each line preceding the connection to each equipment, which require maintenance. Union shall be installed in between the equipment and each valve for piping with screwed or welded joints. Flanges/unions will not measured & shall be treated as part of piping.

**Air Venting**

Air valve shall be provided at the summit of piping system for air venting. Globe valve of same size as air valves shall be incorporated. The sizes of air valves shall be as specified hereunder. All such valves will be measured & paid.

<table>
<thead>
<tr>
<th>MAINS</th>
<th>AIR VALVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100 mm</td>
<td>25 mm</td>
</tr>
<tr>
<td>101 to 300 mm</td>
<td>40 mm</td>
</tr>
</tbody>
</table>

**Drains**

Drains shall be provided at all low points in the system. 25mm dia. gate valve with the same size GI piping up to the nearest drain or floor trap shall be provided for each drain point. The piping shall be pitched towards the drain points. Air venting valves shall also be connected to the nearest floor trap/drain through equal sized GI pipe. All such pipe & valves will be measured and paid.
Sockets for pressure gauges

Pressure gauges shall be provided at the following locations.

   a. Supply and return of chillers and condensers.
   b. All pumps-suction and discharge.
   c. Heat exchangers-inlet and outlets.

Sockets for Thermometer

Direct reading 225mm long industrial thermometers having reading mercy shall be provided at the inlet and outlet of all heat exchangers to read water entering and leaving temperature. The thermometers shall be installed in separate wells. Thermometer shall be of appropriate range and shall be calibrated before installation. Thermometers for insulated piping shall be installed in extended neck to avoid damage or deformation of the insulation. The thermometers will not be measured and paid and shall be treated as part of equipment.

Expansion Tank

Expansion tank made of PVC/HDPE and completely insulated and provided with overflow, make up connection, vent pipe and float valve, shall be provided at location shown on the drawings. The size of the expansion tank shall be as per the requirements.

Insulation

Chilled water piping, condensate drain piping, etc. shall be insulated as per the specification enumerated under the specification "Insulation".

Testing

A) Piping shall be cleaned thoroughly.

B) Piping shall be tested to hydrostatic test pressure at least 2.5 times the maximum working pressure for a period of 24 hours. However, minimum test pressure shall be 10 Kg/sq. cm. The defects in joints and leaks observed during the test shall be rectified to the entire satisfaction of the Engineer-in-charge and piping shall again be subjected to pressure test. The testing of piping system shall conducted in presence of employer's representative. No insulation shall be carried out till the satisfactory completion of pressure testing. The contractor shall furnish all the necessary equipment, tools, instruments and labor to perform the test, to re water and clean space.
Balancing

After the completion of installation and testing of piping, all the piping system shall be adjusted and balanced to deliver the water quantities as specified/as required/as directed. The instruments/equipment required to adjusting the balancing of water system shall be accurately calibrated before taking any measurement. Calibrated orifices and portable flow meters may be used to adjust and balance the water flow. The contractor shall furnish a certified balancing report to the Engineer-in-charge for evaluation and approval.

Painting

After successful completion of installation, testing and insulation all exposed piping shall be given two coats of approved synthetic enamel paint as per the color coding requirement.

**INSULATION**

**Materials of Insulation :**

The following insulating materials shall be used :

a) For Piping

**GENERAL**

All underground and aboveground chilled water lines shall be insulated with pre-insulated PUF.

**INSULATION**

The service pipe insulation shall be polyurethane foam with 36 kg/cu m minimum density, 90% minimum closed cell content, minimum compressive strength of 40 psi and thermal conductivity of 0.14 Btu-in/hr/ft²/OF. The insulation shall completely fill the annular space between the service pipe and jacket and shall be bonded to both, the service pipe & jacket.

The insulation shall be provided to the minimum thickness specified below:

<table>
<thead>
<tr>
<th>Chilled water Pipe Size (mm)</th>
<th>Minimum insulation thickness mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 150</td>
<td>30</td>
</tr>
<tr>
<td>150 to 300</td>
<td>50</td>
</tr>
<tr>
<td>&gt;300</td>
<td>50</td>
</tr>
</tbody>
</table>
However the exact thickness could vary marginally for underground piping based on the exact sizes of HDPE pipes available.

**INSULATION JACKET**

**Over ground Piping:**

For over ground piping the jacket shall be out of Spirally wound GI/Al tubes as per following specs

**GI /AL**

<table>
<thead>
<tr>
<th>Jacket OD (mm)</th>
<th>Minimum Jacket Thickness Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD ≤ 250</td>
<td>26</td>
</tr>
<tr>
<td>250 to 500</td>
<td>24</td>
</tr>
<tr>
<td>&gt; 500</td>
<td>24</td>
</tr>
</tbody>
</table>

**Buried piping:**

The outer protective insulation jacket shall be seamless, extruded, black, uv resistant, high-density polyethylene (HDPE). The minimum thickness of the HDPE jacket shall be as follows:

<table>
<thead>
<tr>
<th>Jacket OD (mm)</th>
<th>Minimum Jacket Thickness (mm.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD ≤ 300</td>
<td>3.5</td>
</tr>
<tr>
<td>300 to 600</td>
<td>5</td>
</tr>
<tr>
<td>&gt; 600</td>
<td>7</td>
</tr>
</tbody>
</table>

**FITTINGS**

**Over ground pipe insulation fittings:**

Use factory fabricated fittings & pour chemicals supplied at site to make composite insulation.

**Buried pipe insulation fittings:**

Take off fittings wherever underground should be factory insulated pipe with mitred HDPE outer covering to suit Carrier pipe fitting.
FIELD JOINTS INSULATION:

Field joints insulation shall consist of PUF poured manually in a prefabricated GI sheet metal mold fixed around the joint. Then a neat shrinkable sleeve with a closure patch is applied & heat shrunk over the insulation to finish the joint.

UNDER GROUND PIPING & INSULATION EXECUTION:

Underground systems shall be buried in a trench of not less than 600 mm deeper than the top of the pipe & not less than 450mm wider than the combined OD of all piping systems. A minimum thickness of 600mm of compacted backfill over the top of the pipe is desirable.

Trench bottom shall have a minimum of 150 mm of sand, pea gravel or specified backfill material, consolidated to suit operating weight & to act as a cushion for the piping

b) For Ducting

For Thermal insulation: 9 mm thick class o nitrile rubber insulation with adhesive as per the recommendation of the manufacture with density 45-55kg/m3

For Acoustic insulation: 10 mm thick insulation with adhesive as per the recommendation of the manufacture with density 140-180kg/m3

For non ac area: - 19 mm thick insulation with adhesive as per the recommendation of the manufacture

Acoustic lining of AHU rooms, walls and ceiling with 10 mm thick class o nitrile rubber with adhesive as per the recommendation of the manufacture with density 45-55kg/m3

Exposed roof insulation - 10 mm thick class o nitrile rubber with adhesive as per the recommendation of the manufacture with density 45-55kg/m3

Duct Insulation:

Sheet metal/Aluminium ducts shall be insulated as described below:

a) Thickness of insulation: Material: 9/10 mm Nitrile Rubber

<table>
<thead>
<tr>
<th>Conditional Space</th>
<th>Unconditional Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) Supply air duct (as shown in the dwgs)</td>
<td>9mm insulation</td>
</tr>
<tr>
<td>ii) Return Air ducts</td>
<td>-Nil-</td>
</tr>
<tr>
<td>iii) Plenums /acoustic Internal lining with 10mm thick insulation as specified on the drawing</td>
<td></td>
</tr>
</tbody>
</table>
DUCT ACOUSTIC LINING

Material shall be processed Open cell Nitrile Rubber foam. The material should be fiber free. The density of the same shall be within 140-180 Kg/m³. The material should have a thermal conductivity not exceeding 0.050 W/mK. The maximum surface temperature the material should withstand is 1050 °C and minimum temperature should be -200°C. Thickness of the material shall be as specified for the individual application. The material should conform to Class 1 rating for surface spread of Flame as per BS 476 Part 7. The recommended thickness is 10/15 mm.

Ducts so identified and marked on Drawings and included in Schedule of Quantities shall be provided with acoustic lining of thermal insulation material for a distance of minimum 5 meters (or 30% of the duct length whichever is more) as follows:

The inside surface for the ducts shall be covered with adhesive recommended by the manufacturer. Cut Foamed sheets into required sizes apply adhesive on the foam and stick it to the duct surface.

ACOUSTIC LINING OF MECHANICAL ROOMS

Two walls and ceiling of air conditioning plant room and air handling unit rooms may be provided with acoustic lining. Material shall be processed Nitrile Rubber foam. The material should be fiber free. The density of the same shall be within 140-180 Kg/m³. The material should have a thermal conductivity not exceeding 0.050 W/mK. The maximum surface temperature the material should withstand is 1050 °C and minimum temperature should be -200°C. Thickness of the material shall be as specified for the individual application. The material should conform to Class 1 rating for surface spread of Flame as per BS 476 Part 7. The recommended thickness is 20/25 mm.

Installation Method

Thoroughly cleaned wall surface should be applied with a layer of adhesive recommended by the manufacturer. A layer of Adhesive also to be applied to Precut 1mx1 mt foam sheet and stuck the same to the adhesive applied wall surface when the adhesive on both surfaces are tack dry. The whole acoustic foam area can be covered with one layer of glass cloth to give additional mechanical protection.

Acoustic lining of walls shall be terminated approximately 15 cm above the finished floor to prevent damage to insulation due to accidental water-logging in plant/AHU rooms.
DUCT ACOUSTIC LINING

Material shall be processed Open cell Nitrile Rubber foam. The material should be fibre free. The density of the same shall be within 140-180 Kg/m3. The material should have a thermal conductivity not exceeding 0.050 W/mK. The maximum surface temperature the material should withstand is 1050 C and minimum temperature should be -200C. Thickness of the material shall be as specified for the individual application. The material should conform to Class 1 rating for surface spread of Flame as per BS 476 Part 7. The recommended thickness is 10/15 mm.

Ducts so identified and marked on Drawings and included in Schedule of Quantities shall be provided with acoustic lining of thermal insulation material for a distance of minimum 5 meters (or 30% of the duct length whichever is more) as follows:

The inside surface for the ducts shall be covered with adhesive recommended by the manufacturer. Cut Foamed sheets into required sizes apply adhesive on the foam and stick it to the duct surface

Valves & Fittings:

All valves, fittings, flanges, strainers etc. in the piping, operating below normal temperature, shall be insulated in the manner described above. Care should be taken to ensure that no damage would be caused to the insulation when valve or strainer is used or serviced.

Pumps & Accessories:

Chilled water pumps and accessories shall be provided with insulation of same thickness as that of pipes to which they are connected. The application of insulation shall generally conform to the method described above. Proper care shall be taken while insulating the pumps such that dismantling of pumps will not cause damage to the insulation.

Expansion Tank:

All tanks such as expansion tank, make-up tank associated with chilled water shall be insulated to the same thickness as for pipes to which they are connected. The method of application of insulation shall be as described for outdoor piping.
Equipment

Air Handling Units:

a) Drain Pan:
25 mm thick expanded polystyrene fire-retardant quality with 2 layers of bitumen.

b) Fan/Coil Section:
Insulation from inside as per equipment schedule & BOQ.

Water Chillers/equipment:

Water chillers or equipment operating below the ambient temperatures shall be insulated with 75mm thick thermoses/equal expanded polystyrene insulation. The equipment surface shall be given a coat of zinc chromate’s primer and two coats of Koldfas compound. Insulation shall then be applied butting all the joints tightly. The joints shall be properly sealed with adhesive. The insulation shall be wrapped with 24swgx19mm GI wire netting and two coats of smooth sand-cement plaster shall be applied to a total thickness of 12mm. the surface thus prepared shall give two coats of synthetic enamel paint of approved shade.

SHEET METAL WORK

Erect GSS Factory Fabricated rectangular duct as per drawings. complete with all fittings such as tee bends, special off-chutes, turning vanes, splitter dampers, ins.doors, transformation pieces etc. as reqd. as per IS 655 including suspension and supporting arrangement for plenums, complete as reqd. and as per specs.(only hi-tech supports shall be used) ducts, joining with easy slip on flange, gasket, corner piece, cleat etc wall opening as good as same

Material for Ducting:

All duct work shall be constructed out of best quality cold annealed, flat galvanized sheet steel (galvanized to specifications of IS : 277 (latest edition)).

The joints shall be finished straight and neat. The duct work shall be supported/secured from roof slab or any other building member using angles, rods as may be required. (Only Hi-tech supports)
Thickness of sheets shall be as shown in the tables given below:

<table>
<thead>
<tr>
<th>Maximum size of Rectangular Duct (in mm)</th>
<th>RoundDuct dia.(mm)</th>
<th>Thickness of GS Sheet in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 750</td>
<td>Up to 600</td>
<td>0.63 (24G)</td>
</tr>
<tr>
<td>751 to 1500</td>
<td>601 to 750</td>
<td>0.80 (22G)</td>
</tr>
<tr>
<td>1501 to 2250</td>
<td>750 to 900</td>
<td>1.00 (20G)</td>
</tr>
<tr>
<td>2251 &amp; above</td>
<td>901 &amp; above</td>
<td>1.25 (18G)</td>
</tr>
</tbody>
</table>

The fabrication of duct shall be done as per IS: 655 (latest edition). Transverse joints, connections, bracing, seam etc. shall be generally as per IS: 655. All the ducts over 300mm in either dimension shall be cross broken except those on which rigid board insulation is applied. Stiffening angles shall be black structural steel and riveted to the cut work. The longitudinal seam on all ducts may be Pittsburgh seam hooked and hammered. Ducts of size 600 mm and above shall be reinforced between the joints. Where drive-slips are used, angles shall be riveted to the ducts 50mm from slips.

