NOTICE INVITING BIDS

FOR

THIRD PARTY QUALITY ASSURANCE FOR 6 LIGHT HOUSE PROJECTS (LHPs) USING ALTERNATE/EMERGING TECHNOLOGIES & BEING IMPLEMENTED ON DESIGN & BUILD BASIS FROM GOVT. INSTITUTIONS/ORGANIZATIONS/ CENTRAL PSUs

(BID No: BMT/2020/GHTC-LHP/TPQA)

BUILDING MATERIALS & TECHNOLOGY PROMOTION COUNCIL
Ministry of Housing & Urban Affairs, Govt. of India
Core-5A, First Floor, India Habitat Centre
Lodhi Road, New Delhi-110003
Phone: +91-11-24636705; Fax: +91-11-24642849;
E-mail: info@bmtpc.org; Website: www.bmtpc.org

Building Materials & Technology Promotion Council
Ministry of Housing & Urban Affairs, Government of India
Core 5A, 1st Floor, India Habitat Centre, Lodhi Road
New Delhi -110 003

LIGHT HOUSE PROJECTS AND INFORMATION FOR PERCENTAGE RATE QUOTATION

BMTPC invites **Percentage Rate Quotations** for **Third Party Quality Assurance (TPQA)** for 6 light house projects (LHPs) using alternate/emerging technologies & being implemented on design & build basis from the Govt. Institutions/Organizations/ Central PSUs in a sealed envelope (as per the list attached below). **The quotation has to be submitted separately for each project.** The sealed envelope having quotations will bear the name of Project with location as below.

The details of various projects are as follows;

S No	Project with Location of Light House Projects (LHPs)	Building Configuration/ DUs	Total Residential Built up area (sqm)	Project Cost (In Rs)	Alternate Technology adopted
1.	Indore, Madhya Pradesh	S+8/1024	47,000.00	1,28,00,00,000/-	Prefabricated Sandwich Panel System
2.	Rajkot, Gujarat	S+13/1144	74,207.87	1,18,89,36,000/-	Monolithic Concrete Construction (Tunnel Form)
3.	Chennai, Tamil Nadu	G+5/1152	43,476.48	1,16,26,96,613/-	Precast Concrete Construction System
4.	Ranchi, Jharkhand	G+8/1008	38,004.54	1,33,99,88,537/-	3 D Volumetric Precast Concrete construction
5.	Agartala, Tripura	G+6/1000	43,590.60	1,62,50,00,000/-	Light Gauge Steel Structural System
6.	Lucknow, Uttar Pradesh	G+13/1040	47,788.00	1,30,90,00,000/-	Stay In Place Formwork System

The quotations are invited from following Govt. Institutions/ Organizations /Agencies;

1. IIT Delhi, Mumbai, Kanpur, Kharagpur, Chennai, Hyderabad, Roorkee, Guwahati, Gandhinagar, Varanasi, Indore, ISM-Dhanbad (12)
2. School of Planning & Architecture, Delhi
3. NIT Bhopal, Allahabad, Tiruchirappalli, Warangal, Jamshedpur, Surat, Rourkela, Nagpur, Silchar & Agartala (10)
4. Delhi Technological University, Anna University (2)
5. CBRI Roorkee, SERC Chennai (2)
6. Engineers India Ltd.,
7. RITES Ltd.
8. Telecommunication Consultants India ltd.
9. WAPCOS Ltd., &
10. MECON, Ranchi

Stipulated time period for the Work	12 months
Time & date for receipt of quotations	March 25, 2020 upto15:00 hrs
Time & date for submitting clarifications/ queries	March 14, 2020
Time & date of opening of quotations	March 25, 2020 at 15:30hrs
Place of Submission	Building Materials & Technology Promotion Council Ministry of Housing & Urban Affairs, Govt. of India Core-5A, First Floor, India Habitat Centre Lodhi Road, New Delhi-110003 E-mail: bmtpcjnnurm@gmail.com, info@bmtpc.org;

Dy Chief (S&PD)
BMTPC

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2. INSTRUCTIONS TO BIDDERS

1. The quotation as per prescribed format (**Annexure V- A to E**), are invited from Govt. **Institution/ Organization/ Central PSU herein referred as "Organization" in document** for providing the Third Party Quality Assurance (TPQA) for LHPs, listed under the scope of services in this bid document for the work**.**

2. **Name of Work**: TPQA for Construction of Light House Projects at 6 locations using location specific alternate technology including on site Infrastructure construction on Design & Build basis.

3. The Organization shall have resources & expertise for undertaking TPQA work with specified alternate/ emerging technologies.

4. The Organization engaged in architectural and structural designing or vetting of a particular LHP is not eligible as TPQA Organization for the same project.

5. **Time duration:** The stipulated duration for construction of each Light house project (LHP) is 15 months (3 months for design & drawing approval & 12 months for execution) from award of work. The time duration for TPQA shall be till the stipulated completion of the project along with the extension of the project if any. The contract agreement for all 6 LHPs has already been signed between the Ministry of Housing & Urban Affairs, GoI & Contracting agencies. The respective contracting agencies have already started working on design & drawing and the role of TPQA Organization is during the execution of the projects which is stipulated as 12 months. In case the execution of the project is extended beyond 12 months, no additional amount shall be paid for first 3 months of extension period, however, a mutually agreed rate of per month shall be paid for extension period of beyond 3 months.

6. Submission of Quotations

Quotations should be submitted in **single outer sealed envelope** titled "**QUOTATION FOR TPQA FOR 6 LIGHTHOUSE PROJECTS USING ALTERNATE/EMERGING TECHNOLOGIES & BEING IMPLEMENTED ON DESIGN & BUILD".** The Organizations may apply for more than one project. In case, an organization applies for more than one location, then all individual quotations (in separate sealed envelope quoting individual project with location) should be inserted in **outer sealed envelope.** The envelope should be addressed to the **Dy Chief (S&PD), BMTPC,** Core-5A, India Habitat Centre, Lodi Road, New Delhi-110003. The BID document can also be seen online on the website of BMTPC www.bmtpc.org.

The duly filled quotation may be sent by Speed post/registered post/ courier before stipulated date & time. The late receipts beyond stipulated date & time shall not be entertained.

7. The standard terms and conditions of the contract for providing TPQA Organization are contained in this document. The Organizations are requested to go through the complete documents.

8. Signature of bidder

An authorized person must sign the bid document with seal of the organization.

9. **Preliminary Costs**

All costs of working on the proposal, preparation & implementation of quality assurance plans/ measures with alternate/ emerging technology, providing services efficiently including site visits by experts, regular site supervision & all consumables, administrative & any other expenses etc. shall be borne by the Organization. At least 25% of samples of materials including cement concrete cubes & other components as per the requirement of alternate technologies shall be taken jointly by contracting Agency, TPQA Organization, BMTPC representative & Competent Authority or his authorized representative. In addition, the 10% testing of total mandatory tests (for which samples shall be taken jointly by contracting Agency, TPQA Organization, BMTPC representative & Competent Authority or his authorized representative) shall be conducted by TPQA Organization independently at its own lab/ outside reputed Govt./NABL accredited labs. The expenses for independent testing including collection & transportation of samples shall be paid by BMTPC to TPQA Organization/ outside lab, as applicable preferably within 15 days of submission of bills.

10. Quotations

The organization should quote the fee in the format at **Annexure V-A to V-E.** The taxes shall be payable as applicable at the time of payment. For the comparison of bids, the amount excluding taxes shall be used.

11. Validity

The offer shall remain valid for a period of ninety days (90) days from the date of opening of quotations. The overall offer including personnel proposed for the assignment as well as quoted fees shall remain unchanged during period of validity.

12. **Award of Contract**

The contract for TPQA of each Project shall be awarded to the Organization offering lowest bid (L1) in conformity with the requirements of these specifications

and documents.

13. The Executive Director, BMTPC reserves the right to accept or reject any or all Quotations without assigning any reason thereof.

