

**TENDER FOR**  
**RENOVATION AND MODERNIZATION OF THE AUDITORIUM BUILDING WITH ACOUSTIC**  
**TREATMENT, CONTROL ROOM, FLOORING, LIGHTING AND SOUND SYSTEM, CONSTRUCTION**  
**OF PUBLIC TOILET AT INDIA HOUSE THIMPHU**

**TENDER NO.: THI/PROP/872/03/2016 (7)**

**EMPLOYER**

---

**PRESIDENT OF INDIA**

Represented through

**Second Secretary & HOC**

**EMBASSY OF INDIA**

PO Box: 193, Jungshina,  
Thimphu, BHUTAN

**Telephone** : +975-2-323227

**Email** : [hoc.thimphu@mea.gov.in](mailto:hoc.thimphu@mea.gov.in)

**Notes:**

- a) The Employer reserves the right to reject any/all tenders without assigning any reason thereof.
- b) Conditions, if added by the bidder, which have bearing on the scope/nature and cost of tendered works shall make the tender liable to be disqualified.

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*SECTION-I*

*NOTICE INVITING TENDER*

## SECTION I: NOTICE INVITING TENDER

Sealed Item Rate tenders are hereby invited from reputed and experienced Bhutanese/ Indian Contractors in the prescribed form for and on behalf of the **PRESIDENT OF INDIA** through Office of Second Secretary & HOC, EMBAASY OF INDIA, INDIA HOUSE, THIMPHU, BHUTAN for **“Renovation And Modernization Of The Auditorium Building With Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction Of Public Toilet At India House Jungshina, Thimphu”**.

1.	Tender No.	THI/PROP/872/03/2016 (7)
2.	Name of Work;	<b>RENOVATION AND MODERNIZATION OF THE AUDITORIUM BUILDING WITH ACOUSTIC TREATMENT, CONTROL ROOM, FLOORING, LIGHTING AND SOUND SYSTEM, CONSTRUCTION OF PUBLIC TOILET AT INDIA HOUSE, JUNGSHINA, THIMPHU</b>
3.	Cost of Tender Document:	<p>Tender documents can be collected from:  <b>Asst. Attache (Administration &amp; Property)</b>  <b>EMBASSY OF INDIA</b>                      PO Box: 193, Jungshina, Thimphu                      Tel. No .00975-2-322293</p> <p>On any working day during office hours from <b>03.05.2019 to 23.05.2019 (till 1600 hrs)</b> on payment of non-refundable fee of <b>Rs. / Nu. 5000/- (Five Thousand only)</b> through Demand Draft in favour of “Embassy of India” from any Bhutanese Scheduled Bank or Indian scheduled bank, payable at Embassy of India, Thimphu.</p> <p>Bidders downloading the tender document online need to submit Demand Draft for Rs./Nu. 5000/- favoring “Embassy of India” Payable at Embassy of India, Thimphu along with Technical Bid.</p>
4.	Earnest Money Deposit:	Rs. / Nu. 2,20,000/- (Two Lakh Twenty Thousand only) in the form of Demand Draft in favour of “Embassy of India”, Thimphu payable at Thimphu or irrevocable Bank Guarantee as per <b>SECTION - VI</b> .
5.	Date of uploading of Tender :	1600 hrs on 03.05.2019
6.	Pre-bid conference	1500 hrs on 17.05.2019
7.	Last date of submission:	1600 hrs on 24.05.2019
8.	Date for opening of Technical bids	1500 hrs on 01.06.2019



9.	Date for opening of Financial bids	03.06.2019 (only technically qualified bidders will be invited for the opening of financial bid)
10.	Place of submission & Opening:	<b>EMBASSY OF INDIA</b> PO Box: 193, Jungshina, Thimphu Tel. No . 00975-2-322293
11.	Stipulated Period of Completion:	04 (Four) months
12.	Normal Working Hours:	10.00 AM to 5.00 PM
13.	Mobilization Advance: (Interest free)	5% (Five percent) of the contract value against Bank Guarantee from a scheduled bank after signing the contract
14.	Security Deposit:	5% of value of work done.
15.	Liquidated damages	1% of contract value per week of delay upto a maximum of 10% of contract value
16.	Defect Liability/ Maintenance Period	6 (Six) months reckoned after the date of issue of final certificate of completion of work.
17.	Ruling Language	English
18.	Performance Guarantee:	5% (five percent) of the Contract Price in the form of Bank Guarantee within 15 days of receipt of notification of award but not later than the date of the signing of the agreement.

Embassy reserves the right to reject any or all the requests for the purchase of Bidding Document without assigning any reason thereof.

Sd/-

**Second Secretary & HOC**  
**EMBASSY OF INDIA**  
PO Box: 193, Jungshina, Thimphu  
Tel. No . +975-2-323227

*SECTION- II*

*INSTRUCTIONS TO BIDDERS (ITB)*

## SECTION II: INSTRUCTIONS TO BIDDERS

### A – GENERAL

#### 2.1. Introduction

Sealed tenders are invited for and on behalf of the Embassy of India from the resourceful & experienced Bhutanese/Indian Contractors for Renovation and Modernization of the Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting and Sound System, Construction of Public Toilet at India House Thimphu.

#### 2.2. Scope of Work

The Scope of Work for the invited bid are:

1. **Providing and fixing Acoustic wall panels (Sound proofing) for auditorium walls.**
2. **Providing and fixing sound proof false-ceiling panels for auditorium roofing.**
3. **Dismantling existing wooden flooring and providing tile flooring as specified.**
4. **Dismantling existing wall and providing entry doors (2 Nos.) in Building.**
5. **Renovation of Existing Toilet in auditorium.**
6. **Construction of Control room with stairs in auditorium.**
7. **Re-align of Chimney pipe below control room.**
8. **Construction of Public Toilet near parking area.**
9. **Supply of auditorium chairs as approved specifications and color and size.**
10. **Providing & fixing of Sound system, Projector with Wall Drop & Audio Video Projection System (LED's)**
11. **All CFL be replaced by LED lights**
12. **Modernization of Stage platform:**
  - **Providing commercial ply lamination to existing stage,**
  - **Provided that partition for Changing room/Green room at back side of stage.**
  - **Stage lighting & Green room lighting system**

The work shall comprise of execution of setting out survey, clearing and grubbing, excavation in soil and rock, backfilling, plain and reinforced concrete works, acoustic treatment, Concrete brick & stone masonry works, steel roof truss, Corrugated Galvanized Iron sheet roofing, wood works, plastering, painting, water supply and sanitation works, electrical works, sound system and lighting, Traditional Bhutanese architectural works, protection & drainage works, and other miscellaneous works to fulfill the architectural, structural and functional requirements but not limited to the major item of works, as per the approved design drawings, Specifications, Bill of Quantities and/or as directed by the Engineer-in-Charge, within the stipulated time period. The above works shall also include:

- a. Providing all construction materials, tools, plant and equipment, consumable materials, electric power, water, inspection, testing and quality control, all supervisory Project Manager, staff including security, workmen (skilled / semi- skilled / unskilled), camps / offices, store / warehouses, access roads, accommodations for staff and labour etc. and all other services and materials as may be necessary during construction, completion, measurement and maintenance of the works under the contract till acceptance by the Engineer-in-Charge.
- b. Execution, completion and maintenance of the above cited works shall be as per the Bill of Quantities, Specifications, drawings and / or as deemed to be required for completion of the works or as directed by the Engineer-in-Charge.
- c. The cost of any infrastructural facilities/working facilities which would be required for execution of the above works shall not be payable separately and shall be deemed to be included by the Contractor in the quoted price.
- d. The Contractor shall also be responsible for preparation and submission of completion reports along with 'As Built' drawings.

### 2.3. Period of Completion

The works under the Contract shall have to be completed in a period of **4 (Four) months** reckoned from the 15th day from the date of issue of the Letter of Acceptance of the Bid.

### 2.4. Minimum Eligibility Criteria

#### Technical Criteria – Similar Work Experience

- i) The similar type of work referred above means Construction of multi-story buildings, Auditorium, Movie theaters, providing sound and light system with acoustic wall panels, false ceiling & flooring. Experience of successfully completed similar works during last five years ending 30.04.2019 should be either of the following:

**THREE (3) similar works costing not less than Nu 4.32 Million.**

**OR**

**TWO (2) similar works costing not less than Nu 6.48 Million.**

**OR**

**ONE (1) similar works costing not less than Nu 8.64 Million.**

Experience details as asked for are to be submitted as per the format given in **Form No. 3** with necessary work completion certificates from the client. Works without experience certificates shall not be considered for evaluation.

- ii) The bidder must possess valid license, Tax Clearance Certificate and registration with Construction development Board (CDB), RGoB in class "L" or CPWD Govt. of India or State Govt. agency of Indian State at the time of submission of bid.
- iii) The bidder, who are under a declaration of ineligibility for Corrupt and Fraudulent Practices issued by the Royal Govt. of Bhutan (RGoB)/Gol shall not be allowed to

participate in the bidding process. A declaration/undertaking denying such involvement shall be submitted by the bidders / and by the each associates/partners along with the technical bid.

### **Financial Criteria**

- i) Average Annual Turnover during last three financial years (i.e. F.Y. 2016-17, 2017-18 & 2018-19) should be more than Nu 8.64 million.
- ii) The firms should be profitable for last three years.
- iii) Chartered Accountant Certificate in support of the list given as in the format given at **Form No. 4** is to be submitted in support of the same along with copies of Audited Balance Sheets and Income Tax Returns for last three Financial Years.

### **2.5. No. of Bid per Bidder**

Each Bidder shall submit **only one (1)** Bid. A Bidder who submits or participates in more than one Bid (other than as a Sub Contractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the Bidder's participation to be disqualified.

### **2.6. Cost of Bidding**

The Bidder shall bear all costs associated with the preparation and submission of his Bid and the Indian Embassy will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Bidding process.

### **2.7. Site Visit**

The Bidder, at his own interest, responsibility and risk, must visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

The bidder or his representative will be granted permission to enter the site of work only upon the condition that the Employer or his personnel or agent will not be responsible for death or personal injury or loss or damage to property and other loss, damage, cost or expenses incurred as a result of inspection/visit.

## **B – BIDDING DOCUMENTS**

### **2.8. Contents of Bidding Documents**

The bidding documents are those as stated below and should be read in conjunction with any corrigendum/modification issued on these document:

- i) Notice Inviting Tender (NIT)
- ii) Instructions to Bidders

- iii) General Conditions of the Contract
- iv) General Technical Specifications
- v) Schedule
- vi) Appendix
- vii) Model rules for health and sanitary arrangements for contractor's workmen
- viii) Contractor's labour regulations
- ix) Safety Precautions
- x) Bill of Quantities
- xi) Drawings
- xii) Any other document as forming part of the Contract/Addendum.

The bidder is expected to examine carefully the contents of all the above documents. Failure to comply with the requirement of bid submission will be at bidders own risk. Bids which are not substantially responsive to the requirement of the bidding document will be rejected. Prior to last date of submission of tender the Employer may, for any reason whatsoever, modify the tender by issuing corrigendum, which will become a part of tender document. No modification of bid shall be permissible after last date of submission, whatever may be the reason.

The employer may at its discretion extend as necessary the deadline for submission of tender, if considered necessary.

## **2.9. Clarification of Bidding Documents**

A prospective bidder requiring any clarification of the Bidding Documents may notify the **Second Secretary & HOC, Indian Embassy Thimphu, Bhutan Tel. No . +975-2-323227** who will respond in writing to any request for clarification/or discuss during pre-bid meeting, if necessary.

Written copies of the Engineer in Charge' response (including a description of the enquiry but without identifying its source) will be sent to all prospective bidders who have purchased the Bidding Documents.

## **2.10. Amendment of Bidding Documents**

At any time prior to the deadline for submission of bids, the Employer may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the Bidding Documents by the issuance of a Corrigendum/Addendum.

The corrigendum/addendum will be sent in writing or by fax to all prospective bidders who have purchased the Bidding Documents and will be binding upon them. Prospective bidders shall promptly acknowledge receipt thereof by fax to the Employer.

In order to afford prospective bidders reasonable time required to take a corrigendum/addendum into account in preparing their bids, the Employer may, at its discretion, extend the deadline for the submission of bids.

## **C – PREPARATION OF BIDS**

### **2.11. Language of Bid**

The bid prepared by the bidder and all correspondence and documents relating to the bid exchanged by the bidder and the Employer shall be written in the English language only.

### **2.12. Bid Process**

The selection process will proceed in two stages – Technical Bid and Financial Bid. Bid documents should therefore be submitted in two separate sealed covers as listed below:

**Part – I : Technical Bid**

**Part – II : Financial Bid**

#### **(a) Documents Comprising Technical Bid**

The Technical Bid should contain only the following documents as per the listed sequence. In case, if a bidder fails to submit any of the following documents in the Technical Bid, it shall be considered non-responsive and liable to be rejected.

- 1) **Tender fee:** Bidders downloading the tender document online need to submit Demand Draft for Rs./ Nu. 5000/- favoring “Embassy of India” Payable at Embassy of India, Thimphu along with Technical Bid. For bidders purchasing Tender documents from Employer has to submit receipt from Employer. The quotations received without Tender fee shall be summarily rejected and the bidder shall be declared Disqualified.
- 2) **Earnest Money:** An EMD of Rs./Nu. 2,20,000/- (Two Lakh Twenty Thousand only) has to be deposited by the bidders by account payee Demand Draft from a Nationalized / Scheduled Bhutanese/Indian bank drawn in favor of “Indian Embassy” at Thimphu or through an irrevocable Bank Guarantee. The Bank Guarantee shall be issued by a Nationalized / Scheduled Bhutanese Bank/Indian Bank in the format attached in **SECTION - VI**. Any changes / deviation in the format for Bank Guarantee attached in **SECTION - VI** shall not be accepted and envelope containing financial bid shall not be opened on discretion of Indian Embassy, Thimphu.  
No other form of EMD shall be accepted. The bids received without EMD or any other form of EMD shall be summarily rejected and the bidder shall be declared Disqualified. The EMD of unsuccessful bidder shall be returned. However, in case of successful bidder the EMD shall be returned on submission of Bank Guarantee towards the security Deposit.
- 3) Technical Bid Submission form as per the format given in **Form No. 1**.
- 4) Organization profile, General organizational capability and resources including manpower, other resources etc.

- 5) List of similar works undertaken (both completed and ongoing) in last 5 years along with the cost and project duration as per format given at **Form No. 3**.
- 6) Work Order and Work Completion Certificates (Last five years) from Clients for the works to be considered for evaluation. Similar Works without completion certificate shall not be considered for evaluation.
- 7) Methodology proposed to be adopted for this work
- 8) Manpower Deployment (Site personnel's) deployment for the work (**Form No. 6**)
- 9) Proposed Deployment of available Machinery & Equipment for this project including their specification
- 10) Activity Schedule for the completion of study preferably in excel format week wise.
- 11) Expenditure phasing on monthly basis as per the work Programme
- 12) Letter of Authorization for the person signing the bid as per **clause 2.19** of ITB.
- 13) An undertaking that financial proposal does not contain any condition (s).
- 14) Copy of Service Tax/ VAT Registration Certificate
- 15) Chartered Accountant Certificate mentioning Turnover of the Company during Last three financial years (as per format given in **Form No. 4**.
- 16) Auditor Certified Copies of Audited Balance Sheets for last three financial Years
- 17) Auditor Certified Copies of Income Tax Returns of Last three Financial Years
- 18) Banker's Certificate/ Working Capital Certificate from a Scheduled Bank as on date of request for the purpose of bidding (as per format given in **Form No. 5**.
- 19) Name and Address of Bankers for verification
- 20) Proof of Constitution, Memorandum and Articles of Association etc of the Contractor Company/ Organization.
- 21) Copy of PAN Card, EPF Registration, valid license, Tax Clearance Certificate and registration with Construction development Board (CDB), RGoB in class "L" or CPWD Govt. of India or State Govt. agency of Indian State.
- 22) The bidder, who are under a declaration of ineligibility for Corrupt and Fraudulent Practices issued by the Royal Govt. of Bhutan (RGoB)/Gol shall not be allowed to participate in the bidding process. A self-declaration/undertaking denying such involvement shall be submitted by the bidders / and by the each associates/partners along with the technical bid.
- 23) Any other relevant material/information.
- 24) The bidder should enclose a copy of original tender document (original uploaded technical and financial tender documents with all forms and schedules, corrigendum/addendum) without rates and cost duly signed on each page in token of having read the tender documents, failing which the bid shall be disqualified (**Clause 2.24**)



**(b) Documents Comprising Financial Bid**

The Financial Bid should contain only the following documents as per the listed sequence. In case, if a bidder fails to submit any of the following documents in the Financial Bid, it shall be considered non-responsive and liable to be rejected.

- 1) Financial Bid Submission form as per the format given in **Form No. 2**.
- 2) Documents as per SECTION X: BILL OF QUANTITIES **are to be submitted including duly filled BOQ as provide in schedule with rates mentioned against each item.**

The BOQ must be signed and stamped on each page. The rates and total cost must be written in numbers and in words and shall match with abstract.

All the pages of Technical Bid & Financial Bid shall be signed and numbered serially. If any information in Bid is missing or not clearly specified or found ambiguous, it will be assumed that the bidder is not in a position to supply/ share the information and therefore will be evaluated accordingly.

**2.13. Bid Prices**

Unless stated otherwise in the Bidding Documents, the Contract shall be for the whole work as described in **ITB Para 2.2** based on the schedule of unit rates and prices submitted by the bidder.

The rates and prices quoted by the bidder are subject to the adjustment during the performance of the Contract in accordance with the provisions of **Clause 3.71 of SECTION - III** of this document.

The rates quoted by the Contractor shall be inclusive of:

- a. Prices/ costs of all materials, labour, fuel, transportation, samples, testing, etc.
- b. All taxes such as sales tax, Value Added Tax (VAT), GST, import/ export customs duties, excise duties, octroi, royalty, service tax or any other tax, duty or levy on material, labour, fuel and works contract tax, education cess, staff/ labour welfare cess, etc. in force or likely to be levied during the currency of the Contract, including the extended period, if any and Defects Liability Period.
- c. Miscellaneous expenses towards insurances, permits, etc.
- d. Rates for working at all levels, for all heights, depths, leads, level differences, etc., as per the requirements of the design, unless mentioned otherwise.
- e. Providing all necessary, barricades, hoists, ladders, stagings, scaffoldings, tools, tackles, instruments, equipments, etc. in all the works, as per the requirements of the design and as directed by the Engineer-in-Charge.
- f. All other costs and expenses, etc. as stipulated in the Tender Document

These rates shall remain firm and final for the duration of the entire Contract period including the extended period, if any and upto completion of the Defects Liability Period, and no escalation in these rates shall be payable on any account whatsoever.

#### **2.14. Currencies of Bid and Payment**

The payment shall be made in Indian Rupees/Bhutanese Ngultrum.

***(One Ngultrum = One Indian Rupee)***

#### **2.15. Bid Validity Period**

Bids shall remain valid for acceptance for a period of **120 days (One hundred twenty days)** from the date of opening of bids.

In exceptional circumstances, prior to expiry of the original bid validity period, the Employer may request the bidder for a specified extension in the period of validity along with validity of Bid Security. The request and the responses thereto shall be made in writing or by fax. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required/ nor permitted to modify his bid, but will be required to extend the validity of his bid security correspondingly. The provision of **ITB Para-2.16** regarding discharge and forfeiture of bid security shall continue to apply during the extended period of bid validity.

#### **2.16. Bid Security / Earnest Money**

Bidder shall furnish as part of his bid Earnest Money for the amount stipulated in ITB **clause 2.12**. Earnest Money of unsuccessful bidders will be returned not later than **30 (thirty) days** after the expiry of bid validity. The Earnest Money will be returned to the tenderer without any interest if his tender is not accepted. The Earnest Money of successful bidder will be discharged after signing of the Agreement or may be converted to Security Deposit on request of contractor.

Earnest money is liable to be forfeited if:-

- a) Bid is withdrawn during the period of its validity, after opening of bids.
- b) Correction of bid price is not accepted by the bidder pursuant to **ITB clause 2.30**.
- c) Successful bidder fails to sign contract agreement and furnish Performance Bond within the Specified time limit.
- d) Successful bidder fails to commence work within the time specified in Letter of Award.

#### **2.17. Bidding Condition**

The bidder shall submit offers which comply fully with the requirements of the Bidding Documents. Any deviation in submitted bid for the bidding documents shall be liable for rejection.

The contractor shall be required to use locally manufactured Bhutan Standard Bureau (BSB) certified domestic construction materials especially concrete blocks/bricks, interlocking cement earth blocks, HDPE pipes, Reinforcement Steel Section etc. in the buildings and road construction works. The material shall conform to the latest BSB standards or in absence of these standards, to the equivalent IS codes/CPWD specifications. These materials must be cost effective as compared to imported materials of certified quality standards.

#### **2.18. Format for Submittal**

Format for submittal of related information for Bid shall be as per **SECTION - VI APPENDIX (FORMS)**, and shall be strictly adhered to. Any change or alteration in the formats lead to the bidder being unresponsive and disqualification of bid.

#### **2.19. Signing of Bids**

The original bid, typed or written in indelible ink and shall be signed by a person or persons duly authorized to bind the bidder to the Contract. Proof of authorization shall be furnished in the form of a written Power of Attorney which shall accompany the bid. All pages of the bid and entries where amendments have been made shall be initialed by the person or persons signing the bid.

The complete bid shall be without alternations or erasures, except those to accord with instructions issued by the Indian Embassy, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

### **D – SUBMISSION OF BIDS**

#### **2.20. Sealing and Marking of Bids.**

Each of the Technical & Financial bid shall be sealed in separate envelopes duly super scribing **Part – I (Technical Bid)** and **Part – II (Financial Bid)** on the respective envelopes.

In case the first envelope (Technical Bid) is not submitted with Earnest Money & Tender document fee in a proper form, the second envelope (Financial Bid) shall not be opened and rejected summarily.

Both the Envelope - 1 & Envelope - 2 are to be placed in a single envelope super-scribing **“Tender for Renovation and Modernization of the Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting and Sound System, Construction of Public Toilet at India House Thimphu”** and shall be received in this office on or before 1200 hours BST on 24.05.2019 and shall be opened by the employer representatives on 01.06.2019 at

1500 hours BST. Bidder(s) or his authorized representative may remain present at the time of opening, if they so desire.

Both inner envelopes (Technical bid & Financial bid) and the outer envelope containing two inner envelopes shall

- a. be addressed to the Indian Embassy at the following address:
- b. Second Secretary & HOC, Indian Embassy Thimphu, Bhutan Tel. No . +975-2-323227, Jungshina, Thimphu
- c. Provide Bid Ref. no. "Thi/Prop/872/03/16"
- d. Provide a warning not to open **before 01.06.2019 (1500 hrs)**.
- e. Both Inner envelopes & outer envelope shall indicate the name and address of the Bidder to enable the Bid to be returned unopened in case it is declared late, or is declared unresponsive, pursuant to **ITB Clause 2.28**

Authority shall not be responsible for delay caused due to postal/courier or any other modes of delivery. Local Bidder(s) may, if so desire, deposit TENDER document by mail or by hand (in person) at this office for this purpose before due date & time. The Bidder shall seal the Technical Bid, Financial Bid & the outer Envelope.

If the outer envelope is not sealed and marked as above, the Indian Embassy shall assume no responsibility for the misplacement or premature opening of the Bid. Such Bids shall be rejected summarily.

#### **2.21. Deadline for Submission of Bids.**

The bids must be submitted to the **Second Secretary & HOC, Indian Embassy Thimphu, Bhutan** not later than **24.05.2019 (1600 hrs)**.

The Indian Embassy may, at its discretion, extend the deadline for submission of bids by issuing an amendment, in which case all rights and obligations of the Indian Embassy and the bidders previously subject to the original deadline shall thereafter be subject to the new deadline as extended.

#### **2.22. Late Submission of Bids**

Any bid received by the Indian Embassy after the deadline for submission of bids in **ITB Clause 2.21** will be considered as rejected and returned unopened to the bidder.

#### **2.23. Modification and Withdrawal of Bids**

The bidder may modify or withdraw his bid prior to deadline for submission of bid by giving modification or withdrawal notice in writing to Indian Embassy.

The bidder's modifications or notice of withdrawal shall be prepared, sealed and clearly marked as "Modification" or "Withdrawal" as appropriate and delivered prior to deadline for submission of bid in accordance with **ITB clause 2.21**.

No bid will be modified after the deadline for submission of the bid. Withdrawal of bid between deadline for submission and expiry of bid validity will result in forfeiture of earnest money pursuant to **ITB clause 2.16**.

#### **2.24. Bidding Documents**

Entire set of document including appendices and addendums, if any, as issued to bidder shall be submitted signing each page as a token of acceptance of all terms & conditions of the bid. No portion of issued document shall be retained by the bidder.

### **E – BID OPENING AND EVALUATION**

#### **2.25. Bid Opening**

The Indian Embassy shall open the Technical bids, including modifications made pursuant to **ITB Clause 2.23**, in the presence of the bidder's authorized representatives who choose to attend on **01.06.2019 at 1500 hrs (BST) in the Conference Hall, Indian Embassy Thimphu**.

Bids for which an acceptable notice of withdrawal has been submitted pursuant to **ITB Clause 2.23** shall not be opened. The bidder's name, bid prices, modifications, withdrawals, presence or absence of earnest money and other such details as considered appropriate will be announced at the time of opening tenders. The record of the bid opening including information disclosed will be preserved for office record.

Financial bids of the technically qualified bidders shall be opened after intimation of due date and time to technically qualified bidders at a later date.

#### **2.26. Confidentiality of Bids**

After the public opening of bids, information relating to the examination, clarification, evaluation and comparison of bids and recommendations concerning the Award of Contract shall not be disclosed to bidders or other persons not officially concerned with such process.

Any effort by a bidder to influence the Indian Embassy in the process of examination, clarification, evaluation and comparison of bids, and in decisions concerning Award of Contract, may result in the rejection of his bid.

#### **2.27. Clarification of Bids**

To assist in the examination, comparison and evaluation of bid the Indian Embassy may ask bidders for clarification of the bids, if any. But no change in price or substances of bid will be

sought, agreed or permitted. The request for clarification and its response shall invariably be in writing.

## **2.28. Technical Evaluation / Determination of Responsiveness**

Prior to detailed evaluation of bid it will be determined whether each bid:

- i) Has been properly signed.
- ii) Is accompanied by required securities/documents.
- iii) Is substantially responsive to the requirement of bidding document.
- iv) Provides necessary clarification or substance.

A substantially responsive document is one which conforms to all the terms, conditions & specifications without material deviation or reservation which

- i) Affects in any substantial way the quality or scope of the work.
- ii) limits in any substantial way the scope of work
- iii) is inconsistent with the bidding document
- iv) Affects unfairly the competitive position of other bidder.

Bids not found substantially responsive are liable to be rejected. Conditions if added by the bidder, which have adverse bearing on the cost and scope of tendered work shall make the tender liable to disqualification.

The technical evaluation criteria is detailed below:

Each responsive proposal will be attributed a technical score based on

S. No.	Parameters	Maximum Technical score
1	Work Experience of Bidder	30
2	Experience of Key Personnel's	30
3	Organizations and Financial Status	10
4	Approach and Methodology	30

Bids with total technical score of 75 and above shall be technically qualified. The financial bids of technically qualified bidders shall only be opened. The financial bids of bidders with technical score or below 75 shall be returned unopened.

## **2.29. Corrections of Errors in Bids**

Bids will be checked for any arithmetical error and will be corrected by the Indian Embassy irrespective of concurrence of the bidder. The amount stated in the form of bid will be adjusted in accordance to procedure as mentioned below and shall be binding upon the bidder.

- i) Where there is a discrepancy between the amount in figures and words, the amount in words will prevail.

- ii) When there is a difference between the rates in figures and in words, the rate, which corresponds to, the amount worked out by the bidder, shall be taken as correct.
- iii) When the amount of an item is not worked out by the bidder or it does not correspond with the rate written either in figures or in words, then the rate quoted by the bidder in words shall be taken as correct.
- iv) When the rate quoted by the bidder in figures and in words tallies but the amount is not worked out correctly, the rate quoted by the bidder shall be taken as correct and not the amount.
- v) Where there is discrepancy between the total bid amount and sum of total costs the sum of total costs will govern.
- vi) If the bidder does not quote for any Item, it is presumed that he will execute the quantity mentioned in the BoQ free of cost and will be assumed that he has covered the price of this item in rate of other items quoted by him.

If the bidder does not accept the corrected amount of bid, his bid will be rejected and the bid security will be forfeited.

### **2.30. Evaluation and Comparison of Financial Bids**

The Indian Embassy will only evaluate and compare the bids determined to be substantially responsive.

In evaluating bids, the Indian Embassy will determine, for each bid, the Evaluated Bid Price by adjusting the Bids Price as follows:

- i) Making any correction for errors.
- ii) Making an appropriate adjustment for any discount and
- iii) Making an appropriate adjustment for acceptable quantifiable variations or deviations.

During evaluation of bids, if it is found that the bid submitted by the lowest bidder is seriously unbalanced or contains substantially high unit rates the Indian Embassy reserves the right to hold negotiations with the bidder prior to Award of works to determine the Contract price at a reasonable level. In case such negotiations fail, the Indian Embassy reserves the right to reject the tender and invite the next lowest bidder for negotiation.

The Indian Embassy reserves the right to accept or reject any variation, deviation or alternative offers. Variations, deviations, alternative offers and other factors which are in excess of the requirements of the Bidding Documents or otherwise result in the accrual of unsolicited benefits to Indian Embassy shall not be taken into account in bid evaluation.

## **F – AWARD OF CONTRACT**

### **2.31. Award Criteria**

The Indian Embassy will award the Contract to the bidder whose bid has been determined to be substantially responsive to the Bidding Documents and who has offered the lowest Evaluated Bid Price.

### **2.32. Indian Embassy's Right to accept any Bid and to reject any or all Bids**

The Indian Embassy reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for the Indian Embassy's action.

### **2.33. Notification of Award**

Prior to the expiry of the period of bid validity prescribed by the Indian Embassy or any extension thereof, the Indian Embassy will notify the successful bidder by fax and confirmed in writing by registered letter that his bid has been accepted.

This "Letter of Award" shall contain the contract price payable to the successful bidder in consideration of the execution, completion and maintenance of the Works by the successful bidders prescribed in the Contract (hereinafter and in the Conditions of Contract called "the Contract Price").

The notification of award will constitute the part of the Contract agreement.

### **2.34. Signing of the Contract**

Within 15 (Fifteen) days of receipt of the Letter of Award, on a date and time mutually agreed upon, or as specified in the letter of award the successful bidder or his authorized representative shall attend the office of the Ambassador of India, Indian Embassy , Bhutan for signing of the Contract Agreement.

Failure on the part of the successful bidder to comply with the above requirements will constitute sufficient grounds for the annulment of the award and forfeiture of the bid security.

### **2.35. Performance Security**

Within 15 (fifteen) days of the receipt of the notification of award from the Indian Embassy, but not later than the date of the signing of the Agreement, the successful bidder shall furnish to the Indian Embassy, a Performance Security in the form of an irrevocable Bank



Guarantee for an amount of 5% (five percent) of the Contract Price in accordance with the Conditions of the Contract as per **Clause 3.10**.

The Performance Security provided by the successful bidder shall be in the favour of “Indian Embassy” issued by the Bank of Bhutan or any Scheduled Bank in Bhutan/India. The Bank Guarantee shall be on the Proforma attached in **SECTION - VI**.

Failure of the successful bidder to comply with this requirement shall constitute sufficient grounds for the annulment of the award and forfeiture of the bid security.

#### **2.36. Mobilization Advance and Recoveries**

In case the Contractor require any mobilization advance & submits his request in writing to the Indian Embassy then the Indian Embassy will provide an interest free mobilization advance equal to 5 (five) % of the total Contract Price against bank guarantee (refer Proforma in Appendix) after signing the Contract. Recovery of advance payment shall be effective in accordance with **Clause 3.61 of SECTION - III**.

#### **2.37. Income Tax**

The Contractor shall be liable for payment of Contractor’s Tax in lieu of income tax as per relevant section of Income Tax Act applicable under the rules of the Royal Government of Bhutan. Deduction towards income tax shall be made from gross amount of every interim payment certified by the Engineer-in-Charge.

#### **2.38. Execution, Completion and Maintenance of Works**

The Contractor shall execute, complete within the stipulated period of time and also in accordance within the provision of contract and maintain till acceptance by Indian Embassy. In case of failure on the period specified, the damages will be imposed as specified in **Clause 47 of SECTION - III (Liquidated Damages)** of General Conditions of Contract.

The drawings furnished in this document are for Tender purpose only. The work shall be executed based upon the Construction drawings issued to Contractor. All cost of execution, completion and maintenance of the works shall be deemed to be included in the contract price. The Contractor will not be paid separately for execution and completion of all such works of amendment, reconstruction and making good the defects or other faults as Indian Embassy may instruct, during the period of maintenance.

#### **2.39. Defect Liability/Maintenance Period**

Defect Liability/Maintenance Period is for **6 (Six) months** reckoned after the date of issue of final certificate of completion of work.

### **G – Project Information**

#### **2.40. Site Location**

The Site for the work is located in India House Thimphu. The contractor shall satisfy himself regarding all aspects of site conditions such as rainfall, temperature, humidity, accessibility

etc. of the area before submission of the bid. No claim will be entertained on the plea that the information supplied by employer is insufficient.

*SECTION - III*

*GENERAL CONDITIONS OF CONTRACT*

## SECTION III: GENERAL CONDITIONS OF CONTRACT

### DEFINITIONS AND INTERPRETATIONS

#### Clause 3.1 Definitions

In the Contract, as hereinafter defined, the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires:

- 1) 'Embassy'/ 'Purchaser' / 'Authority'/ 'Employer' means the Indian Embassy, Thimphu and the legal successor in title to the INDIAN EMBASSY who will employ the Contractor.
- 2) "RGoB" means the Royal Government of Bhutan.
- 3) "Tender/Bid, tenderer/bidders" means synonymous throughout this contract document.
- 4) 'Contractor'/ 'Supplier' means the person or persons, firm or company, group of firms or Joint Venture, whose bid has been accepted by the INDIAN EMBASSY and includes the Contractor's authorised representatives, successors and permitted assigns.
- 5) Employer/Department/Authority shall mean Indian Embassy and include duly authorized representative or any other person empowered or any other person empowered on behalf of INDIAN EMBASSY to discharge all or any of its function.
- 6) Accepting Authority shall mean the Ambassador of India to Thimphu or his authorized nominee.
- 7) "Engineer-in-Charge" (EIC) means the Engineer-in-Charge appointed from time to time by the INDIAN EMBASSY and notified in writing to the Contractor to act as the Engineer-in-Charge for the purposes of the Contract.
- 8) "Engineer-in-Charge's Representative" means any Resident Engineer or assistant of the Engineer-in-Charge appointed from time to time by the INDIAN EMBASSY or the Engineer-in-Charge to perform the duties set forth in **Clause 3.2** hereof, whose authority shall be notified in writing to the Contractor by the Engineer-in-Charge.
- 9) "Works" shall include both Permanent Works and Temporary Works.
- 10) "Site Manager" means the overall in-charge of the construction site appointed by the Contractor to perform all contract obligations as defined in the contract document and whose authority shall be notified in writing to the Engineer-in-Charge for approval.
- 11) "Temporary works" means all temporary works of every kind required in or about the execution or maintenance of Works.
- 12) "Permanent Works" means the permanent works to be executed and maintained in accordance with the Contract.
- 13) "Contract" means the Conditions Governing the Contract, Technical Specifications, Drawings, priced Bill of Quantities, Letter of Award and the Contract Agreement.
- 14) "Contract Price" or "Contract value" means the sum indicated in the Letter of Award. During execution, the Contract Price when exceeds the awarded value (without escalation), comprising BOQ items actually executed plus the extra/deviated items valued at base date without escalation for the purpose of regulating percentage based issues.
- 15) "Constructional Plant", "Plant and Equipment" or "Machinery" means and include plant, equipment, machinery, tools, appliances, other implements of all description 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 Permanent Works.

- 16) "Specifications" means the Technical Specifications and other Specifications referred to in the Bidding Documents and any modification thereof or addition thereto or deletion therefrom as may, from time to time, be furnished/decided by INDIAN EMBASSY and/or submitted by the Contractor and approved in writing by the Engineer-in-Charge.
- 17) "Bhutan PWD Specifications" shall mean the 'Specification for Building and Road Works' of Public Work Department, Thimphu, Bhutan
- 18) "Drawings" means the drawings referred to in the Specifications and any modification of such drawings approved in writing by the Engineer-in-Charge and such drawings, as may, from time to time, be furnished by INDIAN EMBASSY and/or submitted by the Contractor and approved in writing by the Engineer-in-Charge.
- 19) Schedule referred to in these conditions shall mean relevant schedule(s) annexed to these tender documents or the standard schedule mentioned in **SECTION - V** with amendments thereto, if any.
- 20) "Site" means the land and other places on, under, in or through which the Permanent Works or Temporary Works, designed by the Engineer-in-Charge are to be executed and any other lands and places provided by the INDIAN EMBASSY for the purposes of working space or any other purpose as may be specifically designated in the Contract or subsequently approved as forming part of site.
- 21) "Approved" means approved in writing, including subsequent written confirmation of previous verbal approval and "approval" means approval in writing, including as aforesaid.
- 22) "Chief Engineer" means the Chief Engineer-in-Charge of the Works or his successor and to whom the Engineer-in-Charge reports.
- 23) "Second Secretary & HoC" means the Technical and Administrative head of the Project.
- 24) "GoI" means Government of India.
- 25) "Sub-Contractor" means the party or parties having direct contract with the Contractor and to whom any part of the Contract has been sublet by the Contractor with the consent, in writing, of the Engineer-in-Charge.
- 26) "Manufacturer" means the party proposing to design and/or manufacture the equipment and materials as specified complete or in part.
- 27) "Letter of Award" means the letter from the INDIAN EMBASSY conveying acceptance of the bid subject to such reservations as may have been stated therein.
- 28) "Tonne or Metric Tonne" means 1,000 kgs (one thousand kilograms). Metric system shall be followed in all interpretation and execution of Works under this Contract. Any conversion found necessary shall be in accordance with the figures given in 'Indian Standard', IS 786-1967 and subsequent revision(s) of this Standard.
- 29) "B.I.S" means Bureau of Indian Standard Specifications with latest amendments or revisions as currently in force at the time of execution of the Works.
- 30) "Day" means a day from midnight to midnight.
- 31) "Month" means from the beginning of a given date of a calendar month to the end of the preceding date of the next calendar month.
- 32) "Week" means seven consecutive days.

- 33) "Quarter" means a period of three consecutive months starting from January, April, July and October i.e. January to March, April to June, July to September and October to December.
- 34) "Rupees" means Rupees in Indian Currency.
- 35) "Ngultrum" means Ngultrum in Bhutanese Currency.
- 36) Words in singular number shall include the plural number and vice-versa where the context so requires. "He" shall include "She" and vice-versa.
- 37) "Cost" mean all expenditure properly incurred or to be incurred whether on or off the site including overhead and other charges allocable thereto but does not include any allowance for profit.
- 38) The "Goods" means all the gates, hoists, equipment, machinery all their accessories and/or other materials, etc. which the Contractor is required to supply to INDIAN EMBASSY under the scope of Contract, this for execution of all works in totality.
- 39) "Services" means services ancillary to the supply of Goods such as transportation and insurance and any other incidental services such as installation, performance of onsite erection, testing, painting, commissioning for the supplied goods, training and other such obligations of the Contractor covered under the Contract.
- 40) "Project Manager" means the person appointed from time to time by the Contractor and notified in writing to the INDIAN EMBASSY to act as the in-charge for the purpose of the Contract.
- 41) Retention money & security deposit are synonymous.  
The headings in these conditions of the Contract shall not be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof or of the Contract.
- 42) The General conditions of contracts shall be read in conjunction with CPWD General Conditions of contracts. If there are any provisions in these special conditions which are at variance with provision of CPWD General Conditions of contracts, the provision in these special conditions shall take precedence.

## **ENGINEER-IN-CHARGE AND ENGINEER-IN-CHARGE'S REPRESENTATIVES (S)**

### **Clause 3.2 Duties and Powers of Engineer-in-Charge and Engineer-in-Charge's Representative (s)**

- 1) The Engineer-in-Charge shall carry out such duties in issuing decisions, certificates and orders as are specified in the Contract.
- 2) The Engineer-in-Charge's representative(s) shall be responsible to the Engineer-in-Charge, and his duties are to watch and supervise the works and to test and examine any materials to be used or workmen employed in connection with the Works. He shall have no authority to relieve the Contractor of any of his duties or obligations under the Contract nor, except as expressly provided hereunder or elsewhere in the Contract, to order any Work involving delay or any extra payment by the Engineer-in-Charge, nor to make any variation of or in the Works.
- 3) The Engineer-in-Charge may, from time to time in writing, delegate to the Engineer-in-Charge's Representative(s) any of the powers and authorities vested in the Engineer-in-Charge and shall furnish to the Contractor a copy of all such written delegations of Powers and authorities. Any written instructions or approval given by the Engineer-in-Charge's Representative(s) to the Contractor within the terms of such delegation, but not otherwise,

shall bind the Contractor as though it had been given by the Engineer-in-Charge. Provided always as follows:

- 4) Failure of the Engineer-in-Charge's Representative(s) to disapprove any Work or materials shall not prejudice the powers of the Engineer-in-Charge thereafter to disapprove such Work or materials and to order the pulling down, removal or breaking up thereof.
- 5) If the Contractor is dissatisfied by reason of any decision of the Engineer-in-Charge's Representative(s), he shall be entitled to refer the matter to the Engineer-in-Charge, who shall thereupon confirm, reverse or vary such decision.

### **Clause 3.3 Assignment**

The Contractor shall not assign the Contract or any part thereof, or any benefit or interest therein or thereunder, otherwise than by a charge in favour of the Contractor's bankers of any money due or to become due under this Contract, without the prior written consent of the INDIAN EMBASSY.

### **Clause 3.4 Sub-letting**

The Contractor shall not sub-let the whole of the Works. Except where otherwise provided by the Contract, the Contractor shall not sub-let any part of the Works without the prior written consent of the Engineer-in-Charge, which shall not be unreasonably withheld, and such consent, if given, 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 sub-contractor, his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents, servants or workmen. Provided always that the provision of labour on a piece work basis shall not be deemed to be a sub-letting under this Clause.

## **CONTRACT DOCUMENTS**

### **Clause 3.5 Language and Law**

- i)
  - a) The Contract documents shall be drawn up in English. All correspondence and documents relating to the bid, exchanged by the bidder and the INDIAN EMBASSY, shall be submitted in the prescribed form in English. All supporting documents and printed literature in connection with the bid shall be preferably in English.
  - b) The law to which the Contract is to be subject and according to which the Contract is to be construed shall be the law for the time being in force in Bhutan and within the jurisdiction of Thimphu courts.
- ii) Documents Mutually Explanatory  
Several documents forming the Contract are to be taken as mutually explanatory of one another, but in case of ambiguities or discrepancies, the documents shall take precedence in the order in which they are set out in the Proforma of Agreement **(Form No. 7)**.

### **Clause 3.6 Drawings**

i) **Custody of Drawings**

The drawings shall remain in the sole custody of the Engineer-in-Charge, but two copies thereof shall be furnished to the Contractor free of charge. The Contractor shall provide and make, at his own expense, any further copies required by him. At the completion of the Contract, the Contractor shall return to the Engineer-in-Charge all drawings provided under the Contract.

ii) **One copy of drawings to be kept on site.**

One copy of the drawings, furnished to the Contractor as aforesaid, shall be kept by the Contractor on the Site and the same shall, at all reasonable times, be available for inspection and use by the Engineer-in-Charge and the Engineer-in-Charge's Representative and by any other person authorized by the Engineer-in-Charge in writing.

### **Clause 3.7 Further Drawings and Instructions**

The Engineer-in-Charge shall have full power and authority to supply to the Contractor from time to time, during the progress of the Works, such further drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and maintenance of the Works. The Contractor shall carry out and be bound by the same.

## **GENERAL OBLIGATIONS**

### **Clause 3.8 Contractor's General Responsibilities**

- i) The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work signed by the Engineer-in-Charge.
- ii) 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.
- iii) The Contractor shall promptly inform the Engineer-in-Charge of any error, omission, fault and other defect in the design of or specifications for the Works which are discovered when reviewing the Bidding Documents or in the process of execution of the Works.
- iv) Where no specifications have been laid down, the materials used and the Work done shall conform to the relevant Specifications for Building and Road Works: Royal Govt. of Bhutan, Latest version or I.S. Code, as per CPWD Specifications (latest with amendments) unless otherwise specified in the nomenclature of the item or as directed by the Engineer-in-Charge.



- v) All instructions and orders given by the Engineer-in-Charge at Site are to be maintained in the Site Instruction Book and shall be taken to have been conveyed to the Contractor for his compliance.
- vi) The Contractor must have a site office to receive normal correspondence between 9 AM and 5.30 PM on working days and urgent correspondence at any time on all days.

### **Clause 3.9 Contract Agreement**

The Contractor Shall, when called upon so to do, enter into and execute a Contract Agreement, to be prepared and completed at the cost of the INDIAN EMBASSY in the Performa annexed, with such modification as may be necessary.

### **Clause 3.10 Performance Security**

- i) The contractor shall submit an irrevocable Performance Guarantee of 5% (Five percent) of the contract price 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 **SECTION - V SCHEDULE** from the date of issue of letter of acceptance. This period can be further extended by the Engineer-in-Charge up to a maximum period as specified in **SECTION - V SCHEDULE** on written request of the contractor stating the reason for delays in procuring the Performance Guarantee, to the satisfaction of the Engineer-in-Charge. This guarantee shall be in the form of Deposit at Call receipt of any scheduled bank/Banker's Cheque of any scheduled bank/Demand Draft of any scheduled bank/Pay Order of any scheduled bank (in case guarantee amount is less than Rs. 1,00,000/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Scheduled Bank or the State Bank of India in accordance with the form annexed hereto (**Form No. 8**). In case a fixed deposit receipt of any Bank is furnished by the contractor to the Government as part of the performance guarantee and the Bank is unable to make payment against the said fixed deposit receipt, the loss caused thereby shall fall on the contractor and the contractor shall forthwith on demand furnish additional security to the Government to make good the deficit.
- ii) The performance security shall be valid upto 30 days after the date of issue of Maintenance Certificate.
- iii) The Engineer-in-Charge shall not make a claim under the performance guarantee except for amounts to which the President of India is entitled under the contract (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 the Engineer-in-Charge may claim the full amount of the Performance Guarantee.
  - b) Failure by the contractor to pay President of India any amount due, either as agreed by the contractor or determined under any of the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer-in-Charge.
- iv) The Performance Security will be released by the INDIAN EMBASSY, after the issue of the Maintenance Certificate but not later 30 days from the date of issue of Maintenance Certificate.

### **Clause 3.11 Inspection of Site**

The Contractor shall be deemed to have inspected and examined the Site and its surroundings and information available in connection therewith and to have satisfied himself, so far as is practicable, before submitting his Bid, as to the form and nature thereof, including the subsurface conditions, the hydrological and climatic conditions, the extent and nature of work, and materials necessary for the completion of the Works, means of access to the Site and the accommodation he may require and, in general, shall be deemed to have obtained all necessary information, subject as above mentioned, as to risks, contingencies and all other circumstances which may influence or affect his Bid.

### **Clause 3.12 Sufficiency of Bid**

The Contractor shall be deemed to have satisfied himself before bidding as to the correctness and sufficiency of his Bid for the Works and of the rates and prices stated in the priced Bill of Quantities and the Schedule of Rates and Prices, if any, which Bid rates and prices shall, except in so far as it is otherwise provided in the Contract, cover all his obligations under the Contract, and all matters and things necessary for the proper execution/completion and maintenance of all the permanent works.

### **Clause 3.13 Works to be to the Satisfaction of Engineer-in-Charge**

Save in-so-far as it is legally or physically impossible the Contractor shall execute and maintain the Works in strict accordance with the Contract to the satisfaction of the Engineer-in-Charge and shall comply with and adhere strictly to the Engineer-in-Charge's instructions and directions on any matter whether mentioned in the Contract or not, touching or concerning the Works. The Contractor shall take instructions and directions only from the Engineer-in-Charge, or, subject to the limitations referred to in **Clause 3.2** hereof, from the Engineer-in-Charge's Representative.

### **Clause 3.14 Programme to be furnished**

- i) Within a period of 15 days, the Contractor shall, after the acceptance of his Bid, submit to the Engineer-in-Charge for his approval, six copies of a construction Programme showing the order of sequence and procedure in which he proposes to carry out the Works. The Contractor's Programme shall conform to the total time period and completion of the work specified in **Clause 3.44** hereof.
- ii) The detailed construction programme submitted by the Contractor for orderly completion of the Works, shall show planned sequence of operations and the dates for commencement and completion of all salient feature of the Works.
- iii) The programme shall cover activities on the Site and procurement and delivery activities.
- iv) The programme shall be orderly and realistic, and shall be revised at three monthly intervals or as necessary, as the work progresses to meet this requirement and should include a chart of the principal quantities of Work forecast for execution monthly, and a schedule of payments expected to be made to the Contractor by the INDIAN EMBASSY.

- v) The Contractor shall promptly advise the Engineer-in-Charge of any occurrence requiring substantial revision of the programme, giving a detailed explanation of the cause of the revision, and shall furnish a revised programme within 15 days of such occurrence.
- vi) If at any time it should appear to the Engineer-in-Charge that the actual progress of the Works does not conform to the approved programme, the Contractor shall produce, at the request of the Engineer-in-Charge, a revised programme showing the modifications to the approved programme necessary to ensure completion of the Works within the time for completion as defined in **Clause 3.44** hereof.
- vii) The submission to and approval by the Engineer-in-Charge or Engineer-in-Charge's Representative of such programmes or the furnishing of such particulars shall not relieve the Contractor of any of his duties or responsibilities under the Contract.
- viii) The Contractor shall, whenever required by the Engineer-in-Charge or Engineer-in-Charge's Representative also provide in writing, for his information a general description of the arrangements such as deployment of modern and efficient machinery, skilled and unskilled labour and methods, which the Contractor proposes to adopt for the execution of Works.
- ix) The Contractor shall have to obtain prior approval of the Engineer-in-Charge for the sequence of construction which he proposes to adopt.

#### **Clause 3.15 Contractor's Superintendence**

- i) The Contractor shall provide all necessary superintendence during execution of the work and as long thereafter as may be necessary for proper fulfilling of the obligations under the contract.
- ii) The Contractor shall immediately after receiving letter of award of the tender, intimate in writing to the Engineer-in-Charge the name, qualification, experience, age, address, mobile number, email and other particulars along with certificates, of the Site Manager to be the In-Charge of the work.
- iii) Such qualifications and experience shall not be lower than specified in **SECTION - V**. The Engineer-in-Charge shall within 15 days of receipt of such communication intimate in writing his approval or otherwise of Site Manager of the Contractor.
- iv) Any such approval may at any time be withdrawn and in case of such withdrawal the Contractor shall appoint another such Site Manager according to the provisions of this clause. Decision of the EIC shall be final and binding on the Contractor in this respect.
- v) Such Site Manager shall be appointed by the Contractor soon after receipt of the approval from Engineer-in-Charge and shall be available at site within fifteen days of start of work.
- vi) The Site Manager shall on receiving reasonable notice from the Engineer-in-Charge present himself to the Engineer-in-Charge and/or at the site of work, as required, to take instructions. Instructions given to the Site Manager shall be deemed to have the same force as if these have been given to the Contractor. The Site Manager representative and/or the Contractor or his responsible authorized agent shall be available at site as well as during recording of measurement of works and whenever so required by the Engineer-in-Charge by a notice as aforesaid and shall also note down instructions conveyed by the Engineer-in-Charge or his designated representative in the site order book and shall affix his signature in token of noting down the instructions and in token of acceptance of measurement.
- vii) If the Engineer-in-Charge, is convinced that no such Site Manager or agent is effectively appointed or is effectively attending or fulfilling the provision of this clause, then the

decision of the Engineer-in-Charge as recorded in the site order book and measurement recorded in Measurement Books shall be final and binding on the Contractor.

- viii) In case the Site Manager of the Contractor does not discharge his duties satisfactorily, the Engineer-in-Charge shall have full powers to suspend the work and Contractor shall be held responsible for the delay so caused to the work. The Contractor shall submit a certificate of employment of the Site Manager along with every account bill/final bill and shall produce evidence, if at any time, so required by the Engineer-in-Charge.

#### **Clause 3.16 Contractor's Employees**

- i) The Contractor shall provide and employ on the Site in connection with the execution and maintenance of the Works:
- a) only such technical assistants as are skilled and experienced in their respective trades and such sub-agents, foremen and leading hands as are competent to give proper supervision to the work they are required to supervise, and
  - b) such skilled, semi-skilled and unskilled labour as is necessary for the proper and timely execution and maintenance of the Works.
  - c) experienced Safety Officer to maintain and supervise safety requirements at the site of Works. Safety standards shall be followed as provided in these documents.
- ii) The Engineer-in-Charge shall be at liberty to object to and require the Contractor to remove forthwith from the Works any person employed by the Contractor in or about the execution or maintenance of the Works who, in the opinion of the Engineer-in-Charge, misconducts himself, or is incompetent or negligent in the proper performance of his duties, or whose employment is otherwise considered by the Engineer-in-Charge to be undesirable and such persons shall not be again employed upon the Works without the written permission of the Engineer-in-Charge. Any person so removed from the Works shall be replaced as soon as possible by a competent substitute approved by the Engineer-in-Charge.

#### **Clause 3.17 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 of reference given by the Engineer-in-Charge in writing and for the correctness, subject as above mentioned, of the position, levels, dimensions and alignment of all parts of the Works and for the provision of all necessary instruments, appliances and labour in connection therewith.

The checking of any setting out or of any line, alignment, dimensions or level by the Engineer-in-Charge or the Engineer-in-Charge's Representative shall not in any way relieve the Contractor of his responsibility for the correctness thereof and the Contractor shall carefully protect and preserve all bench marks, pegs and other things used in setting out the Works.

#### **Clause 3.18 Boreholes and Exploratory Excavation**

If, at any time during the execution of the Works, the Engineer-in-Charge 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 addition ordered under the provisions of

**Clause 3.52** hereof, unless a provision in respect of such anticipated work shall have been included in the Bill of Quantities.

**Clause 3.19 Watching and Lighting**

- i) The Contractor shall, in connection with the Works, provide and maintain at his own cost, all lights, guards, fencing and watching when and where necessary or required by the Engineer-in-Charge or the Engineer-in-Charge's Representative, or by any duly constituted authority, for the protection of the Works, or for the safety and convenience of the public or others.
- ii) The Contractor shall also be responsible for temporary roadways, footways, guards, fences, caution notices etc. as far as the same may be rendered necessary by reason of the Work for the pedestrians or other traffic and of owners and occupiers of the adjacent property and of the public and shall remain responsible for any accidents that may occur on account of his failure to take proper and timely precautions.

**Clause 3.20 Care of Works**

- i) The Contractor shall take full responsibility for the care of the Works from the date of Commencement of Works until the date of issue of the Completion Certificate for the whole of the Works when the responsibility for the said care shall pass to the INDIAN EMBASSY.
- ii) In the event of any loss or damage to the Works or any part thereof, during the period for which the Contractor is responsible for the care thereof, from any cause whatsoever, other than the risks defined in Sub-Clauses (v) & (vi) of this Clause, the Contractor, at his own cost, shall rectify such loss or damage so that the permanent works conform in every respect within provision of the contract to the satisfaction of Engineer-in-charge. The contractor shall also be liable for any loss or damage to the Works occasioned by him in the course of any operation carried out by him for the purpose of complying with his obligations under **Clause 3.50**.
- iii) In the event of any loss or damage to the Permanent Works which may occur or arise out of any of the Risks defined in Sub-Clause (v) of this Clause, the same shall be made good/rectified by the Contractor, if and to the extent required by the Engineer-in-Charge, at the cost of the INDIAN EMBASSY which sum shall be determined by the Engineer-in-Charge in accordance with **Clause 3.52** and **Clause 3.53**.
- iv) In the event of any loss or damage which may occur or arise out of any of the risks defined in Sub-Clause (vi) of this Clause, neither party to the Contract shall be liable to the other for any such loss or damage. However, in the event of any loss or damage to the Permanent Works arising as a consequence of the risk(s) defined in Sub-Clause (vi) of this Clause the same shall be made good/rectified by the Contractor at the cost of the INDIAN EMBASSY which sum shall be determined by the Engineer-in-Charge under the provisions of the Contract.
- v) The INDIAN EMBASSY's risks are as under:
  - a) Loss or damage due to the use or occupation by the INDIAN EMBASSY of any section or part of the Permanent Works except as may be provided for in the Contract.
  - b) loss or damage to the extent that it is due to the design of the Works other than any part of the design provided by the Contractor.
- vi) Force Majeure/Excepted risks are as under:

- a) war, hostilities (whether war be declared or not), invasion, act of foreign enemies, act of public enemies.
- b) riot, commotion, disorder, strike or lockout by persons other than the Contractor's personnel.
- c) any operation of the forces of nature against which an experienced Contractor could not reasonably have been expected to take precautions.

**Clause 3.21 Dismantled material Employer property**

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

**Clause 3.22 Insurance of Plant & Equipment**

Not applicable

**Clause 3.23 Damage to Persons and Property**

The Contractor shall, except if and so far as the Contract provides otherwise, indemnify the INDIAN EMBASSY against all losses and claims in respect of injuries or damage to any persons or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution and maintenance of the Works and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation or damages for or with respect to injuries or damage to persons or property resulting from any act or neglect of the INDIAN EMBASSY, his agent, servants or other Contractors, not being employed by the Contractor, or for or in respect of any claims, proceedings, damages, costs, charges and expenses in respect thereof or in relation thereto or where the injury or damage was contributed to by the Contractor, his servants or agents, such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the INDIAN EMBASSY, its servants or agents or other Contractors for the damage or injury.