**Duct Construction:**

The intent of the above specification, is to obtain duct pieces that are robust and rigid enough to preclude flutter & to achieve minimum amount of air leakage. The contractor may fabricate ducts conforming to any other approved standard to achieve the desired result. However, detailed specifications shall be submitted for approval before adopting the same. Suitable rubber gaskets shall be provided between the duct flanges. Ducting shall be supported from independent hangers fixed to the building structure. In any case the duct shall not be supported from false ceiling, ceiling hangers, light fixtures, support for light fixtures or piping work etc. In case the structure is under construction, inserts and anchors required for duct support shall be set in the building structure at the time of pouring concrete. The Contractor shall prepare, detailed drawings of hangers and supports and submit for the approval of consultants.

Dimensions of duct sections shown are inside dimension of bare ducts. Where ducts are required to be lined or insulated on inner surface, their dimensions have to be enlarged so that the cross section area is not reduced as compared to those shown on the drawings.
**Elbows, Vanes Etc.**

Simple elbows, transformation sections, shall be formed with Pittsburgh corner seams. Complicated fittings shall be constructed with double corners. Elbows, bends and offset pieces shall have a center line radius of not less than 1.5 times the radial of width of the duct. Turning vanes should be provided at required spacing such that the aspect ratio of each individual elbow formed by the vanes shall not be more.

**Transformation**

Duct transformation shall be made with a side slope of 10mm to 70mm. However, if the duct cross section area need to be reduced, a maximum reduction of 20% of the original area shall be allowable.

**Obstructions**

Where ducting has to avoid building structural members, piping, electrical pipes and cables, ducts shall be transformed, divided or curved to one side. The reduction in area shall not exceed 20% of the original area.

**Take offs**

The branch take-offs and collars shall be provided with turning vanes. Straightening vanes shall be provided in the collars wherever practicable.

**Dampers & Splitters**

Dampers shall be provided in the duct work for proper control and balancing of air distribution. Dampers shall have easily accessible operating mechanism. The operating mechanism shall consist of links, levers and quadrants as required for proper control and setting in a desired position. The position of the handle of Damper operating mechanism shall be clearly visible and it shall indicate the position of the damper in duct. Dampers, splitters and their operating mechanism shall be fabricated of GS sheets of two gauges heavier than duct piece having theses fittings and shall be easily accessible through suitable access doors in the ducts. Dampers shall be installed in duct at all required locations such as chutes, branches etc.

**Fire Dampers**

Fire dampers shall be provided in the ducting as shown on the drawings and wherever required as per the local codes. However, fire dampers shall be provided in the ducts passing through fire walls and where the ducts serves more than two floors. Fire Dampers shall have
same fire resistance as that of fire walls, ceiling, etc. The fire damper shall be installed in the duct in such a manner that vibration and rattling does not occur due to the passage of air. Fire damper with solenoids (solenoids shall be supplied & installed by AC Contractor).

**Apparatus and Equipment connections**

Equipment’s such as air handling units shall be connected to the duct by means of double canvas sleeve of 15 ounce, woven asbestos cloth connection of at least 150mm long.

Duct sleeves made of 20 gauge thick galvanized sheet steel shall be used for ducts passing through load bearing walls or partitions. sleeves shall provide 25mm clearance all around as per duct or insulated duct. The space between sleeve and duct shall be packed with twisted asbestos.

All the sheet metal plenums required to confine the flow of air through filters and fans, shall be fabricated out of 18 gauge galvanized sheet steel, suitably braced as required. Suitable access doors shall provided for plenums.

**Access Doors**

Hinged or bolted access doors shall be provided in ducting for fire dampers, coils, plenums and any apparatus requiring frequent servicing for inspection. Access doors shall be rigid and shall be provided with air tight rubber gaskets. Insulated ducts shall be provided with insulated doors.

**Diffusers, Registers & Grilles**

All side wall supply grilles shall be double deflection type with both horizontal and vertical vanes being adjustable. Grilles shall be provided with multi-louver damper for volume control with adjustable handle from the from of the grille. Side wall grille shall be similar to Tuttle & Bailey. All return air and exhaust grilles shall have only horizontal louvers and similar to Tuttle and Bailey Aerovane T-70 D or equivalent. Ceiling diffuser shall be provided with volume control dampers, which can be operated from below. Ceiling diffusers shall be similar to Tuttle & Bailey type 5-aerofuse.

All the diffusers and grilles shall be of mild steel/powder coated aluminium. Diffusers and grilles shall be provided with sponge rubber gasket between flanges and wall or ceiling. Samples of grilles/diffusers shall be approved by consultant before installation.
Installation

The installation of ducting shall conform to standard practice of the trade. The contractor shall provide and neatly erect all the sheet metal work as shown on the approved drawings.

The Contractor shall prepare detailed shop drawings of ducting for approval by Architect. The drawings shall indicate the exact route of ducting, ducting dimensions, details of splitters, vanes, dampers, fire dampers, heaters, filters etc. as specified and required. The drawings shall also incorporate cross section indicating beams, obstruction, piping, cables etc. The ducting shall be suitably designed to avoid all obstructions and at the same time utilizing a minimum number of bends/transformations/divisions etc. Every duct layout drawing shall clearly indicate the location & spacing of supports & hangers.

Ducting over the false ceiling area shall be supported from the ceiling slab or from beams. In no event, the ducting shall be supported from false ceiling hangers, cable trays/racks, pipe supports or be permitted to rest on the false ceiling. All the ducts shall be rigid and shall be adequately supported and braced wherever required with tees, angles or adequate size to prevent buckling, vibration or breathing. The contractor should mention the total quantity of various sizes ducting sheet along with each floor drawing of duct layout.

Insulation:

Duct work shall be insulated as per specification given under insulation.

Testing:

After completion of ducting, the entire system shall be tested for air leakages. The max. allowable air leakage shall be 10% on commissioning of the plant, the entire air distribution system shall be balanced to supply the required air quantities to various regions and rooms to maintain the specified inside conditions. The readings of air quantities, after final balancing of the system, through each register, diffuser or grille shall be recorded and submitted to the Architect.

Round ducting:

Round duct shall be machine fabricated as per BIS standards. Ducting covering the insulation shall also be factory fabricated including reducers, tees, elbows etc. The entire exposed ducting shall be painted with two coats of paint/primer after subsequently cleaned as explained in the painting methods else where in this tender.
CONTROLS AND INSTRUMENTATION

Refrigeration Machine Safety Controls

Centrifugal Machines:

The unit shall be provided with a control panels comprising of meters/indicators (Generally as per the supplier's standard of manufacture) the following safety devices shall also be incorporated generally:

a. 0-500 Voltmeter with selector switch.
b. 0-600 amp. with 3 Nos. CTs & selector switch.
c. Hours meter.
d. Lube oil heater signal/lamp.
e. Power signal lamp
f. Set running signal lamp
g. Purge unit operation running signal lamp.
h. Condenser high pressure trip lamp.
i. Evaporator low pressure trip lamp.
j. Chilled water low temperature trip lamp.
k. Low chilled water flow trip lamp.
l. Low condenser water flow trip lamp.
m. Lub oil failure trip lamp.
n. Lube oil high temp. trip lamp.
o. Motor overload trip lamp.
p. Start/stop/remote/reset switch.
q. Purge unit operation switch (auto/manual/stop).
r. Capacity control switch (auto/manual/stop.)
s. High condenser pressure cut-out.
t. Low evaporator pressure cut-out.
u. Chilled water low temperature cut-out.
v. Lube - oil low pressure cut-out.
w. Condenser water pressure suspension cut-out.
x. Chilled water suspension cut-out.
y. Motor winding high temperature cut-out or motor ever current cut-out.
z. Time delay mechanism.
These controls shall shut-off the unit and provide audio-visual alarm/signal to the operator. The signal lamps shall be on control panel.

**Capacity control:**

Screw compressors shall be provided with automatic capacity of control system to control partial load conditions. The capacity control system shall be capable of varying the capacity from 100% down to 20% of the full load under normal operating conditions, in step less manner.

The capacity control shall be effected by inlet guide vanes or by employing suction side variable speed diffusers. The controlled variable shall be either chilled water thermostat or temperature sensor.

**Instruments:**

Refrigeration machines shall be provided with the following instruments:

a) Refrigerant pressure gauge on suction and delivery of compressors.

b) Oil pressure gauge.

c) Water temperature Thermometer on inlet and outlet of chiller and condensers.

d) Water pressure gauges on both inlet and outlet connections of chillers, condensers and pumps.

e) Voltmeter and Ammeter.

f) Hours meter.

g) Indicating lamps as specified.

**Air handling Units Controls**

Air handling shall be provided with chilled water flow control device comprising of the following:

a) Modulating 2 way Mixing/Magnetic valve with modular motor.

b) Proportional thermostat

A centralized control panel shall be provided for control indication of refrigeration units, air handling units, pumps etc. The Control Panel shall have indicating lamps, "ON". "OFF" indication lamps for all the equipment’s as enumerated in the schedule of equipment’s. The
Control Panel shall be of free floor standing cubicle type, complete with all internal wiring etc. Control panel shall also indicate failure of any of the safety devices or controls separately.

Testing

The entire system and instrumentation shall be tested for proper operation after commissioning of the plant.

**MOTORS & MOTOR CONTROL CENTERS:**

**General:**

These specifications cover all types of motors used for pumps, air handling units, compressors, machines etc. The motor installation, wiring control shall be carried out strictly in accordance with the specification hereinafter laid down.

**Motors**

a) **Rating:**

The ratings of the motors shall be as indicated in schedule of quantities. The rating shall be selected on the basis of ambient temperature and allowable maximum temperature rise as specified.

b) **Standards**

All motors shall comply with IS: 325, in respect of general requirements and performance. Motors shall also conform to IS: 1231, for foot-mounted motors and IS: 2223 for flange mounted motors.

c) In general all the motors above 1 hp. shall be 3 phase unless otherwise specified. Bhp motors may be either 3 phase or single phase as required.

d) Motors shall run at all loads without appreciable noise or hum. Motors shall be one of the following design as specified in equipment schedule:

   i. Squirrel cage,

   ii. Wound Rotor

   iii. Totally enclosed

   iv. Totally enclosed, fan cooled.

Winding of motors shall be class `B' insulated and fully enclosed.
e) Motors shall be rated for continuous duty as defined in IS:325. All motors shall have suitable torque characteristics as required by the duty of driven equipment. Motors shall be suitable for operation on 415 volts, 3 phase, 50-HZ, AC supply (or 230 volts single phase 50 HZ AC supply if required).

f) Motors shall be provided with ball/roller bearings. Bearings shall have ample capacity to deal with any axial thrust. Suitable grease nipples shall be provided for re-greasing the bearing.

g) Motors shall be provided with a cable box to suit aluminium conductor, PVC insulated, PVC sheathed and steel armored cable.

h) Motors, except fractional horse power motors of 1/8 hp and below, shall be provided with running over current protection generally by means of a bimetallic thermal overload protective device incorporated in the starter panel. Motors larger than 100 hp shall be provided with full thermal protection with a thermostat detector in the stators winding, measuring unit, tripping relay, and necessary wiring. All these shall be part of stators/panel.

k) The type of stators to be used shall be as follows:

<table>
<thead>
<tr>
<th>Type of Motors</th>
<th>Starting Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Squirrel cage motors up to &amp; including 7.5hp</td>
<td>Automatic Direct on line starters</td>
</tr>
<tr>
<td>b. Squirrel cage motors of 10 hp and above</td>
<td>Automatic Star/Delta starters.</td>
</tr>
</tbody>
</table>

The starting current of the motors shall be limited by using the above mentioned starters, as required.

**Motor Starters**

a. Motor Starters shall be in accordance with IS-1882. The starters shall be totally enclosed, metal clad, dust and vermin proof construction. The starters shall be of continuous rating and shall be of automatic type. All starters shall be suitable for 415 volts, 3 phase, 50 HZ, AC supply.

b. Contractors shall have the number of poles as required for appropriate duty. The making capacity of the contractors shall be as per AC23 of ISS.
c. Unless otherwise specified, all starters shall have integral start/stop push buttons. Start push buttons shall be colored green and shall be shrouded to prevent inadvertent operation. Stop push buttons shall have mushroom heads and shall be colored red. All push buttons operated contractors shall be provided with a hold-on/running contact.

d. All remote control circuit connected to the starters shall operate at 230 volts or lower voltage.

e. Motor starters shall be provided with thermal overload relay with adjustable settings, on each phase for three phase motor.