3. BRIEF PROJECT DESCRIPTION

Govt. of India through M/o Housing & Urban Affairs is implementing Global Housing Technology Challenge-India (GHTC-India) with an objective to identify and mainstream a basket of innovative technologies from across the globe that is sustainable and disaster-resilient. Such technologies are to be cost effective, speedier and ensure a higher quality of construction of houses, meeting diverse geo-climatic conditions and desired functional needs. The GHTC-India platform aspires to provide an eco-system for the adoption of innovative technologies in the housing construction sector in a holistic manner. The Expo-cum- conference of GHTC-India was held on March 02-03, 2019, which was inaugurated by the Hon'ble Prime Minister of India. Hon'ble Prime Minister also declared the year April, 2019 to March, 2020 as "Construction Technology Year".

In one of the components of GHTC-India, **"**Identifying and Mainstreaming Proven Demonstrable Technologies for the Construction of Lighthouse Projects", the innovative and established technologies from across the globe were invited to apply through a Global online Expression of Interest (EoI), for use in the Indian context. In all 60 technology providers applied on line, & technologies of the same were evaluated by Technical Evaluation Committee (TEC) under the Chairmanship of DG, CPWD, constituted by the Ministry of HUA, GoI. TEC recommended 54 technology providers in 6 broad categories, for different geo-climatic regions of the country. An Official Memorandum in this regard by MoHUA issued on May 28, 2019 is **enclosed.** The details of GHTC-India may be referred at https://ghtc-india.gov.in web site.

The 54 shortlisted technology providers were further invited to construct lighthouse projects of about 1,000 housing units each at six identified regions of the Country namely Indore, Rajkot, Chennai, Ranchi, Tripura & Lucknow on Design and Build basis. BMTPC has been entrusted with the responsibility of ensuring quality of projects with the help of Govt. Institutes/ Organizations/Central PSUs.

The proposed buildings are on vacant land provided by the respective State Govts. The Projects include building all civil works, finishes, water supply, sanitary installations, internal electrification, lifts, external façade, other development works including rainwater harvesting, Tube wells, Sewage Treatment Plant, street lighting and all such similar allied works as per approved designs/drawings and tenders documents etc. The E&M work would include Internal & External electrical installations, sub-station, transformers, electrical panels etc., provision for firefighting etc.

The actual details of items shall be as per approved drawings & contract agreements. All projects shall consider to minimum GRIHA 3 star rating.

4. SCOPE, FUNCTIONS & DELIVERABLES OF WORK and TERMS OF REFERENCE OF BID DOCUMENT

(A) SCOPE OF TPQA ORGANIZATION

1. TPQA Organization shall ensure that the site is equipped with necessary documents like copy of agreement, approved design & working drawings, BIS Code, CPWD specifications, list of approved manufactures, tools for checking quality of work & testing facilities.

2. TPQA Organization shall ensure that site records like inspection register, cement register, test register, & site order book etc. are being maintained in prescribed forms.

3. TPQA Organization will check various factors such as testing of material & developing check list of important items of work.

4. TPQA Organization will develop quality assurance plan with special emphasis on Selected Technology, test required as per mandatory tests/contract specifications/BIS code. It may also be consider Quality Assurance Plan developed & adopted by technology provider in conformity with contract agreement.

    - TPQA Organization, keeping in view the provisions of the agreement, may indicate which test should be carried out in field lab or outside lab.
    - TPQA Organization will ensure that all the provisions of QA plan are being complied at site by the Organization.

5. TPQA Organization will inspect the work on day to day basis and submit the inspection report on monthly basis. Further, the inspection is to be planned in such a way that the pre-requisite formalities such as testing of material and approval of resource plan for materials and labour is carried out well in advance so that work may be progressed as per milestones fixed in the agreement. TPQA Organization will put special emphasis on Quality Control aspects w.r.t. new technologies.

    TPQA Organization will conduct inspection of work during execution primarily for two aspects;

    Material aspect; TPQA Organization shall check that tests to confirm quality of materials/components are being conducted as per contract specifications/BIS requirements/CPWD specifications. The TPQA Organization shall ensure that at least 25% of samples of materials including cement concrete cubes & other components as per the requirement of alternate technologies shall be taken jointly by TPQA Organization, contracting Organization, BMTPC representative & Competent Authority or his authorized representative. In addition, the 10% testing

of total mandatory tests (for which samples shall be taken jointly by contracting Agency, TPQA Organization, BMTPC representative & Competent Authority or his authorized representative) shall be conducted by TPQA Organization independently at its own lab/ outside reputed Govt./NABL accredited labs.
TPQA shall analyze in details the test results w.r.t. codal provisions and submit the report to BMTPC.

Workmanship Aspect: - To ensure execution of work with laid down procedures and sound engineering practice.

6. The inspection report shall be submitted to the BMTPC on monthly basis in indicative proforma attached at **Annexure-IA & I-B**. TPQA Organization may suitably modify the proforma taking into account the quality assurance plan with emphasis on adopted alternate technology.

(B) FUNCTIONS OF TPQA ORGANIZATION

When a Third Party Quality Assurance Organization is engaged, it shall carry out the following functions;

1. TPQA Organization shall do their job arranging the necessary quality assurance tests for materials and the construction works, analyzing the test results and furnishing the comments/ observations thereon and providing general observations on construction materials and work. The TPQA Organization shall submit their report to BMTPC on monthly basis, preferably in the first week of every month.

2. TPQA Organization shall check and report whether work is being executed according to the designs and specifications of the agreement and in accordance with the approved drawings.

3. The TPQA Organization shall be responsible for bringing-out in writing, to the notice of BMTPC/ Authorized representative, any instances of deviations from accepted quality of construction materials, workmanship and general quality of works at appropriate stages of constriction.

4. TPQA Organization shall inspect the construction site during the works under progress, to achieve the stipulated standards of quality in the project. If there is any discrepancy/ error/omission, it shall point out the same with suggestions and remedial measures as per codal provisions.

5. TPQA Organization shall, highlighting the problem area if any, and also suggest steps/ solutions to rectify the same so as to achieve the overall target of quality assurance.

6. TPQA Organization shall report the results of testing to BMTPC with their suggestions and remedial measures.

7. Manpower Deployment/visits: For proper functioning of TPQA Organization and daily routine test, the TPQA Organization will deploy following manpower;

    i. The expert with minimum 15 years of academic/field experience shall make one site visit each month aligning the visit with critical/ important stages of work. In between also the experts may be required to visit depending on exigency at site/ as per the directions/ requirements of the Ministry/ BMTPC, for which no extra amount shall be payable.

    ii. One Technical person having B.TECH/ BE or equivalent degree in Civil Engineering with minimum 07 (seven) years field experience of which minimum 3 years experience is in quality assurance, will be stationed at the site for daily site supervision. For E&M works, the engineers with requisite experience should visit / remain at site during execution of E&M works.

    iii. In case of any critical observations during site visit of expert, the same shall be reported immediately to BMTPC/ authorized representative along with suggestions/ remedial measures.

(C) DELIVERABLES:

1. TPQA Organization shall submit inspection reports on monthly basis as per the prescribed Proforma. TPQA Organization may however add any other details in inspection report, if so necessary. While submitting monthly report it shall lay particular emphasis on special requirements of new technology.

    TPQA Organization shall analyze in details & the 10% of independent testing conducted by it w.r.t. codal provisions. It shall submit the report to BMTPC including suggestions and remedial measures, if any.

2. TPQA Organization shall mention details of defective work if any in inspection report on priority/timely.
    a. To be dismantled by contractor
    b. To be accepted being structurally safe.
    c. Details of defective material brought at site, which is to be removed from the site.
    d. Suggestions regarding remedial measures, if any, from time to time.

3. TPQA Organization shall check and confirm the quality of the work after verifying the removal of defects and submit compliance report. If, it is observed by TPQA Organization that defects are not being removed by the contractor, matter may be reported to the BMTPC for necessary action.

(D) TERMS OF REFERENCE OF BID

Effectiveness and Duration of the Agreement and Contract Period:

TPQA work will be commenced from 7 day of issuing of letter of acceptance. Agreement will remain live/ effective till completion of project. The stipulated duration for execution of Light house project is 12 months. The time duration for TPQA Organization shall be till the stipulated completion of the project along with the extension of the project if any.

Signing of Agreement:

Agreement must be signed by the person dully authorized from competent authority i.e. Head of the Department/Director/ Dean or equivalent of Institution/Department/Agency. Authority letter issued by the competent authority should be attached along with thebid.