**Clause 3.24 Third Party Insurance**

- i) Before commencing the execution of the Works the Contractor, but without limiting his obligations and responsibilities under **Clause 3.23** hereof, shall insure against his liability for any material or physical damage, loss or injury which may occur to any property, including that of the INDIAN EMBASSY, or to any person, including any employee of the INDIAN EMBASSY, by or arising out of the execution of the Works or in the carrying out of the Contract, otherwise, than due to the matters referred to in the provision to **Clause 3.23** hereof.
- ii) Amount of Third Party Insurance

The Contractor shall take a policy for the Third Party Insurance for an amount to be decided by the Engineer-in-Charge and pay the premium as required or as mentioned in **SCHEDULE of SECTION - V**. However, the decision of the Engineer-in-Charge shall be final & binding on the Contractor.

The Contractor shall, whenever required, produce to the Engineer-in-Charge or the Engineer-in-Charge's Representative the original policy or policies of insurance and the receipts for payment of the current premiums and furnish attested copies thereof.

iii) Provision to Indemnify INDIAN EMBASSY

The terms shall include a provision whereby, in the event of any claim in respect of which the Contractor would be entitled to receive indemnity under the policy being brought or made against the INDIAN EMBASSY, the insurer will indemnify the INDIAN EMBASSY against such claims and any costs, charges and expenses in respect thereof.

**Clause 3.25 Accidents or Injury to Workmen**

i) The INDIAN EMBASSY shall not be liable for or in respect of any damages or compensation payable according to law in respect or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or any sub-Contractor, save and except an accident or injury resulting from any act or default of the INDIAN EMBASSY, its agents or servants. The Contractor shall indemnify and keep indemnified the INDIAN EMBASSY against all such damages and compensation, save and except as aforesaid, and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

ii) On the occurrence of accident arising out of the Works which result in death, or which is so serious as to be likely to result in death, the Contractor shall, within twenty four hours of such accident, report in writing to the Engineer-in-Charge and other statutory bodies of the Government the facts stating clearly and in sufficient details the circumstances of such accident and the subsequent action. All other accidents on the Works involving injuries to persons or damage to property other than that of the Contractor shall be promptly reported to the Engineer-in-Charge and other statutory bodies of the Government stating clearly and in sufficient details of the facts and circumstances of the accidents and the action taken. In all cases the Contractor shall indemnify the INDIAN EMBASSY against all loss or damage resulting directly or indirectly from the Contractor's failure to report in the manner aforesaid. This includes penalties or fines, if any, payable by the INDIAN EMBASSY as a consequence of failure to give notice or failure to conform to the provisions of any Act in regard to such accidents.

iii) Insurance against Accident, etc. to Workmen

The Contractor shall insure against such liability with an insurer approved by the INDIAN EMBASSY, which approval shall not be unreasonably withheld, and shall continue such insurance during the whole of the time that any persons are employed by him on the Works and shall, when required, produce to the Engineer-in-Charge or the Engineer-in-Charge's Representative such policy of insurance and the receipt for payment of the current premium. Provided always that, in respect of any persons employed by any sub-contractor,



the Contractor's obligation to insure as aforesaid under this sub-clause shall be satisfied if the sub-contractor shall have insured against the liability in respect of such persons in such manner that the INDIAN EMBASSY is indemnified under the policy, but the Contractor shall require such sub-contractor to produce to the Engineer-in-Charge or the Engineer-in-Charge's Representative, when required, such policy of insurance and the receipt for the payment of the current premium.

**Clause 3.26 Remedy on Contractor's Failure to Insure**

If the Contractor shall fail to affect and keep in force the insurances referred to in **Clause 3.24 & Clause 3.25** hereof, or any other insurance which he may be required to affect under the terms of the Contract, then and in any such case the INDIAN EMBASSY may affect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the INDIAN EMBASSY as aforesaid from any money due or which may be become due to the Contractor, or recover the same as a debt due from the Contractor.

Failure of the Contractor to maintain adequate insurance cover as set out under **Clause 3.24 & Clause 3.25** hereof or any other insurance which he may be required to affect under the terms of the Contract, shall not relieve him of any Contractual responsibility.

**Clause 3.27 Giving of Notices, Payment of Fees and Compliance with Statutes and Regulations etc.**

- i) Giving of Notices and Payment of Fees  
The Contractor shall give all notices and pay all fees required to be given or paid by any Statute, Ordinance, or other Law, or any regulation, or bye-law of any local or other duly constituted authority in relation to the execution of Works and by the rules and regulations of all public bodies and companies whose property or rights are affected or may be affected in any way by the Works.
- ii) Compliance with Statutes, Regulations etc.  
The Contractor shall conform in all respects with the provisions of any such Statute, Ordinance or Law as aforesaid and the regulations or bye-laws of any local or other duly constituted authority which may be applicable to the Works and with such rules and regulations of public bodies and companies as aforesaid and shall keep the INDIAN EMBASSY indemnified against all penalties and liability of every kind for breach of any such Statute, Ordinance or Law, regulation or by-law.
- iii) The INDIAN EMBASSY will repay or allow to the Contractor all such sums as the Engineer-in-Charge shall certify to have been properly payable and paid by the Contractor in respect of such fees.



**Clause 3.28 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, as between the INDIAN EMBASSY and the Contractor, be deemed to be the absolute property of the INDIAN EMBASSY / RGoB. The Contractor should protect such findings from any damage/theft & notify immediately to the Engineer-in-Charge &/or his authorized representative.

**Clause 3.29 Compliance with Tax laws.**

- i) Income Tax, Works Contract Tax and other taxes as applicable for the works will be deducted by the Employer from all the interim bills and the final bill of the Contractor, and remitted to the Government account, in accordance with the latest laws of Bhutan.
- ii) It will be the responsibility of the Contractor to indicate the various taxes to be deducted, as applicable for the works, while submitting his Interim and Final Bills. All penalties, interests, charges, etc. if levied by the Government/ Authorities on account of any misrepresentation/ ignorance regarding such taxes to be deducted from his bills, shall be borne by the Contractor. The Contractor shall also be responsible for compliance of local laws including deductions/ deposit of TDS and other taxes etc. by the specialized Agencies engaged by him as Sub-contractors for the execution of the works.
- iii) The Contractor shall be required to get himself registered within the prescribed time limit with the local Authorities in Thimpu/ Bhutan under their Income Tax Department, VAT, Labour & Welfare Cess, Employees Provident Fund (EPF), Employees' State Insurance Corporation laws (ESIC), etc. The other charges including the penalty/ fines for delay in registration, if any, shall be borne by the Contractor.
- iv) The Contractor shall submit along with each running account bill, documentary evidence in token of having deposited latest EPF dues with the EPF organization including ESIC etc. He shall also ensure that EPF dues etc. are deposited with the concerned Authorities by his specialized Agencies/ Sub-contractors.

**Clause 3.30 Interference with Traffic and Adjoining Properties**

All operations necessary for the execution of the Works shall, so far as compliance with the requirements of the Contract permits, be carried on so as not to interfere unnecessarily or improperly with the convenience of the public, or the access to, use and occupation of public or private roads and footpaths to or of properties whether in the possession of the INDIAN EMBASSY or of any other person. The Contractor shall save harmless and indemnify the INDIAN EMBASSY in respect of all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of, or in relation to, any such matters in-so-far as the Contractor is responsible therefor.

**Clause 3.31 Extraordinary Traffic**

- i) Protection of Highways and Bridges

The Contractor shall use every reasonable means to prevent any of the highways or bridges communicating with or on the routes to the Site from being damaged or injured by any traffic of the Contractor or any of his sub-contractors and, in particular, shall select routes, choose and use vehicles and restrict and distribute loads so that any increase in traffic frequency as will inevitably arise from the moving of plant and material from and to the Site, shall be limited, as far as reasonably possible to arise any unnecessary traffic congestion damage or injury which may be occasioned to such highways & bridges.

ii) **Settlement of Extraordinary Traffic Claims**

If during the execution of the Works or at any time thereafter the Contractor shall receive any claim arising out of the execution of the Works in respect of damage or injury to highways or bridges, he shall immediately report the same to the Engineer-in-Charge and thereafter the INDIAN EMBASSY shall negotiate the settlement of and pay all sums due in respect of such claim and shall indemnify the Contractor in respect thereof and in respect of all claims, proceedings, damages, costs, charges and expenses in relation thereto. Provided always that if and so far as any such claims or part thereof shall, in the opinion of the Engineer-in-Charge, be due to any failure on the part of the Contractor to observe and perform his obligations under sub-clauses (i) of this Clause, then the amount certified by the Engineer-in-Charge to be due to such failure shall be paid by the Contractor to the INDIAN EMBASSY.

**Clause 3.32 Opportunities for other Contractors**

The Contractor shall, in accordance with the requirements of the Engineer-in-Charge, afford all reasonable opportunities for carrying out their works to any other Contractors employed by the INDIAN EMBASSY and their workmen and to the workmen of the INDIAN EMBASSY and of any other duly constituted authorities who may be employed in the execution on or near the Site of any work not included in the Contract or of any Contract which the INDIAN EMBASSY may enter into in connection with or ancillary to the Works.

**Clause 3.33 Upkeep of Site**

During the progress of the Works, the Contractor shall keep the site reasonably free from all unnecessary obstructions and shall store or dispose of any Constructional plant and surplus materials and clear away and remove from the site any wreckage, rubbish or Temporary Works no longer required.

In case the Contractor does not keep the area clean and if found necessary to get the area cleaned, the Engineer-in-Charge shall issue a notice of forty eight hours, and in the event of non-compliance by the Contractor, get the area cleaned by some other agency. The cost of such cleaning shall be borne by the Contractor. In case of rubbish accumulating due to deposition by more than one Contractor, the share of charges to be borne by the Contractors as indicated by the Engineer-in-Charge shall be final.

### **Clause 3.34 Clearance of Site on Completion**

On the completion of the Works, the Contractor shall clear away and remove from the Site all Constructional Plant, surplus materials, rubbish and Temporary Works of every kind, and leave the whole of the site and Works clean and in a workman like condition to the satisfaction of the Engineer-in-Charge.

## **LABOUR**

### **Clause 3.35 Labour**

i) **Engagement of Labour**

The Contractor shall make his own arrangements for the engagement of all labour local or otherwise, and, save in-so-far as the Contract otherwise provides, for the transport housing, feeding and payment thereof. The Contractor shall not employ in connection with the Works any person who has not completed 18 years of age. No female labour shall be employed in night shifts. The Contractor shall have to arrange permits for the labour/staff for their entry into Bhutan, at his own cost. The Contractor shall recruit local manpower (skilled and unskilled) and use local resources to the extent possible.

ii) **Supply of Water**

The Contractor shall, having regard to local conditions, provide on the Site, to the satisfaction of the Engineer-in-Charge or his Representative, an adequate supply of drinking and other water for the use of the Contractor's staff and workmen.

iii) **Alcoholic Liquor & Drugs**

The Contractor shall not, otherwise than in accordance with the Statutes, Ordinances and Government Regulations or orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor, or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his Sub-Contractors, agents or employees.

iv) **Disorderly Conduct, etc.**

The Contractor shall, at all times, take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his employees and for the preservation of peace and protection, of persons and property in the neighborhood of the Works against the same.

v) **Contractor to Follow Labour Laws and Chathrim**

The Contractor shall, in respect of labour employed by him, comply with the provision of the various labour laws, Minimum Wages as per Chathrim issued by Ministry of Home Affairs, RGoB and shall indemnify the INDIAN EMBASSY in respect of all claims that may be made against the INDIAN EMBASSY for non-compliance thereof by the Contractor.

Notwithstanding anything contained herein, the Engineer-in-Charge may take such actions as may be necessary for compliance of the various labour laws and recover the costs thereof from the Contractor.

vi) **Observance by Sub-Contractors**

The Contractor shall be responsible for observance by his Sub-Contractors of the foregoing provisions.

### **Clause 3.36 Returns of labour etc.**

The Contractor shall, deliver to the Engineer-in-Charge or his Representative, a return in detail in such form and at such intervals as the Engineer-in-Charge may prescribe showing the supervisory staff and the number of the several classes of labour from time to time employed by the Contractor on the site and such information in respect of constructional plant as the Engineer-in-Charge may require.

## **MATERIALS AND WORKMANSHIP**

### **Clause 3.37 Materials and Workmanship**

#### **i) Materials and Workmanship**

The contractor shall be required to use locally manufactured, Bhutan Standard Bureau (BSB) certified domestic construction materials especially concrete blocks/bricks, interlocking cement earth blocks, HDPE pipes, Reinforcement Steel, Section etc. in the buildings and road construction works. The material shall conform to the latest BSB standards or in absence of these standards, to the equivalent IS codes. These materials must be cost effective as compared to imported materials of certified quality standards.

- a) The Contractor shall be responsible for arranging all the materials required for the construction of the Works from the source(s) acceptable to the INDIAN EMBASSY. He shall also be responsible for proper transportation and storage of these materials to the satisfaction of the Engineer-in-Charge and shall bear all related costs.
- b) The Engineer-in-Charge shall be entitled at any reasonable time, to inspect or examine all such materials. The Contractor shall provide reasonable assistance for such inspection or examination as may be required.
- c) The Contractor shall initiate timely action to procure the materials well in advance so as to ensure that the progress of Works does not suffer for want of the materials on the site at least thirty days before these are intended to be used on Works. Any setback to the progress of the Works and consequent delay in completion of the Works on account of non-availability of materials on Site shall be the sole responsibility of the Contractor.
- d) Any assistance that the Engineer-in-Charge can give to the Contractor for arranging the materials shall be provided on a “no responsibility basis”.

#### **ii) Quality of materials and Workmanship and Tests**

- a) The Contractor shall, provide the materials of the quality, kind and specifications as provided in the Contract. The Contractor shall produce to the Engineer-in-Charge, certified quality test reports in respect of the materials procured by him.
- b) In case the materials procured by the Contractor are not to the satisfaction of the Engineer-in-Charge and do not conform to the specifications laid in the Contract, such materials shall be rejected by the Engineer-in-Charge and the cost incurred on such procurement shall be responsibility of the Contractor.
- c) The workmanship shall be of the kind described in the Contract and in accordance with the Engineer-in-Charge’s instructions.
- d) All the materials and the workmanship shall be subjected, from time to time, to such tests as the Engineer-in-Charge may require. The Contractor shall provide such

assistance, instruments, machines, labour and materials as are required for examining, measuring and testing any material and shall supply samples of materials, before incorporation in the Works, for testing, as may be selected and required by the Engineer-in-Charge.

iii) Cost of Samples

All samples shall be supplied by the Contractor at his own cost.

iv) Cost of Tests

Cost of making any test intended by or provided for in the Contract shall be borne by the Contractor.

**Clause 3.38 Inspections of Operations**

The Engineer-in-Charge or any person authorized by him shall, at all times, have access to the Works and to all workshops and places where the 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 for and every assistance in or in obtaining the right to such access.

**Clause 3.39 Examination of Work Before covering up**

- i) No Work shall be covered up or put out of view without the approval of the Engineer-in-Charge or his Representative and the Contractor shall afford full opportunity for the Engineer-in-Charge or the Engineer-in-Charge's Representative 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 thereof. The Contractor shall give due notice whenever any such work or foundations is or are ready or about to be ready for examination and the Engineer-in-Charge or the Engineer-in-Charge's Representative shall, without unreasonable delay, unless he considers it unnecessary and advises the Contractor accordingly, attend for the purpose of examining and measuring such work or of examining such foundations.

ii) 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 Engineer-in-Charge or Engineer-in-Charge's Representative may, from time to time, direct and shall reinstate and make good such part or parts to the satisfaction of the Engineer-in-Charge and all such costs shall be borne by the Contractor.

**Clause 3.40 Removals of Improper Work and Materials**

- i) The Engineer-in-Charge shall have power to issue instructions from time to time for;
- a) the removal from the Site, within such time or times as may be specified in the instructions, of any materials which, in the opinion of the Engineer-in-Charge, are not in accordance with the Contract,
  - b) the substitution of proper and suitable materials, and
  - c) the removal and proper re-execution, notwithstanding any previous test thereof or interim payment therefor, of any work which in respect of materials or workmanship is not, in the opinion of the Engineer-in-Charge, in accordance with the Contract.
- ii) Default of Contractor in Compliance

In case of default on the part of the Contractor in carrying out such instruction, as specified in sub-clause (i) of this clause, the Engineer-in-Charge shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Engineer-in-Charge or may be deducted from any money due or which may become due to the Contractor.

#### **Clause 3.41 Suspension of Work**

- i) The Contractor shall, on receipt of the order in writing from the Engineer-in-Charge,(whose decision shall be final and binding on the contractor) suspend the progress of works as the Engineer-in-Charge may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons:
  - a) on account of any default on the part of the contractor or
  - b) for improper 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 instruction given by the Engineer-in-Charge.

#### **COMMENCEMENT AND DELAYS**

#### **Clause 3.42 Commencements of Works**

The Contractor shall commence the Works on Site within a period of fifteen days from the issue of the Letter of Award to him to this effect by the INDIAN EMBASSY and shall proceed with the Works with due expedition and completion within the stipulated period mentioned under **Clause 3.44** hereof.

#### **Clause 3.43 Possession of Site**

- i) Save in so far as the Contract may prescribe, the extent of portions of the Site of which the Contractor is to be given possession from time to time, the Engineer-in-Charge in turn will issue written order to commence the Works, give to the Contractor possession of so much of the Site as may be required to enable the Contractor to commence and proceed with the execution of the Works in accordance with the programme referred to in **Clause 3.14** hereof. The Contractor shall not be allowed, without any prior consent of the Engineer-in-Charge, to occupy other Government and/or INDIAN EMBASSY land for temporary use.
- ii) **Rights of Way and Facilities**  
The Contractor shall bear all costs and charges for special or temporary rights of way required by him in connection with access to the Site. The Contractor shall also provide, at his own cost, any additional facilities outside the Site required by him for the purpose of the Works.
- iii) The contractor shall not be entitled for any additional payment against any delay of handing over of site upto the extent of 45 days from the date of issuance of Letter of Award

#### **Clause 3.44 Time for Completion**

The period of completion of the whole of the Work shall be **4 (four) months** or such extended time as may be allowed under **Clause 3.45** hereof. The period of completion shall be reckoned from the 15<sup>th</sup> day of issue of the Letter of Award to the Contractor by the INDIAN EMBASSY. The programme submitted by the Contractor in accordance with **Clause 3.14** hereof should match with the total time of completion as specified in this clause.

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

In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value.

#### **Clause 3.45 Extension of Time for Completion**

Should the amount of extra or additional work of any kind or any cause of delay referred to in these Conditions, or exceptional adverse climatic conditions, or other special circumstances beyond the control of the Contractor which may occur, other than through a default of the Contractor, be such as fairly to entitle the Contractor to an extension of time for the Completion of the Works, the Engineer-in-Charge shall determine the period of such extension and shall notify the Contractor accordingly. Provided that the Engineer-in-Charge is not bound to take into account any extra or additional or other special circumstances unless the Contractor has, within 28 days after such work has been commenced, or such circumstances have arisen, or as soon thereafter as is practicable, submitted to the Engineer-in-Charge, full and detailed particulars of any extension of time to which he may consider himself entitled in order that such submission may be investigated at the time. The Contractor shall not be entitled to any payment for the time related costs incurred by him, if any, except those provided under the Contract, during the extended period for completion of Works.

#### **Clause 3.46 Shift Works**

- i) To achieve the required progress, the Work may be required to be carried out round the clock. The period of completion and number of working days shall not be affected by the number of shifts each day. No extra amount on account of any shift work is payable to the Contractor.
- ii) Whenever the Work is carried out at night, adequate lighting of working areas and access paths shall be provided by the Contractor at his cost. Sufficient notice shall be given by the Contractor to the Engineer-in-Charge regarding details of Works in shifts so that necessary supervision could be provided.



### **Clause 3.47 Rate of Progress**

- i) To ensure proper progress during the execution of the Works, the Contractor shall complete 1/8<sup>th</sup> of the Works before 1/4<sup>th</sup> of the whole time allowed in the Contract has elapsed, 3/8<sup>th</sup> of the Works before one half of such time has elapsed and 3/4<sup>th</sup> of Works before 3/4<sup>th</sup> of such time has elapsed.
- ii) If for any reason, which does not entitle the Contractor to an extension of time, the rate of progress of the Works of any section at any time is not commensurate with the rate of progress stipulated in Sub-clause (ii) of this Clause and in the opinion of the Engineer-in-Charge does not ensure completion by the prescribed time or extended time for completion, the Engineer-in-Charge shall so notify the Contractor in writing and the Contractor shall thereupon take such steps as are necessary and the Engineer-in-Charge may approve to expedite progress so as to complete the Works or such section by the prescribed time or extended time. The Contractor shall not be entitled to any additional payment for taking such steps.

### **Clause 3.48 Liquidated Damages for Delay**

- i) If the Contractor shall fail to achieve completion of the Works within the time prescribed by **Clause 3.44** hereof, then the Contractor shall pay to the INDIAN EMBASSY, the sum stated in sub-clause (ii) of this Clause as liquidated damages for such default for each week or part thereof which shall elapse between the time prescribed by **Clause 3.44** hereof and the date of certified completion of the Works. The INDIAN EMBASSY may without prejudice to any other method of recovery, deduct the amount of such damages from any money in its hands, due or which may become due to the Contractor. The payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works, or from any other of his obligations and liabilities under the Contract.
- ii) The Liquidated damages penalty will be charged for all delays due to the fault of the Contractor **at the rate of 1 % of contract value per week** beyond the stipulated period of completion including authorized extensions if any, subject to **maximum of 10% of the contract value**.

### **Clause 3.49 Certification of Completion of Works**

When the whole of the Works have been substantially completed and have satisfactorily passed any final test that may be prescribed by the Contract, the Contractor may give a notice to that effect to the Engineer-in-Charge or to the Engineer-in-Charge's Representative(s) accompanied by an undertaking to finish any outstanding work during the Period of Maintenance. Such notice and undertaking shall be in writing and shall be deemed to be a request by the Contractor for the Engineer-in-Charge to issue a Certificate of Completion in respect of the Works. The Engineer-in-Charge shall, within twenty-one days of the date of delivery of such notice either issue to the Contractor, a Certificate of Completion stating the date on which, in his opinion, the Works are substantially completed in accordance with the Contract or give instructions in writing to the Contractor specifying all the Works which, in the Engineer-in-Charge's opinion, are required to be done by the Contractor before the issue of such Certificate. The Engineer-in-Charge shall also notify the



Contractor of any defects in the Works affecting substantial completion that may appear after such instructions and before completion of the Works specified therein. The Contractor shall be entitled to receive such Certificate of Completion within twenty-one days of completion to the satisfaction of the Engineer-in-Charge of the Works so specified and making good any defects so notified.

## **MAINTENANCE AND DEFECTS**

### **Clause 3.50 Maintenance and Defects**

- i) Period of Maintenance-In these Conditions, the expression “Period of Maintenance” shall mean a period of **6 (Six )** months for all works calculated from the date of commissioning of the Works, certified by the Engineer-in-Charge in accordance with **Clause 3.49** hereof.
- ii) Execution of Work of Repair, etc.-To the intent that the Works shall, at or as soon as practicable after the expiration of the Period of Maintenance be delivered to the INDIAN EMBASSY in the condition required by the Contract, fair wear and tear excepted, to the satisfaction of the EIC, the Contractor shall complete the work, if any, outstanding on the date of completion, as certified under **Clause 3.49** hereof, as soon as practicable after such date and shall execute all such work of repair, amendment, reconstruction, rectification and making good defects, imperfections, shrinkages or other faults as may be required of the Contractor in writing by the Engineer-in-Charge during the Period of Maintenance or within fourteen days after its expiration, as a result of an inspection made by or on behalf of the Engineer-in-Charge prior to its expiration.
- iii) Cost of Execution of Works of Repair, etc.  
All repair works shall be carried out by the Contractor at his own expense if the necessity thereof shall, in the opinion of the Engineer-in-Charge, 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. If, in the opinion of the Engineer-in-Charge such necessity shall be due to any other cause, the value of such work shall be ascertained and paid for as if it were additional work.
- iv) Remedy on Contractor’s Failure to carry out Work Required  
If the Contractor shall fail to do any such work as aforesaid required by the Engineer-in-Charge, the INDIAN EMBASSY shall be entitled to employ and pay other persons to carry out the same and if such work is the work which, in the opinion of the Engineer-in-Charge, the Contractor was liable to do at his own expense under the Contract, then all expenses consequent there on or incidental thereto shall be recoverable from the Contractor by the Engineer-in-Charge from any money due or which may become due to the Contractor.

### **Clause 3.51 Contractors to Search**

The Contractor shall, if required by the Engineer-in-Charge in writing, search under the directions of the Engineer-in-Charge for the cause of any defect, imperfection or fault appearing during the progress of the Works or in the Period of Maintenance. Unless such

defect, imperfection or fault is one for which the Contractor is liable under the Contract, the cost of work carried out by the Contractor in searching as aforesaid shall be borne by the INDIAN EMBASSY. If such defect, imperfection or fault shall be one for which the Contractor is liable as aforesaid, the cost of the work carried out in searching as aforesaid shall be borne by the Contractor and he shall in such case repair, rectify and make good such defect, imperfection or fault at his own expense in accordance with the provisions of **Clause 3.50** hereof.

## **ALTERNATIONS, ADDITIONS, OMISSIONS AND EXTRA ITEMS**

### **Clause 3.52 Variations**

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

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

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:

- a) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value plus
- b) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Engineer-in-Charge

### **Clause 3.53 Determination of Price for Variation**

#### **Extra Items**

In the case of extra item(s) (items that are completely new, and are in addition to the items contained in the contract), the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, for the work and the engineer-in-charge shall within 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.

### **Substituted Items**

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).

### **Deviation, Deviated Quantities, Pricing**

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

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**, and the Engineer-in-Charge shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of the receipt of the notice, revise the rates for the work in question within one month of the expiry of the said period of fifteen days having regard to the market rates.

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

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:

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

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.

If it shall appear to the Employer/ Engineer-in-charge that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials of a quality inferior to that Contracted or otherwise not in accordance with the Contract, the Contractor shall, on demand from the Employer even after virtual completion, materials or articles complained of notwithstanding that the same may have been passed/ certified/ paid for, forthwith rectify/remove/ re-execute the work so specified in whole or in part, as the case may require at his own charge and cost. In the event of failing to do so, the Contractor shall be liable to pay compensation at the same rate as under clause of the Contract (for non-completion of the work in time) for this default.

In such case the Engineer-in-Charge may not accept the item of work at the rates applicable under the Contract but may accept such items at reduced rates as the Employer may consider reasonable during the preparation of on account bills or final bill, if the item is so acceptable without detriment to the safety & utility of the item or he may reject the work outright without any payment and/ or get it rectified, or removed and/ or re-executed at the risk and cost of the Contractor. Decision of the Employer/ Engineer-in-Charge in respect of the same will be final and binding on the Contractor.

## **PLANT, TEMPORARY WORKS AND MATERIALS**

### **Clause 3.54 Plants, Temporary Works and Materials**

- i) Contractor to Provide Plant

The Contractor shall provide at his own expense all Constructional Plant, Temporary Work and materials including Equipment, Materials and Camps required for the execution of the Works. He shall furnish along with the bid a list of items of all Constructional Plant and machinery which he shall be deploying on the particular job. He shall also make necessary arrangements for supplementing them at his own expense, if required to do so by the Engineer-in-Charge at the time of award of the Contract, or later on as the Work progresses.

ii) Plant 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 Work 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 Engineer-in-Charge.

iii) 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 after obtaining written permission of the Engineer-in-Charge.

iv) INDIAN EMBASSY not Liable for Damage to Plant etc.

The INDIAN EMBASSY shall not at any time be liable for the loss of or damage to any of the said Constructional Plant, Temporary Works or materials save as mentioned in Clause 3.20 and **Clause 3.66** hereof.

**Clause 3.55 Approval of Materials etc. not implied**

The operation of **Clause 3.54** hereof shall not be deemed to imply any approval by the Engineer-in-Charge of the materials or other matters referred to there-in nor shall it prevent the rejection of any such materials at any time by the Engineer-in-Charge.

**MEASUREMENT**

**Clause 3.56 Quantities**

The quantities set out in the Bill of Quantities are the approximate estimated quantities of the Work, but they are not to be taken as the actual quantities of the Works to be executed by the Contractor in fulfillment of his obligations under the Contract.

**Clause 3.57 Works to be measured**

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

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

All measurements and levels shall be taken jointly by the Engineer-in-Charge or his authorized representative and by the contractor or his authorized representative from time to time during the progress of the work and such measurements shall be signed and dated by the Engineer-in-Charge and the Contractor or their representative in token of his acceptance. If the Contractor objects to any of the measurement recorded, a note shall be made to that effect with reason and signed by both the parties.

If for any reason the Contractor or his authorized representative is not available and the work of recording measurements is suspended by the Engineer-in-Charge or his representative, the Engineer-in-Charge 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 days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Engineer-in-Charge or his representative shall be deemed to be accepted by the Contractor.

The Contractor shall, without extra charge, provide all appliances instruments labour and other items necessary for survey, measurement and recording of levels etc.

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 issued by the Bureau of Indian Standard and if for any item no such standard is available then a mutually agreed method shall be followed.

#### **Clause 3.58 Method of Measurement**

The Works shall be measured net, notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the Contract. However, the guidelines given in relevant part of IS 1200 will prevail in case any confusion arises during measurement

#### **Clause 3.59 Security Rules**

The Project shall be a protected Area. The Contractor, his employees and labourers shall have to follow the Security Rules as may be imposed from time to time by the Engineer-in-Charge or by the Royal Government of Bhutan. If the Contractor, his employees or labourers are found to be reluctant to follow the Rules, the Engineer-in-Charge will have the right to prohibit such persons from entering into the Project Area. If required the Engineer-in-Charge shall have the authority to take the help of local District Administration and or local police, if it is considered absolutely necessary.

### **Clause 3.60 Indian Personnel**

- i) The Contractor shall submit to the INDIAN EMBASSY, the details and bio-data of all personnel he proposes to bring into Bhutan for the performance of the Works under the Contract. Such data for each person shall, besides the proof of his Indian citizenship (either passport or voter identity card only will be acceptable), contain the name, his present address, his assignment and responsibility in connection with the Works, and a short resume of his qualifications, experience etc. in relation to the Works to be performed by him.
- ii) Any person unsuitable and unacceptable to the INDIAN EMBASSY shall not be brought to Bhutan. Any person, if found unsuitable or unacceptable to the INDIAN EMBASSY on a later date, shall within a reasonable time, be repatriated by the Contractor, who shall make alternative arrangements for providing a suitable replacement.
- iii) No person brought to Bhutan for the purposes of the Works shall be repatriated without the consent of the INDIAN EMBASSY in writing, which shall be based on a written request from the Contractor for such repatriation giving reasons for such an action to the Engineer-in-Charge. The INDIAN EMBASSY may give permission for such repatriation provided it is satisfied that the progress of Works shall not suffer due to such repatriation/replacement.
- iv) The Contractor and his expatriate personnel shall observe/respect all Bhutanese Acts, Laws, Rules and Regulations and shall not in any way interfere with Bhutanese political and religious affairs and shall meticulously follow any other Rules and Regulations which the RGoB, the INDIAN EMBASSY and the Engineer-in-Charge may impose on them from time to time. The Contractor's expatriate personnel shall work and live in close co-operation with their co-workers and the community and shall not engage themselves in any other employment either part time nor shall they take part in any local politics.
- v) The INDIAN EMBASSY will assist the Contractor, to the extent possible, in obtaining necessary permits to travel to Bhutan and back by issue of necessary certificates and other information needed by the RGoB and other agencies.

## **CERTIFICATES AND PAYMENT**

### **Clause 3.61 Certificates and Payment**

- i) Interim Payment Certificate
  - 1. The Contractor shall submit an application for interim payment, in duplicate, to the Engineer-in-Charge at the end of each month in a Proforma approved by the Engineer-in-Charge. The application shall include the following items, as applicable, which shall be taken into account in the sequence listed.
    - a) The estimated Contract value of the Permanent Works executed upto the end of the month in question, obtained by applying the base unit rates and prices in the Bill of Quantities to the quantities measured by the Engineer-in-Charge pursuant to **Clause 3.57**.
    - b) The estimated Contract value of the Permanent Works obtained as in (a) above, executed upto the end of the previous month.
    - c) The estimated Contract value at base unit rates and prices, of the Permanent Works for the month in question obtained by deducting (b) from (a).
    - d) An amount reflecting any changes pursuant to **Clause 3.71** hereof.



- e) Any amount to be withheld under the retention provisions of sub-clause (ii) of this Clause, determined by applying the percentage set forth in paragraph (ii) (a) of this Clause.
  - f) Any amount to be deducted on account of the repayment of Advances under the provisions set forth in sub-clause (iii) of this Clause, and
  - g) Any other sum to which the Contractor may be entitled under the Contract.
- It may be noted that all interim payment would be treated as provisional payment.
- 2. Within twenty eight (28) days of receipt of the said applications for interim payment, it shall be approved or amended such that, in the Engineer-in-Charge's opinion, the certificate reflects the amount due to the Contractor in accordance with the Contract. In cases where there is differences of opinion as to the value of any item, the Engineer-in-charge's view shall prevail. When the Engineer-in-Charge has determined the amount due to the Contractor, he shall issue to the Contractor a certificate hereinafter called "Interim Payment Certificate" certifying the amount due to the Contractor, and
  - 3. No Interim Payment Certificate shall be issued for a sum less than 10% (ten percent) of the Contract Price.
  - 4. The EIC may make any correction or modification in any previous interim Payment Certificate which has been issued by him, and shall have authority, if any work is not being carried out to his satisfaction, to omit or reduce the value of such work in any Interim Payment Certificate.
- ii) Retention Money / Security deposit
- 1. Deduction of Retention Money amounting to 5% (five percent) of the amount included in any monthly Interim Payment Certificate pursuant to sub-clause (i) of this Clause due to the Contractor on account of Permanent Works executed shall be made by the Engineer-in-Charge.
  - 2. The Retention Money shall be certified due for payment after the expiration of the Period of Maintenance, notwithstanding that at such time there may be outstanding claims by the Contractor against the INDIAN EMBASSY. Provided always that, if at such time there shall remain to be executed by the Contractor any Works ordered during such period pursuant to **Clause 3.50** hereof, the INDIAN EMBASSY shall be entitled to withhold payment until the completion of such Works or so much of the Retention Money as shall, in the opinion of the Engineer-in-Charge represent the cost of the Works so remaining to be executed, and
  - 3. Retention Money shall not be refunded till the contractor produces a NOC from all concerned including the Labour officers. As soon as the work is virtually complete the Contractor shall apply for the clearance certificate to the Labour Officer under intimation to the Engineer-in-Charge. On receipt of the said communication, the Engineer-in-Charge shall write to the Labour Office to intimate if any complaint is pending against the Contractor in respect of the work. If no complaint is pending on record till after three months after completion of the work and/or no communication received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the security deposit will be released if otherwise due.
- iii) Advances



Advances for execution of the Works, if required by the Contractor, will be granted in the following cases provided that the advances given or taken for particular Work are spent only for that Work.

1. Mobilization Advance

- a) Advance to the extent of 5% (Five percent) of the Contract Price can be granted for mobilization of labour, stores and workshops including camps, labour sheds, and Construction Plant, etc for preliminary and enabling Works.
- b) The release of this advance shall be regulated and governed by the following conditions:
  - a) The advance shall be interest free.
  - b) The advance will be released, if request by the contractor in writing within one month of the order to commence the work.
  - c) The advance will be disbursed on production of the irrevocable Bank Guarantee (**Form No. 10**) from the Nationalized / Scheduled Bhutanese Bank or Financial Institution of Bhutan.

The advance is recoverable and the deduction of the advance shall be made on prorata percentage basis from the interim payments certified by the Engineer-in-Charge under the Contract. The deduction shall commence in the next Interim Payment Certificate following that in which the total of all such payments to the Contractor has reached 10% (ten percent) of the Contract Price until such time as the advance has been fully repaid, provided always that the entire amount of advance shall be completely deducted by the time the total of all payments to the Contractor has reached 80% (eighty percent) of the Contract Price.

2. Secured Advance

The contractor, on signing an indenture in the form to be specified by the Engineer-in-Charge, shall be entitled to be paid Secured Advance during the progress of the execution of the work upto 75% of the assessed value of any materials against valid Bank Guarantee of any Bank which in the opinion of the Engineer-in-Charge are non-perishable, non-fragile and non-combustible and are in accordance with the contract and which have been brought to 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 been made under this sub-clause are incorporated in the work of the amount of such advance shall be recovered/deducted from the next payment made under any of the clause or clauses of this contract. Such Secured Advance shall also be payable on other items of perishable nature, fragile and combustible with the approval of the Engineer-in-Charge provided the contractor provided a comprehensive insurance cover for the full cost of such materials. The decision of the Engineer-in-Charge shall be final and binding on the contractor in this matter. No secured advance, shall however, be paid on high-risk materials such as glass, petrol, diesel etc.

iv) Corrections

Since all the interim payment certificates are issued provisionally, the Engineer-in-Charge may, by any Interim Payment Certificate, make any corrections or modifications in any previous Certificate (other than one purporting to be Final Payment Certificate) which shall have been issued by him and shall have power to modify or withhold any Interim Certificate if the Works or any part thereof are not being carried out to his satisfaction.

v) Final Account

a) Not later than two months after the date of issue of the Certificate of Completion of works in pursuance of **Clause 3.49** hereof, the Contractor shall submit a draft statement of Final Account and supporting documentation to the Engineer-in-Charge showing in detail the value of the work done in accordance with Contract, together with all further sums which the Contractor considers to be due to him under the Contract upto the date of Maintenance Certificate (Hereinafter called the "Contractor's Draft Final Account").

b) Within four months after receipt of the Contractor's Draft Final Account and of all information reasonably required for its verification, the Engineer-in-Charge shall determine the value of all matters to which the Contractor is entitled under the Contract. The Engineer-in-Charge shall then issue to the Contractor a statement (hereinafter called the "Engineer-in-Charge's Draft Final Account") showing the final amount to which the Contractor is entitled under the Contract. The Contractor shall sign the Engineer-in-Charge's Draft Final Account as an acknowledgement of the full and final value of the Work performed under the Contract and shall promptly submit a signed copy (hereinafter called the "Final Account") to the Engineer-in-Charge.

vi) Final Certificate

On receipt of the Final Account, the Engineer-in-Charge shall promptly prepare and issue to the Contractor a Final Payment Certificate certifying any further money due to the Contractor in respect of the Contract. Payment to the Contractor of the amount due under Final Payment Certificate shall be made by the INDIAN EMBASSY within sixty days of such Certificate being issued. In the event of non-payment within the said period, no interest shall accrue to the Contractor.

**Clause 3.62 Approval only by Maintenance Certificate**

No certificate other than the Maintenance Certificate referred to in **Clause 3.63** hereof shall be deemed to constitute approval of the works.

**Clause 3.63 Maintenance Certificate**

i) The Contract shall not be considered as completed until a Maintenance Certificate shall have been signed by the Engineer-in-Charge stating that the Works have been completed and maintained to his satisfaction. The Maintenance Certificate shall be given by the Engineer-in-Charge within twenty eight days after the expiration of the Period of Maintenance, or, if different periods of maintenance shall become applicable to different sections or parts of the Works, the expiration of the latest such period, or as soon thereafter as any works ordered during such period, pursuant to **Clause 3.50** hereof, shall have been completed to

the satisfaction of the Engineer-in-Charge and full effect shall be given to this Clause, notwithstanding any previous entry on the Works or the taking possession, working or using thereof or any part thereof by the INDIAN EMBASSY . Provided always that the issue of the Maintenance Certificate shall not be a condition precedent to payment to the Contractor of the retention money in accordance with the conditions set out in **Clause 3.61** hereof.

ii) Cessation of INDIAN EMBASSY 's Liability'

The INDIAN EMBASSY shall not be liable to the Contractor for any matter or thing arising out of or in connection with Contract or execution of the Works unless the Contractor shall have made a claim in writing in respect thereof before the giving of the Maintenance Certificate under this Clause.

iii) Unfulfilled Obligations

Notwithstanding the issue of Maintenance Certificate, the Contractor and, subject to sub Clause (ii) of this Clause, the INDIAN EMBASSY shall remain liable for the fulfillment of any obligation incurred under the provisions of the Contract prior to the issue of the Maintenance Certificate which remains unperformed at the time such Certificate is issued and, for the purpose of determining the nature and extent of any such obligation, the Contract shall be deemed to remain in force between the parties hereto.

## **REMEDIES AND POWERS**

### **Clause 3.64 Remedies and Powers**

i) Default of Contractor

If the Contractor shall become bankrupt, or have a receiving order made against him, or shall present his petition in bankruptcy, or shall make an arrangement with or assignment in favour of his creditors, or shall agree to carry out the Contract under a committee of inspection of his creditors or, being a corporation, shall go into liquidation (other than a voluntary liquidation for the purposes of amalgamation or reconstruction), or if the Contractor shall assign the Contract, without the consent in writing of the INDIAN EMBASSY first obtained, or shall have an execution levied on his goods, or if the Engineer-in-Charge shall certify in writing that, in his opinion, the Contractor;

- a) has abandoned the Contract, or
- b) without reasonable excuse has failed to commence the Works or has suspended the progress of the Works for twenty-eight days after receiving, from the Engineer-in-Charge, written notice to proceed, or
- c) has failed to remove materials from the site or to pull down and replace work for twenty eight days after receiving from the Engineer-in-Charge's written notice that the said materials or work had been condemned and rejected by the Engineer-in-Charge under these conditions, or
- d) despite previous warnings by the Engineer-in-Charge's in writing, is not executing the Works in accordance with the Contract, or is persistently or flagrantly neglecting to carry out his obligations under the Contract, or

- e) has, to the detriment of good workmanship, or defiance of the Engineer-in-Charge's instruction to the contrary, sub-let any part of the Contract;  
then the Engineer-in-Charge may, after giving fourteen days' notice in writing to the Contractor, enter upon the Site and Works and expel the Contractor, from the entire Works or part thereof, without thereby voiding the Contract, or releasing the Contractor from any of his obligations or liabilities under the Contract, or affecting the rights and powers conferred on the INDIAN EMBASSY or the Engineer-in-Charge by the Contract, and may itself complete the entire Work or part thereof as the case may be or may employ any other Contractor to complete the Works. The INDIAN EMBASSY or such other Contractor may use for such completion so much of the Constructional Plant, Temporary works and materials, which have been deemed to be reserved exclusively for the execution of the works, under the provisions of the Contract, as he or they may think proper, and the INDIAN EMBASSY may, at any time, sell any of the said Constructional Plant, Temporary works and unused materials and apply the proceeds of sales in or towards the satisfaction of any sums due or which may become due to him from the Contractor under the Contract.
- ii) Valuation at Date of Forfeiture  
The Engineer-in-Charge shall, as soon as may be practicable after any such entry and expulsion by the INDIAN EMBASSY, fix and determine ex-parte, or by or after reference to the parties, or after such investigation or enquiries as he may think fit to make or institute, and shall certify what amount, if any, had at the time of such entry and expulsion been reasonably earned by or would reasonably accrue to the Contractor in respect of work actually done by him under the Contract and the value of any of the said unused or partially used materials, any Constructional Plant and any Temporary Works.
- iii) Payment after Forfeiture  
If the INDIAN EMBASSY shall enter and expel the Contractor under this Clause, it shall not be liable to pay to the Contractor any money on account of the Contract until the expiration of the Period of Maintenance and thereafter until the costs of execution and maintenance, damages for delay in completion, if any, and all other expenses incurred by the INDIAN EMBASSY have been ascertained and the amount thereof certified by the Engineer-in-Charge. The Contractor shall then be entitled to receive only such sum or sums, if any, as the Engineer-in-Charge may certify would have been payable to him upon due completion by him after deducting the said amount. If such amount shall exceed the sum which would have been payable to the Contractor on due completion by him, then the Contractor shall, upon demand, pay to the INDIAN EMBASSY the amount of such excess and it shall be deemed a debt due by the Contractor to the INDIAN EMBASSY and shall be recoverable accordingly.  
In the event of the above course being adopted by the Engineer-in-Charge, the Contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any Constructional Plant, material or entered into any agreements or

made any advances on account or with a view to the execution of the Works or the performance of the Contract.

#### **Clause 3.65 Urgent Repairs**

If, by reasons of any accident, or failure, or other event occurring to in or in connection with the Works or any part thereof, either during the execution of the Works or during the Period of Maintenance, any remedial or other work or repair shall, in the opinion of the Engineer-in-Charge or the Engineer-in-Charge's Representative, 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 INDIAN EMBASSY may employ and pay other persons to carry out such work or repair as the Engineer-in-Charge or the Engineer-in-Charge's Representative may consider necessary. If the work or repair so done by the INDIAN EMBASSY is work which, in the opinion of the Engineer-in-Charge, the Contractor was liable to do at his own expense under the Contract, all expenses properly incurred by the INDIAN EMBASSY in so doing shall be recoverable from the Contractor by the INDIAN EMBASSY, or may be deducted by the INDIAN EMBASSY from any money due or which may become due to the Contractor. Provided always that Engineer-in-Charge or the Engineer-in-Charge's Representative, as the case may be, shall, as soon after the occurrence of any such emergency as may be reasonably practicable notify the Contractor thereof in writing.

### **SPECIAL RISKS/TERMINATION**

#### **Clause 3.66 Special Risks / Termination of Contract**

i) Special Risks

The special risks are war, hostilities (whether war be declared or not), invasion, act of foreign enemies, and all other risks described in **Clause 3.20** (vi) hereof.

ii) Termination of the Contract

If, during the currency of the Contract any of the Special Risks mentioned hereinabove which, whether financially or otherwise, materially affects the execution of the Works, the Contractor shall unless and until the Contract is terminated under the provisions of this Clause, continue to use his best endeavors to complete the execution of the Works. Provided always that the INDIAN EMBASSY shall be entitled at any time after occurrence of such Special Risks to terminate the Contract by giving written notice to the Contractor and, upon such notice being given, this Contract shall, except as to the right of the parties under this Clause and to the operation of **Clause 3.68** hereof, terminate, but without prejudice to the rights of either party in respect of any antecedent breach thereof.

iii) Removal of Plant on Termination

If the Contract shall be terminated under the provisions of the last preceding sub-clause, the Contractor shall, with all reasonable dispatch, remove from the Site all Constructional Plant and shall give similar facilities to his sub-Contractors to do so.

iv) **Payment if Contract Terminates**

If the Contract shall be terminated as aforesaid, the Contractor shall be paid by the INDIAN EMBASSY, in so far as such amounts or items shall not have already been covered by payments on account made to the Contractor, for all works executed prior to the date of termination at the rates and prices provided in the Contract and in addition:

- a) The amounts payable in respect of any preliminary items, so far as the work or service comprised therein has been carried out or performed, and a proper proportion as certified by the Engineer-in-Charge of any such items, the work or service comprised in, which has been partially carried out or performed.
- b) The cost of materials or goods reasonably ordered for the works which shall have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery, such materials or goods becoming property of the INDIAN EMBASSY upon such payments being made by it.
- c) A sum to be certified by the Engineer-in-Charge, being the amount of any expenditure reasonably incurred by the Contractor in the expectation of completing the whole of the works insofar as such expenditure shall not have been covered by payments in this sub-clause before mentioned.
- d) The reasonable cost of removal of Constructional Plant under sub-clause (iii) of this Clause.

Provided always that against any payments due from the INDIAN EMBASSY under this sub clause, the INDIAN EMBASSY shall be entitled to be credited with any outstanding balances due from the Contractor for advances in respect of Constructional Plant and materials and any other sums which at the date of termination were recoverable by the INDIAN EMBASSY from the Contractor under the terms of the Contract.

## **FRUSTATION**

### **Clause 3.67 Payment in the event of Frustration**

If a war, or other circumstances outside the control of both parties, arises after the Contract is made so that either party is prevented from fulfilling its Contractual obligations, or under the law governing the Contract, the parties are released from further performance, then the sum payable by the INDIAN EMBASSY to the Contractor in respect of the work executed shall be the same as that which would have been payable under **Clause 3.66** hereof if the Contract had been terminated under the provisions of **Clause 3.66** hereof.

## **SETTLEMENT OF DISPUTES**

### **Clause 3.68 Arbitration**

Except where otherwise provided in the contract all question and disputes relating to the meaning of the specifications, design, drawings and instructions herein 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 considered any work demanded of him to be outside the requirements of the contract, or disputes any drawings, record or decision given in writing by the Engineer-in-Charge on any matter in connection with or arising out of the contract or carrying out of the work, to be unacceptable, he shall promptly within 15 days request the Engineer-in-Charge in writing for written instruction or decision. Thereupon, the Engineer-in-Charge shall give his written instructions or decision within a period of one month from the receipt of the contractor's letter.

If the Engineer-in-Charge 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 Engineer-in-charge, the contractor may, within 15 days of the receipt of Engineer-in-charge's decision, appeal to the INDIAN EMBASSY 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 INDIAN EMBASSY shall give his decision within 30 days of receipt of contractor's appeal. If the contractor is dissatisfied with his decision, the contractor shall within a period of 30 days from receipt of the decision, give notice to the INDIAN EMBASSY for appointment of an arbitrator failing which the said decision shall be final, binding and conclusive and not referable to adjudication by the Contractor.

- ii) Except where the decision has become final, binding and conclusive in terms of Sub Para (i) above disputes or differences shall be referred for adjudication through arbitration by a sole arbitrator empaneled and selected jointly by the Second Secretary & HoC, Indian Embassy and Contractor. If the arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever another sole arbitrator shall be appointed in the manner aforesaid. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each such dispute along with the notice for appointment of arbitrator and giving reference to the rejection by the INDIAN EMBASSY of the appeal.

It is also a term of this contract that no person other than a person empanelled by the Second Secretary & HoC, INDIAN EMBASSY as aforesaid should act as arbitrator.

It is also a terms of this contract that if the contractor does not make any demand for appointment of arbitrator in respect of any claims in writing as aforesaid within 120 days of receiving the intimation from the Engineer-in-Charge that the final bill is ready for payment, the claim of the contractor shall be deemed to have been waived and absolutely barred and



the Engineer-in-Charge shall be discharged and released of all liabilities under the contract in respect of these claims.

The arbitration shall be conducted in accordance with the provisions of the Arbitration Act, enforced by the Royal Govt. of Bhutan or any statutory modifications or re-enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceeding under this clause.

The arbitrator may from time to time with the consent of the parties enlarge the time for making and publishing the award. It is also a term of this contract that the arbitrator shall adjudicate on only such disputes as are referred to him by the appointing authority and give separate award against each dispute and claim referred to him and in all cases the arbitrator shall give reasons for the award.

It is also a term of the contract that if any fees are payable to the arbitrator, these shall be paid equally by both the parties.

It is also a term of the contract that the arbitrator shall be deemed to have entered on the reference on the date he issue notice to both the parties calling them to submit their statement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees, if any, of the arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award (including the fees, if any, of the arbitrator) shall be the discretion of the arbitrator who may direct to any person by whom and in what manner, such costs or any part thereof shall be paid and fix or settle the amount of costs to be so paid

## **NOTICES**

### **Clause 3.69 Notices**

i) Service of Notices on Contractor

All certificates, notices or written orders to be given by the Engineer-in-Charge to the Contractor under the terms of the Contract shall be served either by sending by post or delivering the same to the Contractor's office on Site or his principal place of business, or such other address as the Contractor shall nominate for this purpose.

ii) Service of Notices on INDIAN EMBASSY or Engineer-in-Charge

All notices to be given to the INDIAN EMBASSY or to the Engineer-in-Charge under the terms of the Contract shall be served by sending by post or delivering the same to the respective addresses given below:

To the INDIAN EMBASSY – Second Secretary & HoC, INDIAN EMBASSY , Thimphu, Bhutan.

iii) Change of Address

Either party may change a nominated address to another address by prior written notice to the other party.



## DEFAULT OF INDIAN EMBASSY

### Clause 3.70 Default of INDIAN EMBASSY

- i) In the event of the INDIAN EMBASSY failing to pay to the Contractor the amount due under any certificate of the Engineer-in-Charge within ninety days after the same shall have become due under the terms of the Contract, subject to any deduction that the INDIAN EMBASSY is entitled to make under the Contract, the Contractor shall be entitled to issue a notice to the Engineer-in-Charge stating that he shall be terminating his Works after thirty days from the issue of such notice, for the reasons stated therein. However, if within the said period of thirty days, the Engineer-in-Charge notifies the Contractor that the reasons stated in the notice of the Contractor are not valid or that the alleged event of default of the INDIAN EMBASSY has been remedied or no longer exists, then the Contractor shall not be entitled to terminate the Contract.
- ii) If the Contractor becomes entitled to terminate the Contract in terms of sub clause (i) of this Clause, after expiry of the notice of thirty days, he may, notwithstanding the provisions of **Clause 3.54** (ii) hereof, remove from the Site all Constructional Plant brought by him.
- iii) In the event of such termination, the INDIAN EMBASSY shall be under the same obligations to the Contractor in regard to payment as if the Contract had been terminated under the provisions in **Clause 3.66** hereof, but in addition to the payments specified in **Clause 3.66** (iv) hereof, the INDIAN EMBASSY shall pay to the Contractor the amount of any loss or damage to Contractor arising out of or in connection with or by consequence of such termination.

## CHANGES IN COSTS AND LEGISLATION

### Clause 3.71 Increases or Decrease of Costs

Not applicable

## ADDITIONAL CLAUSES

### Clause 3.72 Taxation

- i) The price bid by the Contractor shall include all duties, levies and taxes, that may be levied according to the laws and regulations, save, as provided under **2.37** of Instructions to Bidders (Section-II) and under **Clause 3.29** of General Conditions of Contract (Section III), of the date thirty days prior to the closing date for submission of bids, on the Constructional Plant, materials and supplies (permanent, temporary and consumable) acquired for the purpose of the Contract and on the services performed under the Contract. Nothing in the Contract shall relieve the Contractor from his responsibility to pay any tax that may be levied in Bhutan on profits made by him in respect of the Contract.
- ii) **Income Tax**  
The Contractor's staff, personnel and labour will be liable to pay personal income tax in Bhutan in respect of such of their salaries and wages as are chargeable under the laws and regulations for the time being in force, and the Contractor shall perform such duties in regard to such deductions thereof as may be imposed on him by such laws and regulations.

### **Clause 3.73 Bribery and Collusion**

- i) The INDIAN EMBASSY shall be entitled to terminate the Contract and recover from the Contractor the amount of any loss resulting from such termination if the Contractor shall have offered or given to any person any consideration of any kind as an inducement or reward for doing, forbearing to do, any action in relation to obtaining, or in the execution of the Contract or any other Contract with the INDIAN EMBASSY , or for showing favour to any person in relation to the Contract or any other Contract with the INDIAN EMBASSY , or if any of the like acts shall have been done by any person employed by the Contractor or acting on his behalf (whether with or without the knowledge of the Contractor), or if the Contractor shall have come to any agreement with another Contractor or number of Contractors whereby an agreed quotation or estimate shall be offered as a bid to the INDIAN EMBASSY by one or more Contractor(s).
- ii) In the event of such termination, the Contractor shall:
  - a) proceed as provided in **Clause 3.66** (iii) hereof;
  - b) be paid by the INDIAN EMBASSY as provided in **Clause 3.66** (iv) hereof, provided that any loss referred to in sub clause (i) of this clause shall first be deducted.

### **Clause 3.74 Termination of Contract for INDIAN EMBASSY's Convenience**

- i) The INDIAN EMBASSY or the Contractor may terminate the Contract if the other party causes a fundamental breach of the contract.
- ii) Fundamental breaches of Contract shall include, but shall be limited to the following:
  - a) The contractor stops work for 28 days when no stoppage of work is shown on the current program and the stoppage has not been authorized by the Engineer-in-Charge.
  - b) The Engineer-in-Charge instructs the Contractor to delay the progress of the Works and the instruction is not withdrawn within 28 days.
  - c) The Contractor is made bankrupt or goes into liquidation other than for a reconstruction or amalgamation;'
  - d) A payment certified by the Engineer-in-Charge is not paid to the Contractor within 84 days of the date of the Engineer-in-Charge;
  - e) The Engineer-in-Charge gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer-in-Charge.
  - f) The contractor does not maintain a Security, which is required and
  - g) If the contractor, in the judgement of the INDIAN EMBASSY has engaged in corrupt or fraudulent practices in completion for or in executing the contract.
  - h) Notwithstanding the above, the INDIAN EMBASSY may terminate the Contract for convenience.
  - i) The Contractor has delayed the completion of Works by the number of days for which the maximum amount of liquidated damages can be imposed. When the contractor

has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge of behalf of INDIAN EMBASSY shall have powers:

- (I) To determine/terminate the contract as aforesaid (of which termination notice in writing to the contractor under the hand of the Engineer-in-Charge shall be conclusive evidence). Upon such determination, the Earnest Money Deposit, Security Deposit already recovered and Performance Guarantee under the contract shall be liable to be forfeited and shall be absolutely at the disposal of INDIAN EMBASSY.
  - (II) 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.
  - (III) In such case the left out work could be got executed by EIC through other agency at the risk and cost of contractor. Any additional cost determined by EIC to complete the work in all respect shall be recovered from any payment due to the contractor against any other work in Embassy.
  - (IV) If the contract is terminated, the contractor shall stop work immediately, make the Site safe and secure, and leave the site as soon as reasonably possible.
- iii) Payment upon Termination.
- a) If the Contract is terminated because of a fundamental breach of contract by the Contractor, the Engineer-in-Charge shall issue a certificate for the value of the work done and materials ordered less advance payments received up to the date of the issue of the certificate and less the percentage representing INDIAN EMBASSY's additional cost for completing the works as determined by the EIC to apply to the value of the work not completed. Additional liquidated Damages shall not apply. If the total amount due to the INDIAN Embassy exceeds any payment due to the Contractor, the difference shall be a debt payable to the INDIAN EMBASSY.
  - b) If the Contract is terminated for the INDIAN EMBASSY's convenience or because of a fundamental breach of contract by the INDIAN EMBASSY the engineer-in-Charge shall issue a certificate for the value of the work done, Materials ordered, the reasonable cost of removal of Equipment, repatriation of the contractor's personnel employed solely on the Works, and the Contractor's cost of protecting and securing the works, and less advance payments received up to the date of the certificate.