   The motors of 100 hp and above shall be provided with current transformer operated thermal overload relays. The thermal overload relays shall have thermal characteristics suitable for the associated motor, it's starting characteristics and suitably compensated for ambient air temperature variations. Single phase preventers shall be provided for all three phase motors.

f. Terminal block with integral insulating barriers shall be provided for each starter.

g. All the starter shall be provided with a schematic diagram on a durable material fixed permanently within each lid or cover.

h. Starters shall be provided with sufficient extra N/O contacts for interlocks, indicating lamps, etc.

i. Automatic Star/Delta starters shall be provided with adjustable timers.

j. Starters for wound rotor motors shall be rotor resistance type and shall be oil/air immersed, metal clad construction with combination of drum type rotor resistance starter and starter switch. Rotor starter shall be used for starting only. The starter switch shall be of heavy duty, with trip free mechanism. The tripping mechanism shall not reset until the starter handle is in `OFF’ position.

**Installation of Motors**

a. Installation of the motors shall be in accordance with BIS:900. Motors shall be mounted on a common foundation with the driven machine or equipment coupled through a flexible coupling or through belt drive. The drive arrangement shall be provided with a safety guard.
b. The motor along with its driven machine or equipment shall be provided with vibration isolation arrangement. Motors shall generally be provided with slide rails fixed to the base with nuts and bolts to facilitate belt installation and subsequent belt tensioning.

c. Motors shall be wired as per the detailed specification and drawings. All motor frame shall be earthed with 2 Nos. earthing conductors of size not less than 8 SWG. Schedule of wiring cables and earthing conductors has been shown on the relevant drawings.

d. Motors shall be tested at works in accordance with the relevant Indian Standard Specifications and test certificates shall be furnished in triplicate. Motors shall be tested at site after erection for insulation resistance.

e. All the motors and frames shall be painted with two coats of synthetic enamel paint.

**Motor Control Centers**

a) General:

Motor control centers shall be provided and installed wherever specified for controlling motors. Motor control centers shall comprise circuit breakers, switch fuses, starters, control and indicating equipment as specified. The motor control centers shall be totally enclosed, metal clad, flush front and back, cubicle pattern suitable for front and rear access. The motor control centers shall generally conform to IS:8623. (fully conformity not called for).

b) Construction:

Motor control centers shall be free standing type with basic structure being fabricated out of 2.0 mm steel with reinforcing frame welded in place. All the doors shall be 14 gauge steel. The enclosure of motor control shall be rigid and strong. The motor control centers shall have a bus bar chamber and required a number of feeder compartments of dimensions as in vertical section. Breaker and switch handles and starter push button shall be mounted on the devices and not on the doors. Suitable screw and raw device shall be provided on each compartment door for locking the doors in position on the side of each vertical feeder/control compartment section a vertical cable alley shall be provided with separate doors. Cable Alley doors shall be hinged type or otherwise as specified.
c) Bus Bars:

All bus bars shall be suitable for 415 volts, 3 phase, 4 wire, 50 HZ, AC supply. Main and vertical bus bars shall be made of high conductivity aluminium. The thermal short circuit capacity of horizontal bars shall not be less than 35 MVA rms. Bus bars shall be supported and braced at regular intervals on suitable insulating material such as SMC/DMC. All the bus bars shall be adequately shrouded and isolated from unit compartments and wire ways. Special care shall be taken in the design of bus bars with regard to safety aspects.

d) Earthing:

Entire motor control center shall be provided with GI earth bus running throughout the length of the panel. Motor control centers shall be provided with 2 Nos. earthing bolts for connections to the local earth grid shall be provided with 2 nos. earthing bolts for connections to the local earth grid.

e) Unit Compartments:

Unit compartments shall be of adequate dimension to house the feeder equipment and also to maintain the same. Each feeder compartment shall have a independent door. The door shall have rubber gasket.

f) Interlocking Arrangement:

Motor control centers shall be provided with the following safety interlocks.

i. All the switches/breakers shall be interlocked with door so that the unit cannot be closed unless the unit door is closed. This interlock shall also prevent opening the unit door unless the switch/breaker is in ‘OFF’ position.

ii. An integral operating handle shall be provided for each switch/breaker. The position of the breaker/switch shall be indicated by the operating handle.

iii. A suitable de-interlocking device shall be provided for deliberate inspection of feeder switch/breaker without having to switch off the feeder.

g) Switch Disconnector Fuse Unit.

All the switch Disconnector fuses shall confirm to IS. 13947 (part 1 & 3) & IEC 6094-(Part 1 & 3) for isolation duty, with rated insulation voltage of 660 volt, impulse with stand voltage 8 KV and fused shot circuit breaking capacity of 80 KA.
h. Air circuit breaker

All air circuit breaker shall conform to ISI 13947 (part 1 & 2) & IEC 60947-(part 1 & 2) with stored energy, drawn out mechanism. All the internal auxiliaries should front mounted with inbuilt fault indications.

i. Molded case circuit breaker

All MCCB shall confirms to IS 13947 & IEC 60947 with adjustable centralized thermal setting (80% to 100%) and line load reversibility. All MCCB’s should have impulse with stand voltage of 8KV (VIMP = 8KV) and should be suitable for aluminum termination.

j. MPCB

This should confirm fully to IEC 947 standards, operational voltage 690 V, impulse fifth stand voltage 6 KV operating temperature upto 60° C grade should be suitable for isolation with minimum power loss / pole lesser than or equal to 2.5 W.

k. Feeder/Control equipment:

Feeder and control equipment shall be provided as per the drawings and schedule of quantities.

1) Switch fuses: All the switch fuses shall conform to IS:4064, IS:4047.

2) Air circuit breakers: All air circuit breakers shall conform to IS:2516 and draw out type.

3) Molded case circuit breakers: All molded case circuit breakers shall conform to relevant ISS.

4) Starters: All starters shall be as specified herein before.

5) Current Transformers: All CTS shall be as per IS specification.

6) Indicating Lamps: Suitable Red 'ON' Green 'OFF' indicating lamps shall be provided on each feeder/starter compartments.

7) Ammeters: CT operated ammeters of suitable range as specified shall be provided for each feeder/starter compartments.

l. Wiring:

All control and auxiliary wiring shall be carried out with copper conductor, PVC insulated wires. Wiring shall be properly colour coded and laid out neatly in bunches and firmly
fastened to the sides in the trolley. The terminations for conductors shall be done by crimping lugs on to the conductor ends.

Suitable printed PVC ferrules shall be carried out using copper conductor PVC insulated wires of adequate current ratings suitable for the equipment. The wiring shall be color coded using red, yellow, blue and black for 3 phases and neutral respectively. All terminations shall be carried out by crimping lugs on to the conductor ends. The lugs shall be fastened to the equipment using suitable washers and screws. All the wiring shall be neatly bunched and fastened to the sides of the trolley. Wiring selection for power shall be done considering the effects of temperature rise, bunching. All conductors shall be provided with printed PVC ferrules for easy identification.

m. Enclosure and Surface Treatment:

Motor control center shall be of dust and vermin proof construction suitable for indoor installation. All doors shall have rubber gaskets. Adequate protection shall be provided so that ingress of dust and vermin moisture encountered in indoor installation shall not in any amount be sufficient to interfere with the satisfactory operation of enclosed equipment. Sheet metal components and accessories of motor control treatment shall be given a rigorous anti-rust phosphating before the primer paint is applied. The sheet metal then painted enamel paint with approved colors shall also be painted.

n. Name Plate:

Motor control centers as well as their individual compartments shall be provided plastic black anodized screwed name plates.

o. Diagram

Each compartment of MCC shall be provided with a circuit diagram of its components and wiring and fixed on to the inner surface of door or lid.

p. Danger Plate

Standard danger plate indicating the voltage grade shall be provided on the motor control center.

q. Testing:

The panels shall be tested after fabrication, assembling and wiring.
1. Wiring shall be carried with 1000 volt megger to ensure adequate insulation resistance. (at manufacturer's works)

2. H.T. test shall be carried out with 2.5 KV rms for one minute to check the insulation of bus bars. (at manufacturer's works)

**r. Installation:**

Motor control centers shall be installed at the locations shown on the drawings. All motor control centers shall be provided with an integral base channel frame for grouting the motor control centers to the floor. The MCC’s shall be supplied with required number of anchor bolts.

The contractor shall supply foundation drawings for the motor control center. The motor control centers shall be installed on the concrete foundations and fixed to the floor by means of foundation bolts. Wherever RCC foundation is not feasible/provided, robust steel channels with trapped holes shall be embedded in the floor for installing the control centers.

The required cables shall be brought and terminated at the motor control centers, using cable glands, lugs and sockets. All the cables shall be properly arranged and led through the cable alley. The various power and control cables shall be clamped firmly on to the sides of the cables alley.

The tightness of all main and auxiliary bus bar connections shall be checked. All wiring terminations and bus bar joints shall be tightened wherever necessary before energizing the motor control centers.

**ELECTRICAL INSTALLATION**

**General**

Work shall be carried out in accordance with the specifications, local rules I.E. Act 1910 as amended up to date and rules issued thereunder, regulations of the Local Fire Insurance Association and Indian Standards code of practice No. IS : 732-1963 and CPWD General specifications for Electrical Work(Internal) -2013 and Kerala State Electrical Inspectorate standards.
TESTING OF AIR-CONDITIONING SYSTEM:

Routine and type tests for the various items of equipment shall be performed at the Contractor's works and test certificates furnished if required. Functional tests shall be conducted at site.

The performance tests to determine whether or not the full intent of the specification is met shall be conducted by the contractor. After notification to the employers that the installation has been completed and the plant has run continuously for a period of at least one week, the Contractor shall conduct under the direction and in the presence of the employer's representative such tests as specified to establish the capacity of various equipment supplied and installed by the Contractor.

The Contractor shall operate, test and adjust the air conditioning system units, fan, motors, all air handling appliances including adjustment of regulators, dampers etc. All test equipment, labor, operating personnel, oil and refrigerant required for these tests shall be furnished by the Contractor to enable the plant to be put in a continuous running test. The Contractor will be provided with electric power and water.

Procedure:

Design Conditions:

The inside and outside dry bulb and wet bulb temperatures shall be recorded by means of a sling psychrometer with mercury thermometers. The relative humidity shall be computed from the psychometric chart. The inside dry bulb temperature and relative humidity shall fall within the specified limits.

Capacity of the plant

The following aspects shall be checked before conducting the performance tests

a. The outside conditions shall be as close to the design values as possible.

b. The internal loads of various spaces shall be close to the design values as far as possible. Otherwise internal loads shall be simulated to a value required to satisfy the design condition.

c. The plant shall be fully loaded and the temperature stabilized.

d. Hourly readings of water flow shall be recorded.

e. Hourly readings of pressure, temperature, electrical current, voltage and power factor shall be properly recorded. The capacity of the plant and various other equipment and accessories shall be ascertained as follows.
Cooling coils of air-handling units & fan coil units

The flow of air over the cooling coil will be measured by recording the velocity of air across each filter placed before the cooling coil. The velocity shall be measured by means of an anemometer.

Air quantity across the filters = Velocity of air across the filter in FPM x Net filter area in sq. ft.

The wet bulb temperature of air entering the coil and that leaving the coil shall be measured. The enthalpy of entering and leaving air shall be noted from the psychometric chart, corresponding to the WB temperature recorded.

Say, he = Enthalpy of entering air in Btu/lb hl = Enthalpy of leaving air in btu/lb.

Chiller

The temperatures of inlet and outlet water, water flow and pressure drop shall be measured as suggested for the condenser.

The capacity of plant in TR = Water flow through chiller (in gpm) x dT (OF) / 24

Where dT = (Temperature of entering water-Temperature of leaving water)

Note: Rotometer and energy meter duly calibrated shall be arranged by the contractor and test should be conducted for the duration as required to enable at least a record of six table readings under different load condition.

Compressor:

The following readings shall be recorded

a) Suction gas pressure.

b) Discharge gas pressure.

c) Suction gas temperature.

d) Discharge gas temperature.

e) Readings of ammeter, voltmeter & power factor meter.

Same pressure gauge shall be used for different measurements and the same thermometer shall be used for different temperature measurements. The capacity of the compressor shall be computed from the performance chart supplied by the manufacturer.
On of the compressor = \frac{(Power Input in KW)}{0.746 \times Compressor capacity in TR}

**Cooling Tower:**

Temperature of hot water, Temperature of cold water in the sump and wet bulb temperatures shall be measured. The cooling tower efficiency shall be computed as follows:

\[ N = \frac{(Temperature \ of \ hot \ water - Temp. \ of \ cold \ water)}{(Temperature \ of \ hot \ water - Ambient \ wet \ bulb \ temp)} \]

Wet bulb approach = [Temp. of cold water in sump]--[Ambient wet bulb temperature]

**Air balancing:**

After the desired inside conditions are achieved the quantity of air through every outlet shall be measured.

Air Qty (CFM) = Air velocity at the outlet in FPM x Effective area of the outlet in Sft.

**Testing at various loading conditions:**

The performance tests shall be conducted for various loads such as 100%, 75%, 50% of the capacity of the plant.