Responsibilities for Accuracy of TPQA Services:

The TPQA Organization shall be responsible for accuracy of service provided by them for the work the advice and/or opinion, if any, provided shall be with documentary proof of standards/laws/codes etc. However, decision for execution of work will be of the BMTPC/ MoHUA and no claim of any kind of TPQA Organization will be entertained.

TPQA shall be responsible for providing advice and/or opinion regarding Quality Assurance of this work including methodology to be adopted, Specifications, Standards & quality measure parameter etc. and nothing extra will be paid for the same.

Mode of Billing and Payment:

1. The TPQA fee quoted shall be payable on the amount of gross work done (excluding work executed by the main Organization before TPQA agreement comes into force) from the date from which the agreement comes in force. The running and final bill payment will be made to the TPQA Organization after submission of bill by TPQA Organization on the basis of billed amount paid to the contractor. The project work is on design & build basis & stages of the payment is defined. The payment to the TPQA Organization shall be made by BMTPC.
2. Security deposit will be recovered @2.5% of the amount of gross bill being paid. The security deposit shall be refunded to the Organization after completion of project.
3. BMTPC will deduct Income Tax and other statutory deductions from the payment to TPQA Organization as per rules. The Tax Deduction Certificate

for such deductions shall be issued toTPQA Organization. The same will not be deducted if TPQA Organization produces a certificate of exemption of the same.

4. Amount of the TPQA agreement will be Percentage quoted of the total Project Cost. However TPQA fee will be restricted to percentage quoted on specified tendered amount or actual work done, whichever is less.

***Foreclosure*:**

1. The BMTPC may, by not less than thirty (30) days of written notice of foreclosure (The Expiry of the notice period whereof being the date of termination) to the TPQA Organization, without assigning any reasons whatsoever at any stage of the contract, & foreclose the Contract.
2. Upon foreclosure of this contract, the TPQA Organization shall take necessary steps to bring the work to a close in a prompt orderly manner and shall handover all the documents/reports prepared upto and including the date of foreclosure to the BMTPC.
3. The TPQA Organization shall be duly paid for the works carried out and services rendered till date of foreclosure. No extra claim of loss of profit or any other claim will be entertained by BMTPC.

Termination of contract:

The BMTPC may terminate the contract after 30 days of issuing a written notice in this regard. The BMTPC will take such action in following circumstances.

1. If the TPQA Organization fail to render the performance under the agreement.
2. If as the result of force majeure, the TPQA Organization are unable to perform a material portion of the services for a period of not less than thirty (3O) days.
3. If the BMTPC in its sole discretion and for any reason whatsoever, decided to terminate this contract.
4. Upon termination of this contract, the BMTPC shall make payment to the TPQA Organization for services performed satisfactory by TPQA Organization. A prior to the effective date of termination after offsetting against any amount that may be due from the TPQA Organization to the BMTPC.
5. This contract will automatically be terminated, if the main contract for execution of the work is determined/fore closed by the competent authority.

Dispute Redressal:

The disputes, if any, arising out of contract shall be referred by the either party to the Executive Director, BMTPC whose decision shall be final and binding.

Force Majeure:

1. For the purposes of this contract, “Force Majeure" means an event which is beyond the reasonable control of a party and which makes parties performance of its obligations hereunder impossible or so impractical as reasonably to be considered impossible in the circumstances, and includes, but is not limited to, war, riots, civil disorder, earthquake, fire explosion, storm, flood or other adverse weather conditions, strikes, lockouts or other industrial action (except where such strikes, lookouts or other industrial action are within the power of the party invoking Force Majeure to prevent), confiscation or any other action by government agencies.

2. Force Majeure shall not include (i) any event which is caused by the negligence or intentional action of a party or such party's sub TPQA Organization or agents or employees, nor (ii) any event which a diligent party could reasonably have been expected to both [a] take into account at the time of the conclusion of this contract and [b] avoid or overcome in the carrying out its obligations hereunder.

Testing Plans for Major E&M Services

The testing plan for quality control for major E&M services is attached as annexure II. These plans are to be read along with following guiding notes;

1. Lot size sample test and methods etc. prescribed in quality plan are only suggestive in nature. This shall be modified to suit the specific requirement of their work and prescribed in the tender/ agreement accordingly.
2. To eliminate the possibility of receiving outdated/ old material/ refurbished equipment at site, it shall be ensured that the material supply against the contract shall be not older more than 6 months from date of receipt at site.
3. To procure the genuine material from suppliers/ authorized dealer etc shall be the responsibility of contractor who shall preserve copies of invoice/ excise gate pass/ proof of dispatch. The TPQA Organization shall examine/ scrutinize/ verify the same.
4. All routine tests as prescribed in IS/ CPWD specifications shall be carried at manufacture works/ third party labs & as per the contract agreement.
5. All items to be used and workmanship shall be thoroughly checked physically and for their performance as per agreement. The CPWD guideline/ specification in this regard is placed at **Annexure-IV.**

All record in the TPQA process shall be the property of BMTPC/ MoHUA and nothing shall be shared with any other person(s) / organization(s) / except with authorized persons of BMTPC.

5. AGREEMENT

This agreement is made on the _____ day of _____ Two Thousand, Twenty between the BMTPC, established under the MoHUA, having its Office at Core 5A, 1st Floor, India Habitat Centre, Lodhi Road, New Delhi – 110003 (which expression shall mean and include its successor or successors in office and assignee) acting through the Executive Director, BMTPC, New Delhi hereinafter called, 'The Council' on the one part **First Part**, and _____ hereinafter called the "Organization" which expression shall mean and include their heirs, executors, administrators and assignee) on the other part.

WHEREAS, BMTPC, is desirous of 'Third Party Quality Assurance (TPQA) for construction of Light house project at location…… (hereinafter referred to as the "PROJECT") on behalf of the **(**Ministry of Housing & Urban Affairs**)** (hereinafter referred to as "OWNER"), had invited tenders as per Tender documents vide Ref No. BMT/2020/GHTC-LHP/TPQA.

AND WHEREAS **(**NAME OF ORGANIZATION----------) had participated in the above referred bid vide their letter dated _____ and BMTPC has accepted their aforesaid bid and award the work for (NAME OF PROJECT-----) on the terms and conditions contained in its Letter of Intimation No. _____ and the documents referred to therein, which have been unequivocally accepted by **(NAME OF ORGANIZATION)** vide their acceptance letter dated _____ resulting into a work contract.

NOW, THEREFORE, THIS AGREEMENT WITNESSES AS FOLLOWS:

1. In this agreement words and expressions shall have the same meaning as are respectively assigned to them in the conditions of contract (herein after referred to as the contract conditions).
2. The following documents shall be deemed to form and be read and construed as part of this agreement namely:

a) Instructions to Bidders,
b) Background & brief Project description
c) Scope, Function and Deliverable of Work &Terms of Reference of BIDv Document.
d) All the correspondences between the BMTPC and the Organization after receipt of the quotation and before Award of work including negotiation letter, if any.

3. In consideration of the fee to be paid by BMTPC to the institutes/agencies as agreed to between the parties, the institutes/ agencies hereby covenants with the BMTPC to provide the Third Party Quality Assurance (TPQA) in conformity in all respect with the provision of this bid.
4. BMTPC hereby covenants to pay the consultancy in consideration of the provision of Third Party Quality Assurance (TPQA) at the price at times and in the manner prescribed in the bid Document.

For and on behalf of: For and on behalf of:

SIGNED AND DELIVERED FOR AND ON behalf of Organization……

IN THE PRESENCE OF

WITNESS 1. 2.

SIGNED AND DELIVERED FOR AND ON behalf of BUILDING MATERIALS & TECHNOLOGY PROMOTION COUNCIL (BMTPC)

IN THE PRESENCE OF

WITNESS 1. 2.