#### **Clause 3.75 Source of Insurance**

The Contractor shall be entitled to place all insurance relating to the Contract (including but not limited to, the insurance referred to in Clause-23 and 24), with any of the Insurance companies in Bhutan.

**Clause 3.76 Joint Ventures**

If the Contractor is a joint venture, all partners of the joint venture shall be jointly and severally liable to the INDIAN EMBASSY for the execution of the entire Contract in accordance with its terms.

**Clause 3.77 Contractor's near Relative Employed on the Project**

The Contractor shall intimate the INDIAN EMBASSY before submitting his bid whether any of his near relative is posted on the Project as Divisional Accountant or as an Officer in any capacity between the grades of Chief Engineer and Assistant Engineer (both inclusive) in the INDIAN EMBASSY . He shall also intimate the name of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any officer in the INDIAN EMBASSY . Any breach of this condition by the Contractor will render him liable to be removed from the list of Contractors of the INDIAN EMBASSY and his Work may be terminated without any compensation whatsoever.

**Clause 3.78 Retired Officers Taking up Contract**

No official employed on Engineering or Administrative duties in an Engineering Department of the Royal Government of Bhutan or the Government of India is allowed to work as/for a Contractor for a period of two years of his retirement from service without the previous permission of the INDIAN EMBASSY. The 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 the INDIAN EMBASSY as aforesaid, before submission of the bid or engagement in the Contractor's service as the case may be.

**Clause 3.79 Environments, Pollution and Noise**

Subject to and without prejudice to any other provision of the contract and the law of the land and its obligations as applicable, the Contractor shall take all reasonable precautions in connection with streams, watering, drains, water courses, underground water resources including percolating water and will prevent.

- i) Silting
- ii) Erosion of the beds or banks
- iii) Pollution of the water so as to affect adversely the quality or appearances thereof or cause injury or death to animal and plant life.
- iv) Any interference with the supply to or obstruction from such sources
- v) Pollution of the water so as to affect adversely the quality thereof

All works shall be carried out without unreasonable noise and disturbance. The Contractor shall indemnify and keep the employer indemnified from & against any responsibility for damages or in carrying out the work and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in regard or in relation to such liability. NEC's

Regulation for the Environmental Clearance of Projects 2002 and Environment Assessment Act 2000 and its Regulations 2002 with all RGoB environment protection laws will be duly implemented. The vegetation and land shall be protected from damage during the course of execution except to the barest minimum essentially required not to cause or permit any one to cause any nuisance, disturbance or pollution or inconvenience to public, employer or neighborhood of site.

*SECTION - IV*

*GENERAL TECHNICAL SPECIFICATIONS*

## SECTION-IV: GENERAL TECHNICAL SPECIFICATIONS

### 4.1. General

The General Technical Specifications (hereinafter called GTS) shall give general information about execution of various items of works under the Contract and cover the specified stipulations for measurements and payment therefor included in the Bill of Quantities.

These specifications shall be the part of the requirements for various items of works, which shall be executed according to the stipulations of the Contract. Hence, the instructions given herein form an integral part of and are applicable to the bidding documents issued for the works. Addenda to these specifications may be issued, as required during bidding and construction phases.

These specifications shall be read in conjunction with Bill of Quantities (BoQ), drawings and the Conditions of Contract. While quoting the price, the Contractor shall comply with all provisions contained within the bidding documents with an objective to complete each items of work without any addition of cost thereof. In case Specifications, BoQ and Condition of Contract do not corroborate each other for completion of any particular item of work, the same as well as the assumptions made in quoting of price for such item(s) of Works shall be brought out clearly in the bid.

It is the intent of these specifications to establish acceptable standards of quality as specified in the technical specifications. Minor deviations in details due to manufacture's standard shop process for brought out items will be considered for acceptance provided that, in the opinion of the Engineer-in-Charge, the proposed substitutions are equal in quality to those specified.

All works shall be executed in conformity to the approved construction drawings and instructions issued by the Engineer-in-Charge for construction. Execution of works contemplated under these specifications shall include, in complete, all the procurement and supply of all required Man power (skilled and un-skilled) and Materials (inclusive of octroy and all other taxes and charges as levied, if any), Equipment, Plant and Machineries, office, stores and workshop etc., transportation, handling and placement of Materials and Equipment to site in a professional and diligent manner.

All works shall comply with the quality requirements defined in the relevant sections of these specifications and other section of the bidding documents. **Where no specifications have been laid down, the materials used and the Work done shall conform to the relevant Specifications for Building and Road Works: Royal Govt. of Bhutan (latest publication/amendment) or I.S. Code or IRC Code or CPWD specifications (latest publication/amendments) or as directed by the Engineer-in-Charge.** The Contractor shall endeavor to provide all such necessary efforts in order to comply with the intent of these specifications to the satisfaction of the Engineer-in-Charge.

#### **4.1.1.Scope of Work**

The scope of Work in general for “Renovation and Modernization of the Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting and Sound System, Construction of Public Toilet at India House Thimphu” shall include, but not limited to the following:

1. **Providing and fixing Acoustic wall panels (Sound proofing) for auditorium walls.**
2. **Providing and fixing sound proof false-ceiling panels for auditorium roofing.**
3. **Dismantling existing wooden flooring and providing tile flooring as specified.**
4. **Dismantling existing wall and providing entry doors (2 Nos.) in Building.**
5. **Renovation of Existing Toilet in auditorium.**
6. **Construction of Control room with stairs in auditorium.**
7. **Re-align of Chimney pipe below control room.**
8. **Construction of Public Toilet near parking area.**
9. **Supply of auditorium chairs as approved specifications and color and size.**
10. **Providing & fixing of Sound system, Projector with Wall Drop & Audio Video Projection System (LED's)**
11. **All CFL be replaced by LED lights**
12. **Modernization of Stage platform:**
  - **Providing commercial ply lamination to existing stage,**
  - **Provided that partition for Changing room/Green room at back side of stage.**
  - **Stage lighting & Green room lighting system**

Scope of work includes: Setting out survey, clearing and grubbing, Geotechnical Investigations, excavation in soil and rock, backfilling, plain and reinforced concrete works, brick & stone masonry works, steel roof truss, color coated Galvanized trapezoidal steel sheet roofing, wood works, plastering, painting, water supply and sanitation works, electrical works, Bhutanese architectural works, protection & drainage works, construction of different type of water tanks as per requirement , Intake Tube wells, and other miscellaneous works to fulfil the architectural, structural and functional requirements but not limited to the major item of works, as per the approved design drawings and specifications and/or as directed by the Engineer-in-Charge.

The above work shall also include:

- (a) Electrical, Sanitary and Plumbing Works with all fittings and fixtures,
- (b) Misc. works, if any.



## **4.2. WORKING FACILITIES**

### **4.2.1.Scope of work**

The scope of works under this clause to design, provide, erect, operate and maintain all the working facilities as would be necessary for execution of the Works within the specified time schedule, but not necessarily limited to the following:

- Camp and Facilities
- Plant and Equipment
- Electric Power Supply System
- Water Supply System
- Sewage & Waste Water and Garbage Disposal System
- Temporary Access and Construction Roads

Working Facilities shall be subject to the Engineer-in-Charge's approval. The Contractor shall comply with all applicable laws, regulations, and ordinances relating to the construction and operation of the working facilities in Bhutan.

### **4.2.2.Submissions**

The Contractor shall submit basic plans of Working Facilities along with his bid. He shall attach to his bid documents drawings and operating descriptions for his proposed working facilities. At least **15 days** prior to commencing the work, the Contractor shall submit to the Engineer-in-Charge for approval the drawings of layout and details of Working Facilities.

Should the Engineer-in-Charge determine that the details of working facilities furnished does not meet all requirements, the deficiencies shall be made good by the Contractor before commencement of the work. Any cost incurred therefor or replacement shall be borne by the Contractor.

### **4.2.3.Camp and Facilities**

The Camp and Facilities shall include but are not limited to

- Office for the Contractor / Engineer-in-Charge's Site office
- Accommodation for Staff and Workmen
- Miscellaneous Working Facilities like:
- Stores, Warehouses and sheds for the Contractor
- Portable Explosive Magazines

Office for the Contractor shall be of sufficient size and fully furnished and equipped. All working facilities shall be equipped with proper light arrangement, water supply, telephone, sewage and waste water disposal system. Contractor shall make his own arrangement for all working facilities.

The Contractor shall acquaint himself with all applicable laws and regulations as applicable in Bhutan for handling and use of explosives. All such laws, regulations and rules etc., as are

amended from time to time shall be binding on the Contractor. The Contractor shall also arrange mobile / portable explosive magazines of suitable capacity and explosive van. The Contractor shall arrange the security system for the Contractor's own mobile / portable magazine house.

#### **4.2.4.Plant and Equipment**

##### **4.2.4.1. General**

The Contractor shall provide all construction plants and equipment necessary for the efficient execution of the work described in the Specifications and details supplied by the Contractor in the construction plant and equipment schedule. The Contractor shall also deploy additional equipment, if needed, at his own cost for timely completion of the Works. The capacity and number of equipment shall conform to the specific minimum requirements for the works and the climatic conditions prevailing at the site. The Contractor shall maintain all his equipment, tools and plants with sufficient spare parts, special tools for repair work and complete standby units of vital parts to guarantee a continuous operation without untimely delays. The Contractor shall remain fully responsible for any delays due to disregard of said necessity.

##### **4.2.4.2. Transportation and Storage Facilities for Cement**

Transportation of cement shall be accomplished in adequately weather-tight trucks or other means which will protect the cement completely from exposure to moisture. Storage of cement at the Site shall be done in weather-tight and properly ventilated structures with adequate provisions for the prevention of absorption of moisture. Said structures shall be complete with all equipment for loading, unloading and weighing of cement. The cement storage structure on the Site shall be at least for **20-day capacity**, to be determined by the Contractor in consideration of supply capability.

#### **4.2.5.Electric Power Supply System**

The Contractor shall make all arrangement for distribution within his working area. The electric energy consumed by the Contractor shall be measured by a suitable Energy meter installed at the supply point and the cost thereof shall be paid by the Contractor at the prevailing rates.

The power supply to the construction sites, camps and the entire project area shall be designed for continuous operation, 24 hours a day, with sufficient capacity to satisfy peak and emergency demands.

The Contractor shall also furnish, install and maintain the electrical distribution system to the Engineer-in-Charge's site office.

#### **4.2.6. Water Supply System**

The Contractor shall be fully responsible for the arrangement of necessary facilities for water supply. The Contractor shall design, construct, equip, operate and maintain two separate water installations at the Site necessary for the adequate supply of:

- i) Raw water: for general construction use, treated to the extent necessary to meet specified requirements (e.g. for concrete),
- ii) Potable water: for supply to all buildings and plants requiring high quality water meeting relevant requirements for drinking water.

The Contractor shall furnish, install, operate and maintain all pumps, piping, fittings, valves, storage tanks for the water supply and distribution systems, adequate in quantity and pressure. Raw water shall be used for construction purposes only if of adequate quality. There shall be no cross connections of any kind between the raw and potable water supply systems. Only potable water shall be piped into buildings.

#### **4.2.7. Sewage, Waste Water and Garbage Disposal System**

The Contractor shall design, construct, equip, operate and maintain all the installation necessary to properly collect, treat and dispose of sewage from the camp office and other construction facilities. The Contractor shall not, under any circumstances, discharge sewage or contaminated water into natural streams or any open areas. Treatment and disposal of sewage shall be performed in accordance with the current related standards and laws in force in Bhutan and always subject to the Engineer-in-Charge's approval. The drainage systems shall be designed taking into account the rainfall /snowfall rate in the area and the disposal of rainwater/snow shall be accomplished in such a way that no erosion problems are caused which may alter the stability of the soil.

The Contractor shall provide necessary arrangements for disposal of waste and garbage disposal. The areas surrounding camps, offices, job facilities and the work sites shall be kept clean and free of refuse at all times. No waste shall be dumped in areas other than those approved by the Engineer-in-Charge for waste disposal. No waste of any kind shall be deposited in any watercourses. The Contractor shall observe the norms prescribed by the Government of Bhutan for keeping all areas clean.

#### **4.2.8. Testing and Quality Control**

The Contractor shall collect the samples as specified or as directed by the Engineer-in-Charge, carryout the relevant test as approved by the Engineer-in-Charge and submit the test reports to the Engineer-in-Charge in time. All tests will be made according to the approved standards.

#### **4.2.9. Medical Care Facilities**

In the event of illness of an epidemic nature breaking out, the Contractor shall carry out and comply with all orders, arrangements or regulations, which may be issued by the Government or local authorities. Basic Medical facilities are available at Wangdue. The Contractor shall provide and maintain at least one first aid facilities at the work site.

#### **4.2.10. Environmental Obligations**

The Contractor shall, during the whole period of the Works comply fully with all applicable laws and regulations relating to environmental protection, mitigating measures for reducing environmental impacts and remedial works on completion of the Works. This obligation shall extend to the construction sites themselves, all the Contractor's site installations, and all quarries, borrow areas and tips.

#### **4.2.11. Final Clean-Up**

Upon the Completion of Works, or when any plant has completed its functions, the Contractor shall dismantle and demobilize all temporary facilities and remove all refuse, debris, objectionable material, and fill, grade and dress all excavated areas in a clean and proper condition acceptable to the Engineer-in-Charge. All such areas, as far as possible, shall conform to the natural appearance of the landscape.

#### **4.2.12. Measurement and Payment**

No separate payment for establishing the working facilities shall be made. Cost of all such working facilities shall be included in the unit price of works. No separate payment shall be made for complying with any environmental obligations required by applicable laws and regulations, and all such costs incurred by the Contractor to this end shall be considered as being included in the Contractor's Unit Prices.

### **4.3. PREPARATION OF SITE**

#### **4.3.1. Scope of Work**

The Scope of Works under this clause covers preparation of the site of works as required or as designated by the Engineer-in-Charge for proper execution of various works under the Contract. The Contractor shall provide all equipment and machinery, skilled and auxiliary personnel and materials to commensurate with the various tasks and requirements associated with preparation of the site. He shall also adopt all safety measures of the workmen and others as per requirement and or direction of the Engineer-in-Charge. Safety of the workmen and others in all respects bears the sole responsibility of the Contractor.

#### **4.3.2. Submittals**

At least ten **(10) days** before beginning of the works, the Contractor shall submit to the

Engineer-in-Charge for his approval:

- a) Program of works indicating schedule of time and the area to be covered
- b) The arrangements, the Contractor intends to adopt to carry out the work.

#### **4.3.3.Execution**

##### **4.3.3.1. General**

Operation for Site preparation shall be strictly limited to the area to be occupied by the indispensable works unless otherwise directed by the Engineer-in-Charge. Clearing shall be extended to approximately three (3) meters beyond the limit of the works for permanent structures.

For temporary works, such extension shall be as minimum as required.

During clearing and grubbing the trees and shrubs, pole lines, fences, monuments, pipe lines etc. within or adjacent to the work site which are not be disturbed shall be protected properly at his own cost, from injury or damage by the Contractor. In case of Archaeological monuments within or adjacent to the area, the Contractor shall provide necessary fencing all around as per the direction of the Engineer-in-Charge and protect the same properly during execution.

Methods, tools and equipment to be adopted for the work shall be such which will not affect the property to be preserved. Only such methods, tools and equipment as approved by the Engineer-in-Charge shall be adopted in the work.

##### **4.3.3.2. Jungle Clearance**

Jungle clearance shall comprise of cutting, removing and disposing of all materials such as vegetation, grass, brushwood, shrubs, stumps and trees and sapling of girth up to 300 mm measured at height of 1 m above ground level which in the opinion of Engineer-in-Charge are unsuitable for incorporation in the works, rubbish and other objectionable matters.

The roots of trees and saplings shall be removed to a depth of 600mm below ground level or 140mm below sub-grade level, whichever is lower. Trees and shrubs, etc. within or adjacent to the area which are not required to be disturbed during jungle clearance shall be properly protected by the Contractor at his own cost.

No trees shall be cut from outside areas designated unless absolutely warranted and approved by the Engineer-in-Charge and all trees designated outside the areas shall be protected carefully from any damage and cleared areas shall be maintained free of vegetable growth during the progress of the works.

##### **4.3.3.3. Cutting / Felling of Trees**

After clearance of the grass, vegetation, shrubs and bushes, etc, trees having girth of (i) 300mm to 600mm and (ii) above 600mm (measured at a height of one metre above ground level) shall be grouped separately and shall be numbered suitably at site. These trees shall

be cut after approval of the Engineer-in-Charge. Felling trees shall include taking out roots up to 600 mm below ground level or 140 mm below sub-grade level whichever is lower.

The serviceable materials shall be stacked in the manner as directed by the Engineer-in-Charge.

All unserviceable materials shall be disposed off as per the directions of the Engineer-in-Charge. All excavation below ground level arising out of removal trees, stumps, etc. shall be filled with suitable material in 40cm layers and compacted thoroughly so that the surface at these points conform to the surrounding area.

#### **4.3.3.4. Protection of Other Areas**

The Contractor shall ensure that trees and other vegetation outside the areas of the permanent works and the minimal areas required for temporary works including access are protected and preserved from damage.

Any clearing required by the Contractor for construction of temporary works, and for any other purpose shall be at the Contractor's expense and shall not be carried out without the approval of the Engineer-in-Charge unless otherwise specified.

The Engineer-in-Charge reserves the right to reinstate any damage to vegetation and the surface of the ground beyond the areas of the Works (including temporary works) at the expense of the Contractor.

#### **4.3.3.5. Disposal of Stripped Materials**

All useful materials obtained from clearing operations shall be stacked in the manner as directed by the Engineer-in-Charge. Trunks and branches of trees shall be cleared of limbs and tops and stacked neatly at places indicated by the Engineer-in-Charge. The materials shall be the property of the Engineer-in-Charge.

All unserviceable materials which in the opinion of the Engineer-in-Charge cannot be used or auctioned shall be removed from and disposed off as per the direction of the Engineer-in-Charge.

Care shall be taken to see that unserviceable materials are disposed off in such a manner that there is no likelihood of getting mixed up with the materials meant for construction.

When materials are to be buried, they shall be disposed off in horizontal layers alternatively with earth layers and shall be compacted to the maximum extent practicable by routing the haulage traffic over the area. The maximum height of these spoil materials will be 3 m with slope less than 4:1 (4 horizontal to 1 vertical) in adequate conditions in regard of safety for the stability of the deposit. Vegetal matter shall be covered with 1 m of earth material.

Disposal of waste materials by burning will be permitted only at times when conditions are considered favorable for burning and at locations approved by the Engineer-in-Charge. Materials to be burnt shall be piled neatly in such a manner and in such locations as to cause the least fire risk. Burning shall be thorough so that the burnt materials are reduced

to ashes. No logs, branches or charred pieces shall be permitted to remain. The Contractor shall at all times take special precautions to prevent fire from spreading to areas beyond the limits of the cleared areas and shall have available at the times suitable equipment and supplied for use in preventing and suppressing fires. Care shall be taken to see that the burning of such material does not destroy or damage public or private property and adjacent vegetation, and the Contractor shall be fully responsible for destruction, damage, or nuisance, if any

#### **4.3.3.6. Auxiliary Works**

The auxiliary works comprise, but are not necessarily limited to, the following:

- Removing and storing of boundary stones, protection of surveying points; benchmarks, etc and protection of all secondary survey points, profiles, etc.
- Difficulties to be overcome where excavation may have to be carried out on steep slopes.
- Difficulties in transport due to existing access conditions.
- Sorting of excavated material which, if necessary, is to be used for special purposes.
- Conveying and dumping equipment that might be required.

#### **4.3.4. Measurement and Payment**

##### **4.3.4.1. Measurement**

Measurement for preparation of site shall be done only for the designated area over which the cutting of grass, jungles, etc has been done and all rubbish has been removed. Cutting and uprooting of trees, having girth less than 300mm, measured at a height of one metre above ground level will not be measured and therefore, would be covered under "Clearing Jungle (including removal of Rubbish)". Area of site preparation shall be measured in sqm. Measurement for cutting / felling of trees having girth of more than 300mm (girth measured at a height of one metre above ground level or top of the stumps if the height of the stump is less than 1 m from the ground) shall be done in terms of number according to sizes (a) 300-600mm and (b) more than 600-1200 mm (c) 1200-2400mm & (d) more than 2400mm.

##### **4.3.4.2. Payment**

Payment for site preparation shall be made at the Unit rate per sqm. Payment for cutting / felling of trees having girth specified in Clause 3.4.1 of this Section, shall be paid at the Unit rate for each size group separately.

The rate for each case shall cover the cost of carrying out all the required operations including cost of labour, materials, equipment hired / owned, tools and plants and incidentals necessary to complete the work. The rate also includes removal of stumps of trees of all sizes, excavation, back filling to required density, where necessary, and handling,

salvaging, piling and disposing of the cleared materials with all lift and lead as directed by Engineer-in-Charge.

Where a contract does not include separate items of clearing or grubbing the same shall be considered incidental and contract unit prices for the same shall be considered as including clearing and grubbing operations.

#### **4.4. EARTH WORKS**

##### **4.4.1.Scope of Work**

The scope of works under this clause covers excavation and filling in and around foundation trenches, tanks for treatment plant, pits, drains, and similar works including all activities for proper setting out works, stripping / storing of top soil wherever necessary. It also covers filling areas and plinths with selected materials, conveyance and disposal of surplus soils and /or stacking them properly as directed by the Engineer-in-Charge.

The Scope of works shall also cover to provide and maintain all equipment and machinery, skilled and auxiliary personnel and materials as may be necessary for various tasks and requirements associated with all types of excavation / filling along with installation of all temporary and / or permanent supports as necessary or as directed by the Engineer-in-Charge to protect excavated surface from collapse, damage or any mishap.

The Scope of works shall also cover for protection from damage of the existing trees, shrubs and any other plants, pole lines, fences, signs, monuments, buildings, pipelines, drains, sewers, or other surface or sub-surface systems / drains / facilities within or adjacent to the works being carried out. The Contractor shall provide and install suitable safeguards approved by the Engineer-in-Charge for this purpose and carry out all works within the intent of this specification even if not explicitly mentioned herein.

##### **4.4.2.General Requirements**

The Contractor shall make his own arrangements for locating the co-ordinates and positions of all work and establishing the reduced levels (RLs) at these locations based on two reference grid lines and one Bench Mark, before earth work is taken up in hand. The Contractor shall also provide at site all required instruments, materials and man-power, to carry out the work accurately and according to the Specifications and Drawings.

The Contractor shall also provide all safety measures for the workmen and others as per standard practices and requirements and / or direction of the Engineer-in-Charge during all types of excavation / filling at his own cost and responsibility. However, approval given by the Engineer-in-Charge to the Contractor's methods and equipment shall not relieve the Contractor of his full responsibility for a proper and safe execution of excavations, or of liability for injuries to, or death of persons, or any obligations under this Contract.

All excavation shall be carried out in the dry. The Contractor shall take all necessary precautions including supplying and operation all necessary pumping plant to remove all



water from any source whatsoever which may enter the excavations whether these are in progress or completed.

If excavations are carried out within 5m of building or other constructions, the Contractor shall execute the work in a way that will minimize damage and disturbance. In general vertically sided excavation will be required in such places and all necessary timbering or other support shall be provided. Undercutting of excavations sides will not be permitted.

In the case where, in the opinion of the EIC, the works are likely to cause interference to the public, the Contractor shall organize his operations in such a way as to reduce to a minimum the interval between opening up and back-filling the excavations. No further work shall commence until the EIC has inspected and approved the completed excavation.

All excavation operation shall include excavation and “getting out” the excavated material. “Getting out” shall include throwing the excavated material; as directed by the Engineer-in-Charge.

The excavation shall conform to the lines, grades, side slopes and levels shown on the drawing or as directed by the Engineer-in-Charge. The contractor shall not excavate outside the limits of excavation. Subject to the permitted tolerances, any excess depth/ width excavated beyond the specified levels/dimensions on the drawings shall be made good at the cost of the contractor with suitable material of characteristics similar to the removed and compacted to the requirements.

All debris and loose material on the slopes of cutting shall be removed. No backfilling shall be allowed to obtain required slopes excepting that when boulder or soft materials are encountered in cut slopes, these shall be excavated to approved depth on instructions of the Engineer-in-Charge and the resulting cavities filled with suitable material and thoroughly compacted in an approved manner.

After excavation the sides of excavated area shall be trimmed and the area contoured to minimize erosion and ponding, allowing for natural drainage to take place. If trees were removed, new trees shall be planted, as directed by the Engineer-in-Charge. The cost of planting new trees shall be deemed to be incidental to the work.

All materials obtained from excavation shall remain Owner’s property. All salvaged materials of archaeological importance or of value in the opinion of the Engineer-in-Charge shall be segregated from the excavated materials and stacked separately in a regular manner at locations as directed by the Engineer-in-Charge. Within **fifteen (15) days** of taking over of the site, the Contractor shall submit to the Engineer-in-Charge for approval, his proposal for excavation together with pertinent data for each stage of excavation in each work area. The Contractor shall furnish the following details in his proposal:

- a. Details of the proposed setting-out methods before commencing the work.
- b. Descriptions of working methods and sequences of excavation.

- c. Proposals for controlling ground water and details of associated plant and equipment proposed to be deployed, where dewatering is felt necessary.
- d. Preliminary design and procedures for blasting and blast monitoring if proposed to be necessary, including name and qualifications of Blasters [**copies of valid Blaster's Certificates for Blasting Supervisor and Blasters to be attached**], commercial description and technical information for the blasting products (explosive, detonator, fuses, etc.) proposed, capacity of explosives and detonator magazines, elements of drilling, charging, delay patterns and weight of explosive to be detonated per day, etc.

#### **4.4.3. Specifications and Standards**

The methods and practices for all types of excavation shall conform to the Specifications for Building and Road Works, 2015: Royal Govt. of Bhutan and / or latest editions of the Indian Standards, subject to the approval of the Engineer-in-Charge.

#### **A. EXCAVATION**

##### **4.4.4. Classification of Excavation**

Excavation shall be classified depending upon the type of soil encountered during excavation from ground surface or below the finished stripped level and also for purpose of payment. The type of soil in excavation shall be classified as follows:

- a. Excavation in Ordinary Soil
- b. Excavation in Hard soil
- c. Excavation in Ordinary Rock with or without blasting

##### **4.4.4.1. Excavation in Soil**

Excavation in soil includes excavation in all kinds of soil such as vegetable or organic soil, turf gravel, sand, silt loam, clay, peat, gravel; cobble stone, boulders upto one man size etc, which requires close application of picks or jumpers or scarifiers to loosen.

Excavation in soil also includes excavation in soft rock like lime stone, sand stone, hard laterite, hard conglomerate and un-reinforced cement concrete below ground level, which can be excavated by splitting with crow bars or picks and does not require blasting, wedging or similar means of excavation.

##### **4.4.4.2. Excavation in Rock**

Rock when encountered in excavation shall be removed upto the formation level or as otherwise indicated on the drawings. Where, however, unstable shales or other unsuitable material are encountered at the formation level, these shall be excavated to the extent of 500mm below the formation level or as otherwise specified. In all cases, the excavation operation shall be so carried out that at no point on cut formation the rock protrudes above the specified levels. Rock and large boulder which are likely to cause differential settlement and also local drainage problems should be removed to the extent of 500 mm below the formation level in full formation width including drains and cut through the side drains.

Where excavation is done to levels lower than those specified, the excess excavation shall be made good to the satisfaction of the Engineer-in-Charge.

Slopes in rock cutting shall be finished to uniform lines corresponding to slope line shown on the drawing or as directed by the Engineer-in-Charge. Notwithstanding the foregoing, all loose pieces of rock on excavated slope surface shall be removed.

When blasting is to be resorted to the same shall be carried out to clause 4.5 and all precautions indicated therein observed.

#### **4.4.5. Blasting**

Where hard rock is met with and blasting operations are considered necessary, the Contractor shall obtain the approval of the Engineer-in-Charge. For an ordinary rock, in general, blasting operation shall not be carried out unless permitted by the Engineer-in-Charge. All blasting operations including the depth and size of holes and the size and characteristics of charges shall be subject to the approval of the Engineer-in-Charge. The Contractor shall submit all such information to the Engineer-in-Charge for approval **at least 14 days** prior to starting blasting operation.

The Contractor shall obtain a license from the competent authority for obtaining and storing the explosives. The Contractor shall procure the explosives, fuses, detonators, etc from the Government of Bhutan (RGoB) or as per the provision in terms and conditions of the Contract. The Engineer-in-Charge or his authorized Representatives shall have the right to check the Contractor's store and accounts of explosives. The Contractor shall provide all facilities for this. The Contractor shall also comply strictly with the regulations as required by the concerned authorities of RGoB, regarding purchase, storage, issue and use of explosives and detonators and transport of same to and from site.

Blasting shall be carried out at specified times to be agreed upon between the Contractor and the Engineer-in-Charge. Contractor shall take all precautions as per rules for blasting operations as per latest RGoB blasting manuals and shall be responsible for any damage done to the Work or any damage arising out of accident to the workmen, public or property due to storage, transportation and use of explosives during blasting.

#### **4.4.6. Disposal and Stockpiling of Materials from Excavation**

All the excavated material shall be the property of the employer. The material obtained from the excavation of benches & foundations of buildings, roadway, shoulders, verges, drains, cross-drainage works etc., shall be used for filling up of (i) roadway embankment, (ii) the existing pits in the right-of-way and (iii) for landscaping of the road as directed by the Engineer-in-Charge, including leveling and spreading and disposal of surplus soil at the designated dumping area or as directed by the Engineer-in-Charge and no extra payment shall be made for the same.

#### 4.4.7. Excavation Tolerances

The following tabulated tolerances shall apply for all excavations

Description	Excavation Tolerance (cm)
a. bed or formation levels for construction	+0, -10
b. side slope (perpendicular to slope)	+4, -10
c. top elevation	+10, -0

The Engineer-in-Charge may require that the Contractor repair or remove at his own expense, any material that exceeds the limits above specified.

#### 4.4.8. Dewatering

The Contractor shall construct, operate and maintain drainage systems, including drainage trenches, pumps, pump sumps, pipelines etc., to sufficiently dewater all appearing water, service water and underground water encountered during excavation, in order to allow for the workmanlike execution of all excavation works. All costs for dewatering systems including drainage trenches, pump sumps, pumps, pipelines, etc., shall be included in the unit prices in the Schedule of Quantities for excavation and construction of foundation as specified in sub-clause 4.11.2.3.

#### 4.4.9. Slides

If slips, slides, over-breaks or subsidence occur in cutting during the process of construction, they shall be removed at the cost of the contractor as ordered by the Engineer-in-Charge. Adequate precautions shall be taken to ensure that during construction, the slopes are not rendered unstable or given rise to recurrent slides after construction. If finished slopes slide into the roadway subsequently, such slides shall be removed and paid for at the contract rate, provided the slides are not due to any negligence on the part of the contractor.

#### 4.4.10. Slopes Support and Protection

The Contractor is responsible for all necessary safety measures. From the commencement of work until certificate of completion, the Contractor shall strictly follow the safety regulations in order to prevent accidents. Proper strutting, including rearrangements of the struts when necessary, protection of slopes, methods of excavation to reduce risk of slides, etc. shall be deemed to be included in the unit prices. In the event of soil slides occurring during earth and rockwork, all damage will be to the Contractor's account. All additional work from such damage will not be paid for. Where the nature of the soil gives reason to fear of any movement, initial excavation operations shall be carried out with special care. All planking, strutting and supports necessary to retain the sides of the excavations shall be provided, erected and maintained in a safe condition by the Contractor.

Excavation shall not be carried out below foundations of any structure without prior approval of the Engineer-in-Charge, until underpinning and shoring etc. to be performed by the Contractor, have been completed. All existing structures, pipes and foundations, if any,

which are to be incorporated into the final work, shall be adequately protected or replaced by the Contractor.

#### **4.4.11. Measurement and Payment**

##### **4.4.11.1. Measurement**

Measurement for excavation will be made according to the volume of solid mass, actually excavated in its natural state by measuring the length, breadth and depth of cutting corrected upto 4mm. The volume computations shall be based on surveys of the original ground surface and / or rock surface after completion of final excavation. Excavation in soil and rock shall be measured separately.

Excavation work for Working Facilities, e.g. access and temporary service roads, camps, etc., will not be measured. The Contractor shall include the costs of such works in the respective pay-items.

##### **4.4.11.2. Payment**

###### **1. General**

Payment for excavation in soil or rock shall be made at the unit prices tendered in the Bill of Quantities. The Unit prices shall include the all costs required for carrying out all operations including labour, materials, equipment , tools and plants, drilling and blasting, protection, drainage and dewatering, and cleaning of excavation surface, stockpiling, transportation and disposing the excavated materials and incidentals necessary to complete the work.

Damages or alterations caused by wrong blasting or due to any other incorrect operation by the Contractor shall be repaired at his expense in a manner acceptable to the Engineer-in-Charge.

###### **2. Payment for Over-excavation**

###### **1) Over - excavation due to Geological Conditions**

The cost incurred in connection with cave-ins and rock falls due to geological conditions will be reimbursed to the Contractor, subject to the approval of the Engineer-in-Charge, at the reduced rate only in case of unexpected and unavoidable occurrences, which could not be avoided by proper excavation and support methods.

###### **2) Over-excavation due to Contractor's Fault**

Where over-excavation is caused by inappropriate working methods or negligent work (e.g. wrong location of drill holes, careless blasting operations, excessive pulls, etc.), no payment will be made either for the over-excavation / over-break beyond the pay line or for the additional concrete required for filling. The Contractor shall be responsible for all cave-ins, erosion and over-break due to the Contractor's fault. He shall take all necessary measures at his own cost, to control the excavation and make all the repairs ordered by the Engineer-in-Charge.

###### **3) Extra Excavation Required for Operational Reasons**

Extra excavation not described in the Bill of Quantities or not shown on the Drawings, but considered necessary by the Contractor for his operations in excavation or for

supply facilities and the like may be made only if approved by the Engineer-in-Charge. The cost of such excavation including supporting work and of the concrete required to fill them shall be included in the unit prices of excavation in the Bill of Quantities and shall not be paid separately even though their construction has been approved by the Engineer-in-Charge.

### **3. Payment for Dewatering**

No measurement and payment for Dewatering shall be made extra. All cost of dewatering during excavation and construction of foundation of any structure shall be included in the Unit Rates in the respective Bill of Quantities.

#### **4.4.12. Geotechnical Investigation**

The safe bearing capacity of foundation strata of buildings is taken as 12 T/m<sup>2</sup> for tender purpose which needs to be ascertained & confirmed by the agency through bearing capacity test as recommended by the Engineer-in-Charge. The Investigation should be carried out prior to taking up of construction of the respective buildings. The test results are required to be submitted to the Engineer-in-Charge for approval of taking up construction of buildings. The bearing capacity of strata less than 12 T/m<sup>2</sup> may necessitate revision in design/drawings, if found necessary.

### **B FILLING**

#### **4.4.13. Definition of Fill**

The expression 'fill' shall be taken to mean backfill as well as fill in trenches and is deemed to include excavation from trenches / borrow area or stockpile, loading/ unloading, transport up to 2 km radius, spreading / placing, compaction and trimming to final profile and any moisture control measures required to bring the fill to within specified moisture content whether drying or wetting measures.

#### **4.4.14. Fill Material**

Materials to be used for filling purposes shall be obtained in general, from the excavated earth. The fill materials shall be clean and free from shingle, organic matters, roots and excessive amount of sand, lumps, concrete or any other foreign substances which could harm or impair the strength of the sub-structure in any manner. Fines less than 74microns shall not be more than 20%. In any case, materials to be used for filling shall have the prior written approval of the Engineer-in-Charge.

Filling in plinth and under floors shall be done with sand or otherwise as directed by the Engineer-in-Charge. Materials required for filling / banking in the Works, if not available from the required excavation shall be obtained from the Designated Borrow Area. Some degree of selection may be required by the Engineer-in-Charge within the Designated Borrow Area. Where access to suitable material within the borrow area is not possible, the borrow area's site shall be cleared and/ or grubbed at the Contractor's expense.

#### **4.4.15. Execution of Filling**

After completion of foundation, footings, plinth, walls, and other construction below the elevation of the final grades and prior to filling, all temporary shoring, timber, etc shall be sequentially removed and the excavation cleaned of all trash, debris and perishable materials. If anti-termite treatment is required to be done, the same should be done as directed by the EIC. Filling shall begin only with the written approval of the Engineer-in-Charge. Also, area identified for filling shall be cleared of all soft pockets, vegetation, bushes, slush, etc. In case of plinth and similar filling, the ground shall be dressed and consolidated by ramming and light rolling by portable mechanical compacter.

Filling in plinth and under floors shall be with clean sand and free from dust, organic and foreign matter and its grading shall be as approved by the Engineer-in-Charge. Sand filling in plinth shall be in a manner similar to earth filling as specified above except that consolidation shall be done by flooding with water. The surface of the consolidated sand filling shall be dressed to the required level or slope and shall not be covered till inspected and approved by the Engineer-in-Charge.

Fill adjacent to pipes shall be free of stones, concrete, etc and shall be hand placed and compacted uniformly on both sides of the pipes and where practicable up to a minimum depth of 400mm over the top of pipes . While tamping around the pipes, care should be taken to avoid unequal pressure.

Filling shall be accurately finished to the line, slope, cross section and grade as shown on the Drawings. Finished surface shall be free of irregularities and depressions and shall be within 20mm of the specified level.

#### **4.4.16. Measurement and Payment**

##### **4.4.16.1. Measurement**

Filling with excavated earth, borrowed earth and sand shall be measured separately. For filling sides of the foundations, the cubical contents of bed concrete leveling course and masonry / concrete in foundations upto the ground level shall be worked out and the same shall be deducted from the cubical contents of earth work in excavation for foundations already measured under the respective item of earth work to arrive at the quantity of filling the sides of foundations.

Filling in plinth and under floors shall be measured by cubical contents of the filling after consolidation.

##### **4.4.16.2. Payment**

Payment for filling either from excavated earth or borrowed earth or sand shall be made as per the Unit Rates tendered in the Bill of Quantities. The unit rates shall cover the cost of all the required filling operations including cost of labour , materials, equipment, tools and plants, watering, consolidation, etc and incidentals necessary to complete the work. No additional payment will be made for preparation of the borrow area.

#### 4.4.16.3. Sand filling

Sand filling shall be done, similar to earth filling, except that the consolidation is done by flooding with water. The surface of the consolidated sand shall be dressed to required level or slope. Any other operations on top of the sand fill shall not be started until the Engineer-in-Charge has inspected and approved the sand filling.

The measurement shall be made for consolidated volume of sand filling. The dimensions shall be measured correct to 10mm and cubical contents worked out in cubic metre correct to two places of decimal.

The rates shall cover the cost for carrying out all the required filling operations including cost of labour, materials, equipment hired/owned, tools and plants, and incidentals necessary to complete the work.

### 4.5. MASONRY WORKS

#### 4.5.1.Scope of Works

The Scope of Works covered under this clause shall comprise of masonry (Brick/ Concrete Block or Stone) works including supply of all construction materials, equipment, tools and plants, labour (skilled or un-skilled) , etc. as would be required for construction of all types of masonry as shown in the Drawings and as specified herein and / or as directed by the Engineer-in-Charge.

The Scope of Works shall also include to provide all structural parts, scaffolding, transportation, loading, unloading, inspection, test and quality control , preparation of foundation surfaces, adjustment of surfaces adjacent to the walls, linings, pavements, including curing and protection, etc. and all other incidentals and operations required to complete the masonry works in all respects.

#### 4.5.2.General Requirements

All materials and structural parts incorporated in the permanent work shall be new and unused. Quality and dimensions of materials as well as works shall comply with these Specifications and approved Standards.

All masonry shall be carried out in a workman like manner at the highest standards and all works shall be coordinated with the other works carried out at the site to allow the performance of all works simultaneously without causing any hindrance to other works.

The Contractor shall also provide all safety measures for the workmen and others as per standard practices and requirements and / or direction of the Engineer-in-Charge during all masonry works at his own cost and responsibility. However, approval given by the Engineer-in-Charge to the Contractor's methods and equipment shall not relieve the Contractor of his full responsibility for a proper and safe execution of masonry, or liability for injuries to, or death of persons, or any obligations under this Contract.

#### 4.5.3. Submission

At least **fifteen (15) days** prior to commencement of the masonry work, the Contractor shall submit the details of schedule of works to the Engineer-in-Charge for approval. Submission shall also include details of source of supply of Bricks, Stones, Cement, Sand for mortar,



indicating the estimated quantity to be obtained from each source and all other requisite materials.

Approval of plant and equipment or their operation or of any construction procedure will not waive or modify any provisions or requirements contained in this Specification governing the quality of the materials or the finished work.

#### 4.5.4. Classification of Masonry

The masonry works shall be classified as mentioned in Table -5.1. The required works shall be executed as per drawing, specifications and / or as directed by the Engineer-in-Charge

**Table 1: Classification of Masonry**

Type of masonry	Classification	Cement-mortar Mix
Brick Masonry	BM	1 (Cement) : 4 (Sand)
Random Rubble Masonry	RRM	1 (Cement) :6 (Sand)
Random Rubble Masonry	RRM	1 (Cement) : 4 (Sand)
Concrete Block Brick Masonry	CBM	1 (Cement) : 5 (Sand)
Concrete Block Brick Masonry	CBM	1 (Cement) : 3 (Sand)

#### 4.5.5. Execution

##### 4.5.5.1. General

The mortar for all masonry works shall consist of cement, sand as specified above and water with or without admixtures as approved by the Engineer-in-Charge, each complying with its specifications. The quantity of water shall be as necessary to obtain a satisfactory workability regarding the use of the mortar. Quality of mortar shall in general, meet the requirements specified in IS: 2250 (Code of Practice and Use of Masonry mortar).

##### 4.5.5.2. Mixing, Transporting and Placing

The unit of measurement for cement shall be a bag of cement weighing 50kg and this shall be taken as 0.035 cubic metre. Sand in specified proportion shall be measured in boxes of size: 35 x 25 x 40 cm. It shall be measured on the basis of its dry volume. In case of damp sand, its quantity shall be increased suitably to allow for bulking.

Mortar for masonry shall invariably be produced in a mechanical mixture by volume batching. The mortar shall be mixed in small batches such that the quantity of mortar so prepared at a time could be completely used up in masonry **within 30 minutes of mixing**. Mortar that has remained longer than this period or that has become stiff or set on account of delay in consumption or otherwise shall be rejected at the Contractor's cost.

Cement and sand in the specified proportions shall be mixed dry thoroughly in a mixer. Water shall then be added gradually and wet mixing continued for at least two minutes. Care shall be taken not to add more water than that which shall bring the mortar to the consistency of a stiff paste. Only the quantity of mortar, which can be used within 30 minutes of its mixing shall be prepared at a time. The drum shall be totally emptied before a new batching cycle is started. The drum shall be kept free from hardened mortar and shall be thoroughly cleaned prior to change of mix or on cessation of mixing.

Hand-mixing for small batches may be approved by the Engineer-in-Charge. However, the mortar shall be mixed up to the degree obtained with a mechanically operated mixer. Prior to adding water to the mix, sand, cement and admixture (if required) shall be mixed dry thoroughly in a levelled platform until the mixture has a uniform colour. The quantity of dry mix, which can be used within 30 minutes, shall then be mixed in masonry trough with just sufficient quantity of water to bring the mortar to the consistency of a stiff paste.

The equipment and tools used for transporting and placing of mortar shall ensure that contamination or loss of ingredients do not take place. Mortar shall be stirred or worked at frequent intervals to prevent separation. In case, the mortar has stiffened because of evaporation of water from the mortar, it may be re-tampered by adding water frequently as needed to restore the requirements of consistency but this re-tampering shall be permitted only upto 2 hours from the time of original addition of water. Mortar unused for more than two hours shall be rejected and removed from the site of work.

#### **4.5.6. Brick Masonry/Concrete Block Brick Masonry**

##### **4.5.6.1. General Physical Characteristic of Bricks**

A good first class Bricks should be sound, hard and well burnt with uniform size, shape and coloured (generally deep red or copper), homogeneous in texture and free from flaws and cracks. A fractured surface should show a uniform compact structure free from holes, lumps or grit. The surface shouldn't be too smooth as otherwise mortar will not stick to it. Arises should be square, straight and sharply defined. No dimension of first class brick to vary more than 3 mm from the standard size. A brick should give a metallic ring when struck with the small hammer or another brick. A good brick should not break when struck against another brick or when dropped flat from the height of about 1.2 to 1.5 m on the ground. It should have a surface so hard that cannot be scratched by the finger nail.

A first class brick should not absorb more than 1/6th of its weight when dry and a second class brick not more than 1/4th, after immersion in water for 1 hour. Brick of low porosity have greater strength. All brick should be soaked in water for at least one hour before work with cement mortars.

The cessation of bubbles through the water is an indication of saturation being complete. A "Frog" or "Kick" is made 6mm deep and bricks are usually laid frog up which affords a key for the mortar. A small proportion of lime, not exceeding 5% in fairly divided state is useful in brick Earth. Bricks containing oxide of iron lends the bricks to its peculiar red colour and whereas magnesia gives a yellow tint. Bricks containing small amount of alkali is good as it has an influence on plasticity of clay. The Bricks should show no sign of effloresce after soaking in water and drying in the shade. Bricks containing iron pyrites, salts, pebbles, nodules of kankar, gravel and tree roots should be avoided.

##### **4.5.6.2. Physical requirement of bricks**

Crushing strengths of bricks varies from 30 kg/sq.cm. to 150 kg/sq.cm for handmade burnt bricks, while heavy duty bricks machine pressed (Also called engineering bricks) may have compressive strength as high as 450 kg/sq.cm and even 500 kg/sq.cm. The minimum crushing strength (or compressive) of bricks should be as follows:

Sl. No.	Type of Bricks	Crushing(compressive) strength
1.	Common building bricks	35 Kg/sq.cm
2.	Second class bricks	70 Kg/sq.cm
3.	First class bricks	105 Kg/sq.cm
4.	A-4 class bricks	Not less than 140 Kg/sq.cm

The bricks shall be true shape. The actual common size of bricks is 250 mm x 125 mm x 75mm. A tolerance allowance shall be 1.5mm for breadth and height and 3 mm for length.

#### 4.5.6.3. General Physical Characteristic of cement concrete block bricks

Concrete masonry building units shall be made in sizes and shapes to fit different construction needs. They shall include stretcher, corner, double corner, or pier, jamb, header, bull nose, partition block, and concrete floor units. Concrete block, hollow (open or closed cavity) or solid shall be referred to by its nominal dimensions. The term 'nominal' means that the dimension includes the thickness of the mortar joint. Actual dimensions shall be 10 mm short of the nominal dimension (or 6 mm short in special cases where finer joint is specified). The lightweight concrete masonry building units, which are used in the construction of load-bearing and non- load bearing walls shall confirm to IS 2185 (part 2). Their nominal dimensions shall be as follows:

Length            240, 400, 500 or 600 mm  
Height            100, 114, 115, 120 or 200 mm  
Width             50, 74, 75, 80, 100, 150, 200, 250 or 300 mm

The autoclaved cellular (aerated) concrete blocks having density up to 1000 kg/m<sup>3</sup> shall confirm to IS: 2185 (Part 3). Their nominal dimensions shall be as follows:

Length            240, 400, 500 or 600 mm  
Height            100, 114, 115, 120 or 200 mm  
Width             50, 74, 75, 80, 100, 150, 200, 250 or 300 mm

In addition, concrete blocks shall be manufactured in half lengths of 120, 200, 250 or 300 mm to correspond to the full lengths and also as specified. The maximum variation in the length of units shall not be more than  $\pm 5$  mm and maximum variation in height and width of unit, not more than  $\pm 3$  mm. Hollow concrete blocks shall be made either with two cores or three cores. Stretchers in the 120, 200, 250 and 300 mm widths shall generally have concave ends, each end flange being grooved or plain. All 100 and 150 mm wide units shall generally be made with plain ends. Face shells and webs shall increase in thickness from the bottom to the top of the unit. Depending upon the core moulds used, the face shells and webs shall be flared and tapered or straight tapered, the former providing a wider surface for mortar. The minimum thickness of the face shell and web shall be not less than 20 mm. However, for the top face shell of the closed cavity units, the minimum thickness may be less than 20 mm, but

not less than 15 mm. Subject to the tolerances and the provisions, the faces of masonry units shall be flat and rectangular, opposite faces shall be parallel, and all arises shall be square. The bedding surfaces shall be at right angles to the faces of the blocks.

Load bearing lightweight concrete masonry units hollow (open and closed cavity) or solid shall conform to the following grades:

- a) Grade A – These are used below and above ground level in damp-proof course, in exterior walls that may or may not be treated with a suitable weather- protective coating and for interior walls.
- b) Grade B – These are used above ground level in damp-proof course, in exterior walls that are treated with a suitable weather-protective coating and for internal walls.

Non-load bearing lightweight concrete masonry units, hollow (open and closed cavity) or solid shall be used in interior walls, partitions, panels and for exterior panel walls in steel or reinforced concrete frame construction when protected from weather by rendering or by some other efficient treatment.

The concrete mix used for blocks shall not be richer than one part by volume of cement to 6 parts of combined fine and coarse aggregates. Allowances shall be made for bulking of sand materials, if necessary. Concrete shall be normally mixed in a mechanical mixer. Mixing shall be continued until there is a uniform distribution of the materials, and the mass is uniform in colour and consistency.

Placing and compaction of the mixture shall be done in a mould either with hand- operated machine or mechanically operated machine. Immediately after the block is made, it shall be released from the mould and removed with the pallet to a covered shed, to protect it against sun and strong winds. The blocks shall be stored in the shed until they are sufficiently hardened to permit handling without damage but in no case shall this period be less than 12 hours. The hardened blocks shall then be removed from the pallets and placed in a curing water tank or taken to the curing yard, where these shall be kept continuously moist for at least 21 days. When the blocks are cured in an immersion tank, the water of the tank shall be changed at least every 4 days. Blocks can also be cured with pressure and non-pressure curing. After curing the blocks shall be dried under shade for a period of 4 weeks before being used on the work. They shall be stacked with voids horizontal to facilitate through passage of air.

The blocks shall be allowed to complete their initial shrinkage before they are laid in a wall. Concrete masonry building units can be given a variety of surface textures ranging from a very fine close texture to a coarse open texture by proper selection, grading and proportioning of the aggregates at the time of manufacture and by treating the face of the units while still green. Concrete masonry units used in constructing exposed walls shall be free from stains and discolouration, blemishes or defects which detract the desired appearance of the finished wall. Generally all units shall be sound and free from cracks or other defects, which interfere with proper placing of the units or impair the strength or performance of the construction. Minor chipping resulting from the customary methods of handling during delivery, shall not be deemed grounds for rejection. Physical requirements of the concrete blocks are as given in the Table 3.2.

The block density shall not exceed 1600 kg/m<sup>3</sup>. The drying shrinkage of the units when unrestrained being the average of three units shall be as follows:

- |    |   |   |                        |                              |
|----|---|---|------------------------|------------------------------|
| a) | Load-bearing lightweight concrete masonry units, hollow (open or closed cavity) or solid, |   |                        |                              |
| b) | Grade A   | – | 0.08 percent, max; and | Non-load bearing lightweight |
|    | Grade B   | – | 0.09 percent, max.     | Concrete masonry units       |
|    |   |   |                        | – 0.09 percent, max.         |

## PHYSICAL REQUIREMENTS OF THE CONCRETE BLOCKS.

Type and Grade		Minimum compressive Strength		Maximum Average Water absorption with Oven-Dry mass of concrete	
		Average of	Individual	Less than	Less than
(1)	8 Units, Min	unit, Min		1360	1600
	(2)	(3)		(4)	(5)
	N/mm <sup>2</sup>	N/mm <sup>2</sup>		kg/m <sup>3</sup>	kg/m <sup>3</sup>
Hollow, load					
Grade A	7	5.5		-	290
Grade B	5	4		320	-
Hollow, non-load bearing					
	4	3.5		-	-
Solid, load bearing					
Grade A	12.5	10.8		-	290
Grade B	8.5	7		320	-

The moisture movement of the dried blocks on immersion in water, being the average of three units, shall be less than the drying shrinkage by at least 0.01.

#### 4.5.6.4. Laying

The bricks should be laid by breaking joints in successive layer. Half or cut bricks should not be used except where necessary for breaking the joints in successive layers. Close in such a cases should be cut to the required size and used near the ends of walls. A layer of mortar mix specified in the item shall be spread on full width of suitable length of lower course keeping the mortar dropping to the minimum possible. Each brick shall be properly bedded and set home by gentle tapping with handle of shovel or wooden mallet. The side face shall be buttered with mortar before the next brick is laid and pressed against it. On completion of a course, the vertical joints shall be fully filled from the top with mortar.

The wall shall be truly plumb. All courses should be laid truly horizontal and all vertical joints should be truly vertical. The vertical joints in alternate layer shall come directly one over other. A set of tools comprising of wooden straight edges, mason's spirit level, square half metre rule line and pins string and plumb shall be kept on the site of work.

All the connected bricks works shall be carried up nearly at one level and no portion of the work shall be left more than one metre below the rest of the work. All item fixtures, pipes, out lets of water, hold fasts of door and windows etc. which are required to be built in wall shall be embedded in cement mortar or cement concrete as specified in their correct position as the work proceeds.

#### **4.5.6.5. Joints**

Bricks shall be so laid that all joints are quite full of mortar. The thickness of joints shall not exceed a cm. The face joints shall be raked to minimum depth of 10 mm by raking tool daily during the progress of work. When the mortar is still green so as to provide proper key for Plaster or pointing to be done where plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying.

The face of brick work shall be cleaned the very day that brick work is laid daily and all mortar dropping removed.

#### **4.5.6.6. Curing**

Green work shall be protect from rain by suitable covering. Masonry shall be kept constantly moist on all the faces for a minimum period of seven days.

#### **4.5.6.7. Scaffolding**

Single scaffolding having one set of vertical support shall be allowed. The support shall be sound and strong, tied together by horizontal pieces, over which the scaffolding planks shall be fixed. The inner end of the horizontal scaffolding member may rest in a hole provided in the masonry, such holes; however, left in masonry work for supporting the scaffolding shall be filled and made good before plastering.

#### **4.5.6.8. Measurement**

The length and height shall be measured correct to a cm and area calculated correct to 0.1 sq.m.

#### **4.5.6.9. Rate**

Rate shall include all materials and labour described above including scaffolding where necessary.

### **4.5.7. Random Rubble Masonry**

#### **4.5.7.1. General**

The stones shall be hard, sound and durable of approved quarry, approved by the Engineer-in-Charge before used in the works. Stones shall be hammer dressed to seem closed joint so that the stones when laid will come into closed proximately. Stones would be fairly equal

and no stones shall be less than 15cm in size. Mortar shall be as specified and material of mortar shall be as per standard specifications.

Through bond stones of one piece shall be provided one for every 0.5 sqm of face and should be extended to the full thickness of a wall. All stones shall be thoroughly wetted before laying. The masonry shall be kept moist for a period of 10 days and shall be protected from sun, rain, frost and other weather effect.

#### **4.5.7.2. Scaffolding**

Single scaffolding having one set of vertical support shall be allowed. The supports shall be sound and strong, tied together by horizontal pieces, over which the scaffolding planks shall be fixed. The inner end of the horizontal scaffolding member may rest in a hole provided in the masonry. Such holes, however, shall not be allowed in pillars under one metre in width or immediately near the skew back of arches.

The holes left in masonry work for supporting scaffolding shall be filled and made good with cement concrete 1:3:6 (1 cement : 3 coarse sand : 6 stone aggregate 20mm nominal size).

#### **4.5.7.3. Curing**

Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a minimum period of seven days.

#### **4.5.7.4. Protection**

Green work shall be protected from rain by suitable covering. The work shall also be suitably protected from damage, mortar drooping and rain during construction.

#### **4.5.7.5. Measurements**

The length, height and thickness shall be measured correct to a cm. The thickness of wall shall be measured at joints, excluding the bushings. Only specified dimensions shall be allowed anything extra shall be ignored. The quantity shall be calculated in cubic metre nearest to two places of decimal.

#### **4.5.7.6. Rate**

The rate shall include the cost of materials, labour and all lead and lift required for all the operations described above.

#### **4.5.7.7. Water Proofing Materials in Cement Mortar.**

#### **4.5.7.8. General**

The waterproofing compound shall be mixed in the proportion and in the ways as recommended by the manufacturers.

#### **4.5.7.9. Measurement**

Cubical contents shall be worked out in cu.m corrected to two places of decimal only for the volume where cement mortar is mixed with water proofing compound.

#### **4.5.7.10. Rate**

The rate shall include the cost of water proofing compound and labour involved in mixing the compound with cement mortar.

#### **4.5.7.11. Hand packed stone filling or soling with stone**

Stones as obtained from the quarry shall be packed with their broader surface as base. The packing shall be as dense as possible and the interstice shall be filled with small stones. The height of stones shall be as per the thickness of soiling required. The stones shall be arranged neatly and the joints shall be as thin as possible.

#### **4.5.7.12. Measurement**

The length, breadth and height shall be measured correct to 10mm and the volume calculated correct to 0.01 cu.m

#### **4.5.7.13. Rate**

The rate shall include the materials and labour involved in all operation described above.

### **4.6. CONCRETE WORKS**

#### **4.6.1.Scope of Work**

The Scope of works under this clause covers concrete works (PCC and RCC) which shall consist of:

- Supply of all concrete constituents including reinforcements, labour, equipment, tools and plants, joint materials etc.
- Manufacturing, cooling, transporting, placing, consolidating, protecting and curing of concrete
- Constructing, erecting and dismantling of form work
- Placing materials for expansion and construction joints
- Placing reinforcements and embedded items.