**Functional Tests**

**Electrical Equipment**

1) All the cables shall be tested for continuity and absence of cross phasing. Insulation resistance between

the phase conductors and the earth shall be measured with the help of a 500-V meter

Note: B/F - to enable at least a record of 6 stable readings under different load condition.

**Motors**

a. Insulation Resistance of all motors shall be tested with a meter and the value shall not be less than

b. 1 Meg-ohm. If the observed value is less than 1 Meg-ohm the motor winding shall be dried out and windings shall be given a coat of approved insulating vanish.

c. Starting current shall be recorded every time the motor is started.

d. Starter operation shall be checked for single phasing by removing one of the phases.
e. Overload protection shall be checked for single phasing by removing one of the phases.

**Safety Devices & Controls**

1. Interlocks for compressor motor with that of chilled water pumps, condenser water pumps and cooling tower fan shall be checked.

2. Flow switches in condenser water and chilled water lines shall be throttling the valves.

3. High pressure-stat shall be checked by varying the setting of the cutout.

4. Low pressure stat shall be tested by closing the pilot solenoid valve.

5. Anti-freeze thermostat shall be tested by varying the setting.

6. Oil failure switch shall only be tested by varying the setting.

**Capacity Control**

The capacity control arrangement shall be tested by varying the load on the plant. Any other procedure recommended by the manufacturer's may be adopted with the prior permission of the employers and consultants.

**Format For Test Readings After Commissioning**

The following readings shall be recorded hourly during the tests and capacity of the plant shall be computed.

**Compressor**

1. Suction pressure - Kg/Cm2 (psi)
2. Suction temperature - °C (°F)
3. Discharge pressure - Kg/Cm2 (psi)
4. Condensing Temper. - °C (°F)
5. Oil pressure - Kg/Cm2 (psi)
6. Compressor Speed - rpm

**Motor**

a. Rated capacity - HP
b. Rated Volts - Volts
c. Rated current - Amps
d. Starting current - Amps

**Power Consumption for 100%, 75% & 50% loads**

a. Motor current in amps.
b. Voltage
c. Starting current.

**Power details:**

<table>
<thead>
<tr>
<th>%Load</th>
<th>Cond.EWT</th>
<th>Evap.LWT</th>
<th>KW</th>
<th>KW/Ton</th>
<th>Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
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<tr>
<td>75</td>
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</table>

The above power consumption shall be tested in presence of the Architect and test certificate shall be furnished.

**Condenser**

1. Refrigerant condensing pressure - Kg/cm² (psi)
2. Refrigerant condensing Temp. - °C (°F)
3. Water flow rate - lit/sec. (gpm)
4. Entering water temp. - °C (°F)
5. Leaving water temp. - °C (°F)
6. Pressure drop through condenser - Kg/cm² (psi)

**Chiller**

1. Refrigerant evaporating pressure - Kg/cm² (psi)
2. Refrigerant evaporating Temp. - °C (°F)
3. Water flow rate - lit/sec. (gpm)
4. Entering water temp. - °C (°F)
5. Leaving water temp. - °C (°F)
6. Pressure drop through chiller - Kg/cm² (psi)

**Cooling Tower**

1. Water flow rate - lit/Sec (gpm)
2. Entering water temperature - °C (°F)
3. Leaving water temperature - °C (°F)
4. Outside temperature
   a. DB temperature - °C (°F)
   b. WB temperature - °C (°F)
5. Wet bulb approach

**Air handling units & fan coil units**

1. Air velocy - M/Hr (FPM)
2. Coil face area - M² (SFT)
3. Air quantity - M3/Hr (CFM)
4. Entering air temp DB - 0C (0F)
5. Entering air temp WB - 0C (0F)
6. Leaving air temp DB - 0C (0F)
7. Leaving air temp WB - 0C (0F)
8. Entering water temp - 0C (0F)
9. Leaving water temp - 0C (0F)
10. Entering water pressure - Kg/cm2 (psi)
11. Leaving water pressure - Kg/Cm2 (psi)

**12 Motor**

a. Rated Horse Power - HP
b. Rated Volts - Volts
c. Rated Current - Amps
d. Actual current - Amps
e. Actual Volts - Volts
f. Starting current - Amps

**Pumps**

1. Flow Rate
2. Discharge Pressure - lit/Sec. (gpm)
3. Suction pressure - Kg/Cm2 (psi)

**Motor**

a. Rated HP - HP
b. Rated current - Amps
c. Rated Volts - Volts
d. Actual current - Amps
e. Starting current - Volts

**Electric Motors**

1. Insulation resistance - Meg ohm
2. Starting current - Amperes
3. Full load current - Amperes
4. Line voltage - Volt
5. Power factor - Watt
Supply Air Grilles

1. Area of Grill - M2 (Sfi)
2. Velocity - M/Hr (FPM)
3. Air flow rate - M3 (FPM)
4. Temperature DB - 0C (0F)
5. Temperature WB - 0C (0F)

Filters

1. Total area - M2 (Sft)
2. Effective area - M2 (Sft)
3. Velocity of air - M/Hr (FPM)
4. Quantity of air - M3/Hr (CFM)

Controls, Interlocks, etc.

The observations of the test shall be recorded for each item separately.

I.S. STANDARDS AND SAFETY STANDARDS

BIS. STANDARDS

The air-conditioning plant equipment’s and installation shall confirm generally to latest I.S. Standards as given below/and in accordance with the latest Indian standards in force.

I.S. 277 - Galvanized steel sheets
I.S. 325 - Three phase induction motors
I.S. 655 - Metal air ducts
I.S. 732 - Code of practice for Electrical wiring and fittings
I.S. 778 - Gun metal gate, Globe and check valves for general purposes
I.S. 900 - Code of practice for installation and maintenance of induction motors
I.S. 996 - Single phase small A.C. and Universal motors
I.S. 1239 - Mild steel tubes, tubular and other wrought steel fittings
I.S. 1248 - Direct acting electrical indicating instruments.
I.S. 1554 - PVC insulated (Heavy duty) electric cables for working voltages up to and including 1100 volts.
I.S. 1520 - Horizontal centrifugal pumps and for clear cold, fresh water.
I.S. 1822 - Motor starters of voltage not exceeding 1000 volts.
<table>
<thead>
<tr>
<th>I.S.</th>
<th>Standards</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2208</td>
<td>I.S.</td>
<td>HRC cartridge fuse-links up to 650 volts.</td>
</tr>
<tr>
<td>2372</td>
<td>I.S.</td>
<td>Timber for cooling tower.</td>
</tr>
<tr>
<td>2516</td>
<td>I.S.</td>
<td>A.C. circuit breakers.</td>
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FIRE HYDRANT & ALARM SYSTEM

1.01 INTRODUCTION & SCOPE OF WORK

All the equipments and installation shall conform to specifications as per relevant BIS Codes/other applicable standards.

The installation of Fire Hydrant & Detection systems shall conform to norms as per National Building Code, 2005 – Part IV. The scope of work also includes obtaining initial and final approvals (NOC) for the system from local authorities like State Fire Dept. and liaison works with the departments. The scope also includes obtaining statutory approval for energizing electrical items from electrical inspectorate.

In General the scope of Work includes the following.

In compliance with NBC requirements, a Wet riser- standpipe system is proposed to be installed in Research Block, while for the Hostel block a simple down comer system connected to Terrace pump is proposed. As the building parameters, fire system operation parameters are different for the research & hostel blocks and also considering the separating distance between them, individual fire protection system with separate pumps are proposed for the Research & Hostel blocks.

Fire Protection Provisions for the Research Block

Category of Building : Business( E2 )

Height : 29 Mtrs.

No. of Floors : 3 B + G+ 4 Floors

No. of Hydrant Risers : 2 Nos.

Size of Hydrant Risers : 150mm Dia

1. Pumps and accessories.

2. Internal Standpipe and External Fire Hydrant System

3. Sprinkler System

3. Hand Held Appliances.


The Fire protection provisions for the Research block include the following.
1. Hydrant system covering the entire building and Yard consisting of the following

a) Electric Motor Driven Main Pump-2280 Lpm at 75m head.

b) Diesel Engine Driven Stand by Pump-2280 Lpm at 75m head.

c) Electric Motor Driven Jockey Pump-180Lpm at 75 m head.

d) Electric Motor Driven Sprinkler Pump-2280 Lpm at 75m head

e) Suitable electrical panel and instrumentation for automatic operation of pumps as Detailed in technical specification.

f) Cabling from Control panel to electric main pump, Jockey pump, Battery charger of diesel engine. The scope also includes supply of cables, starters, isolators and earthing for all pumps.

g) External hydrant system consisting of Underground pipelines, Isolation Valves in Manholes, for Isolation& segmentation of yard hydrant mains, Yard Hydrants, Fire Brigade Inlet Breeching Points, MS hose boxes containing RRL hoses (15 MTR Each),1 no: Gun Metal Branch Pipe.

h) Internal hydrant system inside the building consisting of 2 Individual Hydrant Riser. Each Hydrant riser shall have the following provisions, all connected to the Fire pumps –

GI pipes of suitable diameter as detailed in BOQ and drawings, Landing valves in each floor accompanied by 1 number of swinging Hose reel, 2 numbers of RRL hose & Branch pipe in hose box.

i) Sprinkler system inside the building consisting of Sprinkler alarm valves, Butterfly Valve for Zonal isolation, one on each floor, Sprinkler flow switch connected to Fire Aalarm, overhead pipelines, Sprinklers, etc.

j) Portable Extinguishers (Hand appliances) as specified in schedule of quantities.

k) Automatic fire detection and alarm system consisting of smoke and heat detectors, multi-sensor detectors, Manual call points, Hooters, Central Fire Alarm panel and control cabling.

l) Preparation of drawings and liaison works for obtaining statutory approvals from local fire authority, Approval from electrical inspectorate for the fire hydrant and detection system in the building.

Fire Protection Provision in Hostel Building
Category of Building : Residential (A3)
Height : 25 Mtrs.
No. of Floors : G+ 7Floors
No. of Hydrant Risers : 1 No.
Size of Hydrant Risers : 100mm Dia

1. Terrace Pumps and accessories.
2. Internal Downcomer System
3. Hand Held Appliances.
4. Manually Operated Electric Fire alarm system (MCP).

Fire protection provisions for Hostel block include the following.
1. Hydrant system covering the entire building consisting of the following
   a) Electric Motor Driven Terrace Pump-900Lpm at 35m head.
   e) Suitable electrical Fire Pump Panel and instrumentation for automatic operation of the terrace pumps as Detailed in technical specification.
   f) Cabling from Fire Pump Control panel to the Terrace pump. The scope also includes supply of cables, starter, isolator and earthing for the pump.
   g) External Underground pipelines, connecting the Fire Brigade Inlet Breeching Point, with the Internal downcomer pipe.
   h) Internal downcomer hydrant system inside the building consisting of a Hydrant Riser the following provisions, all connected to the Terrace pumps –

   GI pipes of 100mm diameter as detailed in SOQ and drawings, single headed Landing valves in each floor accompanied by 1 number of swinging Hose reel, 2 numbers of RRL hose & Branch pipe in hose box.
   i) Portable Extinguishers (Hand appliances) as specified in schedule of quantities.
   j) Manually Operated Electric Fire alarm system consisting of Manual call points, Hooters, Conventional Fire Alarm panel and control cabling.
l) Preparation of drawings and liaison works for obtaining statutory approvals from local fire authority, Approval from electrical inspectorate for the Fire Pumps control panel & associated electrical installations and Electrical detection system in the building.

Site Accessibility

In the Research Block, the Fire Pumps are to be installed in Fire pump area located in the basement utility area.

The equipment must be unloaded & transferred at site in an extremely careful manner to prevent damage to the equipment / building or existing services.

1.02 FIRE HYDRANT SYSTEM

1. STANDARDS

The manufacture, identification of material and testing of equipment covered in this specification shall comply with the latest editions as on date of opening of tenders of the appropriate standards of the following. Unless otherwise specified, Indian Standards are to be followed. All the appliances and accessories shall carry IS or acceptable International certification wherever applicable (viz UL/FM/Vds) which are specific to Fire Protection service and shall be of approved make.

Specifications to be followed

CPWD, General SpecificationsForElectrical WorksPart • V
(Wet Riser & Sprinkler Systems), 2006.

CPWDDGeneral SpecificationsForElectrical WorksPart-Vi-Fire Alarm System1988

IS: 1239 GI, ERW pipes, with fittings.

IS: 3589 Mild steel, black ERW pipes 200 mm dia, and above, with fittings.

IS 4984 HDPE pipes

IS 4985 PVC pipes

IS: 10221 Code of practice for coating and wrapping of underground mild steel pipelines

IS: 823 Welding procedure

IS: 2062 Steel for General Structural Purposes

IS: 780 Cast iron sluice valve
IS: 903 Nozzle, Branch pipe, Female and Male couplings (Gun metal)
IS: 5290 Fire hydrant valve, gunmetal with cap & GI chain.
IS: 908 Fire hydrants
IS: 8423 Water shield controlled percolation hose.
IS: 325 Induction motors
IS: 900 Installation of motors
IS: 13947 SDFUs
IS: 1554 PVCAPVC Al. power/control cables
IS: 1652 Batteries
IS: 694 PVC insulated cables (light duty) for working voltage upto 1100 volts.
IS: 1554 PVC insulated cables (heavy duty) for voltage upto 1100 volts.
IS: 5959 Specification for polyethylene insulated PVC sheathed heavy-duty electric cables, voltage not exceeding 1100 V
IS: 5578 Guide for marking of insulated conductors
IS: 1255 Code of practice for installation and maintenance of power cables.
IS: 5216 Guide for safety procedures and practices in electrical work.
IS: 15105 Design & Installation of Fixed Automatic Sprinkler Fire Extinguishing system – Code of Practice.