Annexure-I-A

CHECK LIST PROFORMA FOR TPQA FOR CIVIL WORKS

Name of TPQA Organization: -		
1.0	**Particulars work**	
1.1	a) Name of Work	
	b) Description of work	
1.2	a) Name of the BMTPC Officer	
1.3	Organization/Contractor Name	
1.4	Agreement No.	
1.s	Stipulated time and date of start	
1.6	Stipulated time and date of completion	
	Accepted tendered cost	
1.7	Percentage progress at time of inspection vis a vis expected as per contract and reasons for delay, if any: (Details are to be enclosed on separate sheet with reference to planned works and executed works for building and various infrastructure components).	
I.8	Inspection Officers (Name & Designation)	
1.9	Officers and Contractor present during inspection (Name & Designation)	
1.10	Date of inspection and number	
2.0	Quality control aids:	
2.1	Is site equipped with	
	a) Copy of Contract agreement	
	b) Approved Design & drawings	
	c) CPWD specification along with up to datecorrection slips	
	d) List of ISI marked /approved materials tobe used	
	e) Testing facilities to check conformations toacceptance criteria	
	f) QACW Circulars on quality control	
2.2	Is field laboratory functional and well equipped	
3.1	Maintenance of inspection register	
3.2	Are all site registers maintained in standard forms?	
3.3	Are test registers are maintained& reviewed	
3.4	Are cement registers maintained by Contractor	
3.5	Site order book and schedule of defects	
3.6	Is sight order book properly maintained& reviewed	
3.7	Have timely notices been issued to the Contractor with the schedule of defects/damage and date of compliance? In case of failure to rectify defects/damages whether the action against contractor has been initiated?	
4.0	Process control aspects	
4.1	Is soil investigation done?(give brief details)	

4.2	Suitability of water for construction	
	a) What is the source of water?	
	b) Has water been tested subsequently (i.e.after every 3 months) and found fit for use in works?	
4.3	Are all mandatory tests carried out at Stipulated frequency?	
4.4	Is 25% sample being taken jointly by Organization and TPQAA / Competent Authority or his authorized representative	
4.5	Are 10% of all samples for testing done independently by TPQA Organization	
4.6	Specific control on RCC work likecentering/stuttering proportioning with boxes, mixing by full bag capacity hopper fed mixer, control of slump, placing compaction with vibrator:	
4.7	Are materials approved by State Nodal Officer/MoHUA representative lf so, are samples available at site?	
4.8	Are samples units/items completed andapproved by State Nodal Officer/MoHUA representative before start of mass finishing work?	
4.9	Any other particular comments on adequacy of process control	
5.1	Observations on floors slope (especially inbath, we, kitchen, terrace, balcony etc.)	
5.2	Observation on QC for dampness/leakages Prevention. If dampness/leakages noticed, then state locations and probable reasons	
6.0	Observations on site material QC aspects (keeping in view the requirement of contract specifications, IS marked/CPWD approved products etc.(Attach details on separate sheet)	
7.0	Observations on workmanship & QC aspectsparticularly taking into account the specific Structural Specifications of Building.(Attach details on separate sheet)	

Note: This is not exhaustive & based on Quality assurance methodologies worked out by TPQA Organization for specific structural specifications for building& other aspects, the same may be modified/ improved.

Annexure-I-B

CHECK LIST PROFORMA FOR TPQA FOR E&M WORKS

1.1	Inspection officers (Name & Designation)		
1.2	Officers and contractor present during inspection (Name & Designation)		
1.3	Date of inspection and number		
1.4	Percentage progress at time of inspection vis a vis expected as per contract and reasons for delay, if any:		
2.0	Quality control aids:		
2.1	Is site equipped with a) Copy of contract agreement b) Approved Design & drawings c) CPWD specification along with up to date correction slips d) List of ISI marked /approved materials to be used: i) Testing facilities to check conformations to acceptance criteria ii) QACW Circulars on quality control		
2.2	Is field laboratory existing and well equipped		
3.0	Department procedure aspects		
3.1	Maintenance of inspection register		
3.2	Highlights of inspection by by Officer requiring compliance		
3.3	Are all site registers maintained in standard forms?		
3.4	Are test registers reviewed by State Nodal Officer/ MoHUA representative		
3.5	Site order book and schedule of defects a) Is site order book properly maintained b) Is site order book reviewed by State Nodal Officer/ MoHUA representative c) Have timely notices been issued to the Contractor with the schedule of defects/damage and date of Compliance? In case of failure to rectify defects/damages whether the action against contractor has been initiated?		
4.0	Process control aspects		
4.1	a) Are the samples of following materials got tested from 3rd party laboratory after taking samples from each lot at the site only. (i) Conduit (ii) wires (iii) Insulation (iv) Metal sheets		

	(v) Cables etc. b) Are test results given by 3rd party laboratory meets BIS/ Technical Specifications etc of tender for the material supplied at site. c) If the materials not tested from 3rd party laboratory then the manufacturer's teat certificate submitted meets agreement requirements. d) Delivery challan of all the materials submitted.		
4.2	Are all mandatory tests at site carried out at stipulated frequency?		
4.3	Are sample units/ Items completed and approved by Engineer in-charge of mass work?		
4.5	Any other particular comments on adequacy of process control.		
5.1	Site Inspection for observation and comments on quality system in place;		

Sub-Head of work in progress		**Whether in progress (If so, tick mark)**	**Whether inspected (If so, tick mark)**	**Location**
1.	**Electrical Works**			
A	Conduit work			
B	Wiring work			
C	Switch Boxes			
D	Distribution boards & floor panel			
E	Fittings and fixtures			
F	Earthing work			
G	Rising mains			
2.	**Sub -Station**			
A	Transformer			
B	HT Panel			
C	LT Panel			
D	Cabling			
E	Earthing System			
3.	**Compound Lighting/ Street lighting**			
A	Poles			
B	Fittings			
C	Cabling			
D	Earthing			
E	Feeder pillar			
4.	**Lightening arrester**			
5.	**Fire Alarm**			
A	Panel			
B	Detector			
C	MCP			
6.	**Fire Fighting**			
A	Piping			
B	pumps			

C	MV Panel			
7.	**DG Set**			
A	Load testing at manufacturer's work			
B	AMF/ Essential Panel/ Synchronizing Panel			
C	Exhaust System			
8.	**Lift**			
5.2	**Observations on electrical fixtures** a) Levelling of switch boxes & DB's b) Levelling of electrical fixtures c) Levelling of all accessories such as Detector,grills, diffuser, Sprinkler etc. d) Red oxide paint on threaded conduitends e) Laying of fish wire in laid conduits f) Earthing of SDB's, DB's, fans arid fittings, poles, rising mains. g) Earthing of sub-station systems. h) Provision and proper fixing of check nuts i) Lugs at cable ends in switch boxes j) Makes of the materials supplied w.r.t. approved makes in the agreement. k) Pressure testing of pipes.			
5.3	Observation on QC for earthling /earth leakage prevention. If leakage noticed, state locations, and probable reasons			
5.4	Whether testing and commissioning of all equipment's, complete system as per CPWD Specifications/agreement conditions are done.			
	If yes a) Whether results conform to requirements as per agreement (b) Proper documentation are done,			
5.5	In built drawing/maintenance manual for all services prepared.			
6.0	Observations on site material QC aspects.(Keeping in view the requirements of contract specifications: BIS marked/ CPWD approved products etc.)(Attach separate sheet}			
7.0	Observation on workmanship QC aspects.(Attach separate sheet).			
8.0				
8.1	a)Whether deviation in quantities noticed?			
	b) If so, state reasons thereof and whether prior approval of competent authority has been obtained before allowing deviations?			
8.2	Items not conforming to specifications:			

	(a) Whether notice was issued as specified in contract? (b) Whether approval in principle was obtained from competent authority before acceptance of sub- standard work?		
8.3	Extra/ substituted items:		
	a) Are Justification of item in remark column of EI/SI proper?		
	b) Whether proper approval of competent authority for execution of EI/SI has been obtained before execution?		
	c) Whether sanction of competent authority issued?		
9.0	Any other observation? (The observation is to be made about quality of material and workmanship)		
10.0	Progress of work and programme chart		
	a) Whether progress of work is as per stipulated milestone/ approved revised milestones b) Whether Contractor has submitted the programme to complete various activities of work within stipulated date of completion as per contract condition?		

Note: This is a proposed one & based on Quality assurance methodologies worked out by TPQA Organization, the same may be modified/ improved.