The Contractor shall also provide all safety measures for the workmen and others as per standard practices and requirements and / or direction of the Engineer-in-Charge in execution of concrete works at his own cost and responsibility. However, approval given by the Engineer-in-Charge to the Contractor's methods and equipment shall not relieve the Contractor of his full responsibility for a proper and safe execution of concreting, or of liability for injuries to, or death of persons, or any obligations under this Contract.

#### **4.6.2.Definitions**

##### **a. Fine aggregate (Sand)**

Fine aggregate is defined as the part of aggregate having a maximum dimension of 4.8 mm.

##### **b. Coarse aggregate**

Coarse aggregate is defined as the part of aggregate having a minimum dimension of 4.8 mm and maximum of 40 mm.

##### **c. Construction Joint**



Concrete surfaces, upon or against which concrete is to be placed or where new concrete is to be adhered, that have become so rigid that the new concrete cannot be incorporated integrally with that previously placed are defined as construction joints.

**d. Expansion or Contraction joint**

All joints allowing relative movement of concrete structures with respect to an adjacent one, due to expansion, shrinkage, settlement of foundations etc. are to be considered expansion or contraction joints.

**4.6.3.Submission**

The Contractor shall perform the concrete works in accordance with the Specifications, the Drawings and the instructions of the Engineer-in-Charge. **At least seven (7) days** prior to commencement of the concrete work, the Contractor shall submit the details of materials of concrete and schedule of concreting to the Engineer-in-Charge for approval.

The approval given by the Engineer-in-Charge to the Contractor's plants and equipment or their operation or any construction method shall not relieve the Contractor of his full responsibility for the proper and safe execution of concrete work or any obligations under the Contract.

**4.6.4.Materials**

All materials like cement, aggregates, water, admixture, etc as would be required for production of concrete shall conform to the Specifications for Building & Road works, 2015, RGoB / IS Codes

**4.6.5.Execution of Concrete Works**

**4.6.5.1. General Requirement**

The concrete (Plain or RCC) to be produced and placed according to the Specifications, shall be of highest quality and uniformity. In all phases of operations, the Contractor shall be subject to strict inspection and tests to assure concrete of the best quality. Special emphasis shall be made on the uniformity of the concrete aggregates, water-cement ratio, consistency, air content and the temperature control of the concrete at the time of placement in the formwork, as well as the density and finishing when placed.

The Contractor shall be fully responsible for producing and maintaining the quality of concrete with especially compressive strength not inferior to the specified one, except if different instructions are given by the Engineer-in-Charge.

The Engineer-in-Charge shall have the right to reject concrete in any of the following events:

- (i) When mixing operations have not been started within thirty (30) minutes after the cement is added to the aggregates or,
- (ii) when more than fifteen (15) minutes have elapsed between the discharging of the mixer and the actual placing of the concrete, without agitating the concrete mix or,
- (iii) when more than one (1) hour has elapsed between the adding of the cement to the aggregates, and the actual placing of the concrete.

The Engineer-in-Charge reserves the right to specify a lesser time, if hot weather or other conditions cause quick stiffening of the concrete.

None of the concrete rejected by the Engineer-in-Charge shall be utilized in any of the permanent works. The re-tempering of concrete, which has partially hardened, that is, remixing with or without additional cement, aggregate or water shall not be permitted.

#### **4.6.5.2. Execution of Plain Concrete Works (PCC)**

##### **1. Mixing of Concrete**

Mixing of concrete shall be done by volume measure in the proportion as specified in the drawing and / or as directed by the Engineer-in-Charge. Boxes of suitable size shall be used for measuring sand and aggregates. The internal dimensions of the boxes shall be generally 35x25x40 cm deep or as otherwise approved by the Engineer-in-Charge. The unit of measurement for cement shall be a bag of 50 kg and this shall be taken as 0.035cum.

While measuring the aggregates, shaking ramming or heaping shall not be done. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand, allowance for bulkage shall be made by adopting the method prescribed under “Mandatory tests”.

Mixing shall be done in mechanical mixers. Mixing by hand shall be employed only in special cases with the specific prior permission of the Engineer-in-Charge. Stone aggregate shall be washed with water to remove dirt, dust or any other foreign materials, where necessary before putting into the mixer.

##### **a. Machine Mixing**

Before starting mixing in a mixer, the mixer drum shall be flushed clean with water. Measured quantity of dry coarse aggregate shall be placed in the skip followed by measured quantity of fine aggregate and then cement. In case damp sand is used, add half of the quantity of coarse aggregate followed by cement and sand. Finally add balance quantity of the coarse aggregate. The skip shall be raised and dry materials slipped into the drum. The dry materials shall be mixed for at least four turns of the drum, after which the correct quantity of water shall be added gradually while the drum is in motion, to ensure even distribution with the dry material. The total quantity of water for mixing shall be introduced before 25% of mixing time has elapsed and shall be regulated to achieve the specified water-cement ratio. The materials shall be mixed for a period of not less than 2 minutes and until a uniform colour consistency is obtained. The time shall be counted from the moment at all the materials have been put into the drum.

The complete contents of the mixed concrete shall be emptied before recharging. When the mixer closed down for the day or at any time exceeding 20 minutes, the drum shall be flushed clean.

##### **b. Hand Mixing**

Hand mixing shall be done on a smooth, clean and water-right platform of suitable size in the following manner.

- a) Measured quantity of sand shall be spread only
- b) The cement shall be dumped on the sand and distributed evenly
- c) The sand and cement shall be mixed intimately with spade, turning the mixture over and over again, until it is of even colour throughout and free from streaks.

- d) The sand cement mixture shall be spread out and measured quantity of coarse aggregate shall be spread on its top. Alternatively the measured quantity of coarse aggregate shall be spread out and the same cement mixture shall be spread on its top.
- e) The above materials shall be mixed at least three times by shoveling and turning over by twist from center to side, then back to the centre and again to the sides.
- f) A hollow shall be made in the middle of the mixed pile.
- g) Three quarters of the total quantity of water required shall be added while the material is turned in towards the centre with spades. The remaining water shall be added by water can fitted with rose head, slowly turning the whole mixture over and again until a uniform colour and consistency is obtained throughout the pile.
- h) The mixing platform shall be washed at the end of the day.

## 2. Consistency and Slump of Concrete

Concrete shall be of a consistency and workability suitable for the conditions on the job. For most concrete a "plastic" mix is required, which will not crumble, but will flow sluggishly when vibrated, without segregation.

The quantity of water to be used for each mix of 50 kg cement , to give the required consistency shall not be more than 34 litres for 1:3:6 mix, 30 litres for 1:2:4 mix, 27 litres for 1:1.5:3 mix and 25 litres for 1:1:2 mix. In the case of vibrated concrete, such limits specified may be suitably reduced to avoid segregation. The quantity of water shall be regulated by carrying out regular slump tests.

Slump tests shall be performed in accordance with the "Standard Method of Slump Test for Consistency of Portland Cement Concrete"- **IS-515**.The Engineer-in-Charge may require to adopt a stiffer consistency than that specified wherever concrete of such consistency can be poured and be compacted easily by vibrators.

Wherever the limits for consistency and/ or slump are exceeded, the concrete shall be rejected and removed at the Contractor's expense. The slumps as given in the **Table 2** shall be adopted for different kinds of work:

**Table 2: Limit of Slump for Plain Concrete**

Works	Slump in mm	
	Vibrator Used	Vibrator not used
Mass concrete in foundation,	10-25	50-75
Thin sections of flooring less than 75 mm thickness	25-40	75-100

## 3. Strength of Concrete

The compressive strength on work tests for different mixes shall be as given in the **Table 3**

**Table 3: Compressive Strength of Concrete**

Mix	Compressive strength in Kg./sq.cm	
	At 7 days	At 28 days
1:1:2	210	315

1:1.5:3	175	265
1:2:4	140	210

#### 4. Placing of Concrete

The entire concrete to be used in the work shall be laid gently (not thrown) in layers not exceeding 170 mm and shall be thoroughly vibrated by means of mechanical vibrators till a dense concrete is obtained. The Engineer-in-Charge may however relax the condition specifying use of mechanical vibrators at his discretion for certain items depending upon the thickness of the members and feasibility of vibrating the same and permit hand compaction. Hand compaction shall be done with the help of tamping rods so that the concrete is thoroughly compacted and completely worked into the corners of the formwork. The layers of concrete shall be so placed that the bottom layer does not finally set before the top layer is placed.

Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to the dry mixture. For items where the vibrators are not to be used, it shall be the duty of the Contractor to take the permission of the Engineer-in-Charge before the start of work.

During cold weather, concreting shall not be done when the temperature falls below 4.70 C. The concrete placed shall be protected against frost by suitable covering. Concrete damaged by frost shall be removed and work redone. During hot weather, precaution shall be taken to see that the temperature of wet concrete does not exceed 38.0 C.

When the placing of concrete is suspended, necessary removal of laitance and roughening the surface for jointing future work shall be done before the concrete sets. When the work is resumed the previous work must be thoroughly cleaned, roughened, watered and a grout of neat cement slurry of the proportion, 1 kg of cement per litres of water applied uniformly.

#### 4.6.5.3. Execution of Reinforced Concrete Works(RCC)

##### 1. General Requirement

The production of concrete for RCC works shall be as specified under concrete works (plain), vide **para 4.6.5.2**. Concrete shall be always mixed by mechanical mixer unless otherwise the Engineer-in-Charge permits hand mixing.

##### 2. Fabrication of Reinforcements

###### a. General

The reinforcements, in general, shall be of Fe 500 grade, unless otherwise specified. The Contractor shall fabricate reinforcing steel to the dimensions and configurations as shown on the Drawings or as approved by the Engineer-in-Charge.

###### b. Bending

All bars shall be cut to the lengths and bent in accordance with IS: 2502 the bar bending schedules as approved by the Engineer-in-Charge.

Bars shall not be pre-heated for bending. Once bent, bars shall not be straightened or re-bent. Bending of bars protruding from matured concrete for the purpose of clearing embedded items shall be carried out only with the approval of the Engineer-in-Charge.

### c. Placing of Reinforcements

Before the reinforcement bars are placed, the surfaces of the bars shall be cleaned of flaky rust, oil, or other foreign substances that are harmful to the bonding of reinforcement bars with concrete. Reinforcement bars shall be accurately placed in the position as shown on the Drawings or directed by the Engineer-in-Charge, and special care shall be exercised to prevent the reinforcement bars from being displaced during the placement of concrete.

Intersecting points and splices of the reinforcement bars shall be fixed by using suitable clips or annealed wires, the diameter of which shall be more than 0.7 mm. The reinforcement bars in structures shall be placed and supported by use of precast spacer blocks to ensure required cover between the reinforcement bars and the shutters. Unless otherwise shown or approved, the minimum cover of concrete to reinforcing steel shall be as in **Table 4**.

**Table 4: Minimum Cover of Concrete to Reinforcement Steel**

Condition of Placement	Minimum cover (mm)
Structures exposed to weather, backfill or submerged but accessible. - DB 17 and smaller bars	40
Structures not exposed to whether or not in contact with ground - beams, girders and columns principal reinforcing steel, ties, stirrups and spirals	40
Upper-structure of buildings - beams, girder, columns and slabs without finishing - slabs with finishing	30 20
Sub-structure of buildings: - beams, girders, columns and slabs - footing	40 50
Water Tanks	40

### d. Splicing of Reinforcements

The number of splices shall be kept to a minimum. Location and length of lap splices shall be in accordance with "IS Standards" (IS-456-2000 / SP-34).

### e. Tolerance for Placing Reinforcing Steel

Unless otherwise required by the Engineer-in-Charge, reinforcement shall be placed within the following tolerances:

- (a) For effective depth of 200 mm or less  $\pm 5$  mm
- (b) For effective depth more than 200 mm  $\pm 15$  mm

The overall shall, in no case, be reduced by more than one-third of specified cover or 5 mm whichever is less.

## 3. Consistency of RCC

The concrete, which will flow sluggishly into the forms and around the reinforcements without any segregation of coarse aggregate from the mortar, shall be used. The consistency shall depend on whether the concrete is vibrated or hand tamped. It shall be determined by

slump test as prescribed in mandatory test. The slumps of concrete for different types of RCC works shall be given in **Table 5**, unless otherwise specified.

**Table 5: Limit of Slump for Reinforced Concrete**

Sl. No	Work	Slump (in mm) Vibrators	
		Used	Not used
1	Mass concrete in R.C.C. foundation footings, and retaining walls.	10-25	80
2.	Beams, slabs and columns, simply reinforced.	25-40	100-125
3.	Thin R.C.C. section or section with congested steel	40-50	125-150

#### 4.6.5.4. Form Work

##### a. Centring and Strutting

Props used for centring shall be steel, timber posts, ballies or any other material approved by Engineer-in-Charge. In no case ballies shall be of diameter less than 100 mm measured at mid length and 80 mm at thin end. Maximum permissible spacing shall be 1.2 m centre to centre. Ballies shall rest squarely on wooden sole plates of 40mm thickness and minimum bearing area of 0.1 sq.m laid either on ground or on 40x40 cm brick masonry pillars in mud mortar of height not exceeding 40 cm. Double wedges shall further be provided between the sole plates and the wooden props so as to facilitate tightening and easing of shuttering without jarring the concrete. In case brick masonry pillar of adequate section are used instead of props, wooden sole plates shall be provided at the top of pillars and double wedges inserted between the sole plate and the bottom of shuttering.

##### b. Shuttering

The shuttering shall have smooth and even surface and the joints shall not permit leakage of cement grout. Timber used shall be well seasoned, free from loose knots, projecting nails, splits or other defects that may mar the cement surface of concrete. It shall not be so dry as to absorb water from the concrete and swell and bulge, or so green or wet as to shrink after erection. Species of timber that are not affected appreciable by its contact with water shall be used. The timber shall be accurately sawn and planned on the sides and the surface coming in contact with concrete. For exposed concrete faces, timber for shuttering shall be wrought on all faces in contact with concrete.

Wooden formwork with metal sheet lining of steel plates stiffened by steel angles shall also be permitted. Where metal forms are used, all bolts and nuts shall be countersunk and well ground to provide a smooth plane surface. The chamfers, beveled edges and moulding shall be made in the formwork itself. Opening for an clamps and other fittings connected with services shall be provided in the shuttering as directed by the Engineer-in-Charge. As for as practicable, clamps shall be used to hold the forms together. Where use of nails is unavoidable minimum number of nails shall be used and these shall be left projecting so that they can be easily withdrawn. Use of double head nails shall be performed.

##### c. Surface Treatment for Shuttering

The surfaces of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution, raw linseed oil, form oil of approved manufacturer or any other approved material (such as polythene/polyethylene sheets), to prevent adhesion of concrete to form work. Soap solution, for the purpose shall be prepared by dissolving yellow soap in water to get the consistency of paint. Inside surface of forms shall be thoroughly cleaned before application or any of the materials mentioned above. Release agents shall be applied strictly in accordance with the manufacturer's instruction and shall not be allowed to come in contact with any reinforcement. Re-use of the shuttering shall be permitted only after the inside surface has been thoroughly cleaned in the manner described above.

Contractor shall give the Engineer-in-Charge due notice before placing any concrete in the forms to permit him to inspect and accept the form work as to its strength alignment and general fitness, but such inspection shall not relieve the Contractor of his responsibility for safety of workman, machinery, materials and for results obtained.

**d Removal of Form Work**

No formwork of any part thereof shall be removed without prior approval of the Engineer-in-Charge. The formwork shall be so removed as not to cause any damage to concrete due to shock or vibration. In a slab and beam construction, sides of beam shall be stripped first, then the under sides of slab and lastly the underside of the beam. Formwork must be so designed that they can be stripped in the order required i.e.

- Shutters to vertical (non load bearing) faces e.g. column boxes, beam sides, wall forms,
- Shutters forming soffits to slab, horizontal and inclined which carry only light load, e.g. slab, roofs, floors and canopies etc.
- Soffit shutters carrying heavy load e.g. beam and girder bottoms.

The whole of the formwork should be planned and a definite scheme of operation worked out. In no circumstances should forms be struck until the concrete reaches strength of at least twice the stress of which the concrete may be subjected at the time of striking. Where possible the formwork should be left longer as it would assist curing. Forms should be eased carefully in order to prevent the load being suddenly transferred to concrete. The period that shall elapse after the concrete has been laid, before easing and removal of centring and shuttering is undertaken shall be as given in **Table 6**.

**Table 6: Minimum period of Removal of Form works**

Type of formwork	Minimum period before striking formwork
Vertical formwork to columns, walls and beams	15-24 h
Sofit formwork to slabs (props to be refixed immediately after removal of formwork)	3 days
Sofit formwork to beams (props to be refixed immediately after removal of formwork)	7 days
Props to slab spanning upto 4.7m	7 days
Props to slab spanning over 4.7 m	14 days

Props to beam and arches spanning upto 7 m.	14 days
Props to beams and arches spanning over 7 m	21 days

**Notes:**

1. For rapid hardening cement, 3/7 of the above period will be sufficient in all cases except for vertical sides of slabs, beams and columns which should be retained for atleast 24 hours.
2. In case of cantilever slabs and beams, the centering shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength.
3. Proper precautions should be taken to allow for the decrease in the rate of hardening that occurs with all cements in cold weather.
4. Work damaged through premature or careless removal of forms shall be reconstructed.

#### **4.6.6.Measurement and Payment**

##### **4.6.6.1. Measurements and Payment for Concrete**

##### **1. Measurements for Concrete**

The concrete work under the following categories shall be measured separately:

- a) From foundation to plinth level
- b) From plinth level to all heights
- c) Concrete work at the parapet shall be measured together with the corresponding work in the wall of the storey next below.

The consolidated cubical contents shall be calculated net nearest to 0.01 cu.m. Concrete laid in excess, of the sections shown in the drawing unless directed by the Engineer-in-Charge shall not be measured.

Pre-cast cement concrete solid articles shall be measured separately and shall include use of moulds, finishing the top surfaces even and smooth with wooden trowel, before setting in position in cement mortar (1 cement: 3 coarse sand).

No deduction shall be made for:

- a) Ends of dissimilar materials (e.g. joists, beams, posts, girders, rafters, purlins, trusses, corbels, step etc.) upto 500 sq.cm in section.
- b) Opening upto 0.1 m<sup>2</sup> or as specified.
- c) Volume occupied by pipes, conduits, sheathing etc. not exceeding 100 sq. cm each in cross sectional area.
- d) Volume occupied by reinforcements

##### **2. Payment for Concrete**

Payment for concrete works shall be made at Unit Rates tendered in the Bill of Quantities. The Unit rate shall include the cost for carrying out all the required operations including the



cost of labour, materials equipment, tools and plants, and incidentals, etc , but excluding reinforcement and form work, necessary to complete the work

#### **4.6.6.2. Measurements and Payment for Formwork**

##### **1. Measurement for Formwork**

Formwork shall be measured separately (i) upto foundation and plinth and (ii) above for each of the items as per Bill of quantities. All measurement shall be taken of the area of shuttering in contact with the concrete surface. Dimensions of formwork shall be measured correct to 10mm.

No deductions from the shuttering due to the openings/obstructions shall be made if area of such opening/obstructions does not exceed 0.1 sq.m. Nothing extra shall be paid for forming.

##### **2. Payment for Form works**

Payment for form work which includes centering and strutting for all heights, shall be paid separately at Unit Rates tendered for the items specified in Bill of Quantities. Where it is not specially stated in the description of the item that formwork shall be paid for separately, the rate of the R.C.C. item shall be deemed to include the cost of formwork.

The Unit rate for form work shall include the cost of labour, materials, tools and plants and all incidentals required for all operations including supporting the members until the concrete is cured , set and hardened as required. No separate payment shall be made for items such as form releasing agent, connections, provisions for openings and other items required for completion of the work unless specified otherwise.

#### **4.6.6.3. Measurement and Payment for Reinforcements**

##### **1. Measurement for Reinforcement**

Measurement for reinforcing bars will be made for actual lengths of reinforcement bars including permissible hooks, bends and splices will be measured. The weight of reinforcing bars will then be calculated for each size of bar from the unit weight as stated on the certified copies of manufacturer's reports, which the Contractor shall submit to the Engineer-in-Charge or otherwise standard weights per metre for each size of bars as provided in the Steel Tables shall be used.

Before starting concreting, the Contractor shall make sure that the measurements of reinforcing bars placed in position have been recorded and that the Engineer-in-Charge has certified the correctness of the reinforcement used.

##### **2. Payment for Reinforcements**

Payment for reinforcements shall be made at the unit rate per kg tendered in the Bill of Quantities, which shall include the entire cost of supply, taxes, handling, storage, cutting, bending, placing, wire clips, ties, separators and any other fastening devices.

No separate payment will be made for the following, which shall be included in the quoted unit price:

- (a) Wire for tying reinforcement.
- (b) Any additional reinforcement or splices required when Contractor's casting sequence differ from construction joints shown on the drawings
- (c) Any reinforcement steel placed by the Contractor for his own convenience in addition to those shown on the drawings.
- (d) Devices like steel chairs, hangers, spacers, small spacer concrete blocks, other supports, ties and anchor rods etc. used to maintain reinforcing steel in position.
- (e) Any reinforcing steel delivered for testing.
- (f) Carrying out tests for checking butt welds to replace lapping/ splicing of reinforcing bars.
- (g) Carrying out tests to verify quality of steel reinforcement to be used as required and directed by the Engineer-in-Charge.

#### **4.7. DOORS AND WINDOWS**

##### **4.7.1.Scope of Works**

The scope of works under this Section in general, shall comprise of supply, fabrication, erection / installation of wooden/aluminium doors and windows with panelled / glazed shutters, Glass fibre reinforced concrete (GRC) cornice, window frame, rabsey, etc. as specified including all hardware, accessories, fittings and fixtures, complete with fixing / fitting in position. The scope of works shall also include all labour, materials and equipment and the performance of all works as shown in the Drawings or as directed by the Engineer and / or as specified herein.

##### **4.7.2.Submission**

The Contractor shall submit, **at least thirty(30) days** in advance of commencement of fixing doors and windows etc., with complete details, (sections and plans) of all parts, assemblies, components, connection and supports, etc., scheduling and sequence of execution of such works with details of method of anchoring and any other pertinent details, to the Engineer for his approval.

Before placing orders, the Contractor shall also submit catalogues or samples of hardware, fittings and fixtures, etc. to the Engineer for his approval.

##### **4.7.3.General Requirements**

The Contractor shall make good to the satisfaction of the Engineer-in-Charge all cuttings / damages resulting from his operations during the installation. He shall also dispose of all unserviceable materials at least 50 m away from the boundary, unless otherwise directed by the Engineer. All serviceable materials shall be stacked as directed by the Engineer-in-Charge. The Contractor shall remain fully responsible for all normal precautions and vigilance to prevent any damage whatsoever till handing over.

#### **4.7.4. Standards and Codes**

Unless otherwise specified the materials to be used for the works shall conform with regard to quality, properties and workmanship, to the 'Specifications for Building and Road Works, 2015: Royal Govt. of Bhutan' and the relevant Indian Standards.

#### **4.7.5. Wooden Doors and Windows**

##### **4.7.5.1. General**

Timber for wood works shall be of first class wood of specified variety. It shall be of the best quality, well-seasoned and free from sap, knots, warps, cracks and other defects. The scantling shall be sawn in the direction of the grains and shall be planed smooth and truly finished to the exact dimensions, rebates, rounding and mouldings as shown in the drawings made, before assembling. Patching and plugging of any kind shall not be permitted except as approved by the Engineer. All joints shall be neat and strong, truly and accurately fitted and coated with white lead before being fitted together.

All portions of timber built into or in contact of masonry or concrete shall be given two coats of boiling tar. All exposed surfaces shall be finely polished or varnished as directed by the Engineer, to give a very attractive finish.

##### **4.7.5.2. Wooden Frames for Doors and Windows**

###### **(1) General**

Frames for doors and windows or otherwise shall be built up from best quality of mixed Conifer wood. All members of the frames shall be of the same species of timber and shall be straight without any warp or bow. Frames shall have smooth, well planed surfaces except the surfaces touching the walls, lintels, etc., which may be left clean sawn. Rebates, rounding or moulding shall be done before the members are jointed into frames. The depth of the rebate for housing the shutters shall be 15 mm and the width of the rebates shall be equal to the thickness of the shutters.

###### **(2) Joints**

The frames shall have dovetail joints. The jamb posts shall be through tenoned into the mortise of the transoms to the full thickness of the transoms and the thickness of the tenon shall not be less than 2.5 cm. The tenons shall closely fit into the mortise without any wedging or filling. The contact surface of tenon and mortise before putting together shall be glued with polyvinyl acetate dispersion based adhesive conforming to IS-4835 or MR grade of IS 851 and pinned with 10mm dia hard wood dowels or bamboo pins. The joints shall be at right angles when checked from the inside surfaces of the respective members. The joints shall be pressed into position. Each assembled door frame shall be fitted with a temporary stretcher and a temporary diagonal brace on the rebated faces.

###### **(3) Fixing**

The frames shall be got approved by the Engineer-in-Charge before painting/treatment and fixing in position. The surface of the frames abutting masonry or concrete and the portions of the frames embedded in floors shall be given two coats of boiling tar. Frames shall be fixed to the abutting masonry or concrete with 3 or more holdfasts as directed by the

Engineer on each side of the door and window frames with one at the centre and the other two at 30cm from the top and bottom of the frames.

After fixing the jamb posts of the frame shall be plugged suitably and finished neat. Vertical members shall be embedded in the floor for the full thickness of the floor finish and shall be suitably strutted and wedged in order to prevent warping during construction.

#### **4.7.5.3. Beading for wooden Doors and Windows**

Beading to the doors and windows shall be made from Blue Pine moulded wood and shall be true and accurate to the size 50 x 20mm. The beading shall have rebate rounding and moulding finished smooth. Fixing of such beading shall be done with screws which shall be sunk into the woodwork and their tops covered with putty. The unexposed surface of beading shall be given a priming coat of paints as directed by the Engineer-in Charge.

#### **4.7.5.4. Wooden Shutter for Doors and Windows**

##### **1. General**

Shutter for doors and windows of all rooms except Kitchen and Bath shall have double leaves and shall be fixed as shown in the drawing or as directed by the Engineer-in-Charge. The shutters shall be 38mm thick for doors and 35mm thick for windows and shall be fabricated from well-seasoned best quality champ wood, unless otherwise specified. Shutters shall be free from twist or warp in its plane and shall be fully panelled in both faces and shall be finished with decorative look. Each style and rail shall be a single piece without any joint. Before taking up work in hand, design of the panelling and its outlook shall be got approved by the Engineer-in-Charge.

Shutters for windows shall be fully glazed.

Shutters for Kitchen doors should be flush, 35mm and shall have a solid core with decorative finish.

Shutters for Bath room doors shall be of PVC made of approved brand and manufacturer. Shutters for Bath room windows (inside) shall be 35mm thick and shall be fully glazed with best quality frosted glass.

Shutters for cupboards shall be 25mm thick, made of best quality champ wood. Shutters shall be fully panelled. Size of rails and styles shall be as mentioned in the **Table 7**

Each shutter for doors shall be fixed with 4nos x 100mm brass press butt hinges with necessary brass screws whereas the shutters for windows shall be fixed with 3nos x 100mm brass press butt hinges.

All shutters shall be provided with all fittings and fixtures, complete in all respects in accordance with the specifications/ drawings and / or as directed by the Engineer-in-Charge.

##### **2. Panelled Shutters**

###### **a. Gluing of joints**

The contact surfaces of tenon and mortise shall be treated, before putting together, with bulk type synthetic resin adhesive conforming to IS: 851 suitable for construction in wood or synthetic resin adhesive (Phenolic and amino plastic) conforming to IS: 848 or polyvinyl acetate dispersion based adhesive conforming to IS: 4835 and pinned with 10 mm dia hardwood dowels or bamboo pins or star shaped metal pins, after the frames are put together and pressed in position by means of press

###### **b. Dimensions of Frame work**

Stiles and bottom rails shall be made out of one piece of timber only. Intermediate rail exceeding 200 mm in width may be out of one or more pieces of timber. The width of each piece shall not be less than 75 mm. Where more piece of timber is tongued and grooved joint glued together and reinforced with mental dowels at regular intervals not exceeding 200 mm. Other dimensions shall be as mentioned in the **Table 7** or as directed by the Engineer-in-Charge.

**Table 7: (To be prepared for paneled doors & glazed windows)**  
**Dimensions of the Frame of Panelled Doors/ Windows Shutters**

Description	Width (mm)	Thickness (mm)
<b>A. For Doors</b>		
Stile, top and freeze rail	100	38
Lock rail	150	38
Bottom rail	200	38
Muntin	100	38
<b>B. For Windows</b>		
Stile, top and freeze rail	80	35
Bottom rail	80	35
Muntin	60	35
Glazing bar	40	35
<b>C. Cupboards</b>		
Stile, top and freeze rail	75	25
Bottom rail	75	25
Muntin	60	25
Glazing bar	40	25
Runners	25	25
Architraves	25	25
Curtain rod	25 dia.	

Muntin bars where required shall be stubtenoned to the maximum depth which the size of the member would permit or to a depth of 25 mm whichever is less. Unless otherwise specified the finished dimensions of the components of frame work of shutters shall be as given above. The tolerance on width of styles and rail shall be + 3 mm. The tolerance in thickness will be + 1 mm. The thickness of all components of framework shall be the same as the thickness of the shutter. Tolerance on overall dimension of the shutter shall be + 3 mm.

c. Rebating

The shutters shall be single leaf or double leaved as shown in the drawings or as directed by the Engineer-in-Charge. In case of double leaved shutter the meeting of the stiles shall be rebated by one third the thickness of the shutter. The rebating shall be either splayed or square type.

d. Panelling

Timber panels shall be preferably made of timber of large width, the minimum width and thickness of the panel shall be 150 mm, and 15 mm respectively. When made from more than one piece, the pieces shall be jointed with a continuous tongued and grooved join glued together and reinforced with headless nails at regular intervals not exceeding 100 mm.

Depth and thickness of such joint shall be equal to one third or thickness of panel. The panels shall be designed such that no single panel exceeds 0.5 square metres in area. The grains of timber panels shall run along the longer dimension of the panels. All panels shall be of the same species of timber.

### **3. Flush Door Shutters**

#### **a. General**

Width and height of the shutters shall be as shown in the drawings or as indicated by the Engineer. All four edges of the shutters shall be square. The shutter shall be free from the warp in its plane. The moisture content in timbers used in the manufacture of flush door shutters shall be not more than 12 percent when tested according to IS:1708.

#### **b. Core**

The core of the flush door shutters shall be pre-fabricated with block board solid core and ply veneer with a decorative finish. The core shall have wooden strips held in a frame constructed of stiles and rails. Each stile and rail have a single piece without any joint. The width of the stiles and rails shall not be less than... and not more than 100 mm. The width of each wooden strip shall not exceed 25 mm. Stiles, rails and wooden strips forming the core of a shutter shall be of equal and uniform thickness. Wooden strips shall be parallel to the stiles.

End joints of the pieces of wooden strips of small length shall be staggered. In a shutter, stiles and rails shall be of one species of timber. Wooden strips shall also be one species only but it may or may not be the same species as that of the stiles and rails.

#### **c. Face Panel**

The face panel shall be formed by gluing, by the hot-press process on both faces of the core, either plywood or cross-bands and face veneers. The thickness of the cross bands as such or in the plywood shall be between 1.0 mm and 3.0 mm. The thickness of the face veneers as such or in the plywood shall be between 0.5 mm and 1.5 mm for commercial veneers and between 0.5 mm and 1.0 mm for decorative veneers. The direction of the veneers adjacent to the core shall be at right angles to the direction of wooden strips. Finished face shall be sanded to smooth even texture.

#### **d. Lipping**

Lipping, where specified, shall be provided internally on all edges of the shutters. Lipping shall be done with battens of the first class hardwood or as specified of depth not less than 25 mm. For double leaved shutters, depth of the lipping at meeting of stiles shall be not less than 35 mm. Joints shall not be permitted in the lipping.

#### **e. Rebating**

Rebating shall be as specified above.

#### **f. Opening for Glazing**

The shutters shall have a opening for glazing of size 25 cm in height and 20 cm in width unless directed otherwise. The bottom of the opening shall not be a height of 140 cm from the bottom of the shutter. Opening for glazing shall be lipped internally with wooden batten of width not less than 25 mm. Opening for glazing shall be provided where specified or shown in the drawing.

#### **g. Tolerance**

Tolerance on width and height shall be + mm and tolerance on nominal thickness shall be +1.2 mm. The thickness of the door shutter shall be uniform throughout with a permissible variation of not more than 0.8 mm when measured at any two points.

**h. Adhesive**

Adhesive used for bonding various components of flush door shutters namely, core, core frame lipping, cross-bands, face veneers, plywood etc. and for bonding plywood shall conform to BWP type phenol formaldehyde synthetic resin adhesive conforming to IS:848.

**Tests**

Samples for flush door shutters shall be subjected to the following tests

- a) End Immersion Test
- b) Knife Test
- c) Glue Adhesion Test

One end of each sample shutter shall be tested for End Immersion Test. Two specimen of 150 x 150 mm size shall be cut from the two corners at the other end of each sample shutter for carrying out Glue Adhesion Test. Knife Test shall be done on the remaining portion of each sample shutter.

**4. Exterior Shutters**

Frames of the exterior shutters shall be 35mm thick, made of mixed conifer wood with size as specified in **Table 7**. All such shutters shall be fixed with galvanized MS wire-gauge, 0.56mm dia wire and shall be provided with the steel mosquito proof nets of approved mesh size and quality within the frame.

**4.7.5.5. Glass and Glazing**

**1. General**

The Contractor shall supply and install all glass and glazing as required for various doors, windows, ventilators and miscellaneous glazing and partitions, unless otherwise stated from approved manufacturer and shall have uniform refractive index and free from flaws specks, and bubbles. The glass shall be brought to site in the original packing from the manufacturer and cut to size at site. The cut edges shall be straight and free from hips, spawls or any other damages.

**2. Materials for Glass and Glazing**

Glare reducing (tinted, or heat absorbing glass) shall be of approved quality and special care shall be taken to grind smooth and round off the edges before fixing. Clear glass shall be flat drawn sheet glass and shall be at least 4 mm thick. Sheet glass for doors shall be minimum 5.5 mm thick.

Composite double-glazing shall be made of double-glazing of two 6 mm thick sheet glass either both sheets of tinted glass or one glass tinted and other plain or both sheets of plain sheet glass. Both the glasses shall be separated by an air gap of 12 mm. The trapped air shall be kept dry by means of suitable desiccant. The sealing shall be under strict quality control. The composite glazing shall be procured as finished product from reputed manufacturers.

In general, the putty shall be of best quality from approved manufacturer. It shall be brought to site in manufacturer's original packing. Quick setting putty shall be used for windows and sashes except when glare-reducing glass is used where it shall be of non-setting type. Neoprene gaskets with snap-fit glazing shall be fixed as per manufacturer's instructions and shall fit firmly against the glass to give a leak-proof installation.



### 3. Glazing, Setting and Finishing

All glass shall be thoroughly cleaned before setting in position. Each glass pane shall be held in place by special glazing clips of approved type. Four glazing clips shall be provided per glass pane except for large panes where six or more clips shall be used as per the instructions of the Engineer. All holes as necessary for holding the clips, glazing beads and all other attachments shall be drilled.

Glass panes shall be set without springing, and shall be bedded in putty and back putties, except where moulding or gaskets are specified. Putty, mastic cement etc. shall be smoothly finished to a true even line. Obscure and figured glass shall be set with smooth side out.

After completing of glazing work, all dirt, stains, excess putty shall be removed and the glass panes cleaned in perfectly acceptable condition. All broken, racked or damaged glass shall be replaced by new ones at the Contractor's own cost.

### 4. Hardware Materials

The Contractor shall submit catalogues or samples of the hardware to the Engineer for his approval. The hardware shall comply with the following requirement:

Tower Bolts	Brass, barrel type, 250mm, 150mm and 100mm size for doors, windows and cupboards respectively.
Sliding Door bolts	Brass, 250 / 100mm size
Knob or Handle	Brass, 150 / 125 / 100mm size
Door closer	Die-cast aluminium body, oil and spring activated with 90 degree stop device.
Hook and Eye	Brass, 100mm
Door Closure	Bright finish brass, Hydraulic
Door Stopper	Bright finish brass
Sash fastener	Die-cast aluminium

### 5. Acceptance Criteria

#### 6. Fabricated Items

- Overall dimensions shall be within  $\pm 1.5$  mm of the size shown on the drawings.
- Mullions, transoms etc. shall be in one length and permissible deviations from straightness shall be limited to  $\pm 1.5$  mm from the axis of the members.
- Door and window shutters shall operate without jamming. The clearance at head and jamb for door shutters shall not exceed  $\pm 1.5$  mm. For double leaf doors, the gap at the meeting stiles shall not be more than  $\pm 1.5$  mm.
- Door leaves shall be undercut where shown on drawings.
- Doors, windows, frames, etc. shall be on a true plane, free from warp or buckle.
- Provision for hardware and fixtures to be installed at site.
- Glazing beads shall be cut with mitred corners.
- Glazing clips, fixing devices etc. shall be supplied in adequate numbers.

#### 7. Installed Items



- a) Installation shall be at correct locations, elevations and in general on a true vertical plane.
- b) Fixing details shall be strictly as shown on drawings.
- c) Assembly of composite units shall be strictly as per drawings, with mastic caulking at transoms and mullions, gaskets, weather strips etc. complete.
- d) All frames on external wall shall be mastic caulked to prevent leakage through joint between frames and masonry.
- e) All openable sections shall operate smoothly without jamming.
- f) Lock, fasteners etc. shall engage positively. Keys shall be non-interchangeable.
- g) Cutting to concrete or masonry shall be made good and all abrasions to shop paint shall be touched up with paint of same quality as shop paint.

It shall be responsibility of the Contractor to see that the material is protected from mortar, paint, plaster, terrazzo framing members to the satisfaction of the Engineer before handing over to the Employer.

#### **8. Glass and Glazing**

- a) All installations shall be free from cracked, broken or damaged glass. Edges of large panes of thicker glass and heat absorbing glass shall be inspected carefully for chipped, cracked or underground edges.
- b) Glazing shall be carefully done to avoid direct contact with metal frames.
- c) All glasses shall be embedded in mastic or fixed by neoprene gaskets to give a leak proof installation.
- d) At completion, the panes shall be free from dirt, stains, excess putty etc. to the complete satisfaction of the Engineer.

#### **4.7.5.6. Measurement and Payment**

Measurement and payment for wood work in frames of door, windows and other frames, wrought, framed and fixed in position shall be made for the finished dimension without any allowance for the wastage, at the unit rate per cum.

Measurement and payment for shutters of doors, windows and cupboards, whether paneled, flush or glazed / PVC shall be made at the unit rate per sq. m on the basis of area of the opening between the frames and shall be inclusive of brass pressed butt hinges and brass screws as required.

Measurement and payment for exterior window shutters shall be made at the unit rate per sq. m on the basis of area of the opening between the frames.

Measurement and payment for Beads, Railing or Curtain Rods shall be made at the unit rate per metre length.

Unit rates for all of the items covered under this section shall include all materials except specified fittings and fixtures as per BOQ, labour, transport, fabrication and fixing in position, etc. as per specification / directions of the Engineer, complete in all respects.

Measurement and payment for false ceiling with all fittings and fixtures as per specifications shall be made for the finished dimension without any allowance for the wastage, at the unit rate per Sqm. The unit rate shall include the cost of materials and labour involved in all operations for fixing in position as per drawing and / or as directed by the Engineer-in-Charge.

#### **4.7.6. Aluminium Doors & Windows**

##### **4.7.6.1. Aluminium Sections**

Aluminium sections used for fixed/openable windows, ventilators, partitions, frame work & doors etc. shall be suitable for use to meet architectural designs to relevant works and shall be subject to approval of the Engineer-in-Charge for technical, structural, functional and visual considerations. The aluminium extruded sections shall conform to IS 733 and IS 1285 for chemical composition and mechanical properties. The stainless steel screws shall be of grade AISI 304.

The permissible dimensional tolerances of the extruded sections shall be as per IS 6477 and shall be such as not to impair the proper and smooth functioning/operation and appearance of door and windows.

Aluminium glazed doors, windows etc. shall be of sizes, sections and details as shown in the drawings. The details shown in the drawings may be varied slightly to suit the standards adopted by the manufacturers of the aluminium work, with the approval of Engineer-in-Charge. Before proceeding with any fabrication work, the contractor shall prepare and submit, complete fabrication and installation drawings for each type of glazing doors, windows, ventilators and partition etc. for the approval of the Engineer-in-Charge. If the sections are varied, the contractor shall obtain prior approval of Engineer-in-Charge and nothing extra shall be paid on this account.

##### **4.7.6.2. Anodising**

Standard aluminium extrusion sections are manufactured in various sizes and shapes in wide range of solid and hollow profiles with different functional shapes for architectural, structural glazing, curtain walls, doors, window & ventilators and various other purposes. The anodizing of these products is required to be done before the fabrication work by anodizing/electro coating plants which ensures uniform coating in uniform colour and shades. The extrusions are anodized up to 30 micron in different colours. The anodized extrusions are tested regularly under strict quality control adhering to Indian Standard.

##### **4.7.6.3. Powder Coating**

The powder used for powder coating shall be Epoxy/polyester powder of make approved by the Engineer-in-Charge. The contractor shall give detailed programme for powder coating in advance, to facilitate the inspection by Engineer-in-Charge or his authorized representative. Each aluminium alloy extrusion or performed section shall be thoroughly cleaned by alkaline or acidic solutions under the conditions specified by chemical conversion coating supplier and then rinsed. A chemical conversion coating shall be applied by treatment with a solution containing essentially chromate ions or chromate and phosphate ions as the active components as applicable. The amount of the conversion coating deposited depends on the type used by the conversion coating chemical supplier. The conversion coating shall be thoroughly rinsed either with the solution specified by the conversion coating chemical supplier or with de-mineralized water and then dried at the temperature for the time specified by the conversion coating chemical supplier.

The contractor shall submit the detail specifications and application procedure for application of conversion coating for approval of Engineer-in-Charge. The metal surface after the conversion coating pretreatment and prior to the application of the coating shall be free from dust or powdery deposits.

#### **4.7.6.4. Frame Work**

First of all the shop drawings for each type of doors/windows/ventilators etc. shall be prepared by using suitable sections based on architectural drawings, adequate to meet the requirement/specifications and by taking into consideration varying profiles of aluminium sections being extruded by approved manufacturers. The shop drawings shall show full size sections of glazed doors, windows, ventilators etc. The shop drawings shall also show the details of fittings and joints. Before start of the work, all the shop drawings shall be got approved from the Engineer-in-Charge.

Actual measurement of openings left at site for different type of door/window etc. shall be taken. The fabrication of the individual door/windows/ventilators etc. shall be done as per the actual sizes of the opening left at site. The frames shall be truly rectangular and flat with regular shape corners fabricated to true right angles. The frames shall be fabricated out of section which have been cut to length, mitered and jointed mechanically using appropriate machines. Mitered joints shall be corner crimped or fixed with self tapping stainless steel screws using extruded aluminium cleats of required length and profile. All aluminium work shall provide for replacing damaged/broken glass panes without having to remove or damage any member of exterior finishing material.

#### **4.7.6.5. Fixing of Frames**

The holes in concrete/masonry/wood/any other members for fixing anchor bolts/fasteners/screws shall be drilled with an appropriate electric drill. Windows/doors/ventilators etc. shall be placed in correct final position in the opening and fixed to Sal wood backing using stainless steel screws of star headed, counter sunk and matching size groove. of required size at spacing not more than 250 mm c/c or dash fastener. All joints shall be sealed with approved silicone sealants.

In the case of composite windows and doors, the different units are to be assembled first. The assembled composite units shall be checked for line, level and plumb before final fixing is done.

Engineer-in-Charge in his sole discretion may allow the units to be assembled in their final location if the situation so warrants. Snap beadings and EPDM gasket shall be fixed as per the detail shown in the shop drawings.

All aluminium windows shall be fixed in position as per IS 1081: Code of practice for fixing and glazing of aluminium windows. All joints between metal and masonry / rough ground wooden frame shall be fully caulked and mastic or polysulphide compound in order to ensure water tight joints. Joints shall be neatly painted with matching cement an excess materials shall be removed. Hardware shall be fixed in workman like manner all as directed by the Engineer-in-charge. The contractor shall be responsible for the doors, windows etc. being set straight, plumb, level and for their satisfactory operation after fixing is complete. The sample of different windows shall be submitted to the Engineer-in-charge for approval.

All windows shall be tested for water tightness. Any leakage found during testing shall be rectified by the contractor without extra charge.

#### **4.7.6.6. Measurements**

All the aluminium sections including snap beadings fixed in place shall be measured in running meter along the outer periphery of composite section correct to a millimeter. The weight calculated on the basis of actual average (average of five samples) weight of composite section in kilogram correct to the second place of decimal shall be taken for payment (weight shall be taken after anodizing). The weight of cleat shall be added for payment. Neither any deduction nor anything extra shall be paid for skew cuts.

#### **4.7.6.7. Rate**

The rate shall include the cost of all the materials, labour involved in all the operations as described in nomenclature of item and particular specification.

### **4.8. STEEL WORK**

#### **4.8.1.Scope of Work**

This clause shall include all works in connection with structural steel works like steel roof truss, GCI roofing, etc as shown in the Drawings or as specified hereafter and / or as directed by the Engineer-in-Charge. The work shall consist of supply of all materials, transportation, fabrication, erection, storage, painting, inspection, and quality control including loading and unloading, protection from damages and all other allied works as required.

#### **4.8.2.Submission**

At least **thirty (30) days** prior to commencing the work, the Contractor shall submit to the Engineer-in-Charge the following documents for his approval:

Complete shop drawings supported by structural computations of all structural steel work showing sizes, type and grade of metal, method of assembly, hardware and anchorage or connection with the main structures.

Mill sheets or certificates of materials which are based on the tests performed in the steel maker or an approved independent laboratory shall be submitted to the Engineer-in-Charge. Work schedule for shop fabrication, transportation, field fabrication, erection at the site and other necessary items related to the work.

#### **4.8.3.Material for Steel Work**

Except as otherwise specified, all materials in general, for the work under this clause shall be new, free from defects and imperfections and conform to the following standards or equivalent (**Table 8**):

**Table 8: Relevant Standards for Steel Structural Materials**

<b>Material</b>	<b>Standards</b>
Angle steel, Channel steel, H-steel	IS 808, 3954
Steel plate	IS 808, 3954, 5986

Steel pipe	IS 3589, 6631
Round steel bar:	IS 1786,432
Steel deck plate	IS 3502
Light gauge steel	IS 979
High strength bolt:	IS 3757
Medium finished bolt	BIS 1363
Welding rod	IS 6419
Stud bolt	IS 1862
Ready mixed Red oxide Paint	IS 2074

#### 4.8.4.Fabrication

##### 4.8.4.1. Straightening, Shaping and Cutting

The steel sections as required shall be straightened and cut as required to correct lengths measured with a steel tape. The cut ends exposed to view shall be finished smooth. No two pieces shall be welded or otherwise jointed to make up the required length of a member. All straightening and shaping to form shall be done by pressure. Bending or cutting shall be carried out in such a manner as not to impair the strength of the metal. A shop drawing giving complete information for fabrication of the component parts of the structure including the location, type, size, length and details of rivets, bolts or welds, shall be prepared in advance of actual fabrication and approved by the Engineer-in-Charge. The drawing shall indicate the shop and field rivets, bolts and welds. The steel members shall be distinctly marked or stencilled with paint with the identification marks as given in the shop drawings.

Great accuracy shall be observed in fabrication of various members so that these can be assembled without being unduly packed, strained or forced into position and when built up, shall be true and free from twist, kinks, buckles or open joints. Wooden or metal sheet templates shall be made to correspond to each member and rivet holes shall be marked accurately on them and drilled. The templates shall be laid on the steel members and holes for riveting and bolting marked on them. The ends of the steel members shall also be marked for cutting. All stiffeners shall be formed by pressure and where practicable, the metal shall not be cut and welded in making these.

##### 4.8.4.2. Making Holes

Holes shall be drilled with a bit at right angles to the surfaces, and shall not be made or enlarged by burning holes. All bolt holes shall be clean-cut without any burrs or ragged-edges resulting from drilling. When loose bolt holes are employed, the shape of loose bolt holes shall be shown on the drawings or as directed by the Engineer-in-Charge. Diameters of holes provided for insertion of bolts shall be as in **Table 9**.

**Table 9**

Nominal diameter of Bolt (D)	Diameter of Bolt Hole
More than 20 mm	D + 1.5 mm
Not more than 20 mm	D+ 1.0mm

#### **4.8.4.3. Assembly**

Before making holes in individual members for fabrication, the steel work intended to be riveted or bolted together shall be assembled and clamped properly and tightly so as to ensure close abutting or lapping of the surfaces of the different members. All stiffeners shall bear tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or dressed true and straight and fitted close together. Web plates of girders which have no cover plates, shall have their ends flush with the tops of angles unless otherwise required. The web plates, when sliced, shall have clearance of not more than 5mm. The erection clearance for cleated ends of members connecting steel to steel shall preferably be not greater than 1.5mm. The erection clearance at the ends of beams without web cleats shall not be more than 3mm at each end but where for practical reasons, greater clearance is necessary suitably designed seating shall be provided.

Butt joints of struts and compression members depending on contact for stress transmission shall be accurately machined and close-buttressed over the whole section. Connecting angles or channels shall be fabricated and placed in position with great accuracy so that they are not unduly reduced in thickness by machining. The ends of all bearing stiffeners shall be machined on ground to fit tightly both at top and bottom.

#### **4.8.4.4. Bolting**

The nominal length of the bolt shall be the distance from the underside of the head to the further end of the shank. The nominal diameter of the bolts shall be the diameter at the shank above the screwed threads. Bolts, nuts and washers shall be thoroughly cleaned and dipped in double boiled linseed oil, before use. All bolt heads and nuts shall be hexagonal unless specified otherwise. The screw threads shall conform to IS- 1363 and the threaded surface shall not be tapered. The bolts shall be of such length as to project at least two clear threads beyond the nuts when fixed in position and these shall fit in the holes without any shake. The nuts shall fit in the threaded end of bolts properly.

Where necessary, washers shall be tapered or otherwise suitably shaped to give the heads and nuts of bolts a satisfactory bearing. The threaded portion of each bolt shall project through the nut at least one thread. In all cases where full bearing area of the bolt is to be developed, the bolt shall be provided with a washer of sufficient thickness under the nut to avoid any threaded portion of the bolt being within the thickness of the parts bolted together. Where there is risk of the nuts being removed or becoming loose due to vibration or reversal of stresses, these shall be secured from slackening by the use of lock-nuts, spring washers or cross-cutting as directed by the Engineer-in-Charge.

#### **4.8.4.5. Welding**

Welding shall be done by electric process as per IS-816 and IS-823. Gas welding shall not be permitted. Welding shall be done as shown in the shop drawings, which should clearly indicate various details of the joint to be welded, type of welds, shop and site welds as well as the types of electrodes to be used. Symbol for welding on plans and shop drawings shall be according to IS-813.

As far as possible every effort shall be made to limit the welding that must be done after the structure is erected so as to avoid the improper welding that is likely to be done due to

heights and difficult positions on scaffolding, etc apart from the aspect of economy. The max. diameter of electrodes for welding any work shall be as per IS-814 and Appendix-B of IS-823. Joint surfaces which are to be welded together shall be free from loose mill scale, rust, paint, grease or other foreign matter, which adversely affect the quality of weld and workmanship.

#### **4.8.5.Erection**

Steelwork shall be hoisted and erected in position carefully, without any damage to itself, other structure and equipment and injury to workmen. The method of hoisting and erection, proposed to be adopted by the Contractor, shall be got approved from the Engineer-in-Charge. The Contractor, however, shall be fully responsible for the work being carried out in a safe and proper manner without unduly stressing the various members. Proper equipment such as derricks, lifting tackles, winches, ropes, etc shall be used.

The work may be erected in suitable units as may be directed by the Engineer-in-Charge. Fabricated members shall be lifted at such points as to avoid the deformation or excessive stress in members. The structure or the part of it placed in position shall be secured against overturning or collapse by suitable means. During execution, the steel work shall be securely bolted or otherwise fastened and when necessary, temporarily braced to provide for all loads to be carried safely by the structure during erection including those due to erection equipment and its operations. The steelwork shall be placed in proper position as per approved drawing. Final riveting or permanent bolting shall be done only after proper alignment has been obtained.

Trusses shall be lifted only at the nodes and shall not be slinged at the apex, as it will develop compression stresses in the bottom tie member. They shall be lifted by sling at two mid-points of rafters, which shall be temporarily braced by a wooden member of a suitable section. After the trusses are placed in position, purlins and wind bracing shall be fixed as soon as possible. The end of the truss, which faces the prevailing winds, shall be filled with holding down bolts, and the other end kept free to move.

#### **4.8.6.Steel Roofing**

##### **4.8.6.1. General**

##### **Colour coated sheet roofing**

Roofing shall be of built up with colour coated Galvanized trapezoidal steel sheet roofing or equivalent. The thickness of the sheet shall be of 0.50mm and shall conform to IS 277 or equivalent standards. The colour coated trapezoidal sheet shall be of 1075mm width (effective cover width 1000 to 1020mm) & nominal pitch of 200mm to 250mm and crest depth of 28 to 30mm. The end rib shall be designed for anti-capillary action, to avoid any seepage of water through the lateral overlap. The Zinc coating shall be of minimum 120 grams per square meter. The organic coating of polyester paint shall be of 16-18 microns over a coat of 5-7 microns epoxy primer and the back coat shall be of 7-10 microns epoxy paint. The colour of the sheet shall be decided and approved by the Engineer-in-Charge.

The steel sheet shall be fastened with Hex head, self-drilling screw as per relevant standards or AS 3566 Class 3 fasteners of approved make with EPDM washer on each crest of sheets



for connecting with purlin (or as per design) perpendicular to the sheeting and in the centre of the corrugation or rib. The fastener size shall be calculated as per the design requirement or as per relevant standards.

Ridge & Gutters are manufactured from same color, finish and thickness as roof panels (or manufacturer's recommendation).

#### **4.8.6.2. Steel Purlins**

Purlins shall be of MS rolled sections of requisite size and shall be fixed over the principle rafters. Maximum spacing of purlins shall not exceed 1.60 metre which may vary in case of colour coated Galvanized sheet. The top surfaces of the purlins shall be uniform and plane. They shall be painted before fixing on top. Embedded portions of wooden purlins shall be coats tarred with two coats.

#### **4.8.6.3. Slope**

Slope of the roof shall be pitched as shown in the drawing or as directed by the Engineer-in-Charge.

#### **4.8.7.Measurement and Payment**

##### **4.8.7.1. Measurement and Payment for Structural Steel**

Measurement for payment of structural steel shall be based on weight in kg. Quantity shall be computed according to the approved shop drawings. All materials including high strength bolt, stud bolt, anchor bolt, medium finished bolt, deckplate and other steel parts shall be measured. Weight of grout mortar, rust resistance paint and other materials which are not steel but necessary for the work shall not be counted in the quantity. Scraps produced at manufacturers or site during the fabrication of steel member except bolt holes shall not be included in the quantity.

Payment for structural steel shall be made at the relevant unit prices in the Bill of Quantities. The unit prices shall include all labour, materials, tools, construction equipment and any other incidental costs for shop fabrication, transportation, storage, erection, field retouch painting, inspection, quality control and other auxiliary works such as mortar grout, scaffoldings, preparation of surfaces of embedded parts, required shattering etc., to do the work as specified under this chapter, shown in the Drawings or as directed by the Engineer-in-Charge.

No separate payment shall be made for supply, preparations and application of rust resistant paint, galvanization and coating. All costs and efforts therefor shall be included in the unit prices. Anchors and other provisions required to attach metal parts temporarily to concrete shall not be measured for payment and will not be paid for.

##### **4.8.7.2. Measurement and Payment for Roof Sheeting**

The length and breadth of the roof shall be measured correct to 10 mm. Area shall be worked out in sq.m correct to two places of decimal. The superficial area of roof coverings shall be measured on the flat without allowance for laps and corrugations. Portion of roof coverings overlapping ridge or hip etc. shall be included in the measurements of the roof.



Measurements shall be taken on the flat and not girth. No deduction in measurement shall be made for opening up to 0.4 sq.m. For any opening exceeding 0.4 sq.m in area, deduction in measurements for the full openings shall be made and in such cases the labour involved in making these openings shall be paid for separately. Cutting across corrugation shall be measured on the flat and not girth.

Payment for colour coated Galvanized sheet shall be made as per the unit rate in the Bill of Quantities. The Unit rate shall include the cost of all the materials and labour involved in all the operations and all the fittings & fixtures required for fixing of colour coated Galvanized sheet as directed and approved by Engineer-in-Charge.

The cost of the ridges / hips, gutters and wind ties shall be paid for separately as per the BoQ rates.

#### **4.8.7.3. Measurement and Payment for Hardware Accessories**

Measurement and Payment of the hardware accessories shall be made as per the BOQ rates. The rate shall include the cost of materials, screws and labour involved in all operations in fixing in position, etc.

#### **4.8.8. Acoustical Suspended Ceiling**

##### **4.8.8.1. Dune Max (Micro look) & Fine Fissured (Micro look) Edge Tiles**

Material: The Dune Max tiles should be Humidity Resistance (RH) of 99%, NRC 0.7, Light Reflectance  $\geq 88\%$ , Thermal Conductivity  $k=0.052 - 0.057 \text{ w/m K}$ , Colour white, Fire Performance UK class 0/ class 1 (BS 457 pt-6 & 7) in module size of 600 x 600 x 20mm with Bio Block coating on the face of the tile, suitable for Green Building application, with Recycled content of 81 – 84%.