1. GI Pipes

GI pipes shall be of standard IS 1239, heavy-duty type (Class C), electric resistance welded.
For pipes 200 mm dia. and above IS 3589 Class ‘2’ shall be applicable.

2. Exposed/Above ground (AG) pipes

Exposed/Above ground (AG) pipelines and fittings shall be coated with two coats of oil primer and two coats of enamel paint as per IS approved color code. The surfaces shall be properly cleaned before applying the primer. AG pipes shall be supported at regular intervals on masonry, RCC, truss, beams, roofs, trenches, structural supports, etc. Air...
release valves shall be provided on long horizontal sections of the hydrant lines at locations susceptible to air locks. The spacing of supports shall be as shown below:

Pipe dia. in mm

80, 100 and 125 mm : 3.5 m
150, 200 and 250 mm : 5.0 m
Above 250 mm : 7.0 m

3. Under ground (UG) pipes

Underground pipes shall be GI type, and to be laid such that the top of the pipe is not less than 1 m below the ground level. Pipes shall be supported by PCC thrust blocks (1:2:4) of size 250 mm x 250 mm x 200 mm at each change in direction. Bends shall also be supported at both sides. Mains shall not be laid under buildings. Care shall be taken to maintain the weld seams of ERW pipes in the upper segment of pipes. Adjacent pipe shall be so positioned so that there is a 30 Degree angular separation of weld seams of pipes running adjacent to each other.

4. Fittings

Fittings installed underground shall be of GI conforming to IS-1239 (Part-II) or IS 3589 as applicable. All fittings shall be of Heavy Type, able to withstand at least a pressure of 150 % of the maximum working pressure. Contractor shall take permission from Architect on use of fabricated fittings on a case to case basis. Fabricated fitting according to the laid down welding procedure may be permitted. Welded parts shall be suitably coated after welding as per the requirement of the areas. Welded joints are not permitted for fittings of less than 50 mm dia.

5. Flanges

The flanges shall be of heavy-duty type manufactured from material as per standards mentioned having flat face as per requirement and its dimensions shall also satisfy appropriate standards. All bolt holes in flanges shall be drilled. The drilling of each flange shall be in accordance with relevant Indian Standards. The gaskets used in all flange joints shall be of standard size and are to be approved, verified and checked before use. Fixing of gasket is to be as per standard procedures so as to ensure efficient and quality type joints. The flange faces shall be true and perpendicular to the axis of the pipes, the Contractor shall ensure that the joints shall be drawn up in order to provide
even and adequate uniform pressure on gaskets. All flanges shall be installed such that
the bolt holes straddle the normal centerlines.

6. Anti-corrosive treatment for UG pipes

Pipe surface shall be thoroughly cleaned and dried before the primer is applied and shall be
free of dirt, grease, oil, rust, scale or other foreign material.

It shall be coated with two coats of asphaltic primer and the primer shall be allowed to dry
until the solvent evaporates and the surface becomes tacky. Then the pipes are wound
with polymeric anticorrosive tape of approved make to a thickness of 2 mm. The Tape
shall be wound around the pipes in a Helical pattern, and the overlap is maintained at a
minimum of 15 mm OR as per manufacturer’s recommendations. The material
shall conform to IS 10221.

7. Welding procedure

The welding procedure shall only be carried out by fully trained and experienced welders and
shall conform to IS-823. RGCB reserves the right to set the correct welding procedure, if
not satisfied. The welding electrode shall be of reputed make, and shall have suitable
coating complying with relevant Indian Standards.

8. Air cushion tank

The air cushion tank shall be of 250 mm dia. and 1200 mm height fabricated out of minimum
8 mm MS sheet or suitable heavy class pipe segment and with dished/flat ends. shall be
complete with 20 mm dia. air release valve, pressure relief valve, pressure gauge and
associated piping work, etc. It shall be constructed with air outlet at the top.

Irrespective of the thickness of plate specified herein, the contractor shall verify the design of
the air cushion tank & shall provide supporting calculations that validate the selection of
plate thickness both for the vessel shell & ends. Drain valves of gunmetal. shall be
provided at the lowest points of the piping work to enable draining of water from the
system. The drain valves assembly shall include nipple and PVC rubber hose, to the
nearest drain point.

9. Diesel tank

Diesel tank shall be fabricated out of MS sheet of thickness minimum 4 mm. It shall be
provided with inlet, outlet, open / close valves, clear level indicators, drain pipes, MS ½
fuel lines (supply & return) to the diesel engine, etc. The same shall be installed at a
suitable height in the pump house with necessary supports. The diesel tank shall be of adequate size to comfortably hold fuel required for 8 Hrs. peak load operation of the Diesel engine driven pump.

10. Butterfly Valve (BV)

It shall be of Cast Iron Body, Nitrile seat, SG iron Disc for water purpose and Wafer type. Pressure class shall be of PN 1.6 and tested to 15 kg/Sq.cm pressure. The valve shall be hand lever operated, for sizes up to 150mm. For sizes 200 & above, they shall be operated by a Hand wheel fixed through a bevel gear mechanism.

12. Non-Return Valve (NRV)

It shall be of Dual Plate NRV to ANSI B 16.4/ API 594 standards. Pressure class shall be of PN 1.6, suitable for water and Wafer type.

13. Ball Valve

The valves shall be of full bore. The body and ball shall be of copper alloy and stem seat shall be of Teflon. Pressure class shall be of PN 10. End connection shall be of screwed type.

14. Pressure gauges

It shall be of dial type with Bourden tube element of SS 316. The dial size shall be 150 mmdia. and scale division shall be in metric unit marked in black on white dial. It shall be comprised with snubber, isolation coke, nipples, tail, connecting pipes, etc.

15. Pressure switches

It shall be of industrial type, single pole, double throw electric pressure switching designed for starting or stopping equipment within the pressure of the system drops or exceeds the pre-set limits. All switches shall have ¼” BSP (F) inlet connection and screwed cable entry for fixing cable gland.

16. Hydrant valves

The external/internal fire hydrant valves shall be of oblique type single headed of 63 mm dia. conforming to IS-5290 suitable for Flanged connection to 80 mm pipe. The hydrant shall be complete with hydrant valve, orifice plate, other fittings, etc. The hydrant couplings shall be flanged gunmetal with instantaneous female spring lock of 63 mm dia. and
valves shall be of screw down type. Orifice plates of suitable design shall be provided for hydrants where pressure exceeds 7 Kg per Sq. cm.

17. Hose reel

The hose reel shall consist of 30 m long 20 mm dia. Thermo plastic(fabric Reinforced) hose mounted on heavy duty circular MS drum complete with gun-metal shut-off valve, nozzle, etc. The hose reel bracket shall be of MS fabricated or cast iron swing type suitable for 90deg. smooth and free rotation in vertical plane conforming to IS-884.

18. Hose boxes

The fire hose boxes shall be of size 750x250x600 mm, 16 SWG sheet steel with front side glass of 4 mm thick, lockable hinged door and painted with one coat of primer and two coats of synthetic enamel paint of approved colour.

19. Couplings

All couplings shall be of the instantaneous spring-lock type and the nozzles shall be of not more than 16 mm dia. All couplings in the branch pipes and nozzles shall be of gunmetal and shall comply with IS-903. The hose shall be attached to the coupling. Spare hoses and nozzles to the extent of 10 % of the total requirements shall be supplied by the contractor as per BOQ.

21. Fire brigade inlets

The fire brigade collective breaching shall be with 150 mm flange outlet connection with gunmetal collecting head having 4 instantaneous connections with built-in check valves. The fire brigade breaching Inlet shall be connected to the main header.

22. Delivery Hose

Delivery Hose for fire fighting, 100% synthetic hose 63 mm dia 15 m long confirming to IS636 1988 (Type A), circular woven jacketed rubber lined Hose, with instantaneous male and female gun metal coupling and copper wire binding. Both hose and coupling shall confirm to relevant Indian Standards and shall have ISI marking. Also have burst pressure 35 Kg/cm2 and working pressure of 14 kg/cm2.
INSPECTION AND TESTING

CPWD, General Specifications For Electrical Works Part • V (Wet Riser & Sprinkler Systems), 2006., shall be adhered to for the Inspection & testing of the hydrant system.

(Hydrant System)

1. Inspection – General

All site fabricated work/material shall be subject to inspection in cleaned condition, prior to erection. At no event, site fabricated work/material shall be installed in position without inspection and approval by Architect. The Contractor shall ensure that each stage of fabrication is carried out in compliance with the procedures specified in the IS/NBC standards as applicable and/or specified in this document.

The contractor shall conduct sample tests of all the materials supplied at reputed laboratories/agencies as directed by RGCB/Architect at his own cost and test reports are to be submitted. Inspecting officials of RGCB/Architect and Local Authorities shall have the right to access the premises of the work at any time with or without giving prior notice. All the formalities or procedures for conducting the inspections by the authorities as required by them shall be arranged by the contractor free of cost.

All testing shall be carried out in the presence of RGCB/Architect in Charge/statutory authorities and test registers shall be maintained by the contractor. The contractor shall provide all material, tools, equipment, instruments, services and personnel required to perform the tests and remove debris/water resulting from cleaning and after testing free of cost.

The original test certificates of all tests conducted are to be forwarded to RGCB/Architect. After conducting the tests, any defects found on materials, equipment, piping, etc. shall be got rectified/repaired by the Contractor without any extracost.

2. Testing

Before energizing electrically operated equipment, care shall be taken to meet the localelectrical rules and regulations, earthing of the body, verifying availability of safe insulation resistance value, etc. Also confirm the motor enclosure to the level of protection required for the particular application.
a. Pumps

The pumps shall be tested according to the standard recommendations of CPWD specification. The following parameters are to be recorded and plotted and submitted to the Architect.

i. Discharge Q

ii. Pressure P or Head H

iii. Motor voltage and current.

iv. Efficiency

The maximum current drawn by the pump motors/ input power needs to be recorded and crosschecked with manufacturer’s data. Any abnormalities, if noted, shall be brought to the notice of the manufacturer and necessary corrective action be taken before commissioning and handing over, without any extra cost.

Manufacturers test certificates shall also be submitted to RGCB for verification.

b. Piping

All piping shall be tested by first removing foreign materials, filling water, removing air locks, etc. and applying pressure at 1.5 times of the maximum working pressure and see that the pressure drop is within 0.25 Kg per Sq. cm over a period of 2 hours. After completion of the installation and connecting to the mains of pumping system the installation shall once again be tested and breakage if any shall be rectified or defective material if any, replaced, free of cost.

At least 10% of the total weld joints on pipes shall be tested by radiography as per TAC requirement. Holiday tests may preferably be carried out by flexible and detachable ringprobe, which shall enable the entire 360 deg. of the surface of the pipe to be scanned.

c. Electrical system

The following tests are required:-

i) Earth resistance

ii) Cable Insulation
Resistance of metal conduits/sheaths (Earth continuity test) Insulation of the cables shall be not less than one mega ohm when tested with a 500 volt megger for any particular section of the wiring.

In case of cables encased in metal conduit or metallic sheathing, the total resistance of the conduit or sheathing from the earthing point to any other position in the completed installation shall not exceed 2 Mega Ohms.

d. Hydrant system

The entire hydrant system shall be tested in the presence of Architect to ascertain the functioning of each system, equipment, etc. The contractor shall hand over the system only if it is proved that the system performs as per the specifications.

3. Operation of pumps

All the pumps shall be operable both in both auto/manual modes, and shall have automatic starting arrangements so as to maintain the system pressure. However auto stop feature shall be provided for Jockey pump only. All main pump shall have only manual stopping facility. Jockey pump shall not be in operation while the main pump is in operation.

Under normal conditions, the water pressure in the hydrant lines is 7.5 kg/sq.cm, and the auto/manual switch shall be in the auto mode. When the pressure drop to 7 kg/sq.cm, as recorded on pressure gauge fixed on the pump discharge header, the jockey pump shall start automatically through pressure switch arrangements and when pressure is restored to 8 kg/sq.cm the pump shall stop automatically.

In case, pressure drops below 6.5 Kg/cm², the main fire pump shall be triggered. In the event of electrical or mechanical failure of main fire pump, the diesel engine driven pump shall start operation automatically. Suitable interlocking of pumps shall be provided to prevent simultaneous starting of pumps.

The control panel shall have status selection for each of the pumps for “automatic” as well as “manual” operation. Pumps when under “manual” status shall be operated manually through relevant pushbuttons. The fire pumps once started shall not be stopped automatically.