Annexure-II

BROAD SPECIFICATIONS FOR ALTERNATE TECHNOLOGIES & INDICATIVE QUALITY ASSURANCE METHODOLOGY

1. Prefabricated Sandwich Panel System:

Specifications:

a. Manufacturing & Fixing of EPS (Beads) based Cement Panel

Providing and fixing in position factory made EPS cement sandwich wall/roof/floor light weight solid core panels made of core material of EPS granule balls/beads (conforming to IS 4671:1984 and shall have density not less than 15 kg per cum) adhesive, cement, sand, flyash and other bonding material in mortar state processed to form in a preset mould. The outer face on both sides of the panels shall be non asbestos fiber cement board conforming to IS 14862:2000 or Calcium silicate board conforming to EN 14306:2009 of 5mm thick each. Panel shall be laid on 6mm thick cement mortar (1 cement: 2 fine sand) mixed with chemical adhesive of 0.5kg per 50kg of cement or shall be preferably fixed into 'C' channel made of 1.2mm thick MS plate screwed/fastened to the slab/column/beam etc. The panel shall fixed vertically with tongue and groove joint and horizontally locked with steel bar between each other and floors and filled with cement mortar and adhesive. Panels should be used as floor & roofing with additional structural support, steel or RCC depending upon the design. All the operation shall be completed in all respect as per drawings, manufacturers specifications and under the overall direction of Engineer-in-Charge.

b. Steel Structural System

Steel structure frame as per design & conforming to IS: 800 shall be used in the construction. U type channels as per manufacturer's specification should be used to hold the panels with the structure. Additional clips may be welded with the frame pillars and beams to hold the U channel firmly with the pillars/beans and floor, to ensure structural integrity. PU glue may be applied to hold the panels firmly.

All relevant Indian Standards/ requirements of NBC shall be conformed for materials, design, fabrication and erection.

c. Indicative Quality Assurance Methodology of building blocks

The Quality Assurance Methodology is to include checking & ensuring proper installation of steel frames, deck slab, its connectivity/ structural Integrity & connection with panels manufactured using EPS beads. Further to check & ensure the specifications of various components of buildings as per vetted design and drawings & relevant IS Codes/ NBC Provisions/ CPWD SOR Provisions/BMTPC PACS/ International Norms

2. Monolithic Concrete Construction (Tunnel Form Work):

A. Aluminum Formwork System

The customized Aluminium formwork using grade 5052 aluminum with panel sheets of minimum 4 mm thick shall be used for monolithic construction of RCC members & for extruded sections grade 6061 (Type-6) aluminium shall be used. The panel sheets shall have repetitive usage of 100 times. The form work includes of beam components i.e. beam side panel, prop head for soffit beam, beams soffit panel, beam soffit bulk head and deck components i.e. deck panel, deck prop, prop length, deck mid, soffit length, deck beam bar and wall components i.e. wall panel, rocker, kiker and internal soffit corner, external soffit corner, external corner, internal corner etc., The panels are to be held in position by pin and wedge system that passes through holes in the outside rib of each panel. The tolerance of finished panels to be (-1 mm), and shall conform to IS 14687-1999 (Falsework for concrete structures – Guidelines). Pins and wedges to be made of high grade mild steel.

a. Modular Tunnel Form Work System

The Modular Tunnel form System shall consist of inverted L- shaped half tunnels (one vertical panel and one horizontal panel) joined together to create a tunnel. These forms are to be made up of factory cut, 80mm x 80 mm angle sections in accordance with the line of building forms. The panels shall be designed based on loading requirements with minimum 3 mm hot dip galvanized steel sheet, stiffened by folded sheet metal sections. All components shall meet relevant Indian Standards.

b. Structural Design

The structural design of plain & RCC shall be as per IS 456:2000 while IS 13920:2016 (Ductile detailing of reinforced concrete structures subjected to seismic forces -Code of practice) is referred for ductile detailing of reinforced concrete structure. Thickness of wall below plinth level should be minimum 200 mm with double layers reinforcement. The minimum thickness of RCC wall member shall be 120 mm. All relevant Indian Standards/ requirement of NBC shall be conformed.

c. Indicative Quality Assurance Methodology of building blocks

The Quality Assurance Methodology is to include checking & ensuring required specification of tunnel forms for providing proper support to placement of slab & walling components. Further, to check & ensure grade of concrete, ductile detailing of reinforcement & compliance of raw materials & various housing components as per vetted design & drawing and provisions of NBC/ relevant IS Codes/ CPWD SOR Provisions/BMTPC PACS/ International Norms.

3. Pre-cast Concrete construction System–Pre-Cast components assembled at Site:

a. Manufacturing of Solid Pre-cast concrete Elements

Solid precast concrete elements shall be fabricated and manufactured with provisions of shear keys, connecting loops, dowel tubes and proper lifting accessories for walls, beams, slabs, stairs, column etc, of various thickness, shape and size of different concrete grades manufactured in controlled factory environment with approved methodology including moulds (Pallet system, Tilts form, table moulds, battery moulds, vertical moulds, beam moulds, column moulds, staircase moulds, Facade mould, etc.), mixing, transporting and placing of concrete, vibrating, curing, finishing, making necessary cutout/holes of required sizes for services, yard handling & stacking all complete as per IS 11447:1985 (Code of practice for construction with large panel prefabricates) and as per approved shop drawings and design mix as per the direction of Engineer-in-Charge. Minimum grade of Concrete for solid structural components shall be M-35.

b. Manufacturing of Pre-stressed Hollow core Slab

Prestressed Hollow Core slab (Hollow area 25 to 30%) of different thickness & modular width 1200 mm shall be fabricated & manufactured in controlled Factory Environment with approved methodology by using long line casting method having arrangement of proper steel bed. Concreting should be done by batch mixing plant capable of producing zero slump concrete, transported through automatic shuttels of standard make & layed on bed with the help of extruder/Slipformer, finishing, curing and also provision of steam curing. Cutting, making necessary cutout/holes of required sizes for services in slab element after achieving required strength, yard handling & stacking all complete as per approved shop drawings & design mix as per the direction of the Engineer-in-charge. Minimum grade of Concrete for prestressed hollow slab is to be M-40.

Prestressing steel strands (low relaxation) shall be provided & laid in position on hollow core bed by using mechanical pulling arrangement like Rabbit/ Bed master including all accessories for Stressing & destressing operations as per approved make conforming to IS1343 (Prestressed Concrete — Code of Practice) & grade FY-1860 etc, complete as per drawings and direction of Engineer -in-charge.

All relevant Indian Standards/ requirement of NBC shall be conformed.

c. Transportation of Pre-cast elements

Transportation of Precast Elements by flat bed Trailor (Double / Triple axle 40ft Length with proper accessories like A frame etc) from factory, including loading, unloading & stacking at site with the help of required capacity cranes.

d. Erection & Installation of Pre-cast elements

Precast/Prestressed Concrete elements shall be erected & Installed in correct & final position with proper line level and plumb at site making all arrangements (i.e cranes, push-pull jacks & all another T & P for lifting placing & alignment of elements, within erection tolerance as per IS 15916 as per approved shop drawings and all complete as per the direction of Engineer-in-Charge

Weather proof sealant shall be applied on outer joints of approved make confirming to relevant Indian Standard.

Levelling sim pads of required sizes (5x5cm to 10x10cm) of PVC / Rubber to adjust level of bearing surface of supporting members shall be applied.