The Fine Fissured tiles should be Humidity Resistance (RH) of 99%, NRC 0.55, Light Reflectance  $\geq 84\%$ , Thermal Conductivity  $k = 0.052 - 0.057 \text{ w/m K}$ , Colour white, Fire Performance UK Class 0/Class 1 (BS 476 pt – 6 & 7) in module size of 600 x 600 x 16mm with Bio Block coating on the face of the tile, suitable for Green Building application, with Recycled content of 38 – 41%.

The tile shall be laid on Superfine 38 with 15mm wide T- section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200mm & 600mm Cross Tees with a web height of 38mm and a load carrying capacity of 14Kg/M<sup>2</sup>. The T sections have a Galvanizing of 90 grams per M<sup>2</sup>.

##### **4.8.8.2. Installation**

To comprise main runner spaced at 1200mm centres securely fixed to the structural soffit using suspension system (specifications below) at 1200mm maximum centre. The First/Las suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall.

Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600mm module. Cut cross tees longer than 600mm require independent support. 6000 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200mm cross tees.

Perimeter trim to be wall angles of size 300x19x19mm, secured to walls at 450mm maximum centres.

#### **4.8.8.3. Suspension System:**

Accessories manufactured of approved make consisting of M6 Anchor Fasteners with Vertical Hangers made of Galvanised steel of size 26 x 26 x 1.2mm with a Galvanised Thickness of 80gsm, A pre Straightened Hanger wire of dia. -2.68mm of 1.83 m length., thickness of 80gsm and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanised spring steel for 2.68mm with a minimum pull strength of 110 kg. The adjustable clip also consists of a 3.5mm aquiline wire to be used with the main runner.

#### **4.8.8.4. Measurement & Payment**

Measurement for acoustical ceiling shall be made on the basis of actual areas in square meters in accordance with the drawings and the specifications and as directed by the Engineer-in-Charge and shall be paid at the unit rates as per the Bill of Quantities.

The unit price shall include all necessary materials i.e. acoustic tiles, galvanised steel, etc., as mentioned, labour, scaffolding and incidentals, etc., involved in all operations to complete the work as per specification and to satisfaction of the Engineer-in-Charge.

#### **4.8.9. Acoustical Wall Panelling**

Acoustical wall panelling with square edges made of fiber glass substrate 25mm thick and wrapped on the front side with an acoustically transparent and fire-resistant fabric with an option of colours as per the choice of the Engineer-in-Charge of size 600x600mm providing a sound absorption level of 0.85 to 1 NRC to be affixed to wall using wall panel impalers and construction adhesives as per the instructions laid down by the manufacturer.

Wall panel impalers of adequate quantity as specified by the manufacturer shall be fixed to be wall surface using self-tapping screws. Silica based construction adhesive shall be dabbed on to the projecting elements (spikes) of the impalers. Wall panels shall be pierced through the spikes of the impalers ensuring the line and level of the panels are maintained.

##### **4.8.9.1. Measurement**

Measurement for acoustical wall panelling shall be made on the basis of actual areas in square meters in accordance with the drawings and the specifications and as directed by the Engineer-in-Charge and shall be paid at the unit rates as per the Bill of Quantities.

##### **4.8.9.2. Rate**

The unit price shall include all necessary materials i.e. acoustical wall panels, impalers, etc., as mentioned, labour, scaffolding and incidentals, etc., involved in all operations to complete the work as per specification and to satisfaction of the Engineer-in-Charge.

#### **4.8.10. Centre – Parting Horizontally Moving Curtain System**

Horizontal moving Centre-Parting Curtain System comprises of machine made curtain rails, Nylon Roller fitted curtain trolleys and curtain drive System. Curtain rails are to be fixed at

appropriate height on the stage in such a way that rails and trolleys are not visible from the auditorium floor, particularly from the front row of seats. Curtains should overlap by at least 0.9 meters in closed condition.

Remote Controlled Drive mechanism should be motorized and should have a speed reduction non-reversing worm-wheel reduction gear box and rope drum assembly. Drive mechanism should be of high efficiency so as to require minimum power to operate curtains. Rope drum could be either pile winding type or of paraboloid type with diverter and tension pulleys. Motor should be totally enclosed, fan cooled, 415V, 3 ph, 50 HZ AC, of power not less than 0.5HP, of Standard make.

Drive should use Galvanized standard steel wire rope of not less than 4 mm dia., Tension and Diverter pulleys should use steel/cast iron pulleys fitted with Ball bearings on machined and ground shafts. All parts must be Zinc plated and passivated to withstand vagaries of weather.

Curtain trolleys shall be made of steel and fitted with Industrial grade engineering Nylon wheels having Brass Roller bushes. PVC or Plastic rollers shall not be acceptable. Trolleys must not make noise while moving on rails. Necessary noise absorbers must be provided on each trolley, such that when they impact no metallic sound is created due to impact. Master trolley should have number of rollers such that it has very smooth movement even with steel wire rope fixed to it.

Roller type Limit switches should preferably be fitted on the Curtain Rails. An actuator on the Master trolley should actuate the limit switches in curtain fully open and fully closed position. This type of arrangement shall ensure that the curtain operates positively and no ambiguity occurs in its operation. It should be possible to operate the curtain manually in case of emergency.

Entire system should be of sturdy design with sufficiently high safety factor. Curtain rails and their fixing brackets should be suitable for supporting the entire weight of curtain, particularly when the curtain is open.

Main curtain made of velvet cloth is generally very heavy, weighting tens of kgs per running metre. Therefore, the entire system should be very strongly built, using good engineering practices.

## **4.9. PLASTERING**

### **4.9.1.Scope of Works**

The Scope of works under this clause covers for Plastering including installation of fittings and fixtures, preparation of foundation surfaces, adjustment of surfaces adjacent to the walls, scaffolding, finishing, curing, protection, maintenance etc and other miscellaneous works till handing over of the works.

The scope of works shall also include supply of all labour, materials, equipment, tools and plants, scaffolding, transportation, loading, unloading, testing and quality control and all other operations and incidentals as required to complete the work of plastering with allied

works as shown in the Drawings and as specified herein and / or as directed by the Engineer-in-Charge.

The Contractor shall also provide all safety measures for the workmen and others as per standard practices and requirements and / or direction of the Engineer-in-Charge during plastering at his own cost and responsibility. However, approval given by the Engineer-in-Charge to the Contractor's methods and equipment shall not relieve the Contractor of his full responsibility for a proper and safe execution of works, or of liability for injuries to, or death of persons, or any obligations under this Contract.

#### **4.9.2.Submission**

At least **ten (10) days** prior to commencement of plastering , the Contractor shall submit to the Engineer-in-Charge, the source of receipt of different types of cement alongwith details of quality and test reports / manufacturer's recommendations, etc in respect of aggregates, flooring materials viz. marble chips, pigments, etc. along with their samples.

The Contractor shall also submit in advance of commencement, scheduling and sequence of the plastering, in details, to the Engineer-in-Charge for his approval. However, the Contractor for finishing items shall remain fully responsible for all normal precautions and vigilance to prevent any damages whatsoever until handing over.

#### **4.9.3.Standards and Codes**

All works related to plastering and the materials and production thereof, procedures of placing, curing and testing , etc shall conform to the 'Specifications for Building and Road Works,2015: Royal Govt. of Bhutan' and /or relevant Indian Standards and Guidelines.

#### **4.9.4.Preparation of Mortar**

##### **4.9.4.1. General**

Mortar for plastering shall be a homogeneous mixture of sand and cement in the appropriate proportion as specified above and / or as directed by the Engineer-in-Charge. If directed by the Engineer-in-Charge, the Contractor shall use approved water proofing admixtures of reputed manufacturer in the mortar in accordance with the manufacturer's instructions subject to the approval of the Engineer-in-Charge. The quantity of water shall be as necessary to obtain a satisfactory workability regarding the use of the mortar. Quality of mortar shall in general, meet the requirements specified in IS: 2250 (Code of Practice and Use of Masonry mortar).

##### **4.9.4.2. Mixing of Mortar**

Mortar for plastering shall be produced similar to the method described in Clause 4.5.5.2 in Masonry Works.

#### **4.9.5.Execution**

##### **4.9.5.1. Surface Preparation**

All joints in masonry walls shall be raked out and brushed down with stiff wire brushes to remove all loose dust from joints and thoroughly washed with water. All laitance shall be removed from concrete to be plastered. In case of concrete slab or masonry surface, the surface shall be roughened by chipping and cleaned of all dirt, grease or loose particles by hard brush and water. The surface shall be thoroughly moist to prevent absorption of water from the base course. Any excess of water shall be mopped up.

At any point, the level of base shall be lower than the theoretical finished floor level by the thickness of floor finish. Any chipping or filling to be done to bring the base to the required level shall be brought to the notice of the Engineer-in-Charge and his approval shall be taken regarding the method and extent of rectification work required. Prior to commencement of actual finishing work, the approval of the Engineer-in-Charge shall be taken as to the acceptability of the base.

##### **4.9.5.2. Application of Plaster**

###### **1. General**

Plastering shall be started from the top and worked down towards the floor. All putlog holes shall be properly filled in advance of the plastering as the scaffolding is taken down. To ensure even thickness and true surface, patches of plaster about 15 x 15cm, shall be first applied, horizontally and vertically, at not more than 2m intervals over the entire surface to serve as gauges. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The method of application shall be 'thrown on' rather than applied by trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness. The surface shall then be brought to a true surface, by working a wooden straight edge reaching across the gauges, with small upward and sideways movements at a time. Finally surface shall be finished off true with trowel or wooden float accordingly as a smooth or a sandy granular texture is achieved. Excessive trowelling or over working the float shall be avoided.

Plaster more than 12 mm thick, shall be applied in two coats, a rendering coat followed by the finishing coat. The thickness of rendering coat shall however, be 10mm or 12mm in thickness as specified above. The surface of the under coat shall be scratched with a scratching tool diagonally both ways or roughened before it is fully hardened to form a mechanical key. The under coat shall be allowed to dry and shrink before applying the second coat of plaster.

###### **2. Finish**

The finished wall surface shall be true to plumb and any irregularity shall be made good without any extra cost. All vertical edges of pillars, door jambs, etc. shall be chamfered or rounded off as directed by the Engineer-in-Charge. All drips, grooves, moldings and cornices as shown on drawings or instructed by the Engineer-in-Charge shall be done with special care to maintain true lines, levels, and profiles. After the plastering work is completed, all debris shall be removed and the area left clean. Any plastering that is damaged shall be repaired and left in good condition at the completion of the job.

Finish to masonry and concrete shall fully comply with the drawings, specifications, approved samples and instructions of the Engineer-in-Charge with respect to lines, levels, thickness, colour, texture, pattern and any other special criteria as mentioned in the body of the specification or as shown on drawing. Generally, the standard finish shall be used unless otherwise shown on the drawings or directed by the Engineer-in-Charge. Whenever any special treatment to the plastered surface is indicated, the work shall be done exactly as shown on the drawings, to the entire satisfaction of the Engineer-in-Charge regarding the texture, colour and finish.

#### **4.9.6.Scaffolding**

Scaffolding shall be strong enough to withstand all the dead, live and impact loads, which are likely to come upon it. It shall also be so designed to ensure the safety of the workmen. For all types of exterior works, scaffolding having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together by horizontal pieces, over which the scaffolding planks shall be fixed. For all other masonry in buildings, single scaffolding shall be permitted. In such cases, the inner end of the horizontal scaffolding poles shall rest in the holes provided only in header course for the purpose. Only one header for each pole shall be left out. Such holes for scaffolding shall, however, not be allowed in pillars/columns less than one metre in width. The holes left in masonry works for scaffolding purposes shall be filled and made good before plastering.

#### **4.9.7.Curing**

Curing of plaster / pointing shall be started as soon as the applied plaster has been hardened enough so as not to be damaged. The decision as to when the plaster has hardened will be given by the Engineer-in-Charge. Curing shall be done by continuously applying water in a fine spray and shall be carried out for at least 7 days. During this period, plaster shall be suitably protected from all damages at the Contractor's expense by such means as the Engineer-in-Charge may approve. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period thereafter can be watched

#### **4.9.8.Precaution**

Any cracks which appear in the surface and all portions which sound hollow when tapped or are found to be soft or otherwise defective, shall be cut out in rectangular shape and redone as directed by the Engineer-in-Charge.

When ceiling plaster is done, it shall be finished to chamfered edge at an angle at its junction with a suitable tool when plaster is being done. Similarly, when wall plaster is being done, it shall be kept separate from the ceiling plaster by a thin straight groove not deeper than 6mm drawn with any suitable method with the wall while plaster is green. The plastering of walls and beam / column in one vertical plane shall be carried out in one go.

#### **4.9.9.Sampling, Testing and Quality Control**

The Contractor shall carry out all sampling and testing in accordance with the relevant Indian Standards or internationally accepted standards or practices and shall conduct such tests as

are called for by the Engineer-in-Charge. Where no specific testing procedure is mentioned, the tests shall be carried out as per the prevalent accepted engineering practice to the directions of the Engineer-in-Charge. Tests shall be done in the field laboratory approved by the Engineer-in-Charge and the Contractor shall submit to the Engineer-in-Charge, the test results in triplicate within three days after completion of a test.

Material / work found unsuitable for acceptance shall be removed and replaced by the Contractor. The works shall be redone as per specification requirements and to the satisfaction of the Engineer-in-Charge.

#### **4.9.10. Measurement and Payments**

##### **Measurement and Payment for Plaster**

Measurement for plastering shall be made on the basis of actual areas in square meters plastered in accordance with the Drawings and the Specifications and as directed by the Engineer-in-Charge and shall be paid at the unit rates as per the BOQ. The measurements of the wall plaster shall be taken between the walls or partitions for the length and from the top of the floor or skirting upto the full height.

Deductions for openings, etc shall be regulated as specified in the Specifications for Building and Road Works, 2015: Royal Govt. of Bhutan

The unit price shall include all necessary materials including admixtures, wire lath, expansion bead, joint, caulking, labour, scaffolding, curing and incidentals, etc involved in all operations to complete the work as per specification and or as directed by the Engineer-in-Charge.

#### **4.10. FLOORING**

##### **4.10.1. Scope of Works**

The Scope of works under this clause covers for flooring including furnishing, preparation of foundation surfaces, and adjustment of surfaces adjacent to the walls, finishing, curing, protection, maintenance etc and other miscellaneous works till handing over of the works.

The scope of works shall also include supply of all labour, materials, equipment, tools and plants, scaffolding, transportation, loading, unloading, testing and quality control and all other operations and incidentals as required to complete the work of floor finish with allied works as shown in the Drawings and as specified herein and / or as directed by the Engineer-in-Charge.

##### **4.10.2. Submission**

At least **ten (10) days** prior to commencement of flooring works, the Contractor shall submit to the Engineer-in-Charge, the source of receipt of different types of cement along with the mill test reports, details of quality and test reports / manufacturer's recommendations, etc in respect of aggregates, flooring materials viz. marble chips, pigments, etc. along with their samples.

The Contractor shall also submit in advance of commencement, scheduling and sequence of the flooring works, in details, to the Engineer-in-Charge for his approval. However, the



Contractor for finishing items shall remain fully responsible for all normal precautions and vigilance to prevent any damages whatsoever until handing over.

#### **4.10.3. Standards and Codes**

All works related to flooring and the materials , production, procedures of placing, curing and testing, etc shall conform to the '**Specifications for Building and Road Works, 2015: Royal Govt. of Bhutan**' and /or relevant Indian Standards and Guidelines.

#### **4.10.4. Material for Flooring**

Materials required for individual finishing items are specified under respective items. In all cases, the materials shall be of the best quality of specified manufacturers and based on approval of samples by the Engineer-in-Charge. The materials shall be ordered, procured and stored well in advance to maintain the construction schedule. The materials shall be as per the following:

Marble chips shall be standard quarry product of machine crushed of specified size and of approved colour and uniform grade. Colour pigments, as selected shall be pure mineral pigments, lime proof and non-fading.

##### **4.10.4.1. Execution**

#### **1. Preparation of Base Surface**

For all types of flooring, skirting, dado and similar works, the base to receive the finish shall be adequately roughened by chipping, raking out joints and cleaning thoroughly all dirt, grease etc. with water and hard brush and detergent if required, unless otherwise directed by the manufacturer of any special finishing materials, or specifically indicated in this specification under individual items.

To prevent absorption of water from the finishing treatment, the base shall be thoroughly soaked with water and all excess water mopped up. The surface shall be done dry where adhesives are used for fixing the finishes.

Prior to commencement of actual finishing work the approval of the Engineer-in-Charge shall be taken as to the acceptability of the surface.

#### **2. Ceramic Tile Flooring**

##### **a. General**

The tiles shall be of approved make and shall generally conform to IS 15622. They shall be flat, and true to shape and free from blisters crazing, chips, welts, crawling or other imperfections detracting from their appearance. The tiles shall be tested as per IS 13630.

The tiles shall be square or rectangular of nominal size such as 150 x 150 mm, 200 x 200 mm, 300 x 300 mm or as directed by the Engineer-In-Charge. The thickness of the tiles shall be 7 mm or as specified.

The length of all four sides shall be measured correct to 0.1 mm and average length / breadth shall not vary more than  $\pm 0.8$  mm from the specified dimension. The variation of individual dimension from average value of length/breadth shall not exceed  $\pm 0.5$  mm. Tolerance in thickness shall be  $\pm 0.4$  mm. The actual size of tiles supplied shall be 1 mm less so that with 1 mm joint, the tile when laid shall conform to the nominal size.



The top surface of the tiles shall be glazed and the glaze shall be either glossy or matt as specified. The underside of the tiles shall not have glaze on more than 5% of the area in order that the tile may adhere properly to the base. The edges of the tiles shall be preferably free from glaze. However, any glaze if unavoidable, shall be permissible on only upto 50 per cent of the surface area of the edges.

**b. Preparation of surface and laying**

Sub-grade concrete or the R.C.C. slab on which the tiles are to be laid shall be cleaned, wetted and mopped. The bedding for the tile shall be with cement mortar 1:3 (1 cement: 3 coarse sand). The average thickness of bedding shall be 12mm under any portion of the tiles.

Mortar shall be spread, tamped and corrected to proper levels and allowed to harden sufficiently to offer a fairly rigid cushion for the tiles to be set and to enable the mason to place wooden plank across and squat on it. Over this mortar bedding neat grey cement slurry of honey like consistency shall be spread at the rate of 3.3 kg of cement per square metre over such an area as would accommodate about twenty tiles. Tiles shall be soaked in water washed clean and shall be fixed in this grout one after another, each tile gently being tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. The joints shall be kept as thin as possible and in straight lines or to suit the required pattern.

The surface of the flooring during laying shall be frequently checked with a straight edge about 2 m long, so as to obtain a true surface with the required slope. Where full size tiles cannot be fixed these shall be cut (sawn) to the required size, and their edge rubbed smooth to ensure straight and true joints. Tiles, which are fixed in the floor adjoining the wall, shall enter not less than 10 mm under the plaster skirting or dado. After tiles have been laid surplus cement grout shall be cleaned off.

**c. Pointing and finishing**

The joints shall be cleaned off the grey cement grout with wire brush or trowel to a depth of 2 mm to 3 mm and all dust and loose mortar removed. Joints shall then be flush pointed with white cement with pigment added if required to match the colour of tiles. The floor shall then be kept wet for 7 days. After curing, the surface shall be washed and finished clean. The finished floor shall not sound hollow when tapped with a wooden mallet

**d. Acceptance Criteria**

The finished floor shall not sound hollow when tapped with a wooden mallet.

No loose tiles shall be accepted. Joints cannot be too wide and too narrow, and shall be in straight lines or as per the layout drawing. Joints shall be parallel to wall and orthogonal.

**3. Ceramic Tiles in Skirting and Dado**

**a. General**

The tiles shall be of approved make and shall generally conform to IS:15622. The tiles shall be of earthenware covered by a glaze thoroughly matured and fitted to the body. The tiles shall be sound, true to shape, flat and free from flaws and other manufacturing defects affecting their utility.

**b. Preparation of surface and laying**

The joints shall be raked out to a depth of at least 10 mm in masonry walls.

In case of concrete walls, the surface shall be hacked and roughened with wire brushes. The surface shall be cleaned thoroughly, washed with water and kept wet before skirting is commenced.

**c. Laying**

12 mm thick plaster of cement mortar 1:4 (1 cement: 4 coarse sand) mix or as specified shall be applied and allowed to harden. The plaster shall be roughened with wire brushes or by scratching diagonally at close intervals.

The tiles shall be soaked in water for one day, washed clean, and a coat of buttery cement slurry applied liberally at the back of the tiles and set in the bedding mortar. The tiles shall be tamped and corrected to proper plane and lines.

The tiles shall be set in the required pattern and jointed. The joints shall be as fine as possible.

Top of skirting or dado shall be truly horizontal and joints truly vertical except where otherwise indicated.

Skirting and dado shall rest on the top of the flooring. Where full size tiles cannot be fixed these shall be cut (sawn) to the required size and their edges rubbed smooth.

**d. Curing and finishing**

The joints shall be cleaned off the grey cement grout with wire/coir brush or trowel to a depth of

2 mm to 3 mm and all dust and loose mortar removed. Joints shall then be flush pointed with white cement added with pigments if required to match the colour of tiles. The work shall then be kept wet for 7 days.

**e. Acceptance Criteria**

After curing, the surface shall be washed and finished clean. The finished work shall not sound hollow when tapped with a wooden mallet, shall be in true level and plain. Joints shall be straight, not too wide, too narrow etc. Tiles shall be laid as per slope indicated. Slope shall be uniform if indicated.

**4. Vitrified Tile Flooring, Dado/Skirting**

**a. General**

The tiles shall be of approved make like Marbonite / Granamite or equivalent and shall generally conform to the approved standards. They shall be flat and true to shape, free from cracks, crazing spots, chipped edges and corners. Unless otherwise specified, the nominal sizes of tiles shall be as under:

The tiles shall be square or rectangular of nominal sizes such as: 600 x 600 mm; 900 x 900 mm or as per tender schedule / drawings or as directed by the Engineer-in-Charge. Thickness shall be as per recommendations of the approved manufacturers. Technical specifications of the tiles shall be generally conforming to the following standards:

**TECHNICAL SPECIFICATIONS FOR VITRIFIED TILES (TABLE)**

Sl. No.	Property	Expected Standards
1.	Deviation in length	(+/-) 0.6%
2.	Straightness of sides	(+/-) 0.5%
3.	Rectangularity	(+/-) 0.6%
4.	Surface flatness	(+/-) 0.5%
5.	Water absorption	< 0.50%
6.	Mohs. hardness	>6
7.	Flexural strength	> 27 N / mm <sup>2</sup>
8.	Abrasion resistance	< 204 mm <sup>2</sup>
9.	Skid resistance (friction coefficient)	>0.4
10.	Glossiness	Min. 85% reflection

The tiles shall conform to the relevant standards in all respects. Samples of tiles shall be got approved from the Engineer-in-charge before bulk procurement for incorporation in the work.

**b. Preparation of Surface for Flooring**

Following procedure shall be followed:

Sub grade concrete or RCC slab or side brick wall / or plastered surfaces on which tiles are to be laid shall be cleaned, wetted and mopped.

Mortar and bedding: Cement mortar for bedding shall be prepared of mix 1:4 or as specified in the schedule of items, to a consistent paste and shall conform to the specification for materials, preparations etc. as specified under cement mortar. The amount of water added while preparing mortar shall be the minimum necessary to give sufficient plasticity for laying. Care shall be taken in preparation of the mortar to ensure that there are no hard lumps that would interfere with even bedding of the tiles. Before spreading the mortar bed the base shall be cleaned off all dirt, scum or laitance and loose materials and well wetted without forming any pools of water on the surface. The mortar of specified proportion and thickness shall then be evenly and smoothly spread over the base by use of screed battens to proper level or slope.

Once the mix is prepared, no further water be added and the same shall be used within one hour of adding water. Apply on an average 20 mm thick bedding of mortar over an area of 1 sqm. at a time over surface of the area for laying tiles, in proper level and allowed to harden sufficiently to offer a fairly good cushion for the tiles to set.

**c. Laying of Tiles for Flooring**

The tiling work shall be done as per the pattern shown in the drawing or as directed by the Engineer-in-Charge. As a general practice laying of tiles shall be commenced from the centre of the area and advanced towards the walls. Cut tiles, if any, shall be laid along wall with necessary border pattern as shown / directed by the Engineer-in-Charge.

Tiling work shall be completed by pressing tiles firmly into place along the wall / floor. A white cement slurry to the back of the tile to be applied to ensure proper and full bedding. The tiles shall be laid on the bedding mortar when it is still plastic but has become sufficiently stiff to offer a fairly firm cushion for the tiles. Tiles, which are fixed on the flooring adjoining the wall, shall be so arranged that the surface on the round edge tiles shall correspond to the skirting or dado. Press gently the tile with wooden mallet for even adherence at the back of the tile. Do not use an iron hammer or some heavy material to press the tile.

The edges of the tiles shall be smeared with neat white cement slurry and fixed in this grout one after the other, each tile being well pressed and gently tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints.

The joints shall be kept as close as possible and in straight line. Unless otherwise specified, joint-less tiling shall be done butting the tiles with each other. If joint is specified, the same shall not exceed 1 mm. in width. The joint shall be grouted with white / matching colour cement slurry. After fixing the tiles, finally in an even plane or slope, the flooring shall be covered with wet sand and allowed undisturbed for 14 days.

**d. Fixing Tiles for Dado & Skirting**

The fixing of tiles on wall surfaces shall be done only after completing fixing of the tiles on the floor. Following procedure shall be followed:

The back of tiles shall be cleaned off and covered with layer of approved adhesive like BALENDURA or equivalent with proper towelling as per manufacturer's recommendations.

The edges of the tiles shall be smeared with the adhesive and fixed on the wall one after the other, each tile being well pressed and gently tapped with a wooden mallet till it is properly fixed in level with the adjoining tiles. There shall be no hollows on the back or in joints. Unless otherwise specified, joint-less tiling shall be done butting the tiles with each other. If joint is specified, the same shall not exceed 1 mm. in width. The joint shall be grouted with approved adhesive. The joints shall be kept in straight line or as per the approved pattern.

While fixing tiles in dado / skirting work, care shall be taken to break the joints vertically. The top line shall be touched up neatly with the rest of the plaster above. If doors, windows or other openings are located within the dado area, the corners, sills, jambs etc, shall be provided with true right angles without any specials. The contractor will not be entitled to any extra claims on this account for cutting of tiles if required.

The fixing shall be done from bottom of wall to upward without any hollows in the bed of joints.

Each tile shall be as close as possible to one adjoining. All tiles faces shall be in one vertical plane.

**e. Grouting of Joints in Floor / Skirting / Dado**

The joints, if specified, shall be cleaned off and all dust and loose particles removed. Joints shall then be filled with approved adhesive like BAL-ENDURA or equivalent grouts. After finishing the grouting process, after 15 minute, wipe off excess grout with a damp sponge and polish the tiles with a soft & dry cloth for a clean surface. The Finished work shall not sound hollow when tapped with a wooden mallet.

**f. Cleaning**

As directed by the Engineer-in-Charge, the tiles shall be cleaned by mild acid (However, Hydrofluoric acid and its derivatives should not be used). After the tiles have been laid in a room or the days fixing work is completed, the surplus cement grout / adhesive that may have come out of the joints shall be cleaned off before it sets. The dado / skirting shall be thoroughly cleaned. In the case of flooring, once the floor has set, the floor shall be carefully washed clean and dried. When drying, the floor shall be covered with oil free dry sawdust. It shall be removed only after completion of the construction work and just before the floor is used.

**5. Kota Stone Flooring**

**a. General**

The tile shall be of selected quality, hard, sound, dense, and homogenous in texture, free from cracks, decay, weathering and flaws. They shall be hand or machine cut to the requisite thickness. They shall be of the colour indicated in the drawings or as instructed by the Engineer-In-Charge.

The tile shall have the top (exposed) face machine polished before being brought to site, unless otherwise specified. The slabs shall conform to the size required. Before starting the work the contractor shall get the samples of slabs approved by the Engineer-In-Charge.

**b. Dressing**

Every tile shall be cut to the required size and shape and fine chisel dressed on the sides to the full depth. The edges shall be table rubbed with coarse sand or machine rubbed before placing. All angles and edges of the tile shall be true, square and free from chippings and the surface shall be smooth and plane.

The thickness of the tile after it is dressed shall be 30 mm as specified in the description of the item. Tolerance of  $\pm 2$  mm shall be allowed for the thickness. In respect of length and breadth of slabs, tolerance of  $\pm 5$  mm for hand cut slabs and  $\pm 2$  mm for machine cut slabs shall be allowed.

**c. Preparation of Surface and Laying**

Base concrete or the RCC floor on which the tiles are to be laid shall be cleaned, wetted and mopped. The bedding for the tiles shall be with cement mortar 1:4 (1 cement: 4 coarse sand).

The average thickness of the bedding mortar under the tile shall be 20 mm and the thickness at any place under the tile shall be not less than 12 mm.

The Kota tiles shall be laid in the following manner:

Mortar of the specified mix shall be spread under the area of each tile, roughly to the average thickness specified. The tile shall be washed clean before laying. It shall be laid on

top of bedding, pressed, tapped with wooden mallet and brought to level with the adjoining tiles. It shall be lifted and laid aside.

The top surface of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar is allowed to harden a bit and cement slurry of honey like consistency shall be spread over the same at the rate of 4.4 kg of cement per sqm.

The edges of the tile already laid shall be buttered with grey or white cement with or without admixture of pigment to match the shade of the kota tiles as specified.

The tile to be laid shall then be lowered gently back in position and tapped with a wooden mallet till it is properly bedded in level with and close to the adjoining tiles with as fine a joint as possible. Subsequent tiles shall be laid in the same manner. After each tile has been laid, surplus cement on the surface of the tiles shall be cleaned off. The flooring shall be cured for a minimum period of seven days. The surface of the flooring as laid shall be true to levels and slopes as instructed by the Engineer-In-Charge.

Due care shall be taken to match the grains of tiles which shall be selected judiciously having uniform pattern of Veins/streaks or as directed by the Engineer-In-Charge.

The tiles shall be matched as shown in drawings or as instructed by the Engineer- In-Charge. Tiles which are fixed in the floor adjoining the wall shall enter not less than 12 mm under the plaster skirting or dado. The junction between wall plaster and floor shall be finished neatly and without waviness.

#### **d. Curing, Polishing and finishing**

The day after the tiles are laid all joints shall be cleaned of the grey cement grout with a wire brush or trowel to a depth of 5 mm and all dust and loose mortar removed and cleaned.

The floor shall then be kept wet for a minimum period of 7 days. The surface shall thereafter be ground evenly with a machine fitted with fine grade grit block (No. 120).

Water shall be used profusely during grinding. After grinding the surface shall be thoroughly washed to remove all grinding mud, cleaned and mopped. The surface shall be again cured

The final grinding with machine fitted with the finest grade grit blocks (No.320) shall be carried out the day after the first grinding described in the preceding para or before handing over the floor, as ordered by the Engineer-In-Charge.

For small areas or where circumstances so require, hand polishing may be permitted in lieu of machine polishing after laying. For hand polishing the following carborundum stones, shall be used:

First polishing - medium grade stone (No. 80)

Final grinding - fine grade (No. 120)

In all other respects, the process shall be similar as for machine polishing.

After the final polish, oxalic acid shall be dusted over the surface at the rate of 33 gm per square metre sprinkled with water and rubbed hard with a 'namdah' block (pad of woollen rags). The following day the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean.

If any tile is disturbed or damaged, it shall be refitted or replaced, properly jointed and polished.

**e. Acceptance Criteria**

The finished floor shall not sound hollow when tapped with a wooden mallet. No loose stone shall be accepted. Joints shall not be too wide or too narrow and shall be in straight line. Joints shall be parallel to the rectangular wall.

**6. Kota Stone in Skirting and Dado**

**a. General**

Kota Stone tiles and Dressing shall be as specified above except that the thickness of the slabs shall be 30 mm or as specified. The tile may be of uniform size if required.

**b. Preparation of surface**

The joints shall be raked out to a depth of at least 10 mm in masonry walls.

In case of concrete walls, the surface shall be hacked and roughened with wire brushes. The surface shall be cleaned thoroughly, washed with water and kept wet before skirting is commenced.

**c. Laying**

The mortar shall be in grey or white cement mixed with or without pigment to match the shade of stone, as specified in the description of the item, with the line of the slab at such a distance from the wall that the average width of the gap shall be 12 mm and at no place the width shall be less than 10 mm.

12 mm thick plaster of cement mortar 1:4 (1 cement: 4 coarse sand) mix or as specified shall be applied and allowed to harden. The plaster shall be roughened with wire brushes or by scratching diagonally at close intervals.

The tiles shall be soaked in water for one day, washed clean, and a coat of buttery cement slurry applied liberally at the back of the tiles and set in the bedding mortar. The tiles shall be tamped and corrected to proper plane and lines. The tiles shall be set in the required pattern and jointed. The joints shall be as fine as possible. Top of skirting or dado shall be truly horizontal and joints truly vertical except where otherwise indicated.

Skirting and dado shall rest on the top of the flooring. Where full size tiles cannot be fixed these shall be cut (sawn) to the required size and their edges rubbed smooth

**d. Curing, Polishing and Finishing**

Curing, Polishing and Finishing shall be as specified in Kotah stone flooring above except that polishing shall be done only with hand. The face and top of skirting shall be polished.

**e. Acceptance Criteria**

Acceptance Criteria shall be same as specified in Kota stone flooring.

**7. Terrazzo- Marble Chips Flooring**

**a. General**

Terrazzo marble chips flooring shall consist of 40mm thick marble chips flooring rubbed and polished to granolithic finish with 30mm thick under layer of cement concrete 1: 2: 4 (1 cement : 2 coarse sand : 4 graded stone aggregate 12.5 mm nominal size) and top layer of 10mm thick with white, black, chocolate, grey, yellow or green marble chips of sizes from ½ to 2B size laid in cement marble powder mix.

**b. Under Layer**

Cement concrete of 1:2:4 mix as stated above shall be laid in panels. The panels shall be of uniform size, not exceeding 2 sqm in area or 2 m in length for inside situations. In exposed situations, the length of any side of the panel shall not be more than 1.25 metre. Cement slurry @ 2.00 kg per sqm shall be applied before laying of under layer over the cement concrete / RCC base.

**c. Fixing of Strips**

4 mm thick glass strips or 2 mm thick aluminium strips as approved by the Engineer-in-Charge shall be fixed with their top at proper level to required slope.

**d. Top Layer**

The mix for terrazzo topping shall consist of white cement with or without pigment, marble powder, marble aggregate (marble chips) and water. The cement and marble powder shall be mixed in the proportion of 3 parts of cement to one part marble powder by weight. For every part of cement – marble powder mix, the proportion of aggregate shall be as follows:

**Table 10: Mix Proportion of Aggregate to Binder**

Size of Aggregate	Proportion of Aggregate to Binder mix
For grade 00.0 and 1	1.75parts
For grade 2 and 3	1.50parts
For grade 4 and 5	1.25parts
Mixed size aggregate	1.50parts

**e. Mixing and Laying**

The chips shall be hard, sound, dense and homogenous in texture with crystalline and coarse grains. It shall be uniform in colour and free from stains, cracks, decay and weathering.

Before starting the work, the contractor shall get the sample of marble chips approved by the Engineer-in-Charge. The cement to be used shall be ordinary grey cement, white cement, or coloured cement with admixture of colouring matter of approved quality in the ratio specified in the description of the item or in the ratio to get the required shade as approved by the Engineer-in-Charge.

Colouring material where specified, shall be mixed dry thoroughly with the cement and marble powder and then marble chips added and mixed as specified above. The full quantity of dry mixture of mortar required for a room shall be prepared in a lot in order to ensure a uniform colour. This mixture shall be stored in a dry place, well covered, and



protected from moisture. The dry mortar shall be mixed with water in the usual way as and when required. The mixed mortar shall be homogenous and still and to contain just sufficient water to make it workable.

The terrazzo topping shall be laid while the under layer is still plastic, but has hardened sufficiently to prevent cement from rising to the surface. This is normally, achieved between 18 to 24 hours after the under layer has been laid. Cement slurry preferably, of the same colour as the topping shall be brushed on the surface immediately before laying is commenced. It shall be laid to a uniform thickness slightly more than that specified in order to get the specified thickness after rubbing. The surface of the top layer shall be trowelled over, pressed and brought true to required level by a straight edge and steel floats in such a manner that the maximum amount of marble chips come up and are spread uniformly over the surface.

**f. Polishing, Curing and Finishing**

Polishing shall be done by machine. About 36 hours after laying the top layer, the surface shall be watered and ground evenly with machine fitted with special rapid cutting grit blocks (carborundum stone) of coarse grade (No.60) till the marble chips are evenly exposed and the floor is smooth. After the first grinding, the surface shall be thoroughly washed to remove all grinding mud and covered with a grout of cement and colouring matter in same mix and proportion as the topping in order to fill any pin holes that appear. The surface shall be allowed to cure for 5 to 7 days and then rubbed with machine fitted with fine grit block (No.120). The surface is cleaned and repaired as before and allowed to cure again for 3 to 5 days. Finally, the third grinding shall be done with machine fitted with fine grade grit blocks (No.320) to get even and smooth surface without pin holes. The finished surface should show the marble chips evenly exposed.

Where use of machine for polishing is not feasible or possible, rubbing and polishing shall be done by hand, in the same manner as specified for machine polishing except that carborundum stone of coarse grade (No.60) shall be used for the 1st rubbing, stone of medium grade (No.80) for second rubbing and stone of fine grade (No.120) for final rubbing and polishing.

After the final polish either by machine or by hand, oxalic acid shall be dusted over the surface @ 33gm per square metre sprinkled with water and rubbed hard with a pad of Woolen rags. The following day, the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean.

Curing shall be done by suitable means such as laying moist sawdust or ponding water.

**g. Precautions**

Flooring in lavatories and bathrooms shall be laid after fixing of water closet and squatting pans and floor traps. Traps shall be plugged, while laying the floors and opened after the floors are cured and cleaned. Any damage done to water closets, squatting pans and floor traps during the execution of work shall be made good.

During cold weather, concreting shall not be done when the temperature falls below 4°C. The Concrete placed shall be protected against frost by suitable covering. Concrete

damaged by frost shall be removed and work redone. During hot weather, precautions shall be taken to see that the temperature of wet concrete does not exceed 38°C. No concrete shall be laid within half an hour of the closing time of the day unless permitted by the Engineer-in-Charge.

## **8. Terrazzo Tile Flooring**

### **a. Terrazzo Tiles**

Terrazzo tiles shall generally conform to IS: 1237. The size of tiles shall be 300 x 300 x 25 mm in general or as required by the Engineer-in-Charge- in- charge. Half tiles for use with the full tiles shall be such as to make two half tiles when joined together, match with the dimensions of one full tile. Tolerances on length and breadth shall be plus or minus one millimeter, and tolerance on thickness shall be plus 5mm. The range of dimension in any one delivery of tiles shall not exceed 1mm on length and breadth and 3mm on thickness.

The tiles shall be manufactured in a factory under pressure process subjected to hydraulic pressure of not less than 140 kg per square centimeter and shall be given the initial grinding with machine and grouting of the wearing layer before delivery to site. The wearing layer shall be free from projection, depressions, cracks, holes, cavities and other blemishes. The edges of wearing layer may be rounded.

The proportion of cement to aggregate in the backing of tiles shall be not leaner than 1:3 by weight. Where colouring material is used in the wearing layer, it shall not exceed 10 percent by weight of cement used in the mix.

The finished thickness of the upper layer shall not be less than top layer of 10mm thick with white, black, chocolate, grey, yellow or green marble chips of sizes from ½ to 2B size laid in cement marble powder mix.

### **b. Laying**

Base concrete or RCC slab on which the tiles are to be laid, shall be cleaned, wetted and mopped. The bedding for the tiles shall be with lime mortar of 1:3 proportions (1 lime putty: 3 coarse sand). The ingredients shall be thoroughly mixed by volume in dry form. Care shall be taken to ensure that there are no hard lumps present. Water shall then be added and the ingredients thoroughly mixed. The average thickness of the bedding mortar shall be 30 mm and the thickness at any place shall not be less 10 mm.

Lime mortar bedding shall be spread, tamped and corrected to proper levels and allowed to harden for a day before the tiles are set. Over the bedding, neat grey cement slurry of honey like consistency shall be spread at the rate of 4.4kg of cement per square meter over such an area as would accommodate about twenty tiles. Tiles shall be washed clean and shall be fixed in this grout one after another, each tile being gently tapped with a wooden milled till it is properly bedded, and in level with the adjoining tiles. The joints shall be kept as thin as possible not exceeding 1.5mm and in straight lines or to suit the required pattern. The surface of the flooring during laying shall be frequently checked with a straight edge at least 2 meter long, so as to obtain a true surface with the required slope. Where full tiles or half tiles cannot be fixed, tiles shall be cut (sawn) from full tiles to the required size and their edges rubbed smooth to ensure a straight and true joint. Tiles which are fixed in the floor adjoining the wall shall enter not less than 12 mm under the plaster, skirting or dado. The junction between wall plaster and tile work shall be finished neatly and without

waviness. After the tiles have been laid, surplus cement grout that may have come out of the joints shall be cleared off.

**c. Curing, Polishing and Finishing**

The day after the tiles are laid, all joints shall be cleaned of the grey cement grout with a wire brush or trowel to depth of 5 mm and all dust and loose mortar removed and cleaned. Joints shall then be grouted with grey or white cement mixed with or without pigment to match the shape of the topping of the wearing layer of the tiles. The same cement slurry shall be applied to the entire surface of the tiles in a thin coat with a view to protect the surface from abrasive damage and fill the pin holes that may exist on the surface.

The floor shall then be kept wet for a minimum period of 7 days. The surface shall thereafter be ground evenly with machine fitted with coarse grade grit block (No.60). Water shall be used profusely during grinding. After grinding the surface shall be thoroughly washed to remove all grinding mud, cleaned and mopped. It shall then be covered with a thin coat of grey or white cement, mixed with or without pigment to match the colour of the topping of the wearing surface in order to fill any pin hole that appear. The surface shall be again cured. The second grinding shall then be carried out with machine fitted with fine grade grit block (No. 120).

The final grinding with machine fitted with the finest grade grit blocks (No.320) shall be carried out the day after the second grinding described in the preceding para or before handing over the floor, as ordered by the Engineer-in-Charge. For small areas or where circumstances so require, hand polishing may be permitted in lieu of machine polishing after laying. For hand polishing the following carborundum stones, shall be used:

1<sup>st</sup> grinding – coarse grade stone (No60)

Second grinding –medium grade (No.80)

Final grinding –fine grade (No120)

After the final polish, oxalic acid shall be dusted over the surface at the rate of 33 gm per square meter sprinkled with water and rubbed hard with a 'namdah' block (pad of woolen rags). the following day the floor shall be wiped with a moist rag and dried with a soft cloth and finished clean. If any tile is disturbed or damaged, it shall be refitted or replaced, properly jointed and polished. The finished floor shall not sound hollow when tapped with a wooden mallet

**4.10.4.2. Measurement and Payments**

**1. Measurement and Payment for Flooring**

Flooring of different types shall be measured separately in sq.m. Length and breadth shall be measured before laying skirting and dado or wall plaster. No deduction shall be made or extra paid for any opening in the floor of area upto 0.10 sqm. The flooring done with strips shall not be measured separately. Payment shall be made at the Unit rates as per the Bill of Quantities.

Tile flooring laid in floor borders and similar band shall be measured under the item of tile flooring. Nothing extra shall be paid in respect of these and similar bands formed of half size or multiply of half size standard tiles or other uncut tiles.

Treads of stairs and similar band shall be measured under the item of tile flooring. Nothing extra shall be paid in respect of these and similar bands formed of half size or multiply of half size standard tiles or other uncut tiles. Treads of stairs and steps paved with without nosing, shall also be measured under flooring. Mounded nosing shall be paid in running meter except where otherwise stated, returned mounded ends and angles to moldings shall be included in the description. Extra shall, however be paid for such areas where the width of treads does not exceed 30 cm.

The rate shall include the cost of all materials and labour and all other charges including cost for sampling & testing, etc involved in all operations for each type of flooring as described above. The rate shall also include application of cement slurry on RCC slab or on sub-grade including roughening and cleaning the surface and providing glass / asbestos sheet strips and also shuttering, wherever used. Nothing shall be paid extra for laying the floor at different levels.

## **2. Measurement and Payment for Tiling on Wall / Dado/Skirting**

Area of wall tiling shall be measured in sqm. Length and height shall be measured along the finished face of walling or dado and shall be paid at the unit rate.

The rate shall include the cost of all materials and labour and all other charges including cost for sampling & testing, etc involved in all operations for tiling as described above. The rate shall also include application of cement plaster including raking out of masonry joints, roughening and cleaning the concrete surface. Nothing shall be paid extra for wall tiling at different levels.

## **4.11. SANITARY AND PLUMBING WORKS**

### **4.11.1. Scope of Works**

The Scope of works under this clause shall cover to:

- supply and installation of all sanitary fixtures like water closets, wash-basins, sinks etc. and toilet accessories like mirrors, shelves, towel rails, etc with all fittings and fixtures.
- supply, laying and installation of pipes for supply of drinking water, surface drains for draining off rain water / surface water, sewage and waste water , etc with all fittings and fixtures including jointing.

The Scope of Works shall also cover to supply of all labour, materials, equipment, tools and plants, scaffolding, transportation, loading, unloading, preparation of foundation surfaces, cutting chases etc, and all other operations including testing and quality control, etc. As required for complete execution of in-house water supply and sanitary works, etc as shown in the Drawings and as specified herein and / or as directed by the Engineer-in-Charge.

### **4.11.2. General Requirements**

All materials and structural parts incorporated in the permanent work shall be new and unused. Quality and dimensions shall comply with these Specifications and approved

Standards. All works covered under this section shall be carried out in a workman like manner at the highest standards and all works shall be coordinated with the other works carried out at the site to allow the performance of all works simultaneously without causing any hindrance to other works.

The Contractor shall make his own arrangements for locating the coordinates and positions of all works and reduced levels (RLs) at these locations based on two reference grid lines and one bench mark which will be furnished by the Engineer-in-Charge. The Contractor shall provide all requirements at site so that the work can be carried out accurately according to the specification and drawing and / or as directed by the Engineer-in-Charge.

The Contractor shall make good to the satisfaction of the Engineer-in-Charge all cuttings / damages resulting from his operations during the installation. He shall also dispose of all unserviceable materials at least 50 m away from office / colony complex, unless otherwise directed by the Engineer-in-Charge. All serviceable material shall be stacked within a lead of 50 m as directed by the Engineer-in-Charge.

#### **4.11.3. Submissions**

At least 30(thirty) days prior to starting installation of any material or equipment, the Contractor shall submit to the Engineer-in-Charge for his approval the following:

- Details of Water Supply and Sanitation System
- Details of piping with fittings and supports, etc
- Sufficient descriptive materials such as catalogues, diagrams and other data published by the manufacturer to demonstrate the conformance to the Specifications and the Drawings as required by the Engineer-in-Charge

The Contractor shall also provide all safety measures for the workmen and others as per standard practices and requirements and / or direction of the Engineer-in-Charge during all types of installations at his own cost and responsibility. However, approval given by the Engineer-in-Charge to the Contractor's methods and equipment shall not relieve the Contractor of his full responsibility for a proper and safe execution or of liability for injuries to, or death of persons, or any obligations under this Contract.

#### **4.11.4. Standards and Codes**

All works and the materials therefore, procedures of placing, curing and testing, etc shall conform to the 'Specifications for Building and Road Works, 2015: Royal Govt. of Bhutan' and /or relevant Indian Standards and Guidelines.

#### **4.11.5. Materials**

##### **4.11.5.1. General**

All water supply and sanitary appliances and fittings shall be of modern pattern, fancy type and are subject to approval of the Engineer-in-Charge before they are purchased / installed.

All pipes, fittings, fixtures, appliances and accessories shall conform to the relevant Standards and / or as directed by the Engineer-in-Charge. These shall be obtained from a reputed manufacturer and shall be approved by the Engineer-in-Charge before supply at site. Wherever indicated by the Engineer-in-Charge, the Contractor shall submit samples of materials. These may be retained by him for subsequent comparison.

The materials brought to the site shall be stored in a separate secured enclosure, away from the building materials. Pipe threads, sockets and similar items shall be specially protected till final installation. Brass and other expensive items shall be kept under lock and key. Fragile items shall be checked thoroughly when received at the site and item found damaged shall be replaced. Chromium plating on fittings and appliances shall be of grade-2 (10 micron thickness) conforming to IS: 4827.

#### **4.11.5.2. Appliances and Accessories**

All appliances and accessories shall conform to the relevant Standards and code of practices.

##### **a. Water Closet**

European type Water Closet shall be white vitreous china pedestal, wash down type and of one piece construction, provided with ISI marked white solid plastic seat and lid, 10 lt low level white PVC flushing cistern of approved make, with fittings and brackets, 40mm flush bend, 20mm overflow pipe with specials of standard make and mosquito proof coupling of approved municipal design, complete. The WC shall conform to IS-2556(I&II).

##### **b. Urinal**

The Urinal installation shall be Vitreous China Urinals with Partition plates. Size of the Urinals shall be 440 x 265 x 355 mm with side fixing arrangements or as directed by the Engineer-in-Charge. The urinals shall conform to IS 2556 (Part-VI). Bowl shall be of one piece construction with flat back and flushing box rim with minimum 12 holes, well distributed in the rim to ensure satisfactory flushing. Size of distribution flush pipe shall be 15 mm nominal bore. Inside and outside visible surfaces of urinals shall be glazed, uniform and smooth.

Urinal shall be fixed at a height of 60 cm from the standing level to the top of the lip of the urinal, unless otherwise directed by the Engineer-in-Charge. Each urinal shall be connected to 32 mm dia waste pipe which shall discharge into a glazed channel of sufficient width, or a floor trap. The white glazed vitreous china partitions shall be provided between the urinals at 60 cm apart.

Partition plates shall be of one piece construction and provided with fixing arrangement at the flat back top and bottom. A counter sunk hole of 8mm (min) at the bottom may also be provided for the purpose of keeping it fixed.

**c. Wash Basin**

Wash basins shall be of white vitreous china flat back type, 630mmx450mm or 550mm x 450mm size unless otherwise specified, with CI brackets painted white. Each basin shall be provided with chromium plated, fancy mixer type pillar tap with Hot and Cold markings of approved quality and design, CP brass chain with rubber plug, 32mm CP brass waste of standard pattern, 32mm CP brass trap and unions, complete. This shall be conform to IS-2556(P-IV).

**d. Mirror**

The mirror shall be superior sheet glass with edges bevelled of approved make. It shall be free from flaws, speaks or bubbles. The size of the mirror shall be 600x450mm and the thickness shall not be less than 6 mm. It shall be uniformly silver plated at the back and shall be free from silvering defects. Silvering shall have a protective uniform covering of lead paint. The mirror shall be fixed over 6mm thick hard board and ground fixed to wooden cleats with CP brass screws and washers, firmly embedded in the walls.

**e. Glass Shelf**

Glass shelf shall consist of an assembly of glass shelf with anodized aluminium angle frame to support the glass shelf. The shelf shall be of glass of best quality with edges rounded off. The size of the shelf shall be 450 x 120 mm and thickness not less than 6 mm. The shelf shall have chromium plated brass guard rail and brackets which shall be fixed with chromium plated brass screws and washers to wooden cleats firmly embedded in the walls.

**f. Towel Rail / Towel Ring**

Towel Rail and supporting brackets shall be made of chromium plated brass. Size of the rail shall be 600 x 20 mm dia, unless otherwise specified. It shall be fixed in position by means of 2 nos. brackets which shall be fixed with chromium plated brass screws and washers to wooden cleats firmly embedded in the walls. Towel ring shall have about 150 mm dia and 12 mm chromium plated brass rod.

**g. Toilet Paper Holder**

The toilet paper holder shall be of recessed ceramic, roll type and of size 150 x 150mm and design as approved by the Engineer-in-Charge. It shall be fixed in position by means of chromium plated brass screws and washers to wooden cleats firmly embedded in the walls.

**h. Soap Tray**

Soap Tray shall be made of stainless steel. Its size shall be 100cm dia or elliptical as directed by the Engineer-in-Charge. It shall fixed in position as approved by the Engineer-in-Charge.

**i. Pillar Taps**



Pillar taps shall be chromium plated brass, fancy type of approved make and quality. The nominal size of pillar taps shall be 15 mm, combined with Hot and Cold water supply system.

**j. Bib / Stop Cock and Gate Valve**

All bib cocks and stop cocks used in sanitary appliances shall be of chromium plated brass, fancy type of approved make and quality with nominal size of 15 mm.

Ordinary type bib cocks and stop socks shall be made of brass and shall be polished bright.

Gate valve, wherever provided on main inlet pipe, shall be made of brass. Unless specified otherwise Class-I, non-rising stem, solid wedge type valve shall be provided.

**k. Pipes**

- a) Unless otherwise specified and/or as directed by the Engineer-in-Charge, following types of pipes shall be used:
- b) For water supply to buildings, pipes and the pipe fittings shall be Triple Layer PPR Pipe with “Anti-Microbial” Inner Layer and shall conform to IS 15801.
- c) For inlet connecting pipes to appliances / fittings, PPR pipes of 15mm N.B. with union of approved make shall be used. Standard length of 300 to 450mm pipe shall be used to suit the site requirements.
- d) For sanitary work above ground, PVC pipes, fittings and accessories shall be used. They shall conform to IS 13592 and shall be of types as given below:  
Type A – for use in ventilation pipe work and rain water applications  
Type B – for use in soil and waste discharge systems.
- e) For drain all pipes with spigot and socket ends and fittings shall conform to class SP1 of IS 651. These shall be sound, free from visible defects such as fire cracks or hair cracks. The glaze of the pipes shall be free from crazing. The pipes shall give a sharp clear tone when struck with a light hammer. There shall be no broken blisters.
- f) For roof drain PVC pipes shall be used for rain water pipes.
- g) For water tanks G.I. pipes of 32/50/80/100/150 mm as directed by the Engineer-in-Charge shall be used.

**4.11.6. Installation of Appliances and Fittings**

**4.11.6.1. General Requirements**

All fittings and fixtures shall be installed in best workman-like manner by skilled workers. These shall be perfect in level, plumb, plane, location and symmetry. All items shall be securely anchored to wall and floors. All cutting in walls and floors shall be made good in conformity with the wall / floor finish.

**4.11.6.2. Water Closet**

Water closet shall be installed along with necessary appliances and fittings including flushing cistern with flush pipe, seat and cover, The wash down water closet shall be fixed to the floor by means of 75mm long, 6.5mm diameter, counter sunk bolts and nuts



embedded in floor. The seat shall be fixed to the pan, by means of two 8mm diameter corrosion resistant hinge bolts, provided with washer.

#### **4.11.6.3. Wash Basin**

The installation of wash basin shall consist of an assembly of wash basin, pillar taps, C.I. brackets, chromium plated brass union as specified. The height of front edge of wash basin from the floor level shall be 75 to 80 cm. The basin shall be supported on a pair of C.I. Cantilever brackets with cement mortar 1:3 (1 cement: 3 sand). The bracket shall be embedded in cement concrete (1:2:4) block and protected by suitable impervious paint. The bracket shall be fixed in position before dado work is done. The wall plaster on the rear shall be cut to rest over the top edge of the basin. Centre to centre distance between 2 basins shall be 75 cm.

The chromium plated brass bottle trap and union shall be connected to 32 mm dia waste pipe which shall be suitably bent towards the wall and shall discharge into an open drain leading to floor trap or direct into the floor trap on ground floor and shall be connected to a waste pipe stack through a floor trap on upper floors.

#### **4.11.6.4. Mirror**

The mirror shall be mounted on 6mm thick plain asbestos sheet ground and shall be fixed in position by means of 4 nos. C.P. brass screws and C.P. washers, cover rubber washers and wooden plugs firmly embedded in walls. Unless specified otherwise, the longer side shall be fixed horizontally. The mirror shall be fixed at a nominal height of 1.45 m.

#### **4.11.6.5. Brass and Gun Metal Water Fittings**

The fitting shall be fully examined and cleared of all foreign matter before being fixed. The fitting shall be fitted in the pipeline in a workman like manner. The joints between fittings and pipes shall be leak proof when tested to a pressure of 6 kg / sq.cm. The defective fittings and joints shall be replaced or redone.

#### **4.11.7. Laying, Installation and Jointing of Pipes and Pipe Fittings**

##### **4.11.7.1. General Requirements**

Relevant Standard Practices shall be followed as general guidance for laying, installation and jointing of different types of pipes and fittings. Some important aspects pertaining to a few commonly used pipes are described in the following clauses for ready reference.

- a) Unless otherwise shown on the drawing, the minimum gradients of soil and drainage pipes shall be as followed for maintaining minimum self-cleaning velocity of 0.75m/sec

Diameter in mm	Gradient
100	1 in 57
150	1 in 100
200	1 in 175

250	1 in 195
300	1 in 240

- b) The pipes and special shall be handled with sufficient care to avoid damage to them. These shall be lined upon one side of the alignment of the trench with socket facing upgrade.
- c) Cutting of pipes may be necessary when pipes are to be laid in lengths shorter than the lengths supplied. The pipe shall be so marked that the cut is truly at right angle to the longitudinal axis of the pipe.
- d) Drainage and soil pipes shall not be allowed to come close to water supply pipe lines.
- e) For water pipe lines, meticulous care shall be taken to avoid chances of airlock and water hammer. The layout of pipe work shall be such that there is no possibility of backflow towards the source of supply from any cistern / appliance whether by syphon or otherwise. The pipes for internal works shall be concealed with cutting of proper chases in masonry or concrete of the structure. Clamps and fittings shall be as per standard practice and as approved by the Engineer-in-Charge
- f) For entry of the pipe lines into any building or structure, suitable conduits under the structure or sleeves shall be used to facilitate installation and maintenance of the services. When openings or chases are required to be made in the structure for entry of pipe lines, locations and sizes shall be marked and got checked from the Engineer-in-Charge. After laying of the pipeline the opening and chases shall be mended.
- g) Where soil, waste and ventilating pipes are accommodated in ducts, access to cleaning eyes shall be provided. Connection to drain shall be through a fully with seal cover to guard against ingress of sewer gas, vermin or back flow.