Over load or under voltage/no volt trip devices for electric fire pump shall not be provided in the starter. LED type indication lamps to indicate the availability of power shall be provided.
The contractor shall carry out necessary arrangements for supply and installation of items required like timer switches, sensors, cables, etc. and control wiring between pressureswitches and panels to operate the pumps as described above. The cost for the same shall be included in the total contract value.

1.03 SPRINKLER SYSTEM

CPWD Technical specification for AUTOMATIC SPRINKLER SYSTEM – chapter 9, shall be followed for Design, selection of components, Installation testing & commissioning of sprinkler system.

1. Sprinklers

Sprinklers shall be of ‘Conventional Pendent’ type with size 15 mm dia. Where sprinklers are necessary to be installed above false ceiling they shall be of the Upright type. Upright sprinklers shall be supplied & installed at no additional cost, than that mentioned for Pendant sprinklers in the SOQ.

Sprinklers shall have temperature rating for 68 deg. C with Red colour code. It shall be of Quartzoid Bulb suitable for installation indoor as well as outdoor and shall have a coverage of 12 Sq.m per sprinkler.

2. Orifice Plates

Orifice plates shall be of brass or SS with a plain central hole without burrs, and of a thickness complying as given below:

<table>
<thead>
<tr>
<th>Pipe nominal bore (mm)</th>
<th>Orifice place thickness mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 80</td>
<td>3</td>
</tr>
<tr>
<td>80 to 150</td>
<td>6</td>
</tr>
<tr>
<td>150 to 200</td>
<td>9</td>
</tr>
</tbody>
</table>

Should have identification tag, projecting beyond any flanges between which it is clamped the nominal pipe diameter and the orifice ‘K” factor. The orifice plate shall be fitted not less than two pipes internal diameters downstream of the outlet from any elbow or bend.
3. Alarm valve

Alarm valves shall be fitted on the main supply pipe immediately above the main control valve leading to the sprinkler installations. The alarm valve shall have the following accessories:

a. Main Stop Valve - 1 No. shall be fitted immediately downstream of the alarm valve and shall be at fire brigade access level.

b. Test Valve - 1 No. shall be provided to test the hydraulic alarm or any electric alarm pressure switch if provided by drawing water from the downstream side of a wet alarm valve. It shall be installed closest to the alarm valve.

c. Drain valve - 1 No. shall be fitted to allow drainage from immediately downstream of the alarm valve.

d. Water motor alarm - 1 No. shall be fitted as close as possible to the alarm valve. It shall be installed with its gong on the outside of an exterior wall.

1.04 Automatic Fire Detection and Alarm System

1 STANDARDS

The manufacture, identification of material and testing of equipment covered in this specification shall comply with the latest editions as on date of opening of tenders of the appropriate standards of the following. Unless otherwise specified, Indian Standards are preferred. All the appliances and accessories shall carry IS or International certification and shall be of approved make.

Applicable standards

NFPA 72E : Standards on automatic fire detection.

IS:2189 : Code of practice for selection, installation and maintenance of automatic fire detection and alarm system.

IS: 823 : Welding procedure

IS: 1652 : Batteries

IS: 694 : PVC insulated cables (light duty) for working voltage upto 1100 volts.

IS: 1554 : PVC insulated cables (heavy duty) for voltage upto 1100 volts.

IS: 5959 : Specification for polyethylene insulated PVC sheathed heavy duty electric cables, voltage not exceeding 1100 V
Unless otherwise mentioned, all applicable codes and standards shall be of the latest editions as published by the Indian Standards and all other such as may be published by them during the tenure of the contract, and shall govern in respect of workmanship, properties of materials, installation and methods of testing. In case where suitable Indian Standards are not available, generally accepted codes and practices as approved by Architect.

Automatic fire detection and alarm system consists of fire control panel, detectors, manual call points, hooters, isolators, response indicators, etc. The equipment and cables of the system shall be independent of any other system in the premises and shall not be shared with any other system. The fire detection and alarm system shall be installed as per NFPA 72E / IS-2189 code.

A. Research Block

Analogue addressable Fire Alarm system

2. Detectors

The fire detectors shall be of analogue addressable type to detect one or more characteristic of fire like smoke, heat or flame. It shall be sleek, suitable communication technique with noise immunity, built-in functional test switch, microprocessor based technology, mechanically integrated photoelectric and ionization shared volume smoke chamber, etc. All types of detectors shall be of both electronically and manually programmable type using dip switches or handheld programmer or from fire control panel.

Reversed polarity or faulty zone wiring shall not damage the detector. The detector shall have no moving parts of components subject to wear. It shall be possible to test the detector in the field. The response of a detector shall always be clearly visible from outside by a flashing light on the base. The detector shall connect to the control unit via a fully supervised two-wire circuit. A built barrier shall prevent entry of insects into the sensor. The detector shall be designed for fast and simple cleaning.

All electronic circuits must be solid-state devices and virtually hermetically sealed to prevent their operation from being impaired by dust dirt or humidity. All circuitry must be
protected against usual electrical transients and electromagnetic interference. All radioactive parts of the source, if any, shall be fully gold plated. The detector shall be inserted into or removed from the base by a simple push-twist mechanism to facilitate easy exchange for cleaning and maintenance.

The smoke & heat detectors shall fit into a common type standard base. The standard base shall be supplied with a seal plate, preventing dirt, dust, condensation or water reaching the wire terminals or the detector points. Detectors shall be provided with a MSbox for entry and termination of armoured cable and to protect detectors terminals. At the time of installation and prior to commissioning, every detector shall be allotted an identification number. All detectors shall have LED blink when it is addressed. Detectors shall not be either partially or totally recessed in ceiling or wall. Detectors shall be suitably protected where they are liable to be subjected to mechanical damage. Detectors should not be painted or coated or covered in any manner after installation, as this will adversely affect the sensitive of operation.

Smoke detectors

It shall be of optical type. Smoke detectors shall quickly respond to smoke containing small particles.

Multisensor detectors

It shall be of optical-cum-thermal type. Each Multisensor Detectors use inbuilt logical programs to accurately identify a fire. They shall respond to smoke containing small particles normally produced and also heat likely to be generated and should adjust sensitivity without needing operator intervention.

Heat detectors

It shall be of fixed - cum rate of rise temperature type. Heat detectors shall be suitable for use in situation where sufficient heat is likely to be generated and Damage caused by heat generated is more.

2. Loop powered Hooters

The hooters shall be so arranged that when any alarm operates all the hooters throughout the premises shall be activated. The hooters at the fire alarm shall be electronic type having frequency of suitable frequency range. The hooters shall be capable to produce a sound
output of 90 db at 1 m. Hooters shall be of loop powered and no separate power is provided.

‘Fault’ alarm and ‘Fire’ alarm in a panel sounder shall be distinctly different. Fire alarm sounders shall not be used for any purpose other than for fire operations. When installed flush with a false ceiling these shall match the ceiling surface. Necessary provisions such as wooden boxing or framework, if required, to accommodate the sounders shall be made in the ceiling in advance.

These shall be installed at a height not lower than 2.4 m, except when recessed in a false ceiling of lower height. In such cases the sounders shall be recessed at false ceiling level.

The panel sounders in the respective panels shall be actuated automatically as soon as fire alarm signal is initiated from any trigger device connected to them. These shall also be sounded when there is a fault alarm signal within their areas of control. The sounds shall be continuous and of the same characteristics from all fire alarm sounders in a building.

4. Loop Isolators

Loop isolators shall be designed to protect one area or a number of devices, which are consecutively wired in a loop. Its function is to isolate a section of the loop if a problem develops within that section, allowing the remainder of devices connected on the loop to function correctly. Loop isolators shall be provided after every 20-30 devices in each loop.

5. Manual Call Points (MCPs)

It shall be of Break- Glass Type, with fire resistant back box for surface mounting. The MCPs shall be recess mounted suitable to support the intelligent addressable panel. It shall form an integral part of the fire detector system. The housing shall be dust/verminproof properly sealed. The unit must be painted fire red outside and white inside and written “In case Of fire Break Glass”.

Installation requirements: -

Manual call points shall be located at exit space and shall be installed at a height of 1.4 m above the floor at an easily accessible position. They shall be installed at easily accessible, well-illuminated positions, preferably in a contrasting background so that they are easily noticeable from either direction. They may be semi-recessed so as to project by 10mm. They shall be installed free from obstructions.
6. Fire Alarm Panel

The fire alarm control panel shall be of microprocessor controlled and of modular hardware design of intelligent addressable type. It shall be housed in a steel enclosure. It shall also be finished with hard wear textured epoxy paint / powder coated. Cable entries shall be provided on the top and bottom of the panel.

The system capacity shall be based on the number of devices and control modules. Each device in the system shall be identified by its unique address position on the two-wire loop. The panel retains command over the alarm process, LED indicators, automatic test feature and loop hooters. The panel shall be of software programmable.

The panel shall be capable of:-

a. Programmable at site.
b. Automatic system test activation
c. Detector sensitivity adjustments
d. Alarm verification
e. Alpha/numerical display
f. Relay control module
g. Maintenance alert facilities

The manufacturer of fire control panel, detectors and other detection devices shall have own or authorized service centre in India with spares for carrying out maintenance service during the guarantee and maintenance periods. The tenderer shall submit a brief write-up of the service centre facilities available in India along with the tender.

B. Hostel Block

Conventional Fire Alarm system

1. Conventional Hooters

The hooters shall be so arranged that when any alarm operates all the hooters throughout the premises shall be activated. The hooters at the fire alarm shall be electronic type having frequency of suitable frequency range. The hooters shall be capable to produce a sound output of 90 db at 1 m. Hooters shall be of loop powered and no separate power is provided.
Necessary provisions such as wooden boxing or frame work, if required, to accommodate the sounders shall be made in the ceiling in advance.

These shall be installed at a height not lower than 2.4 m, except when recessed in a false ceiling of lower height. In such cases the sounders shall be recessed at false ceiling level.

The panel sounders in the respective panels shall be actuated automatically as soon as fire alarm signal is initiated from any trigger device connected to them. These shall also be sounded when there is a fault alarm signal within their areas of control. The sound shall be continuous and of the same characteristics from all fire alarm sounders in a building.

2. Conventional Manual Call Points (MCPs)

It shall be of Break- Glass Type, with fire resistant back box for surface mounting. The MCPs shall be recess mounted. The housing shall be dust/verminproof properly sealed. The unit must be painted fire red outside and white inside and written “In case Of fire Break Glass”.

Installation requirements: -

Manual call points shall be located at exit space and shall be installed at a height of 1.4 m above the floor at an easily accessible position. They shall be installed at easily accessible, well-illuminated positions, preferably in a contrasting background so that they are easily noticeable from either direction. They may be semi-recessed so as to project by 10mm. They shall be installed free from obstructions.

3. Fire Alarm Panel

The Conventional fire alarm control panel shall be a 8 Zone type, microprocessor controlled. It shall be housed in a steel enclosure. It shall also be finished with hard wear textured epoxy paint/ powder coated. Cable entries shall be provided on the top and bottom of the panel.

The panel shall be capable of:-

   - Alarm verification
   - LED display, of Zones in alarm
   - Maintenance alert facilities
The manufacturer of fire control panel, MCP & Hooters shall have own or authorized service centre in India with spares for carrying out maintenance service during the guarantee and maintenance periods. The tenderer shall submit a brief write-up of the service centre facilities available in India along with the tender.

4. Power Supply of Panel

The power supply to drive the system shall be from either the main electrical supply single phase supply or the standby power supply. The standby power supply shall be derived from exclusive SMF back-up batteries of reputed make. Standby power supply shall be capable of maintaining the system in normal operation for a period of not less than 24 hours after the failure of normal main supply.

5. Control Cable

The control cable for wiring fire alarm system shall be of 650 Volt grade. Cables shall be laid as per relevant installation standards. The sizes of these cables are specified in schedule of requirements. It shall be of FRLS armoured copper cable. Conduits for cables shall be provided as required.

6. Cable Glands

Cable glands shall be of heavy-duty single compression type of brass, chrome plated. These shall have a screwed nipple with conduit electrical thread and check nut. These shall be suitable for armoured/un armored cables, which is being used.

7. Cable Connectors

Cable connectors, lugs/sockets, shall be of copper/aluminium alloy, suitably tinned, solderless, crimping type. These shall be suitable for the cable being connected and type of function (such as power, control or connection to instruments, etc.)

INSPECTION AND TESTING

(Fire detection and alarm system)

1. INSPECTION

All materials shall be offered for inspection in cleaned condition, prior to erection. At no event, site fabricated work/material shall be installed in position without inspection and approval by Architect. The Contractor shall ensure that each stage of fabrication is carried
out in compliance with the procedures specified in the IS standards as applicable and/or specified in this document.

The contractor shall conduct sample tests of all the materials supplied at reputed laboratories/agencies as directed by Architect at his own cost and test reports are to be submitted. Inspecting officials of RGCB / Architect, Local Authority shall have the right to access the premises of the work at any time with or without giving prior notice. All the formalities or procedures for conducting the inspections by the authorities as required by them shall be arranged by the contractor free of cost. All testing shall be carried out in the presence of Architect.