Grouting of dowel tubes / Shear keys / Joints of precast members with M-60 grade cementations grout (Non Shrink) of approved make by suitable means (Free flowing /pump) shall be done including curing etc.

e. Indicative Quality Assurance Methodology of building blocks

Preparing Quality Assurance Methodology including checking the entire set up (In Casting yard/ factory) for manufacturing Pre-cast concrete components including various kind of moulds, mixing of various ingredients of concrete, mix design of concrete, transporting and placing of concrete, vibrating, curing, finishing, making necessary cut-out/holes of required sizes for services, yard handling, stacking. It shall further include transportation, erection & installation of precast concrete components in correct & final position with proper line level and plumb including all accessories, jointing, grouting etc. Checking & ensuring conformance of raw materials & various components of building to vetted design & specification and provisions of NBC/relevant IS Codes/ CPWD SOR Provisions/BMTPC PACS/ International Norms

4. 3D Precast Concrete Construction:

a. Manufacturing of 3D Volumetric Components

Fabrication and manufacturing of solid precast concrete modules (room, toilet , kitchen, bathroom, stairs etc) through 3D volumetric casting or structural modules cast in Plant/Casting yard assembled together through casting of wall and floor panels. Modules are manufactured in controlled factory environment with approved methodology including moulds, mixing, transporting and placing of concrete, vibrating, curing, finishing, making necessary cutout/holes of required sizes for services, yard handling & stacking all complete as per approved shop drawings and design mix as per the direction of Engineer-in-Charge. Cost of reinforcement, Mechanical, Electrical and Plumbing inserts are included in the cost.

b. Transportation of Modules

Transportation of Precast Elements by flat bed Trailor (Double / Triple axle 40ft Length with proper accessories like A frame etc) from factory, including loading, unloading & stacking at site with the help of required capacity cranes.

c. Erection & Installation of Modules

Erection & Installation of Precast Concrete modules in correct & final position with proper line level and plumb at site making all arrangements (i.e. cranes, push-pull jacks & all another T & P for lifting Placing & Alignment of elements, within erection tolerance as per IS 15916 (Building Design and Erection Using Prefabricated Concrete - Code of Practice) as per approved shop drawings and all complete as per the direction of Engineer-in-Charge including all accessories, jointing, grouting complete. The structure shall be complete in all respect with all internal and external finishing as per approved drawings.

All relevant Indian Standards/ requirement of NBC shall be conformed.

d. Indicative Quality Assurance Methodology for Building blocks

Preparing Quality Assurance Methodology including checking the entire set up (In Casting yard/ factory) for manufacturing 3D Volumetric building modules including moulds, mixing of various ingredients of concrete, mix design of concrete, transporting and placing of concrete, compaction through vibration, curing, finishing, making necessary cut-out/holes of required sizes for services, yard handling, stacking etc. It shall further include transportation, erection & installation of precast concrete modules in correct & final position with proper line level and plumb including all accessories, jointing, grouting etc. Checking & ensuring conformance of raw materials & various components of building to vetted design & specification and provisions of NBC/relevant IS Codes/ CPWD SOR Provisions/BMTPC PACS/ International Norms

5. Light Gauge Steel Framed Structural (LGSF) System

a. Fabrication & Installation of LGSF Framing Components

Designing, providing, installing and fixing factory finished custom designed cold form Light Gauge Steel Framed super structure comprising of steel wall panel, trusses, purlins etc manufactured out of minimum 0.75 mm thick steel sheet as per design requirements. The steel sheet shall be galvanized (AZ-150 gms Aluminium Zinc Alloy coated steel having yield strength 300- 550 Mpa) conforming to AISI specifications and IBC 2009 for cold formed steel framing and construction and also as per IS: 875- 1987 (Part-I; Dead Load , Part-II; Imposed load, Part-III; wind load , Part-IV; Snow load, and Part-V; Special load & load combinations), IS 800-1984 (Code of practice for general construction in steel) and IS: 801- 1975 (Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members In General Building Construction). The wind load shall be as per provisions of IS 875 (part -III). LGSFS frame shall be designed as per IS: 801 using commercially available software such as Frame CAD Pro-11.7/ STAAD PRO-V8i/ArchitekV2.5.16/ Revit architecture2011 or equivalent.

The framing section shall be cold form C-type having minimum web depth 89 mm x 39mm flange x 11mm lip in required length as per structural design requirement duly punched with dimple/slot at required locations as per approved drawings. The slots will be along centre line of webs and shall be spaced minimum 250mm away from both ends of the member. The frame can be supplied in panelized or knock down condition in specific dimensions and fastened with screws extending through the steel beyond by minimum of three exposed threads. All self drilling tapping screws for joining the members shall have a Type II coating in accordance with ASTM B633(13) or equivalent corrosion protection of gauge 10 & 12, TPI 16 & 8 of length 20mm. The frames shall be fixed to RCC slab or Tie beam over Neoprene rubber using self expanding carbon steel anchor bolt of dia as per approved drawings, design subject to minimum 12mm diameter and 121mm length conforming to AISI 304 and 316 at 500mm c/c with minimum embedment of 100mm in RCC and located not more than 300mm from corners or termination of bottom tracks complete in all respects.

Hot rolled Steel sections as per design & conforming to IS 800 can be used for buildings higher than G+3.

b. Connections

Proper usage of Connection Accessories like Heavy duty tension Ties, Light duty Hold-ons, Twist Straps (to connect truss with wall frames), Strong Tie, Tie Rod, H-Brackets, Boxing Sections, L-Shaped Angles shall be ensured for required structural integrity & stability.

c. Walling Components Walling with Fibre Cement board & Gypsum plaster board

Providing and fixing of external wall system on Light gauge steel frame work with outer

face having 6mm thick heavy duty fiber cement board fixed on 9mm thick heavy duty fiber cement board confirming to IS 14862:2000, category IV type A (High pressure steam cured)as per standard sizes fixed with self-drilling / taping screws / fasteners@ 60cm c/c of approved make. A grove of 2 mm to 3mm shall be maintained and groves shall be sealed with silicon based sealant.

The board shall be fixed in a staggered pattern. Screws shall be of ounter sunk rib head of 1.60mm to 4 mm thick of 8 to 10 gauge of length varying from 25 to 45 mm and internal face 12.5mm thick gypsum plaster board fixed on 8mm thick fiber cement board confirming to IS 14862:2000 of category III type B (High pressure steam cured) as per standard sizes fixed with self-drilling / taping screws / fasteners @ 60cm c/c of approved make, proper taping and jointing to be done using fiber mesh tape and epoxy and acrylic based jointing compound for seamless finish.

A breathable vapour barrier underneath the cement fiber board as per National Building Code2009 is to be provided complete as per direction of Engineer-in-charge.

Any other suitable in-fill walling materials can be used in the system, however it shall be such that the completed wall provides fire resistant & other properties as per the requirements given in National Building Code 2016.

d. Floor/ Slab

RCC floor/ roof slab as per design conforming IS 456 over deck sheet shall be provided. The thickness and profile of decking sheet shall be verified with the erection drawings. These are normally used as temporary supports for the concrete till hardens. Decking sheet has to be screwed to the joist with maximum spacing of 600 mm c/c for uniform action of concrete and joist. All the joints of decking sheets longitudinal direction require a minimum lap of 100 mm.

e. Indicative Quality Assurance Methodology of building blocks

(The use of Hybrid technologies have been permitted for Light House Projects. The agency has proposed to use Hot rolled Steel Sections as structural frame)

The Quality Assurance Methodology is to include checking & ensuring proper installation of steel frames, Light gauge steel frame, deck slab, its connectivity/ structural Integrity & connection with concrete panels. Further to check & ensure the specifications of various components of buildings as per vetted design and drawings & relevant IS Codes/ NBC Provisions/ CPWD SOR Provisions/BMTPC PACS/ International Norms.

6. Stay-in-Place Form work System PVC Form for Shear Walls (Novel Assembler)

a. Brief Description

Stay in place PVC form wall System consists of rigid poly-vinyl chloride (PVC) based polymer components that serve as a permanent stay-in-place durable finished form-work for concrete walls. The extruded components slide and interlock together to create continuous formwork with the two faces of the wall connected together by continuous web members forming hollow rectangular components. The web members are punched with oval-shaped cores to allow easy flow of the poured concrete between the components. The hollow Wall components are erected and filled with concrete, in situ, to provide a monolithic concrete wall with enhanced curing capacity due to water entrapment, as the polymer encasement does not allow the concrete to dry prematurely with only the top surface of the wall being exposed to potential drying. The polymer encasement provides crack control vertically and horizontally for the concrete, and provides vertical tension reinforcement thus increasing the structural strength of the wall. Steel dowels are necessary to anchor the wall to the concrete foundation.