#### **4.11.7.2. Requirement above Ground Level**

##### **a. PPR Pipes for Water Supply**

Unless specified and/or directed, all pipes for water supply shall be concealed. To conceal the pipes, chasing may be adopted or pipes fixed in the ducts or recess etc. Union joints shall be provided for all required locations to facilitate maintenance. All pipes and fittings shall be properly jointed and made completely water tight. Burr from the joint shall be removed after screwing.

The pipes and fittings shall be checked under working pressure. Any joint found leaking, shall be rectified and all leaking pipes removed and replaced. The pipes and fittings shall be tested to a hydraulic pressure of 6kg/sq.cm.

##### **b. PVC Pipe for Sanitary work above Ground**

Sanitary pipe work above ground shall be followed for general guidance. Types of pipe systems shall be as shown on the drawings. Proper ventilation shall be provided in the piping system. The single stack system shall not generally be provided and shall be secured to the walls at all joints with M.S. holder bat clamps of approved size and shape. The clamps shall be fixed to the wall by embedding their hook in cement concrete block 10x10x10cm (1:2:4 mix) for which necessary holes shall be made in the wall at proper places. The clamps shall be kept about 24 mm clear of finished face of wall. All soil pipes

shall be carried up above the roof and shall have sand cast iron terminal guard. The pipes above parapet shall be secured to the wall by means of M.S. stay and clamps.

The pipes shall be fixed perfectly vertical or to the lines as directed. The spigot of the upper pipes shall be properly fitted in the socket of the lower pipe such that there is a uniform annular space for filling with the jointing material. The interior of the socket and exterior of the spigots shall be thoroughly cleaned and dried. The spigot end shall be inserted into the socket right upto the back of the socket and carefully centered by two or three laps of treated spun yarn, twisted into ropes of uniform thickness well caulked into the back of the socket. No piece of yarn shall be shorter than the circumference of the pipe. The jointed pipe line shall be at required levels and alignments. The leading of pipes shall be made by means of ropes covered with clay or by using special leading rings. The lead shall be melted so as to be thoroughly fluid and each joint shall be filled in one pouring.

Floor trap shall be suitably lowered to accommodate the trap and the top of the floor shall be properly sloped towards the trap for effective drainage. A chromium plated/galvanized grating shall be provided on the trap. The sunken floor slab shall be filled with lightweight materials like cinder mixed with cement. Sunken slab shall be made watertight by means of bitumen coating, plastering etc

**c. Rain Water Down Comers**

Rainwater down comers and fittings shall be standard PVC pipes. Rainwater down comers shall run along and be secured to walls, columns etc. Where desired by the Engineer-in-Charge, these may have to be installed in chases cut out in the structure. All pipes shall be well secured to the walls and supported by adequately strong brackets. The brackets may be wrought iron clevis type, slip ring type or perforated strap iron type, as approved by the Engineer-in-Charge. Suitable spacer blocks shall be provided against the vertical surface on which the pipe is fixed. All bends and junctions shall be supplied with water tight cleaning eyes. Joints between successive lengths of pipe can be made by collars. All rainwater down comers shall be provided with roof drain head of the shape and type as shown on the drawing. Unless otherwise specified, dome type drain head shall be used.

**4.11.7.3. Pipe Lines Jointing**

**(1) Jointing Cast Iron Pipes with Stoneware Pipes**

Where any cast iron soil pipe, waste pipe, ventilating pipe or trap is connected with a stoneware or semi-vitrified, waste pipe or drain communicating with a sewer, the beaded spigot end of such cast iron soil pipe, waste pipe, ventilating pipe or trap shall be inserted into a socket of such stoneware or semi-vitrified waste pipe or drain and part of clean sand after placing a tarred gasket or hemp yarn soaked in neat slurry round the joint and inserted in it by means of a caulking tool.

**(2) Jointing Stoneware with Cast Iron Pipe**

Where any earthen-ware trap connected to water closet pan is to be jointed with a cast iron soil pipe, the joint between the stone ware spigot and the cast iron socket shall always be of a flexible (non-rigid) nature. Such joint shall be made preferably with a mixture of bitumen and chopped asbestos fibre (not dust).

### **(3) Jointing Cast Iron Pipes**

#### **i) Lead Run Joints (Cast Lead Joints)**

The spigot shall be centered in the adjoining socket by tightly caulking in, sufficient turns of tarred gasket or hemp yarn to leave unfilled half the depth of socket for lead. When gasket or hemp yarn has been caulked tightly home, a jointing ring shall be placed round the barrel and against the faces of the socket. Molten pig lead shall then be poured into for filling remainder of the socket. The lead shall then be solidly caulked with suitable tools and hammers of not less than 3 kg. weight, right round the joint to make up for the shrinkage of the molten metal on cooling and shall preferably be finished 3 mm behind the socket face. The pipes shall essentially be dry before lead run joints are made.

#### **ii) Cement Joints**

The joint is first yarned with hemp yarn dipped in the cement slurry. The yarn is first inserted to slight depth and well pressed in the same manner as in lead jointing.

#### **iii) Tylon Joints**

The pipe manufacturer's instructions shall be strictly followed in making such joints. Tylon joints shall be made by push on the 'Tylon' rubber gasket and such rubber gasket shall conform to the specifications stipulated by the pipe manufacturer. The tools specified by the pipe manufacturer shall be used to secure the joints fully.

### **4.11.8. Surface Drains**

All surface drains shall be made of stone masonry or as approved by the Engineer-in-Charge. Bed concrete for the drains shall be 100 mm thick cement concrete (1:3:6). The inside of the walls and the top shall be flush pointed with cement mortar (1:4).

The surface drains shall be of the size as specified in BOQ and laid to such gradients and locations as shown on the drawings or as directed by the Engineer-in-Charge. The drains shall be provided, as far as possible, uniform slope from the starting point to the discharge point.

### **4.11.9. SW Gully Trap**

The gully traps shall be fixed on cement concrete foundations, 65 cm square and not less than 10 cm thick. The mix for concrete shall be 1:5:10 (1 cement: 5 sand: 10 graded stone aggregate 40 mm nominal size). The jointing of the gully outlet to the branch drain, shall be done similar to jointing SW pipes.

After fixing and testing gully and branch drain a brick masonry chamber 300x300 cm (inside) in brickwork of specified glass in cement mortar 1:5 (1 cement : 5 sand ) shall be built with a 1/2 brick thick brick work round the gully trap from the top of the bed concrete upto ground level. The space between the chamber walls and trap shall be filled in with cement concrete 1:5:10 (1 cement: 5 sand: 10 graded stone aggregate 400 mm nominal size). The upper portion of the chamber i.e., above the top level of the trap shall plastered inside with cement mortar 1:3 (1 cement: 3 sand) finished with a floating coat of net cement. The comers and the bottom of the chamber shall be rounded off so as to slope towards the grating.

#### **4.11.10. Overhead Water Storage Tank**

Overhead storage tanks shall be made of Virgin HDPE granules of approved quality and make. Tank shall be of 500 litre & 2000 litre capacity as approved by the Engineer-in-Charge and shall have seamless construction, moulded by rotational moulding, conforming to IS 12701. Shape of tank shall be cylindrical-vertical type with corrugation along with length and bottom of the tank. Tank shall have closed top provided with lid and suitable and second ball valve. The material of construction of tank, lid and fittings which come in contact with water shall be such that it does not impart any taste, colour or odour to water, nor have any toxic effect. It shall not contaminate water thereby making it unpotable. The internal and external surface of the tank shall be smooth, clean and free from other hidden internal defects, such as air bubbles, pits and metallic or other foreign material inclusions. The tensile strength of the wall of the water tanks shall not be less than  $12 \text{ N/mm}^2$ .

Tanks shall be provided with all fittings for inlet, overflow, outlet pipes and ball valves including mosquito-proof coupling. These shall be leakage proof and shall be installed with proper support and anchorage for applicable wind and seismic condition. These tanks shall be placed on the roof of the building.

Unless otherwise specified, the outlet pipes shall be 50mm or 40 mm above the bottom of the tank. The wash out or draining pipe shall be made flush at the bottom of the tank at its lowest point. The floor of the tank shall be given a slight fall to the washout pipe for the tank. Water level indicator shall be provided, if asked for.

#### **4.11.11. Septic Tank**

Combined Sewerage System catering to the sewage disposal of the entire colony is envisaged to be taken up instead of individual Prefabricated RCC Septic tanks (as indicated in B.o.Q) alongwith the other infrastructure works of permanent project colony. Therefore, the Contractor is required to obtain written approval from the Engineer-in-Charge prior to procurement of Prefabricated RCC Septic tank.

The Prefabricated RCC Septic tank shall be of size, suitable for 100 users. The design, layout, construction, shall be as per the drawing and / or as approved by the Engineer-in-Charge. Prefabricated Septic tanks may be constructed of reinforced concrete 1:2:4 (20mm aggregate).

Every septic tank shall be provided with a CI cover of adequate strength. Access openings shall be provided for purposes of de-sludging and inspection. The clear opening shall be 500 mm dia. minimum, or 455 x 610 mm rectangular opening. Septic tank shall consist of the tank itself with inlet and outlets complete with all necessary earth work and backfilling.

A ventilating CI pipe of at least 50 mm dia shall be provided with a suitable cage of mosquito-proof wire mesh and cowl at the top. The ventilating pipe shall extend to a height of about 2 m when the septic tank is at least 15 m away from the nearest building and to a height of 2 m above the top of building, when it is located closer than 15 m. Ventilating

pipe can also be connected to the normal soil ventilating system of the building, where so allowed.

After the septic tank has been made water tight and the sewerage system checked, the tank shall be filled with water to its outlet level before the sewage is let into the tank. It shall be seeded with well digested sludge obtained from septic tanks or sludge digesting tanks. In the absence of digested sludge, a small quantity of decaying matter such as digested cow-dung may be introduced. The effluent from the septic tank shall be disposed off by soil absorption system as established by percolation tests and as approved by the Engineer-in-Charge.

#### **4.11.12. Soak Pit**

Soak pit shall be complete as shown on the drawing, with all necessary earth work and backfilling. The pit may be lined with stone, brick or concrete blocks with dry open joints and shall be backfilled with at least 75 mm of clean brick bats or stone aggregates. The lining above the inlet level shall be finished with cement plaster.

If no lining is used, the entire pit shall be filled with loose stones or brick bats 50 to 80 mm nominal size. A masonry ring shall be constructed at the top of the pit to prevent damage by flooding of the pit by surface run off. The inlet pipe shall be taken down to a depth of 0.90 m from the top as an anti-mosquito measure.

#### **4.11.13. Sampling, Testing and Quality Control**

##### **4.11.13.1. General**

The Contractor shall carry out all sampling and testing in accordance with the relevant Indian Standards and/or International Standards and shall conduct such tests as are called for by the Engineer-in-Charge. Where no specific testing procedure is mentioned, the tests shall be carried out as per the directions of the Engineer-in-Charge. Tests shall be done in the field and at a laboratory approved by the Engineer-in-Charge and the Contractor shall submit to the Engineer-in-Charge, the test results in triplicate within three days after completion of a test. The Engineer-in-Charge may, at his discretion, waive off some of the stipulations given for small and unimportant operations.

Material/work found unsuitable for acceptance, shall be removed and replaced by the Contractor. The work shall be re-done as per specification or requirements and to the satisfaction of the Engineer-in-Charge.

##### **4.11.13.2. Testing after Installation**

###### **a. General**

All soil pipes, waste pipes, ventilating pipes and all other pipes, when above ground, shall be gas-tight. The pipe systems shall be tested for gas tightness and for hydraulic performances as given hereunder:

###### **(i) Air Test**

Air test shall be applied by inserting expanding rubber testing plugs in the lower and upper ends of the main soil pipe and main ventilating pipe and sealing the plugs with water, where

possible. The testing plug at the upper end of the ventilating pipe shall be fitted with a tee-piece with a cock on each branch, one branch being connected by a flexible tube into a manometer. Air pressure shall then be introduced into the system through the other branch of the tee piece until the desired pressure is shown on the manometer scale. The pressure applied should be equal to 65 mm water gauge. For locating the fault position, smoke test shall be carried out.

(ii) **Smoke Test**

All soil pipes, waste pipes and vent pipes and all other pipes, when above ground, shall be tested by a smoke test conducted under a pressure of 24 mm of water and maintained for 15 minutes, after all trap seals have been filled with water. The smoke is produced by burning only waste or tar paper or similar material in the combustion chamber of a smoke machine. Care shall be taken to ensure that the system is filled with smoke before sealing with plugs. Chemical smoke is not satisfactory.

(iii) **Water Test**

Water test may be applied before the appliances are connected and may be carried out in sections so as to limit the static head to 4.5 m. It is necessary to seal at openings affected by the test and provide support to the plugs uses as stoppers.

**b. Obstruction / Straightness Test**

The obstructions shall be checked by inserting a smooth ball, of diameter 13 mm less than the pipe bore at the high end of the sewer or drain. In the absence of any obstruction, such as yarn or mortar projecting through the joints, the ball will roll down the invert of the pipe and emerge at the lower end. The straightness shall be checked by means of a mirror at one end of the line and lamp at the other. If the pipe line is straight, the full circle of the light may be observed. The mirror will also indicate obstruction in the barrel, if the pipe line is not straight

**c. Testing of Service Pipes**

The service pipes shall be slowly and carefully charged with water, allowing all air to escape avoiding all shock or water hammer. The service pipe shall then be inspected under working condition of pressure and flow, when all draw off taps are closed. The service pipes shall be checked for satisfactory support and protection from damage corrosion and frost.

**d. Testing of Fixtures**

All fixtures and fittings shall be connected by water tight joints. No dripping of water shall be acceptable.

**4.11.14. Maintenance during Construction**

The plumbing system shall be maintained and protected by the Contractor in a satisfactory condition until final acceptance by the Employer. Defective materials and equipment damage in the course of installation or testing shall be replaced or repaired at the expense of the Contractor in a manner as approved by the Engineer-in-Charge



#### **4.11.15. Measurements and Payment**

Measurement and payment for the supply and installation of the plumbing system and sanitary works shall be made on the basis of unit rates as tendered in the Bill of Quantities. The rates shall constitute full compensation for the cost of all labors, tools, equipment and materials, cutting of chases, incidentals, etc including those for the tests, periodical maintenance till acceptance of the works and any other items necessary to complete the function of the system stipulated in the Specification.

#### **4.12. PAINTING AND POLISHING**

##### **4.12.1. Scope of Works**

The Scope of works under this clause shall comprise of performance of all works necessary for finishing of walls both interior and exterior surfaces of plaster and painting ,varnishing and / or French Polishing over wood work, structural and other miscellaneous steel items, external surfaces of the pipes, roof drains, service water pipes and other ferrous and non-ferrous metal items, etc.

The Scope of Works shall also cover for supply of all materials, labour, equipment, tools and plants, and all other incidentals etc as needed for performance of the work as per specification and / or direction of the Engineer-in-Charge.

##### **4.12.2. General Requirement**

Painting/ varnishing, etc shall not be started until the Engineer-in-Charge has inspected the items of work to be painted/ varnished, etc and satisfied himself about their proper quality and given his approval to commence the finishing works.

Painting/ varnishing, etc except the priming coat, shall generally be taken up in hand after practically finishing all other work. The rooms shall be thoroughly swept out and the entire building cleaned up at least one day in advance of the painting work being started. Painting of external surface should not be done in adverse weather conditions.

The Contractor shall provide all safety measures for the workmen and others as per standard practices and requirements and / or direction of the Engineer-in-Charge during all types of work at his own cost and responsibility. However, approval given by the Engineer-in-Charge to the Contractor's methods and equipment shall not relieve the Contractor of his full responsibility for a proper and safe execution of works, or of liability for injuries to, or death of persons, or any obligations under this Contract.

The Contractor shall also undertake all precautions to prevent damage, disfiguration or straining to work of other trades or other installations.

##### **4.12.3. Submission**

At least **fifteen (15)** days prior to commencement of finishing works, the Contractor shall submit the schedule, sequence and methodology of works, to the Engineer-in-Charge for approval. He shall also submit colour samples, distempers and paints, etc with their specifications, to the Engineer-in-Charge for approval.



#### **4.12.4. Standards and Codes**

All distempering and painting/ varnishing works and the materials therefor, production, procedures of works, curing and testing, etc shall conform to the 'Specifications for Building and Road Works, 2015: Royal Govt. of Bhutan' and /or relevant Indian Standards and Guidelines.

#### **4.12.5. Materials**

##### **4.12.5.1. General**

Materials for painting and varnishing, etc shall be highest grade products of well known approved manufacturers and shall be delivered to the site in original sealed containers, bearing brand name, manufacturer's name and colour shade with labels intact and seal unbroken, in sufficient quantity. All materials shall be subject to inspection and approval by the Engineer-in-Charge. It is desired that the materials of one manufacturer only shall be used as far as practicable and paint of particular shade be obtained from the single batch

All prime coats shall be compatible to the material of the surface to be finished as well as to the finishing coats to be applied. All unspecified materials such as shellac, turpentine or linseed oil shall be of the highest quality available and shall conform to the latest Standards. All such materials shall be made by reputed recognized manufacturers and shall be approved by the Engineer-in-Charge.

All colours shall be as per painting / finish schedule and timing and matching shall be done to the satisfaction of the Engineer-in-Charge. In such cases, where samples are required, they shall be executed in advance with the specified materials for the approval of the Engineer-in-Charge.

##### **4.12.5.2. Water proof Cement Paint**

Water proof Cement wash shall be made from best quality white cement and lime resistant colours with accelerators, waterproofing agents and fungicides.

##### **4.12.5.3. Dry /Acrylic Distemper (Washable)**

Dry / Acrylic distemper of required colour conforming to IS 427 / IS:428 and of approved brand and manufacturer shall be used. The primer where used shall be cement primer or distemper primer as approved by the Engineer-in-Charge. These shall be of same manufacturer as that of distemper.

##### **4.12.5.4. Varnish / French Spirit Polish**

Varnish conforming to IS 347 shall be of approved manufacturer. For French polish, pure shellac conforming to IS:16 varying from pale orange to lemon yellow colour, free from resin or dirt shall be dissolved in methylated spirit at the rate of 140 gm of shellac to 1 litre of spirit. Suitable pigment shall be added to get the required shade. Ready made polish conforming to IS:348 can also be used

#### **4.12.5.5. Synthetic Enamel Paint**

Paint to be used for various items of work shall be of best quality, conforming to IS 1932 and shall be obtained ready mixed in sealed containers from approved manufacturer. The Contractor shall obtain the approval of the Engineer-in-Charge for the make and colour of the paint he proposes to use.

#### **4.12.6. Storage**

The Contractor shall arrange for safe and proper storage of all materials and tools. Paints, etc shall be kept covered at all times, and mixing shall be done in suitable containers. All necessary precautions shall be taken by the Contractor against fire hazards.

#### **4.12.7. Preparation of Surface**

##### **4.12.7.1. Preparation of Surface over Cement Plaster**

The surface of the plaster shall not be painted until it has dried completely. Trial patches shall be laid at intervals and where drying is satisfactory, painting shall be taken up in hand. Surface shall be free from all oil, grease, efflorescence, mildew, loose paint or other foreign and loose materials.

Masonry cracks shall be cleared out and patch filled with mortar similar to the original surface and uniformly textured. Where this type of resurfacing may lead to the finishing paint being different in shade from the original surfaces, the resurfaced area shall be treated with minimum one coat of cement primer which should be continued to the surrounding area for a distance of minimum 100 mm.

Surface with mildew and efflorescence shall be treated as below:

a) Mildew

All mildew surfaces shall be treated with an approved fungicide such as ammoniacal wash consisting of 7g of copper carbonate dissolved in 80 ml liquid ammonia and diluted to 1 litre with water, or 2.5 per cent magnesium silico fluoride solution and allowed to dry thoroughly before paint is applied.

b) Efflorescence

All efflorescence shall be removed from affected surfaces with a solution of muriatic acid in water (1:6 to 1:8), washed off with clear water and allowed to dry thoroughly.

##### **4.12.7.2. Preparation of Wood Surface for Varnishing / Polishing / Painting**

The surface shall be cleaned. All unevenness shall be rubbed down smooth with sand paper and well dusted. Knots if visible shall be covered with a preparation of red lead and glue shall be laid on while hot. Holes and indentations on the surface shall be closed with glazier's putty or wood putty conforming to IS 419. The surface shall then be given a coat of wood filler made by mixing whiting (ground chalk) in methylated spirit at the rate of 1.5 kg of whiting per liter of spirit. The surface shall again be rubbed down perfectly smooth with sand paper and wiped clean.

#### **4.12.7.3. Preparation of Metal Surface for Painting**

All metal surfaces shall be absolutely clean, dry and free from wax, grease and soap films. All rust and scales shall be removed by scribing or by brushing with steel wire brushes. Hard skin of oxide formed on the steel and iron surfaces, which becomes loose by rusting shall be removed.

All galvanized iron surfaces shall be pre-treated with a compatible primer according to the manufacturer's direction. Any abrasion in shop coat shall be touched up with the same quality of paint as the original coat. If the surface is wet, it shall be dried before priming coat is undertaken.

#### **4.12.8. Application**

##### **4.12.8.1. General**

The method of application in each case shall be as recommended by the manufacturer. In case of selection of special shades and colour (not available in standard shades) the Contractor shall mix different shades and prepare test panels of minimum size 1 metre square as per instruction of the Engineer-in-Charge and obtain his approval prior to application of finishing paints. Proper tools and implements shall be used. Scaffoldings if used shall be independent of the surface to be painted to avoid shade differences of the freshly repaired anchor holes.

Painting shall be done by skilled labours in a workman like manner. All materials shall be evenly applied, so as to free of sags, runs crawls or other defects. All coats shall be of proper consistency. In case of application by brush, no brush marks shall be visible. The brushes shall be clean and in good condition before application of paints. All priming undercoats for painting shall be applied by brush only, and rollers, spray equipment's etc. Shall not be used.

No work shall be done under conditions that are unsuitable for production of good results. No painting shall be done when plastering is in progress or is drying. Application of paint which seals the surface to moisture shall only be done after the moisture on and below the surface has dried out.

All coats shall be thoroughly dry before being sand papered or before the succeeding coat is applied. Coats of painting as specified are intended to cover surfaces perfectly. In case the surface is not covered properly by applying the specified number of coats, further coats shall be applied by the Contractor when so directed by the Engineer-in-Charge.

Finished coats shall be of exact colour and shade as per approved samples and all finish shall uniform in colour and texture. All parts of mouldings and ornaments shall be left clean and true to finish.

##### **4.12.8.2. Application of Painting Priming Coat**

Primer for plaster / wood work / Iron & Steel surface shall be as specified below:

**Table 11: Specifications for Primer**

Sl. No.	Surface	Primer to be used
1	Wood work (hard and soft wood)	Pink conforming for IS:3536
2	Resinous wood and plywood	Aluminium primer conforming to IS:3585
3	Iron, Steel and Galvanized steel	Red Oxide Zinc chromate Primer conforming IS:2074
4	Plastered Surfaces to receive Paint finish.	Cement primer conforming to IS: 109

The primer shall be ready mixed primer of approved brand and manufacture or otherwise may be mixed at site. Where primer for wood work needs to be prepared at site, it shall be prepared from a mixture of red lead, white lead and double boiled linseed oil in the ratio of 0.7 kg: 0.7 kg: 1 litre. For steel work, primer shall be mixed at site from a mixture of red lead, raw linseed oil and turpentine in the ratio of 2.8 kg: 1 Litre: 1 Litre. The specifications for the base and thinner for mixed on site primer shall be as follows and shall be of approved manufacture and brought to site in their original packing in sealed condition:

**a) White Lead**

The White lead shall be pure and free from adulterants like barium sulphate and whiting. It shall conform to IS:103.

**b) Red Lead**

This shall be in powder form and shall be pure and free from adulterants like brick dust etc. It shall conform to IS:102.

**c) Raw Linseed Oil**

Raw Linseed oil shall be lightly viscous but clear and of yellowish colour with light brown tinge. Its specific gravity at a temperature of 30 degree C shall be between 0.923 and 0.928. The oil shall be mellow and sweet to the taste with very little smell. The oil shall be of sufficiently matured quality. Oil turbid or thick, with acid and bitter taste and rancid odour and which remains sticky for a considerable time shall be rejected. The oil shall conform in all respects to IS: 75. The oil shall be approved brand and manufacture.

**d) Double boiled Linseed oil**

This shall be more viscous than the raw oil, have a deeper colour and specific gravity between 0.931 and 0.945 at a temperature of 30 degree C. It shall dry with a glossy surface. It shall confirm in all respects to IS: 77. The oil shall be of approved brand and manufacture.

**e) Turpentine**

Mineral turpentine i.e. petroleum distillate which has the same rate of evaporation as vegetable turpentine (distillate product of oleoresin of conifers) shall be used. It shall have no grease or other residue when allowed to evaporate. It shall conform to IS:533.

#### **4.12.8.3. Application of Waterproof Cement Paint**

Waterproof Cement painting shall be applied in two coats over one coat of priming. Waterproof Cement paint shall be mixed in such quantities as can be used up within an hour of its mixing. Avoid setting or thickening of the mix. Cement paint shall be mixed in two stages. The first stage shall comprise of 2 parts of cement paint and 1 part of water stirred thoroughly and allowed to stand for 5 minutes. The second stage shall comprise adding further one part of water to the mix and stirring thoroughly to obtain a liquid of workable and uniform consistency.

Surface to be coated with cement paint shall be washed and brushed down. As soon as the moisture has disappeared, the surface shall be given one coat of paint. Care shall be taken so that the paint does not dry out too rapidly. After 4 to 6 hours, the water shall be sprinkled over the surface to assist curing and prevent cracking. After the first coat has dried (24 to 48 hours), the second coat shall be applied. However, three or more coats of water proof cement paint may be necessary to get a uniform shade. Before application of the second or subsequent coats, the surface of the previous coat shall be not be wetted. In a similar manner the finished surface shall be kept moist by occasional sprinkling with water for seven days after painting. Waterproof cement paint shall not be applied on surface already treated with white wash.

#### **4.12.8.4. Application of Dry Distemper / Acrylic Distemper (Oil bound)**

The dry distemper shall be of approved colour, brand and manufacturer and shall be mixed in clean water using 0.6 litre of water per kg of distemper or as specified by the manufacturer. It shall then be allowed to stand for at least 30 minutes (or if practicable overnight) before use. The mixture shall be well stirred before and during use to maintain an eve consistency. Distemper shall not be mixed in larger quantity than is actually required for one day's work. The dry distemper shall be applied in two coats over one coat of priming. Before the work is distempered, the new plastered surface shall be allowed to dry for at least two months. Before application of the distemper, the surface shall be thoroughly brushed free from mortar droppings and other foreign matter and sand papered smooth. Pitting in plaster if any shall be made good with plaster of pairs mixed with the colour to be used. The surface shall than be rubbed down again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The patched surface shall be allowed to dry thoroughly before the regular coat of distemper is applied.

A priming coat of whiting (white chalk, mixed with solutions of gum dissolved separately in hot water @ 2 kg of gum and 0.4 kg of copper sulphate per cum of whiting starry) shall be applied over the prepared surface and allowed to dry. No white washing coat shall be used as a priming coat for distemper.

After application of the priming coat, the entire surface shall be coated with the mixture of distemper uniformly, with proper distemper brushes in horizontal stokes followed immediately by vertical ones which together shall constitute one coat. The subsequent coat shall be applied only after the previous coat has dried. Two or more coats of distemper shall be applied to make the finished surface shall be even and uniform and shall show no brush marks.

Any varnish left over in the small container shall not be poured back into the stock tin, as it will render the latter unfit for use. Special fine haired brushes shall be used and not ordinary paint brushes. Brushes shall be well worn and perfectly clean.

#### **4.12.8.5. Application of Varnish / French Polish**

##### **a. Application of Varnish**

The varnish shall be applied in two coats over one coat of priming and shall be applied liberally with a full brush and spread evenly with short light strokes to avoid frothing. If the work is vertical, the varnish shall be crossed and recrossed and then laid off, later being finished on the upstrokes so that varnish, as it sets, flows down and eliminates brush marks, the above process will constitute one coat. If the surface is horizontal, varnish shall be applied in every direction, with light quick strokes and finish in one definite direction so that it will set without showing brush marks, in handling and applying varnish. Care should be taken to avoid forming froth or air bubbles. Brushes and containers shall be kept scrupulously clean.

Rubbing down and flattening the surface shall be done after each coat except the final coat with fine sand paper. The work shall be allowed to dry away from draughts and damp air. The finished surface shall then present a uniform appearance and fine glossy surface free from streaks, blister, etc. Special fine haired varnishing brushes shall be used for the work.

##### **b. Application of French Polish**

Two coats of French polish shall be applied over one coat of priming. A pad of woolen cloth covered by a fine cloth shall be used to apply the polish. The pad shall be moistened with the polish and rubbed hard on the wood, in a series of overlapping circles applying the mixture sparingly but uniformly over the entire area to give an even level surface. A trace of linseed oil on the face of the pad facilitates this operation. The surface shall be allowed to dry and the remaining coats applied in the same way. To finish off, the pad shall be covered with a fresh piece of clean fine cotton cloth slightly dampened with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall have a uniform texture and high gloss.

#### **4.12.8.6. Application of Paints over Steel Work.**

In general, painting work shall be in accordance with IS: 1477 (Part I & II) (Latest Revision). Surface of steel work to be painted shall be thoroughly cleaned of all grease, oil, dirt, rust, foreign matter like cement splashing, etc. by suitable solvent and mild rubbing with abrasive paper/hand scrapping to the full satisfaction of the Engineer-in-Charge. Cleaning with solvents/scraping shall be limited to the affected area only.

In case where the existing primer is removed while cleaning the surface damaged portions shall be provided with a coat of wash or etching primer on suitable chemical pre-treatment solutions and another coat of red oxide, zinc chromate primer. The payment for red oxide primer will be made as per item of Bill of Quantities.

After the surface is prepared in a manner described above, the primer coat shall be dry cut without scratching or in any way damaging the primer coats and clean the surfaces from dust.

Over this dry surface apply an optimum coat of undercoating (synthetic enamel paint) by spray with minimum brush marks. Allow the film to dry hard, wet rub, cutting down to a smooth finish (ensuring that at no place the undercoat is completely removed). Allow the water to evaporate.

Finishing coats shall consist of two coats of synthetic enamel paint of approved colour and brand. Additional finishing coat, if found necessary shall be applied to ensure properly uniform glossy surface. The total dry film thickness of each shall be not less than 25 microns. The paint shall be applied by brushing/spraying. Spraying shall be adopted with prior approval of Engineer-in-Charge generally on large surface areas. Paints shall be stirred frequently to keep the pigment in suspension. Paint shall be ready mixed in original sealed containers as packed by the paint manufacturers and no thinners shall be permitted. No painting shall be done in frosty/foggy rainy weather or when humidity is high enough to cause condensation on the surface to be painted. Paint shall not be applied when the temperature of the surface to be paint is 5°C or lower.

Contractor shall provide and use sufficient number of drops, clothes, covers, tarpaulins and other screens to protect adjacent surfaces and shall remove all splatter and stains from such surfaces. The Contractor shall also protect his own work. Any and all damage to adjacent work or any part of the premises due to painting carelessness or accidental performance of the Contractor shall be repaired or made good at the Contractor's expense.

Painting shall be discontinued when exposed to rain and dust storm and shall not commence until the surfaces are perfectly dry and clean. Wherever practicable, surfaces shall be painted when under shade or when temperature is falling.

#### **4.12.9. Scaffolding**

Wherever scaffolding is necessary, it shall be erected on double supports tied together by horizontal pieces, over which scaffolding planks shall be fixed. No bellies, bamboos or planks shall rest on or touch the surface being washed. For all exposed masonry, double scaffolding having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces.

In case of special type of brick work, scaffolding shall be got approved by the Engineer-in-Charge in advance. Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damages or scratches to walls. For white washing the ceiling, the proper stage scaffolding shall be erected.

#### **4.12.10. Clean Up**

All furniture, fixtures, glazing, floor, etc shall be protected by covering during finishing work. The Contractor, upon completion of white / colour washing, distempering or painting, etc. shall remove all marks and make good surfaces, where paint has been spilled or spattered, including all equipment's, fixtures, glass, fittings, etc., to the satisfaction of the Engineer-in-Charge.

#### **4.12.11. Acceptance Criteria**

- i. All finished surfaces shall be uniform and pleasing in appearance.
- ii. The colour, texture, etc. shall match exactly with approved samples.



- iii. All stains, splashes and splatters of white / colour wash, distemper or paint shall be removed from surrounding surfaces

#### **4.12.12. Measurement and Payment**

Measurement and payment for each of the finishing work shall be made separately at the unit rates based upon the area measured in sq.m, except when otherwise stated. Small articles not exceeding 0.1 sq.m of painted surfaces where not in conjunction with similar painted work shall be enumerated.

Painting up to 15 cm in width or in girth and not in conjunction with similar painted work shall be given in running metres. Components of trusses, and similar work shall, however be given in sq. metres irrespective of the size or girth of members.

In measuring painting, polishing etc. of plastering / wood work or steel work etc., the coefficient as mentioned in Table (Page 351) in the **Specifications for Building and Road works, 2015** will be adopted.

Painting of rain water, soil, waste, vent and water pipes etc shall be measured in running metres of the particular diameter of the pipe concerned. Piping of specials such as bends heads, branches, junctions, shoes etc. shall be included in the length and no separate measurements shall be taken for these or for painting brackets, clamps etc.

The unit rates shall include the cost of material, labour, treatment, tools and all other allied works/ operations necessary for performance of the finishing works, complete as per specification and / or direction of the Engineer-in-Charge.

### **4.13. ELECTRICAL WORKS**

#### **4.13.1. GENERAL**

The following technical specifications cover the Internal Wiring Installations and include:

- Concealed conduit installations
- Wiring conductors
- Switches and Fixtures
- Point Wiring
- Circuit Wiring
- Mains and sub-mains

#### **4.13.2. STANDARDS AND CODES**

The relevant Indian and Bhutanese Standard Specifications and Codes of Practice will apply

#### **4.13.3. CONCEALED CONDUIT INSTALLATIONS**

##### **4.13.3.1. CEILING OUTLET BOXES**

Outlet boxes shall be of 16 SWG sheet steel galvanised with 14 mm projected threaded collars and so installed as to maintain continuity throughout. These shall be so protected at the time of laying that no mortar finds its way inside during concrete filling or plastering. For



fluorescent fittings the boxes shall be provided 300 mm off centre for a 1200 mm fitting and 150 mm off centre for a 600 mm fitting so that the wiring is taken directly to the down rod. 3 mm thick perspex/hylam sheet cover of matching colour shall be provided.

#### **4.13.3.2. FAN HOOK BOXES**

Ceiling boxes for fan hooks shall be made out of sheet steel not less than 14 SWG and round in shape with one 'U' shaped 15 mm dia rod inside screwed tightly with the top reinforcement of the roof. 3 mm thick Perspex/hylam sheet cover of matching colour shall be provided.

#### **4.13.3.3. SWITCH BOXES**

16 SWG sheet steel galvanised boxes suitable for modular type switches of required sizes shall be provided to house speed regulators and switches. These will be so designed that accessories are mounted on a grid plate with tapped holes for brass machine screws leaving ample space at the back and on the sides for accommodating conductors and checknuts at conduit entries.

The Grid plates and sheet steel galvanised boxes shall be fitted with a spin rivetted brass earth terminal.

These shall be attached to conduits by means of checknuts on either side of their walls. The M.S. boxes shall be completely concealed leaving edges flush with wall surface. Moulded front covers made from high impact resistant, flame retardant and ultra violet stabilised engineering plastics shall be fixed to these by means of brass machine screws. No timber shall be used for any supports.

Switch boxes shall be located at 1000 mm above floor level unless otherwise indicated.

#### **4.13.3.4. OUTLET BOXES**

16 SWG Galvanised sheet steel boxes suitable for modular type outlets of the required sizes shall be provided to house the switch socket outlets, telephone, T.V., buzzer and other outlets as may be required. These will be so designed that accessories are mounted on a grid plate with tapped holes for brass machine screws leaving ample space at the back and on the sides for accommodating conductors and checknuts at conduit entries.

The Grid plates and sheet steel galvanised boxes shall be fitted with a spin rivetted brass earth terminal.

These shall be attached to conduits by means of checknuts on either side of their walls. These shall be completely concealed leaving edges flush with wall surface.

Moulded front covers made from high impact resistant, flame retardant and ultra violet stabilised engineering plastics shall be used to mount the outlets and shall be fixed to the outlet M.S. boxes by means of brass machine screws. No timber supports shall be used.

#### **4.13.3.5. DRAW BOXES**

16 SWG mild steel draw boxes of ample dimensions shall be provided at convenient points on walls to facilitate long runs of conductors. They will be completely concealed with 3 mm perspex/hylam covers flush with plaster work. These boxes will be located at suitable locations.

#### **4.13.3.6. INSPECTION BOXES**

Inspection boxes of 16 SWG mild steel and having smooth external and internal finish shall be provided to permit inspection and maintenance. These shall be mounted flush with wall/ceiling surface as required and shall have screwed covers of 3 mm thick perspex/hylam sheet. Adequate ventilation holes shall be provided on the covers.

#### **4.13.3.7. CROSS SECTION**

The conduits shall be of ample sectional area to facilitate the drawing of cables. In no case shall the total cross section of cables measured overall be more than half the area of the conduit. The maximum number of wires that can be accommodated in conduits of varying sizes will be limited as per details given in the specifications.

#### **4.13.3.8. ERECTION OF CONDUIT RUNS**

Conduits shall be laid before casting in the upper portion of a slab or otherwise, as may be instructed in accordance with approved drawings, so as to conceal the entire run of conduits and ceiling outlet boxes.

Vertical drops shall be buried in columns or walls.

Wherever necessary, chases will be cut by the Contractor with the written orders of the Site Engineer to sufficient depth to allow full thickness of plaster over conduits. The width of the chases will be such as to accommodate the required number of conduits. The chases will be filled with cement, coarse sand mortar (1:3) and properly cured by watering. If a chase is cut in an already finished surface, the Contractor shall fill the chase and finish it to match the existing finish.

Contractors should not cut any iron bars to fix the conduits.

When the conduit is to be embedded in a concrete member, it shall be adequately tied to the reinforcement to prevent displacement during casting. Conduits in chases or laid in the slab shall be supported at maximum of 1 m centres.

Suitable expansion joint fittings shall be provided at all the points where the conduit crosses any expansion joint in the building.

#### **4.13.3.9. PAINTING OF BOXES**

All draw/junction/fan-hook boxes shall be painted with red oxide in its manufactured form. All boxes before they are laid shall be painted with two coats of red oxide paint.

#### **4.13.3.10. PROTECTION OF CONDUITS**

To safeguard against filling up with plaster etc. all the outlet and switch boxes will be provided with temporary covers and plugs within the tendered cost which shall be replaced by sheet/plate covers as required. All screwed and socketed joints shall be made fully water tight by the use of white lead for steel conduits.

#### **4.13.3.11. CLEANING OF CONDUIT RUNS**

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

#### **4.13.3.12. EARTHING**

Continuous earth wire should be provided for all outlets and sub-mains. Earthing terminals shall be provided inside all switch boxes, outlet boxes and draw boxes etc.

#### **4.13.3.13. LAYING OF DUMMY CONDUITS**

The dummy conduits shall be the same as conduits for electrical work and as specified before. The minimum size shall be 25 mm dia. Junction boxes shall be provided at distance not exceeding 10 m. The Contractor must make such modifications as the system designer/manufacture desires in consultation with the Owners. These conduits shall be provided with steel draw boxes of at least 16 SWG.

All telephone conduits shall be at least 300 mm away from electrical conduits.

#### **4.13.3.14. FISH WIRES**

To facilitate drawing of wiring through conduits/G.I. pipes etc., G.I. fish wire of 18 SWG, wherever needed, shall be provided along with recessed conduit/pipes, without any extra cost.

### **4.13.4. WIRING CONDUCTORS**

#### **4.13.4.1. WIRES**

All wires shall have been manufactured in accordance with the relevant latest I.S. specifications. The wires shall be of 1.1 kV grade.

#### **4.13.4.2. BUNCHING OF WIRES**

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

#### **4.13.4.3. JOINTS**

All joints shall be made at main switches, distribution boards, socket outlets, lighting outlets and switch boxes only. No joints shall be made inside circuits and junction boxes.

Conductors shall be continuous from outlet to outlet. Joints where unavoidable, due to any specified reasons, prior permission, in writing shall be obtained from the Architect before the use of such connections.

#### **4.13.4.4. LOAD BALANCING**

Balancing of circuits in three phase installation shall be planned before the commencement of wiring and shall be strictly adhered to.

#### **4.13.4.5. COLOUR CODE OF CONDUCTORS**

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

#### **4.13.5. SWITCHES AND FIXTURES**

##### **4.13.5.1. SWITCHES**

All 6 and 16 amps switches shall be of the modular enclosed type flush mounted 240 Volt AC of the best quality and standard. The switch moving and fixed contacts shall be of silver nickel and silver graphite alloy and contact tips coated with silver. The housing of switches shall be made from high impact resistant, flame retarding and ultra violet stabilized engineering plastic material.

The switch controlling the light point or fan shall be connected on to the phase wire of the circuit.

##### **4.13.5.2. FAN REGULATOR MOUNTING**

All fan regulators shall be fixed inside the switch boxes on grid plates with tapped holes and brass machine screws, leaving ample space at the back and sides for accommodating wires.

##### **4.13.5.3. FLUSH PLATES**

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

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

##### **4.13.5.4. EXTERNALLY OPERATED SWITCHES**

Externally operated switches, shall be of general purpose type, 240 volts of the proper size and rating and shall be provided in weather proof enclosures, complete with weather proof gasketed covers. The MCB's for all externally operated switches shall be separate and of proper rating.

##### **4.13.5.5. WALL SOCKET OUTLETS**

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

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

All the switched and unswitched outlets shall be of the best standard.

The switch controlling the socket outlet shall be on the phase wire of the circuit.

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

The earth terminal of the socket shall be connected to the earth terminal provided inside the box.

#### **4.13.6. POINT WIRING**

##### **4.13.6.1. GENERAL**

The point wiring shall be carried out as per following

- In recessed conduit system, fixing of conduits and including providing and fixing of conduits, bends, junction boxes, wooden/plastic bushes checknuts etc.
- Looping system shall be adopted through-out including supply and drawing of required sizes of wires without damaging the same.
- All flush type accessories will be used.
- The point will be complete with conduit including accessories, point and circuit wires, necessary junction outlet and switch boxes, connector or ceiling roses, switch plates and flush plates, necessary earthing connections etc.
- For the purpose of determining the load per circuit the following rating of points shall be assumed.

Light points	100 Watts.
Convenience plug point	100 Watts.
Fan points	80 Watts.
Exhaust fan points	300 Watts or as specified.
16 amp socket outlet	1000 Watts.
- Lights and fans may be wired on a common circuit. Such circuit shall not have more than a total of ten points of light, fan and socket outlets or a load of 800 Watts whichever is less.
- The rates shall include for cleaning of dust, splashes of colour wash or paints from all fixtures such as fans fittings etc. at the time of taking over of the installation.
- The rate per point shall include all materials and labour required for completing the point as mentioned.

##### **4.13.6.2. LIGHT POINT**

Point wiring in the case of light shall commence from the Distribution Board and terminate at the ceiling rose connector/lamp holder/ceiling box as required including the controlling switch, junction/draw/inspection boxes as necessary alongwith a continuous run of bare copper/GI wire as specified for earthing.

#### **4.13.6.3. CONVENIENCE OUTLET**

The convenience plug points shall be as for light point above and complete with 3 pin 6 Amps socket enclosed in a M.S. box with the controlling switch as required and third pin shall be earthed with bare copper wire as specified.

#### **4.13.6.4. CEILING FANS**

The ceiling fan points shall be as for light point above and complete with ceiling box, recessed fan hook, moulded cover plate and a provision in the M.S. switch box for mounting the fan regulator which shall be earthed with bare copper wire as specified.

#### **4.13.6.5. EXHAUST FANS**

The exhaust fan and regulator point shall be as for light point above and complete with a provision for mounting the regulator in the M.S. switch box. The outlet shall be provided in recessed M.S. box with moulded cover and switch and outlet shall be earthed with bare copper/G.I. wire as specified.

#### **4.13.6.6. POWER OUTLETS**

Wiring for power plugs shall be as for light point above and shall be complete with a 3/6 pin 16 amps socket and 16 Amps controlling switch mounted in a M.S. box with cover. Each circuit shall have a maximum of one power outlet unless otherwise specified. All power outlets shall be provided with bare copper/G.I. earth wire as specified. Separate circuit shall be run with PVC insulated copper conductor wires for each water heater, kitchen equipment, window Air Conditioners and similar locations as shown on drawings.

#### **4.13.7. CIRCUIT WIRING**

The minimum size of PVC insulated copper conductor wires for all circuit wiring for lights, exhaust fans, ceiling fan points and convenience outlets shall be 3/0.036" unless otherwise specified. Circuit wiring shall not be separately measured and paid for. The point wiring rates shall include the cost of providing circuit wiring as required.

#### **4.13.8. MAINS AND SUB-MAINS**

Mains and sub-mains shall consist of wires, cables, conduits, bends, junction boxes, brass bushes, checknuts etc. as specified herein before. The sizes and capacities of the conduits shall be as stated in the Schedule of Quantities and will commence from main switches to various distribution boards. Wires shall be drawn in the concealed or surface conduits as required, without being damaged. For this purpose, draw boxes shall be located at convenient places. Every main and sub-main will run in an independent conduit with an independent earth wire of bare copper wire as specified running along the entire run of conduit. For single phase, one earth wire shall run and for three phase two earth wires shall run. Necessary provision of wire lengths entering and emerging from the conduit must be made for connections.

Measurement will be taken of the actual conduit run containing the wires from one point to the other.

Rates quoted shall include all materials, connections, labour etc. as specified.

## **B MEDIUM VOLTAGE DISTRIBUTION BOARDS**

### **4.13.9. MINIATURE CIRCUIT BREAKERS**

- The MCB's shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz system.
- The MCB's shall have a rupturing capacity of 10 kA at 0.5 p.f.  
The MCB's shall have inverse time delayed thermal overload and instantaneous magnetic short circuit protection. The MCB time current characteristic shall coordinate with H.R.C. fuse/PVC cable characteristic.
- Type test certificates from independent authorities shall be submitted with the tender.

### **4.13.10. Final Distribution Boards**

- Final distribution boards shall be flush mounting, totally enclosed, dust and vermin proof and shall comprise of miniature circuit breakers, earth leakage circuit breakers, neutral link etc as detailed in the schedule of quantities.
- The distribution equipment forming a part of the Distribution Boards shall comply to the relevant Standards and Codes of the Bureau of Indian Standards and as per detailed specifications included in this tender document.
- The board shall be fabricated from 14 gauge CRCA sheet steel and shall have a hinged lockable spring loaded cover. All cutouts and covers shall be provided with synthetic rubber gaskets. The entire construction shall give a IP 54 degree of protection.
- The bus-bar shall be of electrical grade copper having a maximum current density of 1.6 ampere per square mm and PVC insulated throughout the length.
- All the internal connections shall be with either solid copper PVC insulated or copper conductor PVC insulated wires of adequate rating.
- All the internal connections shall be concealed by providing a hinged protective panel to avoid accidental contact with live points.
- All outgoing equipment shall be connected direct to the bus bar on the live side. The equipment shall be mounted on a frame work for easy removal and maintenance.
- The sheet steel work shall undergo a rigorous rust proofing process, two coats of filler oxide primer and final powder coated paint finish.
- All the circuits shall have an independent neutral insulated wire, one per circuit, and shall be numbered and marked as required by the Owners.
- A sample of the completed board is to be got approved by the architects/owners before commencement of supply and erection.

### **4.13.11. SHEET STEEL TREATMENT AND PAINTING**

- Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognized phosphating process. The steel work shall then receive two coats of

oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

- All sheet steel shall after metal treatment be given powder coated finish painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

#### **4.13.12. NAME PLATES AND LABELS**

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

### **C. EARTHING**

#### **4.13.13. GENERAL**

All the non-current carrying metal parts of electrical installation shall be earthed properly. All metal conduits, trunking, cable sheaths, switchgear, distribution fuse boards, light fittings and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system. All earthing shall be in conformity with Indian Electricity Rules.

The Earthing System shall in totally comprise the following:-

- a) Earth Electrodes
- b) Earthing Leads
- c) Earth Conductors

All three phase equipment shall have two separate and distinct body earths and single phase equipment shall have a single body earth.

#### **4.13.14. EARTHING MATERIAL**

Materials of which the protective system is composed shall be resistant to corrosion or be adequately protected against corrosion. The material shall be as specified in the schedule of quantities and shall comply to the following requirements:

a) Galvanised Steel - Galvanised steel used shall be thoroughly protected against corrosion by hot dipped Zinc coating. The material coating shall withstand the test specified in IS 2309:1969.

f) The strips to be used shall be in maximum lengths available as manufactured normally avoiding unnecessary joints.

#### **4.13.15. EARTH ELECTRODES**

##### **PLATE EARTH ELECTRODE**

The electrodes shall be of GI plate of size 600 mm x 600 mm x 6mm. The electrode shall be buried in ground with its face vertical and top not less than 3 metres below ground level.

- **EARTH ELECTRODE PIT**

#### **METHOD OF INSTALLING WATERING ARRANGEMENT**



In the case of plate earth electrode, a watering pipe of 50 mm dia of medium class G.I. Pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided at the top of this pipe for watering the earth. The watering funnel attachment shall be housed in masonry enclosure of not less than 1000 x 500 x 600 mm. A cast iron/M.S. frame with cover having locking arrangement shall be suitably embedded in the masonry enclosure.

#### **LOCATION OF EARTH ELECTRODE**

The following guidelines shall be followed for locating the earth electrodes

An earth electrode shall not be situated less than 5 metres from any building.

The excavations for electrode shall not affect the column footings or foundations of the buildings. In such cases electrode may be further away from the building.

The location of the earth electrode shall be such where the soil has reasonable chance of remaining moist, as far as possible.

Entrances, pavements and road ways shall not be used for locating the earth electrode.

#### **NUMBER OF EARTH ELECTRODES**

In all cases the relevant provision of rule 33, 61 & 67 of the Indian Electricity Rules 1956 as amended shall be complied with.

Metallic covers or supports of all medium or H.T. apparatus or conductors shall, in all cases be connected to not less than two separate and distinct earth electrodes.

#### **4.13.16. EARTHING LEADS**

The strip earthing leads shall be connected to the Earth Electrode at one end and to the metallic body of the main equipment at the other end. The earthing lead shall connect to the earthing network in the installation.

- **EARTHING LEAD SIZES**

Strip earthing leads shall be of GI and as per specifications.

- **EARTHING LEAD INSTALLATION**

The length of buried strip earthing lead shall be not less than 15 metres and shall be buried in trench not less than 0.5 m deep.

If conditions necessitates use of more than one earthing lead they shall be laid as widely distributed as possible preferably in a single straight trench or in a number of trenches radiating from one point.

- **METHOD OF CONNECTING EARTHING LEAD TO EARTH ELECTRODE**

In the case of plate earth electrode the earthing lead shall be securely bolted to the plate with two bolts, nuts, checknuts and washers as required by IS 3043: 1987.

All materials used for connecting the earth lead with electrode shall be GI in case of GI Pipe and GI plate earth electrodes or tinned brass in case of Copper plate electrode.

- **PROTECTION OF EARTHING LEAD**

The earthing lead from electrode onwards shall be suitably protected from mechanical injury and corrosion by a

15 mm dia GI pipe in case of wire and

100/40 mm dia medium class GI Pipe

The portion of the G.I. pipe within ground shall be buried at least 30 cm deep (to be increased to 60 cm in case of road crossing or pavements). The portion within the building shall be recessed in walls and floors to adequate depth.

#### **4.13.17. EARTHING CONDUCTORS**

Earthing conductors shall form the earthing network throughout the installation for earthing of all non- carrying metal parts.

- **CONNECTION OF EARTHING CONDUCTORS**

- a) Main earthing conductors shall be taken from the earth connections at the main switch boards to all other switchboards in the network.
- b) Sub-mains earthing conductors shall run from the main switch board to the sub distribution boards and to the final distribution boards.
- c) Loop earthing conductors shall run from the distribution boards and shall be connected to any point on the main/sub-main earthing conductor, or its distribution board or to an earth leakage circuit breaker.
- d) Metal conduits, cable sheathing and armouring shall be earthed at the ends adjacent to switch boards at which they originate, or otherwise at the commencement of the run by an earthing conductor in effective electrical contact with cable sheathing, Switches, accessories, lighting fitting etc shall be effectively connected to the Loop Earthing Conductors. These though rigidly secured in effective electrical contact with a run of metallic conduit shall not be considered earthed, even though the run of metallic conduit is earthed.

- **EARTHING CONDUCTOR INSTALLATION**

The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in GI pipe of adequate size.

Joints shall be revetted and brazed in approved manner.

Sweated lugs of adequate capacity and size shall be used for termination. Lugs shall be bolted to the equipment body to be earthed after the metal body is cleaned of paint and other oily substances and properly tinned.

- **SIZING OF EARTHING CONDUCTORS**

All fixtures, outlet boxes and junction boxes shall be earthed with 14 SWG copper/ 12 SWG GI wire.

All 3 phase switches and distribution boards upto 60 amps rating shall be earthed with 2 Nos. distinct and independent 4 mm dia copper/6 mm dia GI wires. All 3 phase switches and distribution boards upto 100 amps rating shall be earthed with 2 Nos. distinct and independent 6 mm dia copper/8 mm dia GI wires. All switches, bus bar, ducts and distribution boards of rating 200 amps and above shall be earthed with a minimum of 2 Nos. separate and independent 25 mm x 3 mm copper/25mm x 6 mm GI tape.

#### **4.13.18. PROHIBITED CONNECTIONS**

Neutral conductor, sprinkler pipes, or pipes conveying gas, water, or inflammable liquid, structural steel work, metallic enclosures, metallic conduits and lighting protection system conductors shall not be used as a means of earthing an installation or even as a link in an earthing system.

#### **4.13.19. RESISTANCE TO EARTH**

No earth electrode shall have a greater ohmic resistance than 3 ohms as measured by an approved earth testing apparatus. In rocky soil the resistance may be upto 5 ohms. The electrical resistance measured between earth connection at the main switchboard and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate fuses or circuit breakers, and shall not exceed 1 ohm.

### **D. SPECIAL INSTRUCTIONS TO TENDERERS**

#### **4.13.20. GENERAL**

- Only the preferred makes of material as stipulated shall be accepted.
- Installation of light fittings shall be with the use of two junction boxes placed 600 mm apart for 36/40-watt fixtures and 300 mm apart for 20-watt fixtures. The junction boxes shall form a part of the conduiting and shall be placed in the slab at the time of concreting.
- For any fixtures and fittings required to be fixed to the RCC slab, the Contractor shall drill the required holes with the use of an appropriate drilling machine with drill bits and no extra charges shall be payable on this account.
- The rates quoted shall be for work to be carried out at all heights and levels as at site and no extra payment shall be made for the same.
- The rates quoted for wiring shall be applicable for concealed or surface conduiting as required

#### **4.13.21. CONDUITING**

The rates to be quoted by tenderers shall include any or all of the following. No additional costs shall be paid for tools etc. as required to complete the work.

- All cutting of chassis in brick walls shall be with chase cutting tools.
- Whenever required chases shall be cut in stone walls with a chase cutting machine and with specific tools as required prior to plastering.

#### **4.13.22. POINT WIRING**

- The Point Wiring shall commence from the Distribution Board and shall include the circuit wiring of length as required via the switch to the fitting/socket outlet as called for unless otherwise specified.
- The Circuit Wiring shall be with 2 nos. 1.5 sq mm PVC insulated stranded copper conductor 1.1 kV grade wires in Conduit.
- The rates for all point wiring shall include the supplying and fixing of:
  - a) ISI approved conduits.
  - b) Conduit accessories conforming to IS
  - c) MS draw, inspection and junction boxes.
  - d) Zinc chromate passivated switch boxes, outlet boxes etc.
  - e) All fixing accessories such as clips, brass screws etc.
  - f) Embedding conduits and accessories in walls and floors etc during construction and/or cutting chases and making good as necessary in the case of concealed conduit work and/or

providing and fixing saddles, hangers, stirrups etc. and grouting of the same as required for surface conduiting.

- g) Switches, wiring accessories and moulded cover plate as required.
- h) Bare copper earth wire for fixture, switch, outlet box and third pin of socket outlet to common earth.
- i) All work necessary for wiring a point circuit of any length from the Final Distribution Board to ceiling rose or connector via switch including circuit wiring with 2 x 1.5 sq mm PVC insulated stranded copper conductor 1.1 kV grade wires in conduit as required.
- j) Painting all conduits, outlet boxes and junction boxes.

#### **4.13.23. EXHAUST FAN WIRING**

The wiring shall be as for point wiring above and including provision for a 6 amp shuttered socket outlet located adjacent to the exhaust fan and the controlling 6 amp switch located at the Switch plate position in the room.

#### **4.13.24. GEYSER POINT WIRING**

The wiring shall be as for point wiring above and including provision for 16 amp shuttered socket outlet located adjacent to the Geyser and the controlling 16 amp moulded switch located at the Switch plate position in the room.

#### **4.13.25. SWITCHES, OUTLETS AND ACCESSORIES**

All switches, socket outlets and other accessories shall be approved by the Owners prior to installation. The Contractor shall furnish samples of all materials within 7 days of the award of the work. All switches, socket outlets and other accessories shall be flat modular type.