The contractor shall provide all material, tools, equipment, instruments, services and personnel required to perform the tests and remove debris resulting from cleaning and after testing free of cost. The original test certificates of all tests conducted are to be forwarded to the Architect. After conducting the tests, any defects found on materials, equipment, piping, etc. shall be got rectified/repaired / replaced by the Contractor without any extra cost.

2. TESTING

1. Fire Detection and Alarm System

The entire fire detection and alarm system shall be tested for continuity and performance as per IS-2189 code. After installation, the visual inspection of all the detectors shall be made to make sure that they are properly installed. Each detector shall be inspected to ensure that it is properly mounted and connected. Heat detectors shall be tested to initiate an alarm by a heat source such as hair drier or a shielded heat lamp. After each heat test, the detectors shall be reset. Smoke detectors shall be tested to initiate an alarm at its installed location with smoke or other aerosol. All detectors found to have the sensibility outside the approved range shall not be used.

Detectors, control and indicating panels, sounders shall be tested at the manufacturer’s factory and test certificate be furnished with the supply. Type test certificate to prove conformity to the relevant contract specifications shall be furnished with the supply, from recognised testing institutions or Govt. test bodies in India or abroad.

Following tests shall be conducted in the presence of Architect and the test certificate shall be furnished with the record of tests.
2. Continuity test

Test for insulation resistance of the wiring work and the control and indicating panels.

3. Test for system operation.

Tests for detectors shall be conducted using a test fire at normal floor level. The system operation for fault conditions shall be conducted by introducing faults such as open circuit, short circuit, removal of detector, open/short circuit in a sounder circuit etc.

Approval from statutory authorities

It is responsibility of the contractor to get initial and final approvals / NOC for, fire hydrant and detection system, from the concerned department. The contractor shall also do all the liaison works with the department for getting the approvals/ NOC. All expenses, incidental or otherwise in connection with the above shall be borne by the contractor with no extra cost to the RGCB. For all approvals / NOC, statutory fees shall be paid by the contractor initially; however, it shall be reimbursed on submission of documentary evidences.

All testing/calibration, etc. are to be carried out as per the requirements of statutory authorities at no extra cost to RGCB. The tests/calibration certificates shall be submitted.
List of Approved Makes/Brands

The contractor shall quote his rates on the basis of the price of best quality product of the brand/make. In case any particular brand of item is not acceptable to the client, the contractor shall supply items of other approved brands without extra cost.

A. CIVIL WORKS

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th>MAKES/BRANDS NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil Works</td>
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<tr>
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<td>Latecrete/ St.Gobain/ Bal</td>
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<tr>
<td>Vitrified Tiles</td>
<td>Asian/Nitco/ Johnson/ Kajaria/ Euro</td>
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<tr>
<td>Ceramic Floor Tiles</td>
<td>Kajaria/ Somany/Johnson</td>
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<tr>
<td>Ceramic Wall Tiles</td>
<td>H &amp; R Johnson/Somany/ Kajaria</td>
</tr>
<tr>
<td>Colour pigmented precast Pavement tiles</td>
<td>Ultra/ Eurocon/ Scorpio</td>
</tr>
<tr>
<td>Exterior Emulsion paint</td>
<td>Asian/ICI/Nerolac/ Berger</td>
</tr>
<tr>
<td>Interior Plastic emulsion</td>
<td>Berger /ICI/ Asian/ Nerolac</td>
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<tr>
<td>Wall putty</td>
<td>Wipco/ Birla/ Altec</td>
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<tr>
<td>Distemper</td>
<td>Nerolac/ J&amp;N/ Asian Paints/ Shalimar/ Berger</td>
</tr>
<tr>
<td>Cement paint</td>
<td>Surfacer/Snowcem./Nerocem</td>
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<tr>
<td>Plywood</td>
<td>Western India Plywood/ Anchor/ Kitply/ Marrino</td>
</tr>
<tr>
<td>Hardware</td>
<td>Everite/ Garnish/ ECE/ Yenbee/ D-Line/ Hettich/ Haffle</td>
</tr>
<tr>
<td>Aluminium Extrusion</td>
<td>Indal/ Hindalco/ Jindal</td>
</tr>
<tr>
<td>Patch fittings/handles/Door locks &amp; Door Closers</td>
<td>Dorma/Ozone/Godrej/D-Line</td>
</tr>
<tr>
<td>Aluminium Powder coating</td>
<td>Hindalco/Jindal/IndalMetacoats</td>
</tr>
<tr>
<td>Aluminium fabrication/Glazing</td>
<td>DM Wall Co /GEFAB / Domal/Sherbrooke/ SP Fabricators/Shoba glazing</td>
</tr>
<tr>
<td>Aluminium Composite Panel</td>
<td>Reynobond/Alucobond/Allupoli</td>
</tr>
<tr>
<td>EPM/Silicon Gasket Rubber</td>
<td>Bohra Rubber/ Elastomer/AnandReddiflex Osatca</td>
</tr>
<tr>
<td>Anchor fasteners</td>
<td>Hilti India Pvt. Ltd./ Fischer</td>
</tr>
<tr>
<td>Glass Wool</td>
<td>U.P.T/wigaFibre Glass/ Rockwool/ Lloyds Insulation</td>
</tr>
<tr>
<td>Laminate</td>
<td>Decolam/ Formica/Greenlam, Green ply/Anchor</td>
</tr>
<tr>
<td>Material</td>
<td>Brands</td>
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<td>-------------------------------------------------</td>
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<tr>
<td>False Ceiling</td>
<td>Armstrong/AMF/Comceil</td>
</tr>
<tr>
<td>Waterproofing materials/Tile Adhesive</td>
<td>Fosroc/STP/BAL/IWL/EnduraArdech</td>
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<tr>
<td></td>
<td>Zypex/BASF/Cerachem</td>
</tr>
<tr>
<td>Glass (all types)</td>
<td>Saint Gobain &amp; Asahi/Glaverbal</td>
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<tr>
<td>Hardware</td>
<td>Godrej/Everite/Ganish/Dorma</td>
</tr>
<tr>
<td>Steel windows</td>
<td>“Agnew”/Saktimet</td>
</tr>
<tr>
<td>Press Metal Doors</td>
<td>“Sakthi Met”, Godrej</td>
</tr>
<tr>
<td>Stainless Steel Handrail</td>
<td>KICCH/JAKOB/Inox Line/JNB</td>
</tr>
<tr>
<td>Cement</td>
<td>Malabar/Indian Cement /Ultratech/Ambuja/ACC/RAMCO</td>
</tr>
<tr>
<td>Roof tiles &amp; Red Clay tiles (walls)</td>
<td>Comtrust/KAP India/Clay Craft</td>
</tr>
<tr>
<td>Reinforcing Steel</td>
<td>TATA/SAIL/Vizag</td>
</tr>
<tr>
<td>Ceiling tiles</td>
<td>Armstrong/Hilux/Gypsum India</td>
</tr>
<tr>
<td>Gypsum/Calcium Silicate Ceiling</td>
<td>Gypboard/Hilux</td>
</tr>
<tr>
<td>Secondary Fibre reinforcement</td>
<td>Recron of Reliance/Saint Gobain</td>
</tr>
<tr>
<td>Expansion joint</td>
<td>Supreme industries/Sika/BASF</td>
</tr>
</tbody>
</table>
## B PLUMBING WORKS

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<tr>
<th>MATERIALS</th>
<th>MAKES/BRANDS NAME</th>
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</thead>
<tbody>
<tr>
<td>UPVC Pipe Pasted Pipe (IS: 4985)</td>
<td>Supreme, Finolex, Astral.</td>
</tr>
<tr>
<td>UPVC Pipe (IS: 13592)</td>
<td>Supreme, Finolex, Astral.</td>
</tr>
<tr>
<td>PVC Pipes and specials conforming to IS 4985 – 2000 or its latest</td>
<td>Finolex/Supreme/Balco/Chloroplast/Hycount</td>
</tr>
<tr>
<td>PVC Pipes (SWR Type) conforming to IS 13592</td>
<td>Finolex/Supreme/Prince/Jain</td>
</tr>
<tr>
<td>PVC Pipe Fittings conforming to IS 14735</td>
<td>Finolex/Supreme/Prince/Jain</td>
</tr>
<tr>
<td>G.M.F.W.W Valves conforming to IS 778 – 1984</td>
<td>NETA/ZOLOTA/Leader</td>
</tr>
<tr>
<td>CI Sluice Valves conforming to IS 14846 – 2000</td>
<td>Calsens/Upadhyaya/Indian Valve Co./Kamala Castings</td>
</tr>
<tr>
<td>GI Pipes conforming to IS 1239</td>
<td>Appolo/Zenith/Tata/Sree Sarbti Steel Tubes (SST) / Tamilnadu Steel Tubes (TSS)</td>
</tr>
<tr>
<td>Water Supply Fittings (Taps, Showers, Angle Valves etc.)</td>
<td>ARK/ Jaquar/ RanutrolHansa/Ideal Orient</td>
</tr>
<tr>
<td>Stainless Steel Sinks</td>
<td>AMC/ Prince/Diamond</td>
</tr>
<tr>
<td>ASTM D-1785 Sch-40/80 (External Water Supply)</td>
<td>Supreme / Finolex/Astral Aquarius.</td>
</tr>
<tr>
<td>Hot Water Pipes</td>
<td></td>
</tr>
<tr>
<td><strong>PPR Pipes</strong></td>
<td>Amitex/ Supreme/ Unitech/ Prince</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>Jindal composite</td>
</tr>
<tr>
<td><strong>SANITARY WARE</strong></td>
<td></td>
</tr>
<tr>
<td>Water closets without Cisterns/Wash basin/Urinals/Cisterns/Bidets with or</td>
<td>CERA, Parryware, Hindware, Toto, American Standard Roca, Toto, Grohe, Hapsgrohe, CERA, Johnson –Peddar, Fordham</td>
</tr>
<tr>
<td>PVC Flushing Cisterns</td>
<td>Commander/ Campion/ Fordham</td>
</tr>
<tr>
<td>Sanitary Fixtures</td>
<td>Hindware / Cera</td>
</tr>
<tr>
<td>Item</td>
<td>Brand</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>CP Fittings</td>
<td>Cera / Jaquar/ Hindware</td>
</tr>
<tr>
<td>Faucets</td>
<td>Jaquar, Marc, Sanitaryware</td>
</tr>
<tr>
<td>Forged Brass Ball Valve</td>
<td>RB (Rubinetterie Bresclane)/ SKS</td>
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<tr>
<td>Air release Valve (Brass)</td>
<td>I Tap / RB/ SKS</td>
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<tr>
<td>Pump (Submersible)</td>
<td>C.R.I. Pumps / Kirloskar.</td>
</tr>
<tr>
<td>Hydro pneumatic Pump.</td>
<td>Kirloskar / Grundfos / C.R.I. Pumps</td>
</tr>
<tr>
<td>Ductile Iron Man hole Cover Frame</td>
<td>Neco/ Areco</td>
</tr>
<tr>
<td>GI Slotted Iron Brackets / Hangers.</td>
<td>HI-Tech / Equivalent.</td>
</tr>
<tr>
<td>Floor Trap</td>
<td>Supreme, Finolex, Astral.</td>
</tr>
<tr>
<td>Robe Hook</td>
<td>Hindware / Cera</td>
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</table>
## C ELECTRICAL WORKS