#### **4.13.26. MAINS AND SUB-MAINS**

The rate for all items shall include:

- a) ISI approved & marked PVC conduits.
- b) Conduit accessories conforming to IS
- c) MS draw, inspection and junction boxes.
- d) Providing and fixing approved saddles, hangers, trays, etc., and grouting the same as required for exposed conduits.
- e) Embedding conduits and accessories in walls and floors etc during construction and/or cutting chases and making good as necessary in the case of concealed conduit work and/or providing and fixing saddles, hangers, stirrups etc. and grouting of the same as required for surface conduiting.
- f) Providing and fixing junction boxes with 3-mm thick Perspex sheet covers including painting covers on inner side to match the colour of the surrounding walls.
- g) Bare copper earth wire for fixture, switch, outlet box and third pin of socket outlet to common earth.
- h) Effecting adequate and proper connections at termination.
- i) Providing all fixing accessories such as clamping devices, nuts, bolts and screws.
- j) Providing sealing compound thimbles, crimping etc., at joints and terminations as called for.

#### **4.13.27. DISTRIBUTION BOARDS**

The rates for the distribution boards apart from the switches, and instruments shall also include:

- a) Supporting rigid steel framework.
- b) Cubicle type 2-mm thick M S sheet enclosure with 1.6 mm thick MS sheet door.
- c) Interconnections.
- d) Proper bonding of earth.
- e) Touching up all damaged paint with one coat of red oxide primer and two finishing coats of approved synthetic enamel paint.
- f) Painting/lettering on switches and distribution boards, the location they serve, providing on each board its circuit diagram.
- g) Termination of incoming cables at the incoming unit in the distribution boards.

#### **4.13.28. EARTHING**

The rates for earthing items include:

- a) All fixing accessories such as brass saddles, brass screws rawl plugs, etc.
- b) Jointing by riveting and soldering after tinning.
- c) Cutting chases holes and making good the same wherever required.
- d) Effecting adequate and proper interconnections.
- e) Use of copper thimbles.
- f) Excavation of earth, refilling, watering and ramming and making good as approved.

#### **4.13.29. FIXING OF LIGHTING FIXTURES**

The rates shall include the following:

- 1. All components that may be required to make the installation complete in all respects such as,
  - a) Suitable length of down rod, hanger and connecting wires where called for. The Down rod shall be paid for separately on a running metre basis.
  - b) Internal wiring between accessories.
  - c) Wiring for connecting the fixtures to the point through connection blocks.
  - d) All metal blocks to serve as base of fixtures.
  - e) Bonding with earth wires.
- 2. Drilling holes in supports where required.
- 3. Fixing clamps, GI bolts and nuts, brass screws, saddles, rawl bolts and other fixing accessories as required.

#### **4.13.30. DRAWINGS**

General Arrangement drawings with constructional details shall be submitted to the Architects for all Distribution Boards etc and their approval obtained prior to commencement of fabrication. Equipment shall not be accepted unless the drawings have been approved by the Architects. These drawings shall be prepared and submitted within one month of the award of work.

#### **4.13.31. WIRES AND CABLES**

All wires and cables used shall be of the approved make. The contractor shall provide a certificate from the manufacturer confirming that all wires and cables supplied to site are of their make, irrespective of whether the wires/cables are purchased from the manufacturer directly or through a dealer.

Payment for wires/cables shall not be made without the manufacturer's certificate being furnished to the owners.

#### **4.13.32. STAGE FURNISHING LIGHTING & AUDIO VISUAL STAGE FURNISHING SYSTEM**

##### **4.13.32.1. CYCLORAMA SCREEN**

It is installed in front of the stage rear wall at a distance of approx. 300mm, where no rear passage is required behind screen. It is constructed out of GI pipe in a welded self-supporting system. Front of the frame is covered with white/off white perforated PVC fabric or Matt white cotton cloth. Cyclorama lights where fixed are directed to fall on this screen.

##### **4.13.32.2. VERTICALLY MOVING LIGHT BAR-MOTORIZED**

Light bars are installed on stage to suspend stage luminaries. Number of luminaries are required to be fixed on the bar at any time. Bar offer the facility to position the luminaries precisely to meet the theatrical requirement. Light bars are to be made from GI steel pipe. It is to be suspended using a minimum of 3 No. of standard steel wire ropes not less than 4 mm. Safe work of load of bar shall be 250 Kg, spread along the length of bar. Arrangement to run box type enclosed cable tray along the length of the bar is to be made. Metal clad 3-pin sockets are to be fixed on the box cable tray. Diverter pulleys to direct steel wire rope should be made of steel or cast iron machined and fitted on ball bearing and shafts. Safety provision should be of highest order. All parts should be Electro Zing Plated or painted to avoid corrosion due to rusting.

##### **4.13.32.3. LIGHT LADDER**

Light ladder is required to suspend stage Luminaries from side of stage. It should have facility to fix C-clamp and safety chain of luminaries. Ladder should be designed so as to permit easy suspension on stage sides. It should be built with Steel channels, sheet metal fabricating parts

##### **4.13.32.4. ELECTRONIC DIMMER RACK**

The dimmer rack should be standard size DIN Rack from CRCA sheet steel painted in two tone good looking colors. The rack should be lockable rear door. The rack should also house Input/Output RFI filters circuits, incomer dimmer distribution MCBs, lamp load terminals, low noise cooling fan, safety micro switch for rear door. All incoming /outgoing cables to enter rack from bottom through removable gland plate. Gland plate should have punched holes for incomer, output light circuits and control circuits.

Dimmer rack should accommodate Dimmer modules and control power supply modules and are to be connected to R,Y,B phase of incoming supply. The power supply module shall supply low voltage DC regulated supply for electronic circuits. Internal wiring of the rack should be done as per I.E rule and IS code of practice, using flexible copper 1.1kV grade wires of appropriate rating. Dimmer should work DMX 512A or Analog signal of 0-10V DC, for control of Dimmer intensity.

#### **4.13.32.5. LIGHT CONTROL CONSOLE**

It should be capable of remotely controlling the electronic dimmers. It should have adequate channels corresponding to number of dimmer used. It should have analog and DMX output.

#### **4.13.32.6. PATCH PANEL**

It is required for connecting/disconnecting luminaires to dimmer outputs. Panel should be of compact wall/floor mounting type, fabricated from sheet steel of not less than 1.6mm CRCA sheet.

#### **4.13.32.7. CABLE TRAY/ WIRE & CABLE**

Cable tray is to be made of 2mm thick steel sheet. Required nut bolts and washers should be supplied for installation. All cables used in wiring should be of annealed copper and PVC insulated, fire retardant and smoke free type.

#### **4.13.32.8. STAGE CONTROL**

This control panel is designed for control of functions, from multiple locations i.e stage, control room etc.

#### **4.13.32.9. STAGE LIGHTING/ SOUND REINFORCEMENT SYSTEM**

Lighting/Sound details as specified in the BOQ and the whole setup be specifically designed for the auditorium as per the requirement of client with proper acoustical and light effects.

### **4.14. FIRE FIGHTING WORKS**

#### **4.14.1. General**

Work under this contract shall be executed as shown on the drawings and given in the specifications; and required at site whether specifically shown or not.

Supplying, installing and commissioning of ABC Powder 10 Kg Fire Extinguisher containing Mono Ammonium Phosphate Powder 50, Stored Pressure Type, Pressure Gauge, fitted with discharge hose, wall mounting bracket etc., Discharge Time less than 15 Secs, Controllable discharge mechanism, Range minimum 4 Meters, applicable on Class A,B,C and electrically started Fire, A Rating- 8A, B Rating 34B, Can Construction : Deep drawn & Co2 Mig welded, Valve Construction : Forging & Machining, Internal Coating of Can : Epoxy Powder coating, External Coating of Can : Epoxy Polyester Powder coating, Sheet metal thickness : 1.60MM, ISI approved as per IS:15683:2006

#### **4.14.1.1. INITIATING DEVICES**

- a. All automatic fire detectors shall be interchangeable without requiring different mounting bases or alterations in the signal panel.
- b. Fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
- c. The detector shall be provided with Dip switches / rotatory switches to provide necessary address to detector.
- d. Each detector shall use the minimum of power, for economic circuits, so that it shall have capacity to connect at least 159 detectors and 159 monitor and control module including isolator module in one loop.
- e. Each detector shall incorporate indicator "LED" at the detector which shall blink during normal condition and light up on actuation of the detector to locate the detector which is operated. The detector shall not be affected by the failure of the response indicator lamp. The LED shall be give 360o view from all possible points. Any other sequence of operation of LED of detector as per NFPA standards is acceptable.
- f. The detector shall be vibration and shock proof. When disassembling for cleaning purposes, its components must not be damaged by static over voltage.
- g. The detector shall so designed as to be practically immune to environmental criteria such as air currents, humidity, temperature fluctuations, and pressure and shall not trigger false alarm, due to the above conditions.
- h. An alarm release shall not effect a detector's functioning. After resetting the alarm, the detector shall resume operation without any readjustment.
- i. Detectors shall be designed for adaptability to humid locations. No performance deterioration shall be acceptable.
- j. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
- k. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof features.
- l. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

#### **4.14.1.2. Addressable Multi-Sensor Detectors**

- a. The multi-sensor smoke detector shall be combination of photoelectric and thermal sensing technology designed to reduce the possibility of false alarm. The detector shall have an inbuilt microprocessor that processes the alarm data and adjust the alarm sensitivity automatically according to environment, without the need of operator action or control panel programming. The detector shall be capable of work in Heat only alarm mode and ignore smoke alarm when given a command from control panel. The detector communications shall have remote test feature in form of inbuilt test switch and can tested extremely by giving command from control panel. The detector communications shall allow the detector to provide alarm input to the system and alarm output from the system within 3 seconds. Detectors shall be programmable as application specific, selected in software for



different environmental fire profiles. These fire profiles shall eliminate the possibility of false indications caused by dust, moisture rise, obscuration rate changes and hot/cold smoke phenomenon into the alarm decision to give the earliest possible real alarm condition report. The intelligent smoke detector shall have three distinct outputs from the control panel. The output shall be from an input of smoke obscuration, a thermal condition or a combination of obscuration and thermal conditions. The detector shall be designed to eliminate calibration errors associated with field cleaning of the chamber. The detector shall support the use of a relay, or LED remote indicator. The detector shall be provided with Dip switches/rotatory switches to provide necessary address to detector. The electronic method of addressing is also acceptable. The detector shall be listed for velocity range 0-1200 mtrs per minute with thermal sensitivity at 57oC. It shall be sealed against back pressure.

#### **4.14.1.3. Addressable Heat Detector (Fixed Temp Cum Rate of Rise):**

- a. Thermal detector shall be rated at 57oC/68oC fixed temperature and 8.3 to 9.4 degree per minute rate-of-rise. Detectors shall be constructed to compensate for the thermal lag inherent in conventional type detectors due to the thermal mass, and alarm at the set point of 57oC/68oC. The choice of alarm reporting as a fixed temperature detector or a combination of fixed and rate-of-rise shall be made in system software and be changeable at any time without the necessity of hardware replacement. An alternate solution can be considered to achieve feature of fixed temperature or rate of rise, based on merit for selection. The detector shall be provided with Dip switches/rotatory switches to provide necessary address to detector. The electronic method of addressing is also acceptable. It shall be sealed against back pressure. The detector shall have remote test feature in form of inbuilt test switch and can be tested externally by giving command from control panel.

#### **4.14.1.4. Addressable Laser Smoke Detector: For Supply ducts**

- a. The intelligent laser photo smoke detector shall be a spot type detector that incorporates an extremely bright laser diode and an integral lens that focuses the light beam to a very small volume near a receiving photo sensor. The scattering of smoke particles shall activate the photo sensor.
- b. The laser detector shall have conductive plastic so that dust accumulation is reduced significantly.
- c. The intelligent laser photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.03 percent per foot.
- d. The laser detector shall not require expensive conduit, special fittings or PVC pipe.
- e. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.

#### **4.14.1.5. Detector Bases**

- a. Detector bases shall be low profile twist-lock type with screw clamp terminals and self-wiping contacts.
- b. The base shall be universal for all detectors.

#### **4.14.1.6. Addressable Manual Call Points: At stairs**

- a. Flush or surface mounted as required. Manual call points shall contain the intelligence for reporting address, identity, alarm and trouble to the fire alarm control panel. The manual call point communications shall allow the station to provide alarm input to the system and alarm output from the system within less than 4 seconds. The manual call point shall be equipped with terminal strip and pressure style screw terminals for the connection of field wiring. Surface mounted call points shall be mounted using a Manufacturer's prescribed matching red enamel outlet box. The MCP shall be designed so that after actual emergency operation, they cannot be restored to use a key operated test-reset lock, and normal use except by the use of a key. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger. Provision shall be made to test the MCP without operation of notification appliances in case of testing. The MCP shall be installed not less than 42 inches, or more than 48 inches above the finished floor unless otherwise specified by applicable building codes. The detector shall be provided with Dip switches / rotary switches to provide necessary address to detector. The electronic method of addressing is also acceptable.
- b. Operation: Pushing IN and then pulling down on the handle causes it to latch in activated position with word activated/relevant word to appear in front panel at top of handle.

#### **4.15. INTERFACE DEVICES:**

The modules / relays shall be installed within one meter of Plant need to be supervised or / and control. The module shall be provided with necessary LED to indicate when it is in normal position and when it is activated. The wiring required from module to Plant shall be in scope of Contractor. The module required for system shall include but not limited to:

##### **4.15.1. Addressable Control Module**

Shall be provided to supervise and control notification appliances including directional sounders and visual strobe. The 24 V power supply shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply. Each module shall be provided with two nos dip/rotatory switches to assign a address to module. The electronic method of addressing is also acceptable. The electronic method of addressing is also acceptable.

##### **4.15.2. Addressable Control Relay Module**

Shall provide the system with dry contact output for activating AHU tripping and gas suppression system of server room. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires. Each module shall be provided with two nos dip/rotatory switches to assign a address to module. The electronic method of addressing is also acceptable. The module shall be suitable for mounting on North American 2 1/2 " (64 mm) deep 2-gang boxes and 1 1/2" (38 mm) deep 4" square boxes with 2-gang covers, or European 100 mm square boxes.

#### 4.15.3. Isolator Module

Shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A circuit or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section. The isolator module shall not require address-setting, and its operation shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

##### • Circuits

- a. Initiating Device Circuits: Initiating device circuits monitoring manual fire alarm stations, smoke and heat detectors, water flow switches and fire pump functions shall be Class A.
- b. Notification Appliance Circuits: All notification appliance circuit shall be Class A.
- c. Signaling Line Circuits: The signaling line circuit connecting to addressable/analog devices including, detectors, monitor modules, control modules, and isolation modules shall be Class A (style 6).
- d. The signaling line circuit connecting to the audio communications (pre-amp signal), amplifiers, and nodes shall be Class A (style 6).
- e. The signaling line circuit connecting to the two-way communications circuit (riser) shall be Class A (style 6).

#### 4.16. Power Supply: Power Supply Source:

At least two independent and reliable power supply shall be provided, one primary and one secondary, each of which shall be of adequate capacity for application.

- a. Primary Power Supply: A dedicated branch circuit from power supply source with independent MCB shall be provided near to control panel. The circuit shall be mechanically protected by means of conduit. The power supply shall be rated for 230 VAC +/-5%, and shall provide sufficient power to panel.
- b. Secondary supply: It shall be in the form of storage batteries of sufficient capacity and rating to operate fire alarm system.
- c. The power supply shall be capable of operating the system under quiescent condition (non alarm condition) for minimum of 24 hours and then shall be capable of operating the system during fire condition for a period of 15 minutes at maximum connected load.
- d. The power supply shall be capable of operating the system under quiescent condition (non alarm condition) for minimum of 24 hours and shall be capable of operation the system during fire supervisory condition for period of 10 minutes at maximum connected load.

##### • Cable and Wirings

- a. All wiring from Fire Alarm Control Panel (FACP) to fire detection & alarm devices, wiring from fire control panel to network repeater panel and in between network repeater panels shall be Fire Survival Armoured cable of 600/1000V with class-2 annealed copper conductor. Should have cross linkable Halogen Free insulation with special Glass Mica (Fire barrier) tape

as per BS: 7846:2009. Inner & outer sheath should be low Smoke Zero Halogen as per BS:7846:2009 Should meet Fire resistance/survival test as per clause 26.2e of BS 5839-1 for Enhanced Fire Resisting cables when tested in accordance to BS 8434-2 (CWZ test on one sample @ 9500C & not on separate sample)

- b. Wiring for signal line circuits shall be 1.5 mm<sup>2</sup> minimum and subject to the circuit load.
- c. Wiring for Notification Appliances circuits shall be 1.5 mm<sup>2</sup> minimum and subject to the circuit load.
- d. Wiring for speaker circuits shall 1.5mm<sup>2</sup> minimum and subject to the circuit load.
- e. Wiring for telephone circuits shall be 1.5 mm<sup>2</sup> minimum and subject to the circuit load.

- **Execution**

Install the system in accordance with the Manufacturer's installation instruction manual. Examine the areas to receive the work and the conditions under which the Work would be performed. Identify conditions detrimental to the proper and timely completion of the Work.

- a. All wiring for the System shall be in accordance with applicable Standards.
- b. All splices shall be made using solder less connectors. All connectors shall be installed in conformance with the Manufacturer recommendations.
- c. Crip – on type spade lugs shall be used for terminations of stranded conductors to binder screw or stud type terminals. Spade lugs shall have upset legs and insulation sleeves sized for the conductors. Wherever possible use screw less terminals of wire termination at device in order to reduce the chances of loose connections and bad workmanship.

#### 4.17. Demonstration & Training

Contractor shall instruct Employer for complete operation of the system. Training sessions shall be presented by a fully qualified, trained representative of Contractor who is thoroughly knowledgeable of the specific installation. Instruction shall include, but not be limited to, activation and restoration of the following:

- Smoke detectors, ceiling mounted, aspiration detectors, duct type detectors.
  - Water-flow and valve tamper switch zones.
  - Operation of the Fire Command Panel including all annunciation, status indication, one-way and two-way voice communication systems and interpretation of all signals and readouts at the command Panel.
- Initiating all systems inquiry and system status reports.
- Replacing fuses at FACP and NRP locations.
  - Operation and resetting procedures for all types of initiating and output devices.
  - Routine checks and maintenance of system.

#### Approved List of Makes

S.no	Item	Manufacturer
1.	Fire Alarm Control Panel	Notifier (Onyx Series)/ Ansul /Gamewell IFC
2.	Network Repeater Panel	Notifier (Onyx Series)/ Ansul /Gamewell IFC
3.	Mimic Panel	Notifier (Onyx Series)/ Ansul

		/Gamewell IFC
4.	Network Control Station with Graphics	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
5.	Multi-Sensor Smoke Detectors	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
6.	Laser Detectors	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
7.	ROR Heat Detectors	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
8.	Manual Call Point	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
9.	Directional Sounder	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
10.	Hooter cum visual strobes	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
11.	Wall Mounted /Ceiling Type Speakers	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
12.	Fire Fighter Telephone Hand Set	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
13.	Monitor Module/ Isolator Module	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC
14.	Fire Survival cable	Notifier(Onyx Series)/ Ansul / XLS-3000 ( Eclipse)/ Gamewell IFC

#### **NOTES**

1. Mixing of two phases in one conduit is not permitted.
2. Pull Boxes shall be provided after every 8-10 M conduit run & every tow bends.
3. Flexible coupling shall be used wherever conduit crosses through expansion joint
4. The following colour code shall be adopted  
Phase : Red/Yellow/Blue  
Neutral : Black
5. No joints in wires/cables shall be permitted.
6. Electrical driven chase cutting machine shall be used for cutting chase in brick work for conduit laying. No manual hand cutting shall be allowed. Nothing extra shall be paid for this.
7. Test certificates for wires & conduits shall be submitted along with the material supplies in addition to above random test for wires & conduits (at least one for each) shall be carried out at Contractors risk & cost

#### **4.18. LIST OF APPROVED MAKES OF MATERIAL**

The material shall conform to the latest BSB standards or in absence of these standards, to the equivalent IS codes. These materials must be cost effective as compared to imported materials of certified quality standards. A list of approved makes of material is mentioned in the tender or in absence of these brands, the equivalent brands with approval of EIC.

**I. PLUMBING MATERIALS**

Sl. No.	Materials	Approved Brands
<b>1</b>	Pipes	
a.	GI	Bansal Skipper
b.	HDPE (potable water)	Arpan, Berlia, Dura-Line, Jain, Ajaplas, Supreme, Drukpipe, Umex
c.	DWC HDPE	
d.	PPR	Umex
e.	CPVC (potable water)	Raksha, Astral, Ori-plast
f.	u-PVC (potable water)	Jain, Skipper-Bansal, Ori-plast
g.	u-PVC(SWR)	Bansal Utkarsh, SFMC, Astral Ultradrain, B-sure, Skipper-Bansal, Ori-plast
h.	Ductile Iron (DI)	Jindal Saw, Electrosteel
i.	M.S pipes (tubular)	Bansal Skipper
<b>2</b>	Pipe Fittings ( <i>Union, Socket, Elbow, Tee, Plug, Bend, Tank nipple, Barrel nipple, Flanges</i> )	
a.	GI	NVR
b.	HDPE	Ajaplas, Duraline, Supreme
c.	PPR	
d.	CPVC	Raksha, Astral
e.	DI	Electrosteel
<b>3</b>	Valves & Cocks	
a.	Bibcocks, Stopcocks, Pushcocks, Lift cocks, Gate valves, Float valves, Non- return valves, etc.	PIC, Essco
<b>4</b>	Sanitary Appliances	
a.	Sinks, Wash basins, WC pans, Cistern, Urinals, Bath tubs, Bidets, etc.	
B	Bathroom fittings (Bib taps, pillar taps, concealed Valves and angle stop valves)	Jal, Jalangi, Gold Star
<b>5</b>	Water Storage Tanks	
a.	Water storage tanks	Ori-Plast

**II. ELECTRICAL MATERIALS**

Sl. No.	Materials	Approved Brands
<b>1</b>	LAMPS	
a.	Incandescent/GLS lamps	

b.	Fluorescent tube light	
c.	CFLs	
2	LUMINARIES/FIXTURES	
a.	Outdoor lighting/Indoor Lighting	
3	SWITCHES, SOCKETS & WIRING ACCESSORIES	
		Kolors(Krest, Kraze, Kubik, .kom), System, Newlike, Tinsel, Logus(Millon), Indoasian,CPL-Synchro, CPL-Flirt
4	WIRES & CABLES	
a.	Domestic wires (0.5 sq.mm to 10 sq.mm, 1100V grade)	Emgee, Royal Cables, Mescab, Anchor by Panasonic, Homeflex, ATC, KEI, Richa, V-guard, RR Kabel, Paradise, Kolors, System, Pointer, Juvas, Finolex
b.	LT Power cables (2.5 sq.mm to 600 sq.mm)	Mescab, ATC, KEI, V-guard, RR Kabel, Paradise, System, Richa
5	LV SWITCHGEARS	
a.	MCB	Geco, Kolor(Kwiktrip),C&S Electric, Anchor by Panasonic, Indoasian
b.	RCCB/ELCB/RCBO	Geco, C&S Electric, Anchor by Panasonic, Indoasian
c.	Distribution Board	C&S Electric
d.	Isolators	Geco, Kolor(Kwiktrip), C&S Electric, Anchor by Panasonic, Indoasian
e.	Control Panels(LT)	JD Electrical
6	FANS	
a.	Celing/exhaust/pedestal/wall/table fans	V-guard, Anchor by Panasonic(ceiling fan only), system(ceiling fan only), Berlia(Ceiling fans only)
7	ELECTRIC WATER HEATERS	
a.		Venus, V-Guard, Racold, System, Berlia, Atlantic
8	PVC CASING CAPPING & FITTINGS	
a.		Richa
9	PVC CONDUIT & FITTINGS	
a.		Richa
10	HDPE PIPES AND FITTINGS	

A	DWC HDPE pipes and fittings	
11	ELECTRICAL EARTHING	
		Gee Slab

### III. OTHER MATERIALS

S.N o.	Materials	Approved Brands
1	Reinforcement Steel	
a.	Fe 415	KARMA TMX
b.	Fe 500	PELDEN TMX TMT, Electrosteel, PERFECT TMX TMT
2	Roofing Sheet /Tiles/Tubular pipes( <i>This is in addition to the locally available materials</i> )	
a.	CGI	Aarti Suraksha (0.60mm and above)
	Aluminium roofing sheet	
b.	Pre-painted galvanized steel sheets (Colour Roof)	Durakolor, Galvacolor, CRIL, METASHIELD(coil), Dyna Roof (0.60mm and above)
c.	Fiber-cement Roofing tiles	SHERA
3	Flooring and Wall Tiles	
	Tiles (floor, wall, bath, etc )	SOMANY, Johnson, Endura, Marbonite, AGL
4	Bitumen/Emulsion	
a.	Cationic Emulsion	Bhubit (Bhutan Bitumen Industries)
5	Bricks/Hollow Blocks & Others	
a.	Interlocking Cement Earth Block	E3 (Druk Soednam Enterprise)
b.	Solid/hollow blocks	<p>A.Bhutan Concrete Bricks</p> <ol style="list-style-type: none"> <li>1. Solid (240x115x53)</li> <li>2. 2 Hole porous (230x110x70)</li> <li>3. Hollow(390x90x190)</li> </ol> <p>B.Yang Building Materials (Solid bricks- 240x120x74)</p> <p>c. Biltech-ACE-AAC (Aerated)-625x250x100-300</p> <p>D.Bhutan Concrete Bricks (Phuntsholing) - 240x114x80</p> <p>E. Yangjung Sonam Bricks (Gelephu)</p> <ol style="list-style-type: none"> <li>1.solid bricks-16"x8"x4" &amp; 16"x8"x8"</li> <li>2. hollow blocks- 16"x8"x4 &amp; 16"x8"x6"</li> </ol>



6	Boards/Ply	
a.	Fiber- Cement boards/ply/wood	SHERA
b.	Plywood/block board, Decorative laminates and Veneers	Archidply, Archidstar/Archidlam, Archidgold
7	Cements	
a.	33 Grade	Penden Ordinary
b.	43 Grade	Penden Supreme, Dungsam cement, Druk Cement
c.	PSC	Penden Special, Dungsam Cement
d.	PPC	Penden premium, Dungsam Cement
e.	OPC 53	
8	<b>Integral Water proofing compound for cement mortar, concrete and concrete admixtures</b>	
9	<b>M.S Wires and Mesh</b>	Tata Wiron, Gabions & Gabion Materess (Zn and Zn+PVC coated), Terramesh, Green Terramesh (Maccaferri)
10	<b>Adhesives for use with ceramic tiles and mosaics</b>	Dendrite (Denseal & yamapoxy)
11	<b>High Strength Geo-synthetics for Soil Reinforcement</b>	Paralink and Paraweb (Maccaferri)

*SECTION - V*

*SCHEDULE*

## SECTION V: SCHEDULE 'A' - SUMMARY INFORMATION WITH REFERENCE TO CONDITIONS OF CONTRACT

1.	Department	The Indian Embassy, Thimphu
2.	Name of work	<b>RENOVATION AND MODERNIZATION OF THE AUDITORIUM BUILDING WITH ACOUSTIC TREATMENT, CONTROL ROOM, FLOORING, LIGHTING AND SOUND SYSTEM, CONSTRUCTION OF PUBLIC TOILET AT INDIA HOUSE, JUNGSHINA, THIMPHU</b>
3.	Earnest Money	Rs. / Nu. 2,20,000/- (Two Lakh Twenty Thousand only) in the form of Demand Draft in favour of "Embassy of India", Thimphu payable at Embassy of India, Thimphu or irrevocable Bank Guarantee as per <b>SECTION - VI.</b>
4.	Performance Security	5% (five percent) of the Contract Price in the form of Bank Guarantee within 15 days of receipt of notification of award but not later than the date of the signing of the agreement <b>(Clause 3.10)</b>
5.	Retention Money/ Security deposit	5% of value of work done.
6.	Accepting Authority	The Ambassador of India , Indian Embassy, Thimphu
7.	Deviation Limit	This is an item rate contract. All Items would not attract any deviation limit & the quoted rate shall apply for all variations.
8.	Percentage in cost of material and labour to cover all overheads and profits.	15%
9.	Standard Schedule of rates for determining rates for additional/alterd /substituted items during the period of execution	Bhutan Schedule of Rates prevailing at the time of award of work.
10.	Specification to be followed	Specifications for Building and Road Works,; MoWHS, Royal Govt. of Bhutan, Thimphu., National Building Code of India & DSR 2016
11.	Minimum qualification and experience required for technical representative of contractor.	Graduate Engineer with minimum of 03(Three) year relevant experience or Diploma holder with 05(Five) years' experience.
12.	Basis of determination of labour	Bhutan Schedule of Analysis or as specified in the

	and consumption of quantities of materials.	contract or as directed by Engineer-in-Charge in that order.
13.	Defects liability period	6 (Six) months reckoned after the date of issue of final certificate of completion of work.
14.	Date of commencement	Within 15(fifteen) days from the date of issue of the Letter of Award.
15.	Time of Completion	<b>4 (Four) months</b> reckoned from 15 <sup>th</sup> day of issue of the Letter of Award
16.	Liquidated damage	1% of contract value per week of delay upto a maximum of 10% of contract value
17.	Value of work for interim payments	Minimum 10% of contract price.
18.	Periodic of submission of interim payments.	1 month after submission of previous bill.
19.	Deduction income tax at source	2% or as applicable as per Income Tax Act applicable under rules of RGoB
20.	Validity of tender (Section-II Para 2.16)	120 days from the date of opening of Bid
21.	Minimum amount of third party insurance	<p>i) Damages to property of third parties including neighboring buildings etc, for an amount of Nu. 10 (ten) Lacs.</p> <p>ii) Damages to the third parties including the employers staff, visitors, neighbors and other passers-by against any claim due, limited to 10 (ten) occurrences of maximum of Nu. 5 (five) lacs each.</p>
22.	Taxes	<p>i) The Royal Government of Bhutan shall exempt taxes, levis/duties for plant, construction materials &amp; equipment, machineries and services imported for direct use in the construction of the Project. Any procurement made under tax exemption basis shall be liable for tax payment as per the Tax Act of the Kingdom of Bhutan if disposed off in Bhutan.</p> <p>ii) The Government of India shall exempt from central excise duty any material/equipment exported to Bhutan for the Project. The contractor shall avail exemption of central excise duty at source for materials/equipment brought to the project.</p> <p>iii) The Royal Government of Bhutan shall receive</p>

		royalty from the contractor for the timber boulders, aggregates and other construction materials required from Bhutan for the work.
23.	Operation & Maintenance	Period of Maintenance is for <b>6 (Six) months</b> calculated from the date of commissioning of the Works, certified by the Engineer-in-Charge

*SECTION - VI*  
*APPENDIX (FORMS)*

## SECTION – VI: APPENDIX (FORMS)

### Form No. 1. PROFORMA FOR SUBMISSION OF TECHNICAL BID

To,

**Second Secretary & HOC**

**EMBASSY OF INDIA**

PO Box: 193, Jungshina, Thimphu

**Subject: RENOVATION AND MODERNIZATION OF THE AUDITORIUM BUILDING WITH ACOUSTIC TREATMENT, CONTROL ROOM, FLOORING, LIGHTING AND SOUND SYSTEM, CONSTRUCTION OF PUBLIC TOILET AT INDIA HOUSE, JUNGSHINA, THIMPHU**

Sir,

1. We have read and examined the following documents relating to the above tender (Tender No. ....), visited the project site and verified the existing conditions as they relate to the tender submitted herein:

#### **Conditions of Contract**

- a. Notice Inviting Tender
- b. Instruction to bidders
- c. General conditions of contract
- d. General Technical specifications
- e. Schedules
- f. Appendix (forms)
- g. Model rules for Health & Sanitation
- h. Contractor's labour regulations
- i. Safety Precautions

#### **Bill of Quantities**

**BOQ for RENOVATION AND MODERNIZATION OF THE AUDITORIUM BUILDING WITH ACOUSTIC TREATMENT, CONTROL ROOM, FLOORING, LIGHTING AND SOUND SYSTEM, CONSTRUCTION OF PUBLIC TOILET AT INDIA HOUSE, JUNGSHINA, THIMPHU**

2. We hereby tender for the execution of the works referred to in the aforesaid documents upon the terms and conditions contained or referred to therein and in accordance with, in all respects, the specifications and designs and other relevant details, quantities at the rates contained in the schedule of quantities and within the period of completion as stipulated.
3. The tender fee for the amount of Nu./Rs. \_\_\_\_\_ towards the purchase of tender document in the form of \_\_\_\_\_ is enclosed.
4. Earnest Money Deposit & Validity of Bid  
We hereby tender the E.M.D. of Rs./Nu. 2,20,000/- (Two lakh and twenty thousand only), in the form provided by you, which will bear no interest. We agree to abide by this Tender for

a period of 120 (One hundred twenty) days from the date of bid opening. It shall remain binding upon us as may be accepted by you at any time before the expiration of this period. We undertake, if our Tender is accepted, to commence the works within 15 days of your order to commence. We also agree that the above-mentioned EMD may be forfeited by you in the event of our failure to abide by any of the terms set out in tender document (or failure to commence the work within 15(fifteen) days from the date of issue of the Letter of Award).

5. We agree to complete and handover the whole of the works comprised in the Contract within 4 (four) months, calculated from the 15th day after the issue of the letter of Award.
6. Unless and until an agreement is prepared and executed, this Bid, together with your written acceptance thereof, shall constitute a binding Contract between us.
7. We confirm that after acceptance of our Tender, we shall sign the Agreement/ Contract documents within 15 (Fifteen) days of the issuance of the Letter of Award. Expenses for the execution of the Contract Document including the cost of stamp papers, duty (if any) and other fees/ levies, etc., required to be paid shall be borne by us.
8. We acknowledge and accept that you are not responsible for and shall not defray any expenses incurred by us in visiting the site or in submitting this Tender.
9. We acknowledge and accept that you have unfettered right to reject any or all the Tenders, or to accept any Tender received by you, at your sole discretion, without assigning any reason whatsoever therefor.
10. We acknowledge and accept all liabilities to pay sales tax/ works contract tax/ VAT, GST/ service tax, toll tax, education cess, labour welfare cess, excise duty, octroi, royalty, import/ export duties, or any other tax, duty, levy on material, labour, fuel, transportation, etc. already in force or likely to be levied by the Government/ RGOB Authorities during the currency of the Contract including the extended period of the Contract and the Defects Liability Period, and you shall not entertain any claim whatsoever in that respect. The rates quoted by us are all inclusive, firm and final.
11. We acknowledge and accept that all temporary site works shall be provided by us at our own cost and nothing separate is payable by you on this account. We also agree to dismantle all such temporary works, clear debris, clean the site and hand over the clear site to you at the time of the issue of the completion certificate.
12. We promise to indemnify (through Indemnity Bond on non-judicial stamp paper) and keep you indemnified in respect of all taxes, duties (including customs and excise) and all other costs & expenses to be borne and paid by us under the Contract and pay for any permits required for the works. We will also insure the Whole Work and take out Comprehensive All-risk Policy (including Third Party) and Insurances under the Workmen's Compensation Act in respect of any claim, if any, against you arising out of the



performance of this Contract or otherwise/ whatsoever upto the completion of the Defects Liability Period.

13. If our Bid is accepted, We will undertake full responsibility of the works and, we will furnish a performance security in the form of a bank guarantee to be jointly and severally bound with us in an amount of 5 (five) percent of the above named sum in accordance with the Conditions of Contract.
14. We confirm that our payment for the works is acceptable to us in Indian Rupees (INR)/ Ngultrum or as may be decided by you.
15. We understand that you are not bound to accept the lowest or any Bid you may receive.

Date \_\_\_\_\_

Signature \_\_\_\_\_  
in the capacity of \_\_\_\_\_

Witness;

1. \_\_\_\_\_  
Address and Occupation  
\_\_\_\_\_  
\_\_\_\_\_

2. \_\_\_\_\_  
Address and Occupation  
\_\_\_\_\_  
\_\_\_\_\_

**Form No. 2. PROFORMA FOR SUBMISSION OF FINANCIAL BID**

To,

**Second Secretary & HOC**

**EMBASSY OF INDIA**

PO Box: 193, Jungshina, Thimphu

**Subject: RENOVATION AND MODERNIZATION OF THE AUDITORIUM BUILDING WITH  
ACOUSTIC TREATMENT, CONTROL ROOM, FLOORING, LIGHTING AND SOUND  
SYSTEM, CONSTRUCTION OF PUBLIC TOILET AT INDIA HOUSE, JUNGSHINA, THIMPHU**

Sir,

1. With reference to the Bidding Documents, Tender No. \_\_\_\_\_ dated \_\_\_\_\_, we the undersigned, having examined the Drawings, Conditions of Contract, Specifications and Bill of Quantities for the execution of the above named works offer to execute and complete the whole of the said works in conformity with the approved Construction Drawings, Conditions of Contract, Specifications and Bill of Quantities given in the Bidding Documents at the rates mentioned in the Bill of Quantities with a total cost of Nu / Rs..... (Nu / Rs. .... ) only (Total Bid Price both in figures and words) as ascertained in accordance with the said Bill of Quantities.
2. We understand that you are not bound to accept the lowest or any Bid you may receive.

Date \_\_\_\_\_

Signature \_\_\_\_\_  
in the capacity of \_\_\_\_\_  
duly authorized to sign on behalf of \_\_\_\_\_

Witness;

1. \_\_\_\_\_  
Address and Occupation  
\_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
Address and Occupation  
\_\_\_\_\_  
\_\_\_\_\_

**Form No. 3.                      Details of Similar Works**

**Assignment No.**

<b>Name of Work</b>	
<b>Name of the Client</b>	
<b>Contact Details of Client</b>	
<b>Cost of project in Rs.</b>	
<b>Commencement of Date</b>	
<b>Scheduled date of Completion</b>	
<b>Actual Completion Date</b>	
<b>Reason for Delay, if any</b>	
<b>Details of Services provided by the firm</b>	
<b>Key Professionals involved in the Study and their proposed position</b>	

We hereby certify the information as given in below in table is correct and we have attached Client Completion Certificates in support of list of works given as above.

**Signature of Bidder**

**Date**

**Place**

**Form No. 4. Turnover Details****Name of firm:**

Sr. No.	Financial Year	Turnover (In Lakh Rs./Nu.)
1.	2015-2016	-
2.	2016-2017	-
3.	2017-2018	-
	Avg. Annual Turnover	-

**Certificate from the Statutory Auditor**

This is to certify that..... (Name of the Applicant) has received the payments shown above against the respective years on account of professional fees.

Name of the audit firm:

Seal of the audit firm

Date:

(Signature, name and designation of the authorized signatory)

In case the Applicant does not have a statutory auditor, it shall provide the certificate from its chartered accountant that ordinarily audits the annual accounts of the Applicant.

**Form No. 5. FORM OF BANKER'S CERTIFICATE FROM A SCHEDULED BANK**

This is to certify that to the best of our knowledge and information M/s/ Shri/ Smt. .... having marginally noted address, a customer of our bank are/ is respectable and can be treated as good for any engagement up to a limit of Rs..... (Rupees.....).

This certificate is issued on the request of Second Secretary & HOC, EMBASSY OF INDIA, Jungshina, Thimphu for purpose of bidding for Tender No.....dated.....

(Signature) For the Bank

Note:

- I. Banker's certificates should be on letter head of the bank
- II. In case of partnership firm, certificate to include names of all partners as recorded with the bank.

.....

**OR**

**Form of working capital certificate from a scheduled bank**

Certified that M/s/ Shri / Smt.....S/o/W/o ..... And resident(s) of ..... has/ have been maintaining a savings bank account/ current account/ fixed deposit account with this branch of bank since ..... and an amount not less than Rs..... (Rupees ..... ) has been available to the credit in his/ her/ their account No. .... for the last six months.

This certificate is issued on the request of Second Secretary & HOC, EMBASSY OF INDIA, Jungshina, Thimphu for purpose of bidding for Tender No.....dated.....

(Signature) For the Bank

Note:

- I. Banker's certificates should be on letter head of the bank
- II. In case of partnership firm, certificate to include names of all partners as recorded with the bank.

**Form No. 6. List of Key Professionals Available**

**Name of Firm:**

<b>Sr. No.</b>	<b>Name</b>	<b>Education qualification</b>	<b>Total Experience in years</b>	<b>Years with firm</b>	<b>Summary of Professional Experience</b>

**CVs of Persons as in above list is attached**

**Signature of Bidder**

**Date**

**Place**

## Form No. 7. PROFORMA FOR AGREEMENT

[Note; This Performa is included in the Bidding Documents only for the information of Bidders. Only the successful Bidder shall, in due course, be required to fill this Proforma].

THIS AGREEMENT MADE the \_\_\_\_\_ day of \_\_\_\_\_ BETWEEN The Indian Embassy (THE INDIAN EMBASSY, THIMPHU) \_\_\_\_\_ of (Mailing address of THE INDIAN EMBASSY, THIMPHU) \_\_\_\_\_ (hereinafter called “the THE INDIAN EMBASSY, THIMPHU”) of the one part and (Name of Contractor) \_\_\_\_\_ of (Mailing address of Contractor) \_\_\_\_\_ (hereinafter called “the Contractor”) of the other part.

WHEREAS the INDIAN EMBASSY, THIMPHU is desirous that “Construction of Water Treatment Plant for Project Colony at Pheyta Kha”.

(here-in after referred to as “the Work”) should be executed by the Contractor AND WHEREAS by a Letter of Award No. \_\_\_\_\_ dated \_\_\_\_\_ THE INDIAN EMBASSY, THIMPHU has accepted a Bid by the Contractor for the execution and completion of such Works AND WHEREAS the Contractor has agreed to undertake such work and furnish a performance security/bond pursuant to the Clause 2.37 of the section ‘Instructions to Bidders.’

NOW THIS AGREEMENT WITNESSETH as follows;

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them in the conditions of Contract hereinafter referred to.

2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz;

- a) The Agreement
- b) The Letter of Award
- c) Corrigendum/Amendments if any
- d) Documents furnished by bidder
- e) Notice Inviting Tender (NIT)
- f) Instructions to Bidders
- g) General Conditions of the Contract
- h) General Technical Specifications
- i) Schedule
- j) Appendix
- k) Model rules for health and sanitary arrangements for contractor’s workmen
- l) Contractor’s labour regulations
- m) Safety Precautions

- n) Bill of Quantities
- o) Drawings
- p) Any other documents as forming part of the contract

3. The aforesaid documents shall be taken as complementary and mutually explanatory of one another.

4. In consideration of the payment to be made by THE INDIAN EMBASSY, THIMPHU to the Contractor as hereinafter mentioned, the Contractor hereby covenants with THE INDIAN EMBASSY ,THIMPHU to execute and complete the Works in conformity, in all respects, with the provisions of the Contract.

5. THE INDIAN EMBASSY ,THIMPHU hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein the Contract Price or such other sum as may become payable under the provisions of the contract at the time and in the manner prescribed by the Contract.

IN WITNESS whereof the parties hereto have caused their respective common Seals to be hereunto affixed (or have hereunto set their respective hands and Seals) the day and year first above written.

#### SIGNED, SEALED AND DELIVERED

By the said

\_\_\_\_\_

NAME \_\_\_\_\_

on behalf of the Contractor

in the presence of:

\_\_\_\_\_

NAME \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

By the said

\_\_\_\_\_

NAME \_\_\_\_\_

on behalf of the THE INDIAN EMBASSY  
,THIMPHU

in the presence of;

\_\_\_\_\_

NAME \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_



**Form No. 8.        PROFORMA FOR BANK GUARANTEE FOR PERFORMANCE SECURITY**  
**(ON A NON-JUDICIAL STAMP PAPER OF THE REQUISITE VALUE)**

**To**

**Second Secretary & HOC**  
**EMBASSY OF INDIA**

**PO Box: 193, Jungshina, Thimphu**

WHEREAS (Name and Address of Contractor) \_\_\_\_\_ (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. \_\_\_\_\_ dated \_\_\_\_\_ to execute (Name of Contract and Brief Description of Works) \_\_\_\_\_ (hereinafter called "the Contract").

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of Rs./Nu. \_\_\_\_\_ (Amount of Guarantee) (in words) to be inserted by the Guarantor, representing the percentage of the Contract Price, specified in the Contract, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of Rs./Nu. \_\_\_\_\_ (Amount of Guarantee) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee is valid until the date of 30 days after issuing of the Maintenance Certificate.

**SIGNATURE AND SEAL OF THE GUARANTOR**

Name of Bank

Address

Date

Note; The Bidders are not required to fill this Performa.

**Form No. 9.      PROFORMA FOR BANK GUARANTEE FOR BID SECURITY**

**To**

**Second Secretary & HOC**

**EMBASSY OF INDIA**

**PO Box: 193, Jungshina, Thimphu**

WHEREAS, (Name of Bidder) \_\_\_\_\_ (hereinafter called "the BIDDER") has submitted his bid dated ( \_\_\_\_\_ for the construction of (Name of Contract) \_\_\_\_\_ (hereinafter called "the Bid")).

KNOW ALL MEN by these presents that we (Name of Bank) \_\_\_\_\_ of (Name of Country) \_\_\_\_\_ having our registered office at \_\_\_\_\_ (hereinafter called "the Bank") are bound Unto the The Indian Embassy in the sum of \_\_\_\_\_ for which payment well and truly to be made to the THE INDIAN EMBASSY ,THIMPHU the Bank binds himself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this \_\_\_\_\_ day of \_\_\_\_\_.

THE CONDITIONS of this obligation are;

- i) If the Bidder withdraws his Bid during the period or bid validity specified in the Proforma of Bid; or
- ii) If the Bidder having been notified of the acceptance of his Bid by THE INDIAN EMBASSY, THIMPHU during the period of bid validity;
  - a) fails or refuses to execute the Performa of Agreement in accordance with the Instructions to Bidders, if required; or
  - b) fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders,
  - c) does not accept the correction of its Bid Price pursuant to ITB Sub-Clause-2.31.

We undertake to pay to THE INDIAN EMBASSY, THIMPHU upto the above amount upon receipt of its first written demand, provided that in its demand THE INDIAN EMBASSY, THIMPHU will note that amount claimed by it is due to it owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date 120 days after the closing date for submission of bids as stated in the Invitation to Bid or as extended by you at any time prior to this date, notice of which extension to the Bank being hereby waived, and any demand in respect thereof should reach the Bank not later than the above date.

DATE .....

SIGNATURE OF THE BANK .....

WITNESS .....

SEAL .....

(Signature, Name and Address)

**Form No. 10.      PROFORMA FOR BANK GUARANTEE FOR MOBILISATION ADVANCE**  
**(ON A NON-JUDICIAL STAMP PAPER OF THE REQUISITE VALUE).**

In consideration of The Indian Embassy (THE INDIAN EMBASSY ,THIMPHU ) (which expression shall unless repugnant to the subject or context include its administrators, successors and assigns), (hereinafter called the "Principal") having agreed to make advance payment to (Name and full address of the Contractor) \_\_\_\_\_ (hereinafter called "the Contractor(s)", (which expression shall unless repugnant to the subject or context or meaning thereof include its successors, administrator, executors and permitted assigns), whose bid for (Name of the Contract ) \_\_\_\_\_ has been accepted and to whom the acceptance of the bid has been communicated by a Letter of Award and who is required to execute a formal agreement on conditions of production of a Bank Guarantee for Rs..... (Both in figures and words) \_\_\_\_\_ we, the \_\_\_\_\_ Bank Limited (Bank of Bhutan or any scheduled Bank of Bhutan) hereinafter referred to as "the Bank") do hereby undertake promise and guarantee payment to the Principal on demand all the amounts advanced by the Principal to the said Contractor.

2. The Bank further agrees that;

- a) The Principal shall have the fullest liberty without affecting in any way the liability of the Bank under the Guarantee or Indemnity, from time to time, to vary any of the terms and conditions of the said Contract or to extend time for performance by the said Contractor or to postpone for any time and from time to time any of the powers exercisable by it against the said Contractor and either to enforce or forbear from enforcing any of the terms and conditions governing the said Contract or the securities available to the Principal and the Bank shall not be released from its liability under these presents by any exercise by the Principal of the Liberty with reference to the matters aforesaid or by reason of time being given to the said Contractor or any other forbearance, act or omission on the part of the Principal or any indulgence by the Principal to the said Contractor or of any other matter or thing whatsoever which under the law relating to sureties would but for this provision have the effect of a releasing the Bank from its such liability.
- b) These presents shall be governed by and constructed in accordance with Bhutanese laws.
- c) The Bank hereby declares that it has the power to issue this Guarantee and the undersigned has full power to do so.
- d) It shall not be necessary for the Principal to proceed against the Contractor before proceeding against the Bank and the Guarantee herein contained shall be enforceable against the Bank, notwithstanding any other security which the Principal may have obtained or obtain from the Contractor, shall at the time when proceedings are taken against the Bank hereunder, be outstanding or unrealized.

- e) The Guarantee herein contained shall remain in full force and effect, during the period that would be taken for the performance of the terms and conditions of the said Contract, Letter of Award and the Agreement which is to be executed as aforesaid and that it shall continue to be enforceable until all the dues of the Principal have been duly paid and its claims satisfied and discharged and till the Principal discharges the Guarantee in writing or until \_\_\_\_\_ whichever is earlier.
- 3 The Bank lastly undertakes not to revoke this Guarantee until all the dues of the Principal have been duly paid except with the previous consent of the Principal in writing.

Dated the \_\_\_\_\_ Day of \_\_\_\_\_ 2016

Here affix the Common Seal of the  
Bank for \_\_\_\_\_ Bank Ltd.

Note: The Bidders are not required to fill this Proforma.

## **Form No. 11. PRE-CONTRACT INTEGRITY PACT**

*Note: This Proforma is included in the Bidding Documents for information of Bidders and shall be signed by successful Bidder when the work(s) is awarded. Signing authorities will be the head of the client (agency) or the authorized representative of the bidder.*

### **1. General**

Whereas The Indian Embassy hereinafter referred to as the Employer on one part and the..... (Name of Bidder) as the other parts hereby execute this agreement as follows.

### **2. Objectives**

Now, therefore, the Employer and the Bidder agree to enter into this pre-contract agreement, hereinafter referred to as Integrity Pact, to avoid all forms of corruption by following a system that is fair, transparent and free from any influence/unprejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to:-

- 2.1 Enabling the Employer to obtain the desired works at a reasonable and competitive price in conformity with the defined specifications of the goods and services;
- 2.2 Enabling bidders to abstain from bribing or any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also refrain from bribing and other corrupt practices and the Employer will commit to prevent corruption, in any form by their officials by following transparent procedures.

### **3. Commitments of the Employer:**

The Employer Commits itself to the following:-

- 3.1. The Employer undertakes that no official of the Employer, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favor or any material or immaterial benefit or any other advantage from the Bidder, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the Contract.
- 3.2. The Employer will, during the pre-contract stage, treat all Bidders alike, and will provide to all Bidders the same information and will not provide any such information to any particular Bidder which could afford an advantage to that particular Bidder in comparison to other Bidders.
- 3.3. All the officials of the Employer will report to the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.
- 3.4. In case of any such preceding misconduct on the part of such official(s) is reported by the Bidder to the Employer with full and verifiable facts and the same is prima facie found to be correct by the Employer, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the Employer and such a person shall be debarred from further dealings related to the contract process. In such a case while an enquiry is being conducted by the Employer, the proceedings under the contract would not be stalled.

#### **4. Commitments of Bidders**

The Bidder commits himself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of his bid or during any pre-contract or post contract stage in order to secure the contract or in furtherance to secure it and in particular commits himself to the following:-

- 4.1. The Bidder will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favor, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Employer, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the Contract.
- 4.2. The Bidder further undertakes that he has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favor, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the Employer or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the Contract or any other contract with the Government for showing or forbearing to show favor or disfavor to any person in relation to the Contract or any other contract with the Government.
- 4.3. The Bidder will not collude with other parties interested in the contract to preclude the competitive bid price, impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.
- 4.4. The Bidder, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the Employer or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.
- 4.5. The Bidder commits to refrain from giving any complaint direct or through any other manner without supporting it with full and verifiable facts.
- 4.6. The Bidder shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.

#### **5. Previous Transgression**

- 5.1. The Bidder declares that no previous transgression occurred in the last three years immediately, with any other Employer in respect of any corrupt practices envisaged hereunder that could justify bidder's exclusion from the tender process.
- 5.2. If the Bidder makes incorrect statement on this subject, Bidder can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

#### **6. Sanctions**

- 6.1. The provisions regarding Sanctions for violation of the Integrity Pact include forfeiture of Performance Bond incase the Employer decides to forfeit the same without assigning any reason for imposing sanction for violation of Integrity Pact.

#### **7 Sanctions for Violation**

Any breach of the aforesaid provisions by the Employer shall face administrative charges and penal actions as per the existing relevant rules and laws. The breach of the Pact by the Bidder or any one employed by him or acting on his behalf (whether with or without the knowledge of the Bidder) or the commission of any offence by the Bidder or any one employed by him or acting on his behalf,

shall be dealt with as per the provisions of the Bhutan Penal Code 2004, and the Anti-Corruption Act, 2006. The Employer / relevant agency shall also take all or any one of the following actions, wherever required:-

- 7.1 To immediately call off the pre-contract negotiations without assigning any reason or giving any compensation to the Bidder. However, the proceedings with the other Bidder(s) would continue.
- 7.2 The Earnest Money / Security Deposit / Performance Bond shall stand forfeited.
- 7.3 To immediately cancel the contract, if already awarded / signed, without giving any compensation to the Bidder.
- 7.4 To recover all sums already paid by the Employer.
- 7.5 To encash the advance bank guarantee and performance bond / warranty bond, if furnished by the Bidder, in order to recover the payments, already made by the Employer, along with interest.
- 7.6 To cancel all or any other Contracts with the Bidder.
- 7.7 To debar the Bidder from entering into any bid from the government of Bhutan as per the Debarment clause of the Procurement Manual.

## **8. Conflict of Interest**

- 8.1 A conflict of interest involves a conflict between the public duty and private interest (for favor or vengeance) of a public official, in which the public official has private interest which could improperly influence the performance of their official duties and responsibilities. Conflict of Interest would arise in a situation when any concerned members of both the parties are related either directly or indirectly, or has any association or had any confrontation. Thus, conflict of interest of any official of the Employer must be declared in the prescribed form attached.
- 8.2 The Bidder shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the Employer, and if he does so, the Employer shall be entitled forthwith to rescind the Contract and all other contracts with the Bidder.

## **9 Examination of Books of Accounts**

- 9.1 In case of any allegation of violation of any provisions of this Integrity Pact or payment of commission, the Employer or its agencies shall be entitled to examine the Book of Accounts of the Bidder and the Bidder shall provide necessary information of the relevant financial documents and shall extend all possible help for the purpose of such examination.

## **10 Monitoring and Arbitration**

- 10.1 The Procurement Division of the Ministry of Finance be responsible for monitoring and arbitration of IP.

## **11 Legal Actions**

- 11.1 The actions stipulated in the Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.



**12     Validity**

- 12.1    The validity of this Integrity Pact shall be from the date of its signing and extend up to the complete execution of the contract to the satisfaction of both the Employer and the Bidder, whichever is later.
- 12.2    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.

The parties hereby sign this Integrity Pact at \_\_\_\_\_ on \_\_\_\_\_

**EMPLOYER**

**BIDDER**

Witness:

Witness:

1. \_\_\_\_\_

1. \_\_\_\_\_

2. \_\_\_\_\_     *(Legal Officer)*

2. \_\_\_\_\_

*SECTION –VII*

*MODEL RULES FOR HEALTH AND SANITARY ARRANGEMENTS FOR CONTRACTOR'S  
WORKMEN*

## SECTION –VII: MODEL RULES FOR HEALTH AND SANITARY ARRANGEMENTS FOR CONTRACTOR’S WORKMEN

### 7.1. Application

These rules shall apply to all construction work under the charge of the Indian Embassy, Thimphu.

### 7.2. Definitions

- (a) “Work place” /or work site means a place at which, at an average 50 or more workers are employed, in connection with construction work.
- (b) “Large work place” or large work site means a place at which at an average 500 or more workers are employed in connection with construction work.

### 7.3. First Aid

- (a) At every work place, there shall be maintained in a readily accessible place first aid appliance including an adequate supply of sterilized dressings and sterilized cotton wool. The appliances shall be placed in good order and in a large work place and they shall be placed under the charge of a responsible person who shall be readily available during working hours.
- (b) At large work places, where hospital facilities are not available within easy distance of the work, First Aid posts shall be established and run by trained Compounders.
- (c) Where large work places are remote from regular hospitals, an indoor ward shall be provided with one bed for every 250 employees.
- (d) Where large work places are situated in cities/towns or in their suburbs and no beds are considered necessary owing to the proximity of city or town hospitals, suitable transport will be provided to facilitate removal of emergent cases to the hospitals. At other work places, some conveyance facilities such as car shall be kept readily available to take injured persons(s) or person(s) suddenly taken seriously ill, to the nearest hospital.

### 7.4. Drinking Water

- (a) 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.
- (b) 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.
- (c) Every water supply storage shall be at distance of not less than 15 meters from latrine, drain or any other source of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap door which shall be dust and water proof.
- (d) 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 in a month.

### **7.5. Washing and Bathing Places**

- (a) Adequate washing and bathing places shall be provided, separately for men & women.
- (b) Such places shall be kept in a clean and drained condition.

### **7.6. Latrines and Urinals**

There shall be provided within the precincts of every work place adequate number of latrines and urinals in an accessible place. If women are employed, separate urinals and latrines shall be provided for them. All those shall be cleaned regularly and kept in a good sanitary condition.

### **7.7. 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 approved by the local health officer or Engineer-in-Charge. Alternatively, excreta may be disposed of by putting a layer of night soil at the bottom of pucca tank prepared for the purpose and covering it with a 150mm layer of waste or refuse and then covering it up with a layer of earth for a fortnight (when it will turn into manure).

### **7.8. Provision of Shelter for Rest.**

At every work place there shall be provided free of cost, for the use of labour, two suitable sheds, and one for meals and other for rest.

### **7.9. Crèches**

At every work place, at which 50 or more women workers are ordinarily employed, there shall be provided a crèche for the use of children, belonging to such women.

### **7.10. Canteen**

A cooked food canteen on a moderate scale shall be provided for the benefit of workers wherever it is considered expedient.

*SECTION –VIII*

*CONTRACTOR’S LABOUR REGULATIONS*

## SECTION –VIII: CONTRACTOR’S LABOUR REGULATIONS

### 8.1. SHORT TITLE

These regulations may be called the “The Indian Embassy Thimphu, Contractor’s Labour Regulations”.

### 8.2. DEFINITIONS

In these regulations, unless otherwise expressed or indicated, the following words and expressions shall have the meaning hereby assigned to them respectively;

- I) “Labour” means workers employed by the Indian Embassy, Thimphu Contractor directly or indirectly through a sub-contractor or other persons or by an agent on his behalf but will not include supervisory staff like section officer, etc.
- II) “Fair Wage” means wage whether for time or piece work notified at the time of inviting tenders for the work and where such wages have not been so notified, the wages prescribed by the Indian Embassy for the area in which the work is done. Such wages will not be less than the minimum wages fixed by the Royal Government of Bhutan for that class of employees engaged on the same type of work in the same area.
- III) “Contractor” shall include every person whether a sub-contractor or head-man or agent, employing Labour on the work taken on contract.

### 8.3. DISPLAY OF NOTICE REGARDING WAGES, ETC.

The Contractor shall

- a) Before he commences his work on Contract, display and correctly maintain and continue to display and correctly maintain in a clean and legible condition in conspicuous place on the Work, notices in English and in Hindi and Local languages spoken by the majority of the workers, giving the rate of wages which have been certified by the Engineer-in-Charges as fair wage and the hours of work for which such wage are earned.
- b) Normally working hours of a worker should not exceed 9 (nine) hours a day. The working day shall be so arranged that inclusive of interval for rest, if any, it shall not spread over more than 12 hours on any day.

### 8.4. PAYMENTS OF WAGES

- I) Wages due to every worker shall be paid to him directly.
- II) Arrears claimed after 3 months after the completion of the Work shall not be entertained.
- III) All wages shall be paid in current coin/ currency.

### 8.5. FIXATION OF WAGE PERIODS

- I) The Contractor shall fix the wage periods in respect of which the wages shall be payable.
- II) No wage period shall exceed one month.
- III) Wages of every worker employed on the Contract shall be paid;
  - a) In the case of establishment for whom wage period is one week, within 3 days from the end of the wage period and

- b) In the case of other establishment before the expiry of the 7th day and 10th day from the end of the wage period for the number of workers employed in such establishment not exceeding 1000 and exceeding 1000 respectively.
- IV) When the employment to any worker is terminated by or on behalf of the Contractor, the wages earned by him shall be paid before the expiry of the day succeeding the one on which his employment is terminated.
- V) All payments of wages shall be made on a working day except when the work is completed before the expiry of the wage period in which case final payment shall be made within 48 hours of the last working date at work site and during the working time.

#### **8.6. WAGE BOOK AND WAGE SLIPS ETC**

- i. The Contractor shall maintain a Wage Book of each worker in such forms as may be convenient at the place of works, but the same shall include the following particulars:
  - a) Name of the worker
  - b) Rate of daily or monthly wages.
  - c) Nature of work on which employed.
  - d) Total number of days worked during each wage period.
  - e) Dates and periods for which work overtime.
  - f) Gross wages payable for the work during each wage period.
  - g) All deduction made from the wage with an indication in each case of the ground on account of which the deduction is made.
  - h) Wages actually paid for each wage period.
  - i) Signature or thumb impression of the workers.
- ii. The Contractor shall also issue a wage slip containing the aforesaid particulars to each worker employed by him on the work at least a day prior to the day of disbursement of wages.
- iii. The Contractor shall issue an employment card in the prescribed Form-I (attached) to each worker on the day of work or entry into his employment.
- iv. The Contractor shall issue an attendance cum wage card as per Form-II to each worker on the day of entry into his employment.

#### **8.7. REGISTER OF UNPAID WAGES**

- The Contractor shall maintain a register of unpaid wages in such form as may be convenient at the place of work but the same should include the following particulars.
- a) Full particulars of the workers whose wages have not been paid.
  - b) Reference number of the muster roll and wage register.
  - c) Rate of Wages.
  - d) Wage period.
  - e) Total amount not paid.
  - f) Reasons for not making payment.
  - g) How the amount of unpaid wages was utilized.
  - h) Acquaintance with dates.

### **8.8. REGISTER OF ACCIDENTS**

The Contractor shall maintain a register of accidents in such form as may be convenient at the work place, but the same should include the following particulars;

- a) Full particulars of the worker(S) 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 earnings capacity and disability assessed by medical officer.
- k) Compensation required to be paid.
- 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.

### **8.9. FINES AND DEDUCTIONS WHICH MAY BE FROM WAGES**

- i. The wages of a worker shall be paid to him without any deductions of any kind except the following;
  - a) Fines
  - b) Deductions for absence from duty i.e. from the place or the places where by the terms of 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 good 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 for advance or for adjustment for over payment of wages, advances granted shall be entered in a register.
  - e) Any other deductions which the Indian Embassy, Thimphu may from time to time allow.
- ii. No fine should be imposed on any worker save in respect of such acts and omissions on his part as have been approved of by the Engineer-in-Charge.
- 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.

### **8.10. REGISTER OF FINES ETC.**

The Contractor shall maintain a register of fines and a register of deductions for damage or loss in Form Nos. III & IV respectively which should be kept at the places of work.



The Contractor shall maintain both in English and in the local Languages, a list approved by the Engineer-in-Charge clearly stating the acts and omissions for which penalty or fine may be imposed on a workman and display it in a good condition in a conspicuous place on the work.

#### **8.11. PRESERVATION OF REGISTER**

The wage book, the wage slips, register of unpaid wages, the register of accidents, the register of fines, deduction required to be maintained under these regulations shall be preserved for 12 months after the date of last entry made in them and shall be made available for inspection by the Engineer-in-Charge, Labour officer or any other officer authorized by the Indian Embassy, Thimphu in this behalf.

#### **8.12. POWERS OF LABOUR WELFARE OFFICERS TO MAKE INVESTIGATION OR ENQUIRY.**

The Labour Welfare Officer or any other persons authorized by the Indian Embassy, Thimphu on it behalf shall have power to make enquiries with a view to ascertaining and enforcing due and proper observance of the fair wage clauses and the provisions of these regulations. He shall investigate into any complaint regarding the default made by the Contractor or sub-contractor in regard to such provision.

#### **8.13. REPORT OF LABOUR WELFARE OFFICER**

The Labour welfare officer or other persons authorized as aforesaid shall submit a report or result of his investigation or enquiry to the Engineer-in-Charge indicating the extent, if any, to which the default has been committed, with a note that necessary deductions from the Contractor's bill be made and the wages and other dues be paid to the worker(s) concerned. In case an appeal is made by the Contractor under para 4.14 of these regulations, actual payment to worker(s) will be made by the Engineer-in-Charge or authorized agent after the Indian Embassy, Thimphu has given its decision on such appeal. The Engineer-in-Charge shall arrange payments to the Labourers concerned within 45 days from the receipt of the report from the Labour Welfare Officer.

#### **8.14. APPEAL AGAINST THE DECISION OF LABOUR WELFARE OFFICER**

Any person aggrieved by decision and recommendations of the Labour Welfare Officer or other person so authorized may appeal such decision to the Engineer-in-Charge, within 30 days from the date of decision. The decision of the Engineer-in-Charge shall be final and binding upon the Contractor.

#### **8.15. INSPECTION OF BOOK AND SLIPS**

The Contractor shall allow inspection of the wage books and the wage slips, register of unpaid wages, register of accidents, the register of fines and deductions to any of his workers or to his agent at convenient time and place after due notice is received or to the Labour Welfare Officer or any other persons, authorized by the Engineer-in-Charge on his behalf.

#### **8.16. SUBMISSION OF RETURNS**

The Contractor shall submit periodical returns as may be specified from time to time.

#### **8.17. AMENDMENTS**

The Indian Embassy, Thimphu may from time to time add to or amend the regulations and on any question as to the application, interpretation or effect of those regulations the decision of the Engineer-in-Charge or of his authorized representative shall be final.

**Form No. 12. EMPLOYMENT CARD REGULATION**

Name & Sex of the worker.

Age or date of birth.

Father's name

Identification marks.

(Particulars of next of kin wife and children, if any, or of dependent next to kin in case the worker has no wife or child)

Name .....

Full address of dependents

(Specify village, district, state and Country).

Sl. No.	Name and address of employer (Specify whether a contractor or Sub-contractor	Particulars of location work site and description of work done	Total period for which the worker is employed (From .. to .....)	Actual number of days worked	Leave taken (Number of days should be Specified).
1	2	3	4	5	6

**FORM – 12 (Contd.)**

**(BACK SIDE OF THE CARD)**

Nature of work done by the workers.	Wage Period	Wage rate (with particulars of unit in case of piece work)	Total wage earned by the worker during the period Shown under column (5)	Remarks	Signature of the employer
7	8	9	10	11	12

**Form No. 13. ATTENDANCE-CUM-WAGE CARD**

Card No. ....

Name of Contractor .....

Name of work .....

Name of worker .....

Address .....

Designation .....

Rates of wages .....

-----			
Dates	Attendance	Signature of person marking attendance	REMARKS
-----			
1			
2			
3			
4			
5			
etc.			
-----			

(ON THE BACK SIDE OF CARD)

Wage period	Date on which Overtime	Gross wage payable	Deductions if any.	Actual wages paid.	Date of payment	Signature of the Worker.
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**Form No. 14. REGISTER OF FINES**

Sl. No.	Name	Father's/ Husband's Name	Sex	Department	Nature & Date of the offence for which fine imposed	Whether workmen showed cause against fine or not, if so, enter date.	Rate of wages	Date and amount of fine Imposed.	Date on which fine Realized.	Remarks
1	2	3	4	5	6	7	8	9	10	11

**Form No. 15. REGISTER OF DEDUCTIONS FOR DAMAGES OR LOSS REGULATION**

Sl. No.	Name	Father's/ Husband's Name	Sex	Department	Damage or loss caused with date	Whether worker showed cause against deduction if so, enter date.	Date of amount of deduction imposed.	Number of installments if any.	Date on which total amount Realized.	Remarks
1	2	3	4	5	6	7	8	9	10	11



*SECTION- IX*  
*SAFETY PRECAUTIONS*

## SECTION- IX: SAFETY PRECAUTIONS

- 9.1. Suitable scaffolds shall 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 workman shall be engaged for holding the ladder. If the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 0.25 to 1 (0.25 horizontal and 1 vertical).
- 9.2. Scaffolding or staging more than 3.6 m above the ground or erected floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise secured at least 0.9 m 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 the materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the structure.
- 9.3. Working platform, gangways and stairways shall be so constructed that they do not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 m above ground level or floor level, they shall be closely boarded, and shall have adequate width and shall be suitably fastened as described in Para 2 above or as required and directed by Engineer-in-Charge.
- 9.4. Every opening in the floor of a structure or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 0.9 m. Employees working on steep slopes or otherwise subject to possible falls from levels not protected by guardrails or safety nets, shall be secured by safety belts and lifelines.
- 9.5. 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 9.0m in length while the width between side rails in hung ladder shall, in no case, be less than 28cm. for ladder upto and including 3.0m in length. For longer ladders, this width shall be increased at least by 6mm for each additional 30 cm of length. Uniform step spacing shall not exceed 30 cm. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the Sites of Work shall be so stacked or placed as to cause danger or inconvenience to any person or the public.
- 9.6. All trenches, 1.2m or more in depth, shall, at all times, be supplied with atleast one ladder for each 30 meters length of fraction thereof. Ladder shall be extended from bottom of the trench to at least 0.9m above the surface of the ground. The sides of the trenches which are 1.5m 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 to collapse. The excavated materials shall not be placed within 1.5m of the edges of the trench or half of the depth by the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.
- 9.7. Before any demolition work is commenced and also during the process of the Work:
  - i) All roads and open areas adjacent to the Site shall either be closed or suitably protected.
  - ii) No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain 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 structure shall be overloaded with debris or materials as to render it unsafe.
- 9.8.** All necessary personal safety equipment as considered adequate by the Engineer-in-Charge shall be kept available for the use of the persons employed on the Site and maintained in conditions suitable for immediate use, and the Contractor shall take adequate steps to ensure proper use of equipment by those concerned.
- i) Workers employed on mixing asphaltic materials, cement mortar and cement concrete shall be provided with protective footwear and protective goggles.
  - ii) Those engaged in mixing or stacking of cement bags or any materials which is injurious to eyes shall be provided with protective goggles.
  - iii) Those engaged in welding works shall be provided with welder's protective eye shields.
  - iv) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
  - v) The Contractor shall not employ any person below the age of 18 years. Whenever a person above the age of 18 years is employed on the work of lead painting, the following precautions shall be taken:-
    - i) No paint containing lead, sulphate of lead or products containing their pigments shall be used except in the form of paste or readymade paint.
    - ii) Suitable face masks shall be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
    - iii) Overalls shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of Work.
    - iv) Measures shall be taken, whenever required, in order to prevent danger arising from the application of a paint in the form of spray.
    - v) Measures shall be taken, whenever practicable, to prevent danger arising out form dust caused by dry rubbing down and scrapping.
    - vi) Suitable arrangements 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 a medical officer appointed by the competent authority of the Indian Embassy.
    - viii) The Indian Embassy, when necessary, shall arrange for 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.
  - vi) The Contractor shall observe all safety precautions to control the noise on all Sites and also provide all workmen deployed in the affected areas with the necessary equipment for safety against noise.

- 9.9.** When the Work is done near any place where there is risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision shall be made for prompt first aid treatment of all injuries likely to be sustained during the course of the Work.
- 9.10.** Use of hoisting machines and shackle including their attachments, anchorage and supports shall conform to the following standards or conditions;
- i) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defect and shall be kept in good working order.
  - ii) 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.
  - iii) Every crane driver or hoisting appliance operator shall be properly qualified for his job.
  - iv) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or a means of suspension, the safe working load shall be ascertained by adequate means. Every hoisting machine and all gears referred to above shall be plainly marked with the safe working load.
  - v) In case of hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing. The capacity of the hoisting machines shall be periodically checked.
  - vi) The Contractor shall notify the safe working load of the machines to the Engineer-in-Charge whenever he brings any machinery to Site of work and get it verified by the Engineer-in-Charge or his representative.
- 9.11.** Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards. Hoisting appliances shall be provided with such means as shall reduce to the minimum, the risk of any part of a suspended load becoming accidentally displaced. When workmen are employed on or near electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boot, as may be necessary, shall be provided. The workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.
- 9.12.** All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe conditions and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near place of Work.
- 9.13.** These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place on the Site. The person responsible for compliance of the safety code shall be named therein by the Contractor.

- 9.14.** 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 the Engineer-in-Charge.
- 9.15.** The Contractor shall at all times exercise reasonable and proper precautions for the safety of the people on the Works and shall comply with the provisions of current safety laws and building and construction codes as may be applicable. All machinery and equipment and other sources of physical hazards shall be properly guarded.
- 9.16.** The Contractor shall provide all necessary fencing and lights to protect the public from accidents and shall be bound to bear all the expenses of defense of every suit, action and 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 costs which may be awarded in any such suit, action and proceedings to any such persons or which may, with the consent of the Contractor, be paid to compromise any claim by any person.
- 9.17.** About his employees, the Contractor shall ensure as follows:
- i) Each employee shall be provided initial indoctrination regarding safety by the Contractor so as to enable him to conduct his Work in a safe manner.
  - ii) No employee shall be given a new assignment of work unfamiliar to him without proper introduction as to the hazardous incident thereto, both to himself and his fellow employees.
  - iii) Under no circumstances shall an employee hurry or take unnecessary chances when working under hazardous conditions.
  - iv) Employees shall not leave naked fires unattended. Adequate firefighting equipment shall be provided at crucial locations.
  - v) Employees under the influence of any intoxicating beverage, even to the slightest degree, shall not be permitted to remain on Work.
  - vi) There shall be a suitable arrangement on every Site for rendering prompt and sufficient first aid to the injured under the guidance of the Medical Officer.
  - vii) The stair cases and passage ways shall be adequately lighted.
  - viii) The employees, when working around moving machinery, shall not be permitted to wear loose garments. Safety shoes are recommended when working in shops or places where materials or tools are likely to fall. Only experienced workers shall be permitted to go behind guard rails or to clean around energized or moving equipment.
  - ix) The employees shall use the standard protection equipment intended before and after it is used.
- 9.18.** The following precautions shall be taken for fire prevention:
- i) All construction areas and storage yards shall be kept clean and well arranged.

- ii) A clear space of 15 meters around the outer boundary of saw mill and lumber storage area may be provided. All lumber shall be stored in section with fire breaks with a distance of 15 meters between consecutive sections.
- iii) All combustible waste material, wood scaling and soiled rag etc. shall be removed daily and burnt in suitable burning areas. The saw mill and lumber yard shall be kept free from accumulation of combustible debris.
- iv) Fire, welding, flame cutting shall in general not permitted in combustible areas. Fires and open flame devices shall not be left unattended.
- v) Smoking shall be prohibited in all fire prone areas, flammable material storages viz. carpentry, paint shops, garages, service stations etc. "No smoking" signs shall be pasted on all such areas.
- vi) Accumulations of flammable liquids on floors, walkways etc. should prohibited. All spills of flammable liquids shall be cleaned up immediately.
- vii) Smoke pipes from Diesel Engines passing through roof of combustible material e.g. in compressor stations on various Sites shall be insulated by asbestos. All joints of smoke pipe shall be riveted, welded or otherwise securely fastened together and supported to prevent accidental displacement or separation. The joints shall not be leaky.
- viii) Flammable liquids, lubricants etc. shall be handled and transported in safety containers and drums which can be kept tightly capped.
- ix) Storage of fuels and other flammable materials and liquids shall be set not less than 100 m away from the Works and permanent installations. All storage installations and tanks conform to the regulations set out in relevant Indian Standards.
- x) Petrol or other flammable liquids with a flash point below 100 degrees Centigrade shall not be used for cleaning purposes.
- xi) Oxygen cylinders shall not be stored with combustible materials.
- xii) All electric installation shall be properly earthed. Repairs shall not be made on electrical circuits until the circuit has been de-energized.

**9.19.** The following firefighting arrangements shall be made by the Contractor:

- i) Fire extinguishers and fire buckets, painted red, shall be provided at all fire hazardous locations viz. Batching and Mixing Plant, Winch houses, Workshops, store yards, Saw-mill, Switch Gear Room, Compressor Stations, Officer establishments etc. The extinguishers shall be inspected, serviced and maintained in accordance with manufacturer's instructions. The inspection shall be evidenced by notations on tag attached to the extinguisher.
- ii) Full reliance shall never be placed on portable hand extinguishers as all of these have a very limited capacity. Water, in ample quantity and under adequate pressure, shall always be available for fire fighting.
- iii) All staff shall be conversant with the use of all types of fire extinguishing apparatus.

**9.20.** When any work is carried on, which is likely to affect the security or stability of an installation or structure or any part thereof and endanger any person employed, all practicable precautions shall be

taken by shoring or otherwise to prevent collapse of structure or fall of any part thereof and thus remove the cause of danger to such structures and the persons employed.

- 9.21.** For person engaged in handling of corrosive materials, adequate equipment shall be provided.
- 9.22.** Where, in connection with any grinding, cleaning, spraying or manipulation of any material, there is emission of any dust or fume of such character and to such extent as is likely to be injurious to the health of persons employed, all practical measures shall be taken by securing adequate ventilation or by the provision and use of suitable respirators or otherwise to prevent inhalation of such dust and fume.
- 9.23.** In addition to instructions contained here-in-above, the safety regulations contained in the following IS Codes shall also apply wherever the provisions in the codes are exhaustive in nature.

i)	IS : 3664-1992	Safety Code for Excavation Work
ii)	IS : 7293-1974 (Reaffirmed 1991)	Working with Construction Machinery
iii)	IS : 6969-1965 (Reaffirmed 1991)	Handling and Storage of building materials
iv)	IS : 4081-1986 (Reaffirmed 1991)	Blasting and related drilling Operations
v)	IS : 3696-1986 (Part-I) (Reaffirmed 1991)	Scaffolds & Ladders (Pt. I Ladders)
vi)	IS : 3696-1991 (Part-II)	Scaffolds & Ladders (Pt. II Ladders)
vii)	IS : 3016-1982 (Reaffirmed 1990)	Fire Protection in welding and cutting operations.

- 9.24.** Notwithstanding the above provisions, the Engineer-in-Charge may require the Contractor to follow any other Act or Rules in force in Bhutan/India in respect of Safety Precautions so as to ensure the safety of the Workmen and the Constructional Plant and the Contractor shall promptly comply with such requirements.

*SECTION -X*

*BILL OF QUANTITIES*



## SECTION X: BILL OF QUANTITIES

### 10.1. PREAMBLE

- i) The bill of Quantities shall be read in conjunction with the Instruction to Bidders, General Condition of Contract, General Technical Specification, Forms, Schedule and Tender Drawings.
- ii) The bidders are advised to quote their item rates for execution of work, which may be evaluated from **the B.S.R. 2018 Phuentsholing**, at which they can execute the different items of works at Pheythakha, Wangdue taking into account all cost of transportation of materials, loading, unloading, duties & taxes (**Clause 3.29 of SECTION - III**), etc. all complete and shall remain firm till the completion of work in all respects.
- iii) During evaluation of bids, if it is found that the bid submitted by the lowest bidder is seriously unbalanced or contains substantially high unit rates the employer reserves the right to hold negotiations with the bidder prior to Award of works to determine the Contract price at a reasonable level. In case such negotiations fail, the employer reserves the right to reject the tender and invite the next lowest bidder for negotiation.
- iv) The Contractor has to quote in **10.2 and 10.3** of this section, **Form No. 2** and in **detailed BOQ**.
- v) All bidders must write the rates against each B.O.Q items both in figure & in word very clearly & neatly. Corrections, if any, shall be made by crossing out, initialing, dating and rewriting. In case rate for any B.o.Q item is not entered, or all the rates are not written both in figure & in words then the bid will be considered as incomplete and liable to be rejected at the discretion of employer.
- vi) The quantities given in the Bill of Quantities are approximate and provisional and are given to provide a common basis for bidding. The basis of payment will be on the actual quantities of work ordered and carried out, as jointly measured by the Contractor and the Engineer-in-Charge and valued at the rates and price tendered in the priced Bill of Quantities, where applicable, and otherwise at such rate and price as the Engineer-in-Charge may fix within the terms of the contract.
- vii) The rate and prices entered/specified in the priced Bill of Quantities except insofar as is otherwise provided under the Contract, be for the finished items of work and include all constructional plant, labour, supervision, materials, all temporary works and false works, erection, maintenance, establishment and overhead charge, profit, taxation, levies, local levies and other charges together with all general risks, liabilities and obligations set out implied in the contract and including remedy of any defects during the Defects Liability Period.
- viii) The whole cost of complying with the provisions of the Contract shall be included in the quoted price.

- ix) The method of measurement of completed work for payment shall be in accordance with the standard practice and requirement as stated in the relevant section of the condition of the contract.
- x) Errors will be corrected by the Employer for arithmetical inaccuracy pursuant to relevant Clause of the Instruction to Bidders. Non acceptance of such correct figures/amounts shall render the bid liable for rejection.
- xi) Tender rate for each item of work provided in the bill of quantities shall be submitted only on printed Bill of Quantities enclosed without adding any alternative or condition of any sort.
- xii) In tender, only item rate quoted shall be considered. Any tender containing the percentage below/above the rates quoted is liable to be rejected.
- xiii) The description given in the Bill of Quantities shall unless otherwise stated be held to include, wastage in execution, carriage, cartage and return of empties, hosting setting, fitting and fixing in positions and all other labours necessary in and for the full and entire execution and completion of work as aforesaid in accordance with good practice and recognized principles.
- xiv) Recording of measurement 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 from liabilities from any over measurement or defects noticed till completion of the defects liability period.
- xv) Any operation incidental or contemplated and necessary for proper execution of items quoted in Bill of Quantities shall be deemed to be included in the rates Quoted. Nothing extra shall be admissible for such operation.
- xvi) Where the term crushed gravel/shingle, crushed stone, broken stone or stone aggregate appear in any part of these document or drawings, they refer to crushed material obtained from integrated crushing plant having appropriate primary crusher, secondary crusher and vibratory screens.
- xvii) Performa for summary of quoted prices and bill of quantities have been provided hereinafter. Bidders are required to fill completely under their signature and seal, before submission.
- xviii) The contractor shall be required to use locally manufactured Bhutan Standard Bureau (BSB) certified domestic construction materials especially concrete blocks/bricks, interlocking cement earth blocks, HDPE pipes, Reinforcement Steel Section etc. in the buildings and road construction works. The material shall conform to the latest BSB standards or in absence of these standards, to the equivalent IS codes. These materials must be cost effective as compared to imported materials of certified quality standards.

## 10.2. QUOTED PRICE

Total Contract Price Nu.....

Total Contract Price (in words) -----

Signature of Contractor

(Seal)

### 10.3. SUMMARY OF ABSTRACT

Sl. No.	Description	Amount (Nu.)
1.	Dozer Excavation/Bench Development	
2.	Excavation	
3.	Stone soling ,Filling & Edging	
4.	Anti-Termite Treatment	
5.	Damp Proof Concrete	
6.	Form work	
7.	Plain Concrete Cement	
8.	Steel Reinforcement	
9.	Reinforced Cement Concrete	
10.	Masonry Works	
11.	Flooring	
12.	Plastering	
13.	Roofing	
14.	Painting	
15.	Door and Windows	
16.	Water Supply and Sanitary	
17.	Protection Works	
18.	Dismantling	
19.	Acoustic Panels	
20.	Seating arrangement	
21.	Electrical works	
	<b>Grand Total</b>	

#### 10.4. Bill of Quantities

BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"						
S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
1	<b>Dozer Excavation/Bench Development</b>					
1.1	Earthwork in excavation over areas by Dozer including levelling and dressing (Bench Development).	cu.m	32.00			
	<b>Sub Total(1)</b>					
2	<b>Excavation</b>					
2.1	Excavation in Foundation Trenches or drains, including dressing & ramming disposal of surplus soil within 50m lead and all lift, complete as directed by EIC (Infra)					
2.1.1	Ordinary Soil	Cu.m.	60.50			
2.1.2	Hard soil	Cu.m.	60.50			
	<b>Sub Total(2)</b>					
3	<b>Stone soling ,Filling &amp; Edging</b>					
3.1	Filling of trenches, sides of foundation etc. in layers <200mm using selected excavated earth ramming etc. within all leads & lifts.	sq.m	72.60			
3.2	Providing and laying dry earth bedding under floors including consolidation each deposited layers by watering, ramming and dressing.	sq.m	26.26			
3.3	Providing and laying hand packed stone filling or soling with hard stones in foundation and rooms Including filling of voids with send/screened materials watering & ramming complete	Cu.m	49.36			

BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"						
S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	<b>Sub Total(3)</b>					
4	<b>Anti-Termite Treatment</b>					
4.1	Providing and injecting chemical emulsion for Pre-construction antitermite treatment using aldrin emulsifiable 0.5% concentration in Auditorium flooring	Sq.m	225.00			
4.2	Providing and laying moisture barrier using plastic sheeting underlay-200 micro-metre	Sq.m	225.00			
	<b>Sub Total(4)</b>					
5	<b>Damp Proof Concrete</b>					
5.1	Providing and applying a coat of hot bitumen (maxphalt) 80/100 or equivalent using 1.7kg per sq.m including the surface dressing.-Auditorium flooring	Sq.m	225.00			
5.2	Providing and laying damp-proof course with cement concrete 1:2:4, 20mm aggregate ,50 mm thick	Sq.m.	272.85			
	<b>Sub Total(5)</b>					
6	<b>Form work</b>					
	Providing and fixing centering and shuttering (formwork), including strutting, propping etc. and removal of formwork					
6.1	All works upto Foundation & plinth etc.	sqm	95.13			
6.2	Lintels, floor beams and bresumers cantilevers etc.	sqm	71.04			
6.3	Columns, pillars, post struts etc.	sqm	50.68			
6.4	Suspended floor, roof, landing, shelves and their supports, balconies, chajjas, etc.	sq.m	51.52			

BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"						
S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	<b>Sub Total(6)</b>					
<b>7</b>	<b>Plain Concrete Cement</b>					
7.1	Providing and laying in position plain cement concrete excluding the cost of centering and shuttering in proportion 1:3:6 (1 cement : 3 sand : 6 graded crushed rock 20 mm nominal size) - All work upto plinth level	Cu.m	29.01			
7.2	Providing & mixing water proofing materials in the proportion 12kg/cum or as prescribed by the manufacturer.	Cu.m	52.03			
	<b>Sub Total (7)</b>					
<b>8</b>	<b>Steel Reinforcement</b>					
8.1	Providing and fixing Thermo-Mechanically Treated reinforcement bar (Yield Strength 500 MPa) for R.C.C works including cutting, bending , binding, placing in position complete.	kg	5256.70			
	<b>Sub Total (8)</b>					
<b>9</b>	<b>Reinforced Cement Concrete</b>					
	Providing & laying in position reinforced cement concrete excluding the cost of centering, shuttering and reinforcement in proportion 1:1:2 (1 Cement:1 Sand:2 Graded crushed rock 20 mm nominal size)					
9.1	All works upto Foundation & plinth etc.	cum	17.4			
9.2	In columns, pillars, posts, etc upto any heights	cum	4.4			
9.3	In suspended floors, roofs, landings, balconies, shelves,and chajjas	cum	7.7			

BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"						
S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
9.4	In beams, lintels, bands, staircases, windows	cum	7.9			
9.5	Bhutan Type Traditional Cornice in RCC 1:1:2, 20mm aggregate, including cost of formwork, finishing with 6mm thick plaster 1:3 on the exposed surface, excluding reinforcement and decorative painting, as per approved design for :					
9.5.1	Single Storied building, including Phana	m	25.0			
9.5.2	Phana (at roof levels)	m	25.0			
9.5.3	Lintel Cornice (only cornice portion at external face)	m	15.0			
	<b>Sub Total (9)</b>					
<b>10</b>	<b>Masonry Works</b>					
10.1	Providing & laying concrete solid brick ( 240 mm X 115 mm 80 mm ) in Superstructure- In cement mortar 1:3	Cu. m	15.00			
10.2	Extra for concrete block brick work in superstructure above plinth level	cum	15.00			
10.3	Extra, for mixing water-proofing compound in cement mortar.	Cu. m	15.00			
10.4	Providing & laying Concrete Solid Block Masonry (115 mm) in superstructure below floor 2 level -In cement mortar 1:3	sqm	60			
10.5	Providing & laying Random Rubble Masonry with hard stone in foundation & plinth-In cement mortar 1:4	cum	19.25			
	<b>Sub Total (10)</b>					



BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"						
S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
<b>11</b>	<b>Flooring</b>					
11.1	Providing & fixing white/ coloured anti-skid glazed tiles in flooring on bed of 12mm thick cement mortar 1:3 finished with flush pointing in white cement :300x300 mm	sq.m.	37.57			
11.2	Providing & fixing white/ coloured glazed tiles in walls of toilet (Dado Work) on bed of 12mm thick cement mortar 1:3 finished with flush pointing in white cement :300x300 mm	sq.m	20.00			
11.3	Providing & fixing white/ coloured glazed tiles in flooring laid on bed of 12mm thick cement mortar 1:3 finished with flush pointing in white cement: 600 x600 mm -auditorium flooring preferably in wooden colour	sq.m.	225.00			
11.4	Providing & fixing white/ coloured Glazed tiles, 150 x150 mm in skirting, step risers, dado, finished with flush-pointing in white cement	sq.m.	12			
11.5	Providing & fixing 6mm, commercial ply to stage area	sqm	75.00			
	<b>Sub Total (11)</b>					
<b>12</b>	<b>Plastering</b>					
12.1	Providing and laying 15mm Cement plaster (C.M. 1:4) on external walls	sq.m	60.00			
12.2	Providing and laying 12mm Cement plaster (C.M.1:4) on internal walls	sq.m	144.00			
12.3	Providing and laying 6 mm cement plaster C.M. 1:4 in ceilings	sq.m	37.57			
	<b>Sub Total (12)</b>					

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
13	<b>Roofing</b>					
13.1	Providing & Fixing Pre Painted Corrugated Galvanised Iron (CGI) sheeting including bolts, hooks & nuts 8mm dia with bitumen & G.I limpet washer filled with white lead for connection excluding the cost of purlins, rafter & trusses - 24g sheet	sqm	93.60			
13.2	Providing & fixing 450mm over all semi-circular plain G.I gutter, including brackets, bolts, nuts, washers & rain water pipes connections, excluding the cost of pipes	m	25.00			
13.3	Providing & fixing 600mm ridges or hips in Pre Painted Galvanised Steel sheets, including bolts, hooks and nuts 8mm dia G.I limpet and bitumen washers for connection.	m	9.00			
13.4	Providing & fixing Steel work welded, in built up sections, trusses, frame-works including cutting, hoisting, fixing and appl. Priming					
13.4.1	In Tees, angles, flats and channels	kg	3500.00			
13.4.2	Steel work welded, in built up sections, trusses, frame-works including cutting, hoisting, fixing and appl. Priming (Entry Gates )	kg	300.00			
13.5	Providing and fixing wind tie of 40 x 6mm flats	m	36.00			
13.6	Providing and fixing on wall face PVC coupler-110mm for rigid rain water pipes including jointing with seal ring leaving 10 mm gap for thermal expansion - complete	each	10.00			
13.7	Providing and fixing M.S round holding down bolts with nuts & washer plates	kg	175.00			

BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"						
S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
13.8	Providing and fixing bolts of various size including nuts & washer	kg	175.00			
13.9	Providing & fixing M.S. rivets of various sizes	kg	175.00			
13.10	Providing, making and fixing M.S. flats, straps, sole plates etc.	kg	175.00			
13.11	Providing and fixing on wall face single socketed rigid PVC ( Working Pressure 4 kgf per sq.cm) rain water pipe-110mm including jointing with seal ring leaving 10 mm gap for thermal expansion- complete	m	50.00			
	<b>Sub Total (13)</b>					
14	<b>Painting</b>					
14.1	Providing and applying Water-Proof Cement Paint on new works - three coats on External Walls.	sqm	60.00			
14.2	Providing and applying acrylic washable distemper, two coats on new work, including cement primer coat- Internal Walls	sqm	144.00			
14.3	Providing & applying one coat of primer - wood work - pink primer	sq.m	40.00			
14.4	Providing & applying wood preservatives- Brown, two coats on new work.	sq.m	40.00			
14.5	Providing, preparing & applying sum dung non washable Bhutanese painting -Ding	sq.m	60.00			
	<b>Sub Total(14)</b>					
15.0	<b>Door and Windows</b>					
15.1	Providing and fixing in position dressed wood work in frames of doors, windows, clerestory windows and	Cu. m	3.75			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	other frames wrought, framed and fixed in position- in mixed conifer.					
15.2	Providing & fixing blue pine moulded beading to door, window frames with iron screws including plugs, priming coat on unexposed surfaces (50 mm x20 mm)	m	60.1			
15.3	Providing & fixing 38 mm thick Panelled or glazed doors Shutters etc. complete including wood or glass for pannels, hinges and fixed in position- in mixed conifer.	sqm	4.84			
15.4	Providing & fixing 35 mm thick Panelled or glazed doors Shutters etc. complete including wood or glass for pannels, hinges and fixed in position- in mixed conifer.	sqm	25.20			
15.5	Providing and fixing 30 mm thick flush doors shutters (prefabricated ), block-board core with commercial ply veneer	sqm	12			
15.6	Providing & fixing Wire-gauze Shutters 25 mm for doors & windows using galvanised M.S wire gauze 0.56mm dia wire including the cost of hinges fixed in position- in mixed conifer.	kg	4.84			
15.7	Providing & fixing ornamental steel grills (10 mm wide, 5 mm thick ) in frames with M.S. flats & bars including round headed bolts and nuts etc.	kg	200.00			
15.8	Providing & fixing anodised aluminium butt hinges with necessary aluminium screws etc. complete (For Both main and wire gauge shutter )					
15.8.1	100mm-For Windows	each	16.00			
15.8.2	175mm-For Doors	each	48.00			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
15.9	Providing and fixing Brass Tower Bolt (barrel type) of approved quality with necessary screws etc. complete.					
15.9.1	250mm- for Door	each	6.00			
15.9.2	100mm- For Window	each	8.00			
15.1	Providing and fixing brass Sliding Door Bolt with Nuts of approved quality with necessary screws etc. complete.					
15.10.1	250mm	each	6.00			
15.10.2	200mm	each	12.00			
15.11	Providing and fixing brass Handle of approved quality with necessary screws etc. complete.					
15.11.1	100mm	each	6.00			
15.11.2	75mm	each	12.00			
15.12	Providing & fixing bright finish brass spring-loaded, hinged door-closer	each	2.00			
15.13	Providing and fixing Bright finish M.S. Door Stopper with nuts with necessary screws etc. complete	each	8.00			
15.14	Providing & fixing bright finished brass hook-and-eye with necessary screws etc. complete,100 mm	each	8.00			
15.15	Providing and fixing 40x3mm M.S. hold fast 400mm long, fixing to frame with 10mm bolts & nuts, plugs, concrete blocks 300x100x150mm with 1:3:6, 20mm aggregate	Each	50.00			
15.16	Providing & fixing anodised Aluminium section for doors, windows, ventilators, partitions framing, false ceiling framing of specified sections including all accessories such as U-rubber gasket for fixing glass	Kg	100.00			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	panes, weather strips or weather seals, roller, springs, etc complete (excluding the cost of glass panes or boards in case of partitions/doors/windows and ceiling boards in case of ceiling) Sliding and open able doors					
15.17	Extra for providing and fixing plain glass panes on aluminium section complete (excluding the cost of aluminium frame & accessories) -5.5mm thick, plain glass	sqm.	15.00			
15.18	Providing & fixing Panelled or Panelled-&-Glazed partition, single-central-panelling including frame-100mm framing, 38mm thick Champ or Blue Pine panelling	sqm	75.00			
15.19	Providing & fixing Mixed Conifer (undressed) in wooden steps.	cum	5.00			
	<b>SubTotal (15)</b>					
16	<b>Water Supply and Sanitary</b>					
16.1	Providing and fixing European- type vitreous china w.c. pedestal including seat and lid with c.p. brass hinges, 15 lit. white PVC low level cistern , fittings, brackets, repair walls-White, with plastic seat & lid	Each	4.00			
16.2	Providing & fixing Indian-type vitreous china w.c squatting pan, including 100 mm H.C.I P or S trap, 10 lit low level vitreous china cistern & fittings, repair walls -580mm, colour Orissa-model	Each	2			
16.3	Providing and fixing white vitreous china wash basin, including C.I brackets, 15mm C.P brackets, 15mm C.P	Each	6.00			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	brass pillar taps, c.p. chain & rubber plug, 32mm p.v.c waste, 32mm dia trap & union, repair walls-Flat back basin size 550x400mm with a pair of 15mm c.p. brass pillar taps					
16.4	Providing & fixing white vitreous china flat back, lippe d front urinal basin 430x260x350mm including partitio n,fittings, brackets, G.I. flush pipe & spreaders, brass u nions, G.I. clamps, painting, repair walls	Each	4.00			
16.5	Providing and fixing 600x450 bevelled edge mirror (superior glass) including 4mm AC sheet base fixed to wooden cleat.	Each	7.00			
16.6	Providing & fixing 450x120mm glass shelf, including c.p brass brackets fixed to wooden cleats	Each	7.00			
16.7	Providing and fixing C.P. towel rail 750x20mm with c.p brass bracket fixed to wooden cleats	Each	10.00			
16.8	Providing and fixing CP brass toilet paper holder.	Each	7.00			
16.9	Providing and fixing liquid soap container, c.p, including c.p. brass lid & brackets, wooden cleats, c.p. brass screws.	Each	6.00			
16.1	Providing & fixing brass full way valve with wheel-32mm	Each	4.00			
16.11	Providing and fixing CP brass stop cock 20 mm dia with standard CP knob.	Each	12.00			
16.12	Providing and fixing 15mm, standard vertical, c.p knob bib cock incl. fittings	Each	6.00			
16.13	Providing & fixing P.V.C soil waste and vent pipes, single or double socketed, including pipe clip	m	15.00			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	complete (excluding the cost of PVC fittings)-75 mm dia					
16.14	Providing and fixing 110mm dia PVC door bend,	Each	6.00			
16.15	Providing and fixing 110mm dia PVC plain bend,	Each	6.00			
16.16	Providing and fixing PVC Nahini floor trap 110mm dia inlet and 75mm dia outlet.	Each	10.00			
16.17	Providing & fixing plastic tank including all accessories complete- 1000 litres Capacity	Each	4.00			
16.18	Providing & fixing square mouth S.W gully-trap A-grade including C.I grating, C.I. cover with frame of 300 x 300 mm, brick masonry chamber	Each	6.00			
16.19	Providing and laying PPR pipes including fitting and clamps and repair of walls complete as approved by EIC					
16.19.1	20mm dia	m	30.00			
16.19.2	25mm dia	m	30.00			
16.19.3	32mm dia	m	10.00			
16.20	Constructing Brick masonry manhole in cement mortar 1:5, R.C.C top slab with 1:2:4 20mm aggregates, foundation concrete 1:4:8 40mm aggregates, 12mm plaster in CM 1:3 finished with floating coat of neat cement and making channels in cement concrete 1:2:4 20mm aggregates, neatly finished complete - Inside size 900 x 800 mm and 450 mm deep including C.I.cover with frame (light duty) 455mm x 610 mm internal dimension total weight of cover and frame to be not less than 38 kg. (weight of cover 23 kg. and weight of frame 15 kg.)	Each	2.00			



BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"						
S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
16.21	Providing and laying G.I. Pipes including G.I. fitting like Tee, Bend ,Unioun , push on joints ,tail piece, joints					
16.21.1	32 mm dia	m	20			
16.22	Constructing Septic Tanks, in R.R Masonry in cement mortar 1:6, including fittings, C.I cover with frame, 40mm thick concrete flooring (40mm aggregates) cement plaster concrete base in C.C 1:4:8 etc. complete as per standard design - for 50 users	Each	1			
16.23	Constructing Soak Pit -Size 1200x1200x1200mm, filled with brick bats including 100mm SW drain pipe X 1200mm long	Each	1			
16.24	Providing & fixing in position urinal partition in granite slab of 1.00 m x 0.60 m x 20 mm thick of approved colour & shade with half round, with all necessary accessories for fixing etc., complete in all respect between urinal bowls with wooden plugs fixed in walls and brass screws.	sqm	4			
16.25	Providing and Laying Ductile Iron K - 9 pipes 100 mm for Chimny including all fittings	m	10			
	<b>Sub Total(17)</b>					
17	<b>Protection Works</b>					
17.1	Providing and laying 50mm thick Plinth Protection and grouted with fine sand mix including well rammed, finishing the top smooth With cement concrete 1:3:6, 20mm aggregates, laid over 75mm thick layer of compacted gravel (40mm)	sq.m.	37.50			
17.2	Constructing second class brick masonary open	m	25.00			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	surface drain in cement mortar 1:4 including earth work in excavation 100mm thick concrete bed 1:5:10, 40mm aggregate and 25 mm thick cement concrete 1:2:4, 12mm aggregate for filling haunches including 12mm cement plastering 1:4 with a floating coat of neat cement and disposal of surplus earth etc. complete - 250mm x 300mm depth.					
17.3	Providing and fixing welded steel work in grating over surface drains	Kg	163.89			
	<b>Sub Total (17)</b>					
18	<b>Dismantling</b>					
18.1	Dismantling wooden flooring including stacking useful materials & disposal of rubbish	sqm	225.00			
18.2	Demolishing cement concrete 1:3:6 & richer, including disposal of materials	cum	22.50			
18.3	Demolishing brick work including stacking useful materials & disposal of rubbish-In cement mortar	cum	6.70			
18.4	Dismantling doors, windows, and clerestory windows <3sq.m (steel, wood) including architrave, hold fasts,stacking within 50m lead	each	1			
18.5	Dismantling existing acoustic strawboard on auditorium walls and extracting useful materials	sqm	240.00			
	<b>Sub Total (18)</b>					
19	<b>Acoustic Panels</b>					
19.1	Providing and fixing wall paneling comprising of 25mm thick commercial wall panel boards of size	sqm	240.00			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	600x600mm fixed into wall using surface impalers. Impalers shall be fixed on the wall using the screws and impalers shall have the darts for holding the panels in place. Panels shall be of square edged with NRC value between 0.85 to 1 of standard make. Complete as per the standard drawings and specifications. Complete as per the EIC.					
19.2	Providing & Fixing of Mineral Fibre Acoustical Suspended Ceiling System with Fine Fissured (Microlook) egde tiles with 15mm Exposed grid. The tile shall be laid on Suprafine 38 with 15 mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 38mm and a load carrying capacity of 14 Kgs/M2. The T Sections have a Galvanizing of 90 grams per M2.	sqm	268.10			
	<b>Sub Total (19)</b>					
20	<b>Seating arrangment</b>					
20.1	Supply of Auditorium Chairs , made as per Fire Safety Norms and Standards, with maximum lumbar support for fatigue free healthy seating, engineered for ergonomic shape, environment friendly , complete is all respect as directed and in color shade approved by the the Engineer-in-Charge	each	225.00			
	<b>Sub Total (20)</b>					

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
<b>21</b>	<b>Electrical works</b>					
21.1	Light point wiring with 1.5 sq mm PVC insulated copper conductor 1.1 kV grade wires in 2 mm thick HDPE concealed conduit including cost of cutting and filling chases and including providing and fixing a 6 amp 240 Volt grid plate mounted switch with moulded cover plate in sheet steel galvanised box and circuit wiring and including circuit wiring with 1.5 sq mm copper conductor PVC insulated wire, complete as required					
	One point controlled by one 6 amp switch					
21.1.1	Short Point (upto 3m)	each	110			
21.1.2	Medium Point (3 to 6 m)	each	150			
21.1.3	Long Point (6 to 10m)	each	80			
21.2	Wiring for a 5/6 pin 240 volt 6 amp single phase and neutral switch socket outlet with 2.5 sq mm PVC insulated copper conductor 1.1 kV grade wires in 2 mm thick HDPE concealed conduit including cost of cutting and filling chases and providing and fixing of a combined 3 pin 240 volt 6 amp socket outlet with safety shutters and 6 amp 240 volt single pole grid plate mounted switch with moulded cover plate in galvanised sheet steel box and including circuit wiring with 2.5 sq mm copper conductor PVC insulated wire, complete as required	each	100			
21.3	Wiring for 5/6 pin 240 volt 16 amp single phase and neutral switch socket outlet with 4.0 sq mm PVC insulated copper conductor 1.1 kV grade wires in	each	150			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	25mm dia 2 mm thick HDPE conduit including providing and fixing of a combined 3/6 pin 240 volt 16 amp switch socket outlet with safety shutters and 16 amp 240 V single pole grid plate mounted switch with moulded cover plate in sheet steel galvanised box complete as required					
21.4	Providing and making 300 x 300x 300 mm Brick masonry chamber with CI cover in ground complete with sand cushioning at Meter Board and Tel tag Block	each	4			
21.5	Providing and fixing of bracket holder for stair case light,balcony and dinning/drawing room	each	18			
21.6	Supply and drawing of the following P.V.C. insulated copper conductor 1.1 kV grade wires from meter to Distribution Board including the cost of providing and laying the concealed 2 mm thick HDPE conduits and including the cost of cutting and filling chases as required and making suitable end connections complete as required					
21.6.1	4 x 16sq mm PVC insulated copper wires in 32 mm dia 2 mm thick HDPE conduit (Meter Board to DB)	m	200			
21.6.2	25 mm dia HDPE conduit (from DB to switch board and switch board to points separately)	m	400			
21.6.3	32 mm dia HDPE conduit (from main to each DB)	m	250			
21.7	Wiring for lighting circuit with 1.1kV grade, 2 x 2.5sq mm PVC insulated copper conductor cable in PVC surface conduit including connections, painting, testing and commissioning etc. as required,	m	400			
21.7.1	Supplying of 6A SP/TPN MCB	each	150			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
21.7.2	Supplying of 16A SP/TPN MCB	each	50			
21.7.3	Supplying of 32A SP/TPN MCB	each	40			
21.7.4	Supplying of 50A and 62A SP/TPN MCB	each	20			
	<b>Main Switch Board Lighting Auditorium</b>					
21.8	Design, manufacturer, supply, installation, testing and commissioning of 2 mm thick MS sheet fabricated cubical type meter board dust & vermin proof complete with hinged and lockable doors & covers with opening for meter reading. The meter boards shall be wall mounted and dead front construction complete with inter-connections by copper tapes/wires & powder coated etc. MDB suitable for 430V 3 phase 4 wire 50Hz AC supply.					
21.8.1	a) Incoming /Outgoing as per calculation	Set	1			
	b) Bus Bar					
	Ms panel board with 3 phase indication light					
	<b>Main Switch Board Stage Lighting</b>					
21.9	Design, manufacturer, supply, installation, testing and commissioning of 2 mm thick MS sheet fabricated cubical type meter board dust & vermin proof complete with hinged and lockable doors & covers with opening for meter reading. The meter boards shall be wall mounted and dead front construction complete with inter-connections by copper tapes/wires & powder coated etc. MDB suitable for 430V 3 phase 4 wire 50Hz AC supply.					
21.9.1	a) Incoming /Outgoing as per calculation	Set	1			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	b) Bus Bar					
	c) Ms panel board with 3 phase indication light					
21.10	<b>EARTHING</b>					
21.10.1	Supply and making earth pits including the cost of 5 feet length 40 mm dia Class B GI Pipe, funnel with wire mesh charcoal, coke, salt all earth work masonry work for manhole CI cover frame painting etc. as required with as per IS 3043 : 1987. with Copper Plate 600x600mmx3mm	each	3			
21.10.2	Providing and fixing 4.0 mm dia single strand insulated copper conductor for earthing of DBS and main panel	m	150			
21.10.3	Providing and fixing 2.5mm dia single strand insulated copper conductor for loop earthing	m	450			
21.10.4	Providing and laying of metal strip at 0.5m below ground level for as strip earth electrodes including soldering etc as required GI strip 25 x 4mm	m	50			
21.11	<b>LIGHTING DETAILS</b>					
21.11.1	Providing and fixing Ceiling rose - Anchor -3224	each	60			
21.11.2	Providing and fixing domestic luminaries for fluorescent tube fittings incl., suitable tube 1x40W 1200mm Philips TMS 200/140 LPF of approved brand	each	10			
21.11.3	Providing and fixing 1200mm ceiling fan including electronic regulator of approved brand	each	8			
21.11.4	Providing and fixing Aluminium louvers for exhaust fan complete all accessories as required.(crompton)	each	4			
21.11.5	Cyclorama screen in plastic perforate material. The screen to be fixed on tublat frame					
21.11.5.1	1000W PLANO CONVEX SPOT LIGHT	each	4			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
21.11.5.2	1000W FRESNEL HALOGEN SPOT LIGHT	each	4			
21.11.5.3	1000W HALOGEN SPOT LIGHT (PROFILE)	each	4			
21.11.5.4	5X3W LED LIGHT FOR CYCLORAMA & STAGE BAR	each	12			
21.11.5.5	Modular High Efficiency Mirror Optics (4x 14w	each	25			
21.12	Cyclorama Junction Box specially designed for required to be enable every similar color light to be connected in parallel within the capacity of dimmer.	each	2			
21.13	Providing and fixing indoor ceiling mounted luminaries suitable for LED lamp for maximum wattage upto 1x18 watts complete with all accessories such as base, holder, glass globe etc. excluding lamp - Globe dia 250, projection 315mm, finish-painted.of approved brand	each	12			
21.14	Supplying of LED lamps 18 w,250 volts A.C, of approved brand	each	12			
21.15	LED LAMPS of approved brand	Each	98			
	<b>FIRE FIGHTING AND PROTECTION</b>					
21.16	Smoke detectors					
	Supply and installation of Analog addressable optic smoke detectors(multi sensor) suitable for detecting a wide range of smoke from slow smouldering and fast flaming fire.The detector shall have following features and also including supply of all fixing materials complete as required.					
21.16.1	I. Solid state addressing arrangement in combination with a hand held programmer to configure the sensor address.	Each	35			



**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
21.17	Electronic Hooters					
	Supplying, installing ,testing and commissioning of Hooter Cum Strobe at 85 dBA @ 3m for Audible annunciation and 75cd flashing at 1 Hz for visual indication. With Control Module. The Hooter cum Strobe with Control Module shall be flush or surface mountable type with all accessories etc., complete and as per technical specification. The devices shall be of EN and LPCP listed	Each	10			
21.18	<b>Manual call station</b>					
21.18.1	Supplying, installing ,testing and commissioning of break glass type Manual call point . The Manual call point with monitor module shall be single stage type with all accessories and suitable sinages complete., the Manual call point shall be as per technical specification. and shall be of EN and LPCP listed.	Each	10			
21.18.2	Supplying, installing ,testing and commissioning of Addressable Monitor Module complete with all accessories. The two wire monitor module shall mount in a 101.6 mm square, 54 mm deep electrical box or with an optional surface back box. The monitor module shall be as per technical specification and shall be of EN and LPCP listed.	Each	10			
21.18.3	Supply, installing testing and commissioning of Addressable Control Module. It shall be provided to supervise and control the operation of one conventional device of compatible, 24 VDC powered, polarized audio/visual Notification layout. The	Each	2			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	Addressable control module shall be as per technical specification. And shall be of EN and LPCP listed.					
21.19	<b>Fire alarm control panel</b>					
21.19.1	Supply, installation, testing and commissioning of micro processor based, digital, distributed processing real time, multi-tasking and multi - user type 4 loops as per Analogue addressable type fire alarm control panel (FACP) and control panel shall have the following features including supply of all fixing materials interconnections earthing complete as required.	set	1			
21.20	<b>Supply and Wiring</b>					
	Supply and wiring with 2C x 1.5 sq.mm FR twisted pair shielded,1.1KV grade PVC insulated unarmoured copper conductor cable, PVC overall sheathed cable in already laid conduit with interconnections complete as required (For fire detector )	Mts	1500			
21.21	<b>Conduit</b>					
21.21.1	Supply and embedment of 25mm dia HGMS conduit concealed in wall / floor / ceiling including supply and drawing of 12 SWG GI wire as fish wire including supply of all fixing materials complete as required	Mts	600			
21.22	<b>FIRE EXTINGUISHERS -</b>					
21.22.1	Supplying, installing and commissioning of ABC Powder 10 Kg Fire Extinguisher containing Mono Ammonium Phosphate Powder 50, Stored Pressure Type, Pressure Gauge, fitted with discharge hose, wall mounting bracket etc., Discharge Time less than	Each	12			

**BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"**

S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	15 Secs, Controllable discharge mechanism, Range minimum 4 Meters, applicable on Class A,B,C and electrically started Fire, A Rating- 8A, B Rating 34B, Can Construction : Deep drawn & Co2 Mig welded, Valve Construction : Forging & Machining, Internal Coating of Can : Epoxy Powder coating, External Coating of Can : Epoxy Polyster Powder coating, Sheet metal thickness : 1.60MM, ISI approved as per IS:15683:2006					
21.23	Sound System		1			
	HARMAN AUDIO SYSTEM					
	Installation, Testing & Commissioning of Digitl Surround sound system along with all accessories and equipments Main FOH speakers ,Mounting bracket for Array speakers,Subwoofer,Amplifier for subwoofer and FOH speakers, Stage front fill loud spaekrs,Amplifier for Front fill speakers,Stage monitors,Amplifier for stage monitors,Audio Equiliser,Loudspeaker for Green rooms and Pre function area,Speakers for Post function area,DI Box,Amplifier for Pre/Post function area and green room,Volume controller ,Digital audio processor,Expansion for audio processor, 32 Channel audio mixer,Outboard effect processer,Control room Speakers,Headphone for monitoring,Cable end XLR male/female,Sourround sound preamplifier,Wireless Handheld Microphone set,Plate mount XLR Female/male,Installation, Testing & Commissioning of			Lump sump		

BOQ for "Renovation And Modernization of The Auditorium Building with Acoustic Treatment, Control Room, Flooring, Lighting And Sound System, Construction of Public Toilet at India House Thimphu"						
S. No.	Description of Items	Unit	Quantity	Quoted Rate		Amount (Nu.)
				In Figure ( Nu.)	In Words (Nu.)	
	following items for Surround Sound System as per the specifications & instructions, Wired stage microphone, Stage breakout box with 12 mic in 2 line in and 2 line out with all connectors					
21.24	<b>DISPLAY SYSTEM FOR AUDITORIUM</b>					
21.24.1	Removing along with its mounting arrangement Tensioned Motorised Front Projection Screen, Matte White, Size: 290" Diagonal - 153.5"H X 246"W VIEWING AREA with an additional black drop of 36". Wide format 16:10 aspect ratio.	each	1			
21.24.2	Removing along with its ceiling mountsLUMENS, Native resolution WUXGA (1920 X 1200) with standard Lens. Contrast Ratio: Up to : 7500:1 Aspect ratio : 16:10 native	each	1			
21.24.3	Supply, Installation, testing & commisioning of the following equipments and accessories as per the design & drawings and as instructed by EIC.	each				
21.24.3.1	32 Inch LED display for Green room including wall mounting arrangement	each	1			
21.24.3.2	32 Inch LED display with Floor mount cart for stage foldback display	each	1			
	<b>Sub Total (21)</b>					
	<b>Grand total</b>					
	<b>Grand total (In Words)</b>					

*SECTION -XI*

*DRAWINGS*

## SECTION XI: DRAWINGS

1. Auditorium Building-Layout Plan
2. Auditorium Building-Elevation A-A(Stage)
3. Public Toilet-Layout Plan
4. Lighting And General Electrical Arrangements
5. Fire Fighting And Protection