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<tr>
<th>MATERIALS</th>
<th>MAKES/BRANDS NAME</th>
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</thead>
<tbody>
<tr>
<td>Alternator</td>
<td>Stamford / Leroy Somer / KEC / BHEL / Crompton Greaves</td>
</tr>
<tr>
<td>APFC Panels</td>
<td>L&amp;T / Sprague / EPCOS / INEL</td>
</tr>
<tr>
<td>Battery Charger</td>
<td>Keltron / Automatic Electric / Sabnife / Waves Electronics</td>
</tr>
<tr>
<td>Bus Riser / Bus duct</td>
<td>Schneider / L&amp;T / Legrand / GE</td>
</tr>
<tr>
<td>Cable Gland</td>
<td>Dowells / Polycab / Jaison / Comet</td>
</tr>
<tr>
<td>Capacitors</td>
<td>Crompton Greaves / Schneider / Mehar / Shreem / Sprage / Epcos</td>
</tr>
<tr>
<td>Cable Management</td>
<td>OBO Betterman / Legrand / MK</td>
</tr>
<tr>
<td>Ceiling Roses/Batton Holder/ Angle</td>
<td>Precision / Anchor / legrand / MK / Schneider</td>
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<tr>
<td>Contactors</td>
<td>L&amp;T / ABB / GE / BCH / Schneider</td>
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<tr>
<td>Crimping Sockets</td>
<td>Dowells/ Polycab / Jaison / Comet</td>
</tr>
<tr>
<td>Current transformer / PT</td>
<td>PGR Power / Intrans / Indus / Kappa / Kapco</td>
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<tr>
<td>Diesel Generator Engine</td>
<td>Caterpillar / Mitsubishi / Cummins / Volvo / Perkins / Ashok Lyland / Kirloskar</td>
</tr>
<tr>
<td>Distribution Boards</td>
<td>GE / Legrand / Siemens / Schneider / L&amp;T</td>
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<tr>
<td>Dry Type Transformers</td>
<td>ABB / Intrans/ Schneider / BHEL</td>
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<tr>
<td>LT Panel Enclosure</td>
<td>Rittal / Hensel / Mehar / Megavin</td>
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<tr>
<td>Ceiling / Exhaust fan</td>
<td>Bajaj / Crompton Greaves / Havells / Khaitan / Usha / Almonard</td>
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<tr>
<td>HT / VCB Panel</td>
<td>Siemens / ABB / Schneider</td>
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<tr>
<td>HT &amp; LT Cables</td>
<td>Polycab / Gloster / Havells / Finolex / V-Guard</td>
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<td>HT Cable Termination Kit</td>
<td>Raychem/ M-Seal [Heat shrinkable type]</td>
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<tr>
<td>HT Panels</td>
<td>ABB / Siemens / Schneider</td>
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<tr>
<td>Indicating Meters</td>
<td>Socomec / L&amp;T / Elmeasure / Conzerv</td>
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<tr>
<td>Industrial Sockets &amp; Tops</td>
<td>Clipsal / Hensel / Legrand / Schneider / Anchor</td>
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<tr>
<td>Isolator / SFU</td>
<td>L&amp;T / ABB / Siemens / Schneider</td>
</tr>
<tr>
<td>KWHR, KW Meters / TOD</td>
<td>Socomec / L&amp;T / Enercon</td>
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<tr>
<td>Product</td>
<td>Manufacturers</td>
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<td>-------------------------------</td>
<td>----------------------------------------</td>
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<tr>
<td>Light Fixtures</td>
<td>Philips / Wipro / Havells / GE / Bajaj / Crompton</td>
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<tr>
<td>Lightning Arrestor</td>
<td>OBO Bettermann / Eritech / Foudretech</td>
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<tr>
<td>LT ACBs</td>
<td>L &amp; T / ABB / Schneider / Siemens</td>
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<tr>
<td>MCB, RCBO &amp; ELCB</td>
<td>Legrand / ABB / Schneider / L&amp;T / Siemens</td>
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<td>MCCB’s</td>
<td>L&amp;T / ABB / Siemens / Schneider</td>
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<td>Metal Clad Sockets / Top</td>
<td>Crompton Greaves / Indo-Kopp / GE / Legrand / Havells / Hensel-Walther/ Clipsal / Schneider</td>
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<td>L&amp;T / Conserv / Enercon / El measure</td>
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<tr>
<td>PLC / Synchronization</td>
<td>ABB / Siemens / BCH Electric Ltd / DEIF</td>
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<tr>
<td>PVC Conduit</td>
<td>Balco / Finolex / Avon Plast / Supreme / Precision</td>
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<td>PVC wires</td>
<td>Finolex / Polycab / Havells / RR Cable / V-Guard</td>
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<tr>
<td>Relay &amp; Controls</td>
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<tr>
<td>RMU</td>
<td>Siemens / ABB / Schneider / Crompton Greeves</td>
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<tr>
<td>Storage Battery</td>
<td>Exide / STANDARD / Amaron</td>
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<tr>
<td>Switches/Sockets</td>
<td>Anchor / Legrand / Schneider / L&amp;T / MK</td>
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<tr>
<td>UPS</td>
<td>APC / Legrand / Emerson / TATA Liberty</td>
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<tr>
<td>Load Banks</td>
<td>Havells / GE / Legrand / ABB / Siemens / Schneider</td>
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<tr>
<td>Cable Tray</td>
<td>OBO Bettermann / Copper B Line / Panduit</td>
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<tr>
<td>Telephone/Network cable</td>
<td>Havells / Finolex / RR cable / V-guard / Amber</td>
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<td>MDF</td>
<td>Krone</td>
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<tr>
<td>Other Items</td>
<td>Approval from Client/ Consultant</td>
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<td>Trane / York/ Dunhambush/ Carrier/ climaveneta / Daikin Mcquay/Hitachi</td>
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<tr>
<td>VRV/ Split unit / Package unit</td>
<td>Diakin / Carrier / LG/ Hitachi/Samsung/ Toshiba/ Mitsubishi /Bluestar/ Panasonic/ ETA/General/Voltas/Trane</td>
</tr>
<tr>
<td>Chilled water &amp; condenser water pumps</td>
<td>Grundfos /ITT/Armstrong</td>
</tr>
<tr>
<td>Cooling tower</td>
<td>Marley / Baltimore/CANI</td>
</tr>
<tr>
<td>Air handling unit</td>
<td>York/Carrier/ Trane/VTS/Edgetech/Zeco/system air</td>
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<tr>
<td>Heat recovery wheel</td>
<td>Dynair/ Bryair/</td>
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<tr>
<td>Fan coil unit</td>
<td>Sinko / Carrier/ Trane/ Media</td>
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<tr>
<td>VAV</td>
<td>Honeywell/ Staefa / Johnson Controls/TROX</td>
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<tr>
<td>MS/ GI piping</td>
<td>Tata / Jindal</td>
</tr>
<tr>
<td>Pre insulated piping</td>
<td>Seven star/Zeco</td>
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<tr>
<td>Drain piping</td>
<td>Supreme / Finolex</td>
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<tr>
<td>Butterfly valves</td>
<td>SKS/Econosto/ Audco</td>
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<tr>
<td>Ball valves</td>
<td>Danfoss/ Tour &amp; Anderson/CIM/econosto</td>
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<tr>
<td>Non return valves</td>
<td>Danfoss/ Tour &amp; Anderson/SKS</td>
</tr>
<tr>
<td>Balancing valves</td>
<td>Danfoss/ Tour &amp; Anderson /Advance /Flowcon /Belimo</td>
</tr>
<tr>
<td>Y strainer/Suction guide</td>
<td>Sant/RB/Emerald</td>
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<tr>
<td>Pressure gauge/Thermometer</td>
<td>H.Guru/ Feibing</td>
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<tr>
<td>Pressurized tank</td>
<td>Anergy / ITT</td>
</tr>
<tr>
<td>Air separator</td>
<td>Anergy/ITT</td>
</tr>
<tr>
<td>Auto air vents</td>
<td>Anergy/ Sant</td>
</tr>
<tr>
<td>Flexible connectors</td>
<td>Cori rubber / Hi-tech</td>
</tr>
<tr>
<td>Two way / Pressure independent valve</td>
<td>DanfosS / Oventrop / Tour &amp; Anderson /Flowcon /Belimo</td>
</tr>
<tr>
<td>Ducting</td>
<td>Sail/ Jindal</td>
</tr>
<tr>
<td>Factory fabricated Ducting</td>
<td>Rolarstar/ zeco</td>
</tr>
<tr>
<td>Flexible duct</td>
<td>Seven star/ flaktwood</td>
</tr>
<tr>
<td>Grills and diffusers</td>
<td>Dynacraft/ Air flow/N air systems</td>
</tr>
<tr>
<td>Duct insulation</td>
<td>Armaflex/ Kflex</td>
</tr>
<tr>
<td>Ducting support</td>
<td>Gripple hangers</td>
</tr>
<tr>
<td>Equipment</td>
<td>Manufacturers</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------------------------------------</td>
</tr>
<tr>
<td>Ventilation unit</td>
<td>Greenheck/ System air/ Kruger/ Nicorta/ Flaktwoods/Humidin</td>
</tr>
<tr>
<td>Rubber pad</td>
<td>Rubberind Enterprises</td>
</tr>
<tr>
<td>Damper/Modular motors</td>
<td>Honey well/Siemens/Flaktwoods/Belimo/TROX/N air systems</td>
</tr>
<tr>
<td>Fire Damper</td>
<td>Caryaire/Ravistar/Air master/Dynacraft/N air systems</td>
</tr>
<tr>
<td>Jet fans</td>
<td>system air, FlaktWoods/Greenheck</td>
</tr>
<tr>
<td>Vfd</td>
<td>Danfoss, Seimens/Schneider/Toshiba/Emerson/Vacon</td>
</tr>
<tr>
<td>All controls</td>
<td>Dan Foss/Honeywell/Siemens</td>
</tr>
<tr>
<td>Electrical panel, switch gear</td>
<td>Siemens/Schneider/GE/L&amp;T</td>
</tr>
<tr>
<td>Multi-Function Meters</td>
<td>Schneider/AE/L&amp;T/CADEL/ENERCON</td>
</tr>
<tr>
<td>CT’S</td>
<td>AE/KAPPA/ESM</td>
</tr>
<tr>
<td>Indicators</td>
<td>L&amp;T/Seimens/Technik</td>
</tr>
<tr>
<td>Selectors</td>
<td>L&amp;T/Seimens/Technik/GE</td>
</tr>
<tr>
<td>Contactors</td>
<td>L&amp;T/Siemens/Schneider/Technik</td>
</tr>
<tr>
<td>Push buttons</td>
<td>L&amp;T/Seimens/Technik</td>
</tr>
<tr>
<td>Cables</td>
<td>INCAB/CCI/GLOSTER/Finolex</td>
</tr>
<tr>
<td>STARTERS, Relays/Timers</td>
<td>Seimens/Schneider/L&amp;T/GE</td>
</tr>
<tr>
<td>MPCB/MCCB</td>
<td>Seimens/Schneider/L&amp;T/GE</td>
</tr>
</tbody>
</table>
### E  FIRE PROTECTION WORKS

<table>
<thead>
<tr>
<th>MATERIALS</th>
<th>MAKES/BRANDS NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fire Fighting System</strong></td>
<td></td>
</tr>
<tr>
<td>Pump</td>
<td>Kirloskar / Beacon / Mather &amp; Platt</td>
</tr>
<tr>
<td>Motor</td>
<td>Kirloskar / Crompton / Abb</td>
</tr>
<tr>
<td>Engine</td>
<td>Kirloskar/Ashok Leyland/Greaves</td>
</tr>
<tr>
<td>Pipes</td>
<td>Tata / Jindal / Zenith</td>
</tr>
<tr>
<td>Hydrant Valve</td>
<td>Aaag/ Winco / Newage / Arihanth / Kartar</td>
</tr>
<tr>
<td>Hose Reel</td>
<td>Eversafe/Adi/ Reade/Life Guard /Monsher</td>
</tr>
<tr>
<td>Fire Hose</td>
<td>New Age / Crc / Priyanka</td>
</tr>
<tr>
<td>Branch Pipe</td>
<td>Winco / Newage / Gtech / Kartar</td>
</tr>
<tr>
<td>Hose Box</td>
<td>Friends, Newage Industries, Zenith Engineers</td>
</tr>
<tr>
<td>Air Release Valve</td>
<td>Atom, Newage</td>
</tr>
<tr>
<td>Butterfly Valve</td>
<td>Audco / Intervalve / C &amp; S</td>
</tr>
<tr>
<td>Non Return Valve</td>
<td>Audco / Intervalve / C &amp; S</td>
</tr>
<tr>
<td>Foot Valve</td>
<td>Kirloskar / Bir / Kalpana (Heavy Duty)</td>
</tr>
<tr>
<td>Pressure Gauge</td>
<td>H-Guru / Fiebig / Mahavir</td>
</tr>
<tr>
<td>Fire Extinguisher</td>
<td>Hitech / Safex / Safe Zone/Life Guard</td>
</tr>
<tr>
<td>Automatic Sprinklers</td>
<td>Tyco/Hd/ Automatic Sprinkler Corp</td>
</tr>
<tr>
<td>Pressure Switch</td>
<td>Danfoss / Switzer / Indfoss</td>
</tr>
<tr>
<td>Flow Switch</td>
<td>Systemsensor / Hd</td>
</tr>
<tr>
<td><strong>Fire detection and alarm system</strong></td>
<td>(i) Analogue Addressable Fire alarm system (Research Block)</td>
</tr>
<tr>
<td>Fire alarm components</td>
<td>Notifier, Siemens, Honeywell, Simplex</td>
</tr>
<tr>
<td>Detectors</td>
<td>Notifier, Siemens, Honeywell, Simplex</td>
</tr>
<tr>
<td>Response indicators</td>
<td>Honeywell, Siemens, Notifier, Simplex</td>
</tr>
<tr>
<td>Manual call points</td>
<td>Honeywell, Siemens, Notifier, Simplex</td>
</tr>
<tr>
<td>Hooter cum strobe</td>
<td>Honeywell, Siemens, Notifier, Simplex</td>
</tr>
<tr>
<td>Control/ Monitor module</td>
<td>Honeywell, Siemens, Notifier, Simplex</td>
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<tr>
<td>(ii) Conventional Fire alarm system (Hostel Block)</td>
<td></td>
</tr>
<tr>
<td>Fire alarm components</td>
<td>Honeywell, Ravel, Carmel</td>
</tr>
<tr>
<td>Detectors</td>
<td>Appollo, System sensor</td>
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<tr>
<td>Response indicators</td>
<td>Ravel, Carmel, Honeywell</td>
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<tr>
<td>Manual call points</td>
<td>Ravel, Carmel, Honeywell</td>
</tr>
<tr>
<td>Hooter</td>
<td>Ravel, Carmel, System Sensor, Honeywell</td>
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<tr>
<td>FRLS Cables</td>
<td>Polycab, Havells, RR cable</td>
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</tbody>
</table>

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