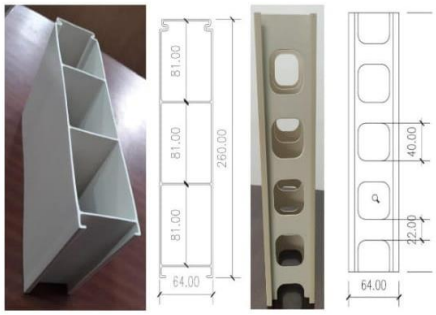
b. Size of Panels

Size: Wall Panels have been developed in various cross-sectional sizes as per project requirement. The common sizes are 64mm, 126mm, 166mm & 206mm. However available wall types are as follow:

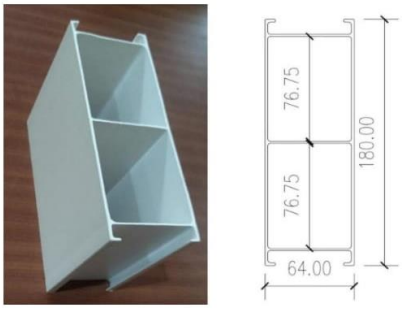
Wall components	**Wall Thickness**		
	Overall (Nominal)	**Concrete Core**	**Insulation[1]**
N64	64 mm	60 mm	0
N126	126 mm	120 mm	0

- N64 walls are erected individually and not preassembled, except for headers and sills.
- Pre-assembled walls sections are used for walls over 4300 mm (14') high
- The height of walls made with the Formwork vary according to the requirement.
- N126 walls less than 4300 mm (14') high are erected individually except for walls of uBIDue projects and for headers and sills.

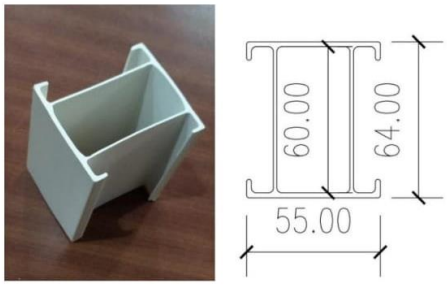
c. Panel Components



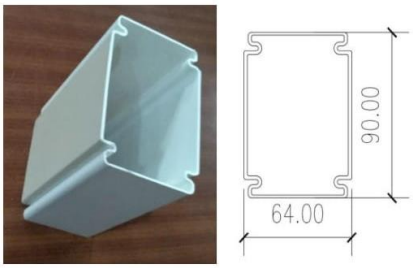
Main Panel – 250 mm



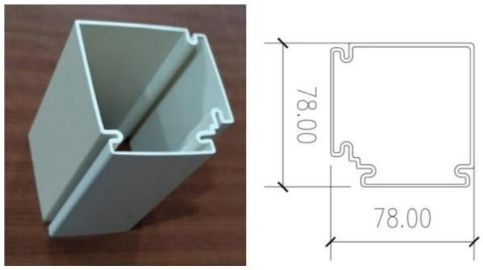
Connector – 158mm



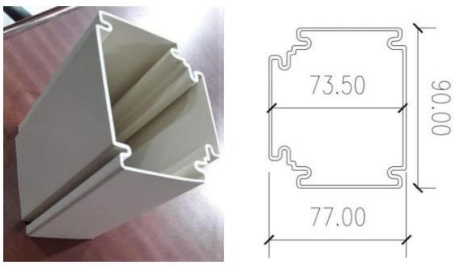
Connector -33mm



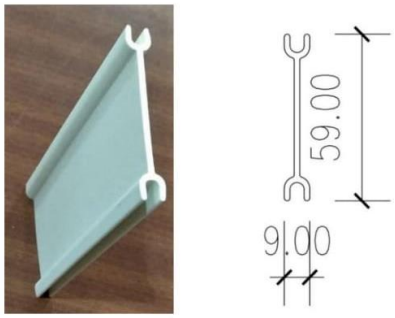
Panel – 91mm



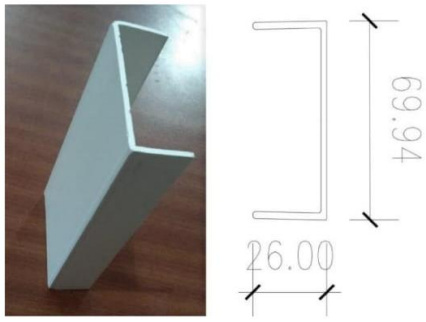
Corner Panel



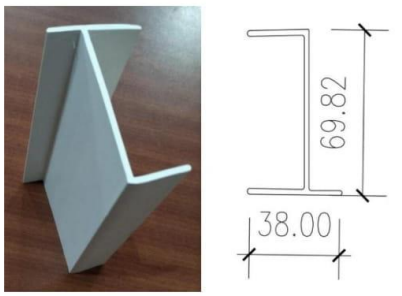
3-WAY (T-CONNECTOR



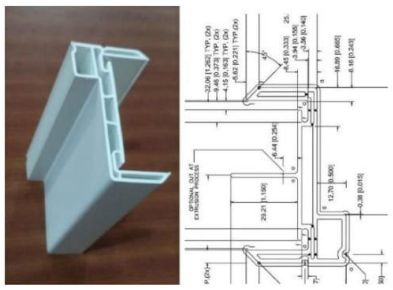
Jointer Connector



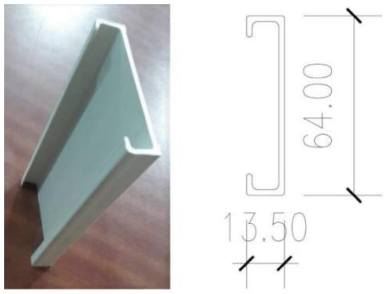
Basic Frame



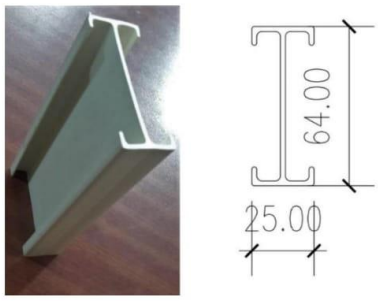
Window Frame



Azteca Frame



Starter



Jointer Panel

d. Design Consideration

General

The walls shall be designed to accommodate a wide range of axial, wind and seismic load conditions, using the equations developed for conventional and slender concrete walls. However, one of the unique properties of Novel walls is the ability of the permanent polymer formwork to provide concrete confinement and reinforce the concrete in tension. There are two main structural elements used in the wall, namely panel sections and box connectors. The panels come as three-cell sections 250 mm wide, while the box connectors are one-cell sections 64 mm wide. The webs of these elements have oval cores which allow lateral flow of the poured concrete between the adjacent cells and provide a mechanical transfer of forces between the concrete and the polymer thus creating a composite action.

Floor/Slab

In-situ RCC slab as per IS:456:2000 shall be provided.

e. Structural Aspects

The buildings constructed with the system walls shall be designed as reinforced concrete structure since the parameters required for their design are the same as needed for traditional reinforced concrete. The building shall be designed in accordance with IS 456:2000, as applicable.

The system shall be designed to provide the required performance against the loads to be taken into account in accordance with IS 875 (Parts 1-5):1987 and the data given by manufacturer for various panels. It shall also provide the required bearing resistance for earthquake and wind forces as per IS 875 (Part 3):2015 and IS 1893 (Part 1):216, wherever applicable.

Foundation shall be specifically designed in accordance with provision given in IS 1904:2005. Both single and double panels should have starter bars from either foundation or ground floor slab.

The structural design calculations should clearly demonstrate structural integrity and stability including connection details. In addition, any other requirement regarding safety against earthquake need to be ensured by the designer as per prevailing codal requirements. All relevant Indian Standards/ requirement of NBC shall be conformed.

f. Indicative Quality Assurance Methodology of building blocks

(The use of Hybrid technologies have been permitted for Light House Projects. The agency has proposed to use Hot rolled Steel Sections as structural frame)

The Quality Assurance Methodology is to include checking & ensuring proper installation of steel frames, Light gauge steel frame, deck slab, PVC form wall System consists of rigid poly-vinyl chloride (PVC) based polymer components its connectivity/ structural Integrity & connection with concrete panels. Further to check & ensure the specifications of various components of buildings as per vetted design and drawings & relevant IS Codes/ NBC Provisions/ CPWD SOR Provisions/BMTPC PACS/ International Norms

Annexure-III

GENERAL SPECIFICATIONS FOR DWELLING UNITS AND OTHER PROVISIONS

The specification for construction of Dwelling Units and other provisions shall be as under:

Sl.No	Item of Work	Specification
1.	**Finishes**	
1.1	External, internal walls & ceiling	As per requirement of proposed technology. External surface should be made smooth with coarse putty and internal walls shall be made smooth with putty before painting if required.
1.2	Rooms	Low VOC Acrylic washable distemper.
1.3	Kitchen	Low VOC Acrylic washable distemper and ceramic tiles up to 6 feet height
1.4	Toilets/Bath	Ceramic tiles up to 6 feet height
1.5	External Finishes	As per Architectural Design
2	**Flooring**	
2.1	Rooms & Kitchen	Vitrified anti skid tiles (600mmX600mm)
2.2	Toilet/Bath & Balcony	Anti skid ceramic tiles (300mmX300mm)
2.3	Common Circulation/Stair case	Pre-Polished Kota Stone in single length of treads & riser
2.4	Kitchen Platform	Pre-polished Granite Stone with nosing
3.	**Door & Windows Frame, Shutters and Hardware fittings**	
3.1	Main Entrance Door Frame & Shutter	Frame with Pressed Steel/MS Angle iron i) Outer Shutter shall be of MS with mosquito proof wire mesh with grill ii) Inner shutter 35 mm thick factory made enamel painted
3.2	Door Frames	Pressed Steel/MS Angle iron
3.3	Window Frames	All frames of external windows with double rebates for fixing same materials frame with mosquito proof wire mesh. UPVC extruded fame sections with wall thickness minimum 2 mm.
3.4	Door Shutters	35 mm thick flush doors confirming to ISI 2202 (part 1)
3.5	Door fittings	ISI marked Aluminium fittings e.g. Tower bolts, handles,

Sl.No	Item of Work	Specification
		door stopper etc. (IS:1378)
3.6	Toilets shutters	24 mm thick factory made PVC door shutters
3.7	Kitchen Doors	35 mm thick having 12 mm thick prelaminated particle board panel at bottom & MS wire mesh at upper part.
3.8	Widow Shutter	Three track UPCV frame with double shutter one with glazed panel & other with wire mesh
4	**Water supply lines**	
4.1	External pipe line up to 50 mm	CPVC
4.2	Internal piping exposed & concealed	CPVC
4.3	Soil & Waste Pipes and fittings	UPVC
4.4	Rain water pipe and fittings	Unplasticised PVC rainwater pipe & fittings.
5	**Water Proofing**	
5.1	Terrace of Top floor	As per technology proposed otherwise Koba treatment as per CPWD specifications
5.2	Sunken Area	As per technology proposed
6	Railing	
6.1	Railing (Balcony & Stair case))	1.2 mtr high MS railing as per drawing
7	**Miscellaneous**	
7.1	Plinth Protection	50 mm CC M-15 grade over 75 mm bed of CC M-10 grade
7.2	Numbering of houses	Granite plate of 300X375 mm at height of 1200 mm with GHTC-India logo
7.3	Nubering of other places	75 mm in height with enamel paint on overhead tanks, water meter box etc

INTERNAL ELECTRIC INSTALLATION (IEI)	
1.	The work will be carried out in recessed PVC conduit wiring system in accordance of latest CPWD General Specifications for Electrical Works with amendments up to the date of opening of tenders and the governing specifications including

	makes for some of the important materials to be used in the work. In case of ambiguity between the two, the specifications shall prevail. All Pipes sizes shall be as per Contract agreement &drawing.

	FIREFIGHTING SYSTEM
1.	Fire extinguishers of required capacity, type and number on each floor as per the provisions of NBC-2016/ Fire Safety Norms

Further, the infrastructure facilities at site shall include the following;

i. Internal Water Supply
ii. Laying of Sewerage Pipe Line
iii. RCC storm water drain
iv. Provisions for Fire Fighting
v. Internal Electrification
vi. Internal Road & Pathway (CC Road and Bituminous Road)
vii. Providing Lifts in building blocks
viii. Landscaping of site
ix. Street light with fluorescent lamps
x. Solar Street Light System
xi. Sewerage Treatment Plant/ Septic Tank
xii. External Electrification
xiii. Water Supply System including underground water reservoir
xiv. Compound wall with Boundary Gates
xv. Horticulture facilities
xvi. Rain Water Harvesting

Annexure-IV

CPWD SPECIFICATION/ GUIDELINE FOR E&M WORKS

A- Internal E1								
State / Sr. No.	Material / Process	Standard Applicable / Test Required to be / Done	Total Qty. (each type) reqd. in agreement or lot size whichever is less	Whether proof of dispatch required	Whether manufacturers test certificates required	Sample size	Location of Test	
							At Manufacture	At third Party Lab
1	LT Panels with ACB	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases ,phase to body ,IP rating, Short Circuit ratings etc.	Any	Y	Y	100%	Y	N
2	LT Panels with incomer of more than 200 A	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc.	Up to 2	Y	Y	0	N	N
			>2 and <10	Y	Y	1	Y	N
			>10	Y	Y	2	Y	N
3	Rising Main and Bus Trunking	CPWD specs Part IV/QA Plan	Length upto500 mtr	p	p	10% lengthandfittings	N	N
			Length> 500Mtr	Y	Y	10% length and fittings	Y	N
4	Rigid MS Conduit	IS 9537 Pt I &2	up to 2500 mtr	Y	N	N	N	N
			>2500 mtr	Y	Y	1 piece of 1 mtr for every 1000mt	N	Y
5	Rigid PVC Conduit	IS 3419 :1989	up to2500 mtr	Y	N	N	N	N
			>2500 mtr	Y	Y	1 piece of mtr for 1000 mt	N	Y
6	Cable Tiny	CPWD Spec. Part-I/II: Check for perforation area, paint/Galvanizing thickness and Material Composition	Length upto 500 mtr	Y	Y	N	N	N
			Length500 Mtr	Y	Y	One pieceforevery500 mtr	N	Y
7	DWC / Corrugated HDPE Pipe	IS 14930 , Check for thickness, material, Mechanical Strength and smoothness	Length upto 500 mtr	Y	N	N	N	N
			Length >500 Mtr	Y	Y	One piece for every 500 mtr	N	Y
8	Wire	IS 694:1990	up to 10000	Y	N	N	N	N
			>l0000 mtr	Y	Y	1 piece for every 10000 mtr	N	Y
Y = Yes; N = No/Not applicable.								

B-Street / Compound Lighting								
State / Sr. No.	Material / Process	Standard Applicable / Test Required to be / Done	Total Qty. (each type) reqd. in agreement or lot size whichever is less	Whether proof of dispatch required	Whether manufacturers test certificates required	Sample size	Location of Test	
							At Manufacture	At third Party Lab
1.	LT Panels with ACB	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc.	Any	Y	Y	100%	Y	N
2	LT Panels with incomer of more than 200 A	CPWD specs. part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases, phase to body ,IP rating, Short Circuit ratings etc.	Up to 2	Y	Y	0	N	N
			>2 and <l0	Y	Y	1	Y	N
			>10	Y	Y	2	Y	N
3	Poles	Whether in conformity with tender specs	Up to 100	Y	Y	N	N	N
			>l00	Y	Y	2%	Y	N
4	LT cable	IS: 1554 Part 1	Upto 2500 mtr	Y	N	N	N	N
			>2500 mtr	Y	Y	One piece forevey mtr	N	Y
5	DWC/ Corrugated HDPE Pipe	IS 14930 , Check for thickness, material, Mechanical Strength and smoothness	Length upto 500 mtr	Y	N	N	N	N
			Length > 500 mtr	Y	Y	One piece forevey 500 mtr	N	Y
6	Fittings	Whether in conformity With tender specs	>100	Y	Y	NA	N	N

C- Sub Station, DG Set, UPS								
State / Sr. No.	Material / Process	Standard Applicable / Test Required to be / Done	Total Qty. (each type) reqd. in agreement or lot size whichever is less	Whether proof of dispatch required	Whether manufacturers test certificates required	Sample size	Location of Test	
							At Manufacture	At third Party Lab

1	HT panel	CPWD specs part N/QA Plan: CT ratio and accuracy Class should be invariably checked	Any	Y	Y	1	Y	N
2	HT Panel: metering & Protection devices	Check CT ratio and accuracy Class , Relays and Meters	Any	Y	Y	1	Y	N
3	LT Panels with ACB	CPWD specs. Part IV/QA Plan: Construction, Ratings of SWG, air gaps between phases ,phase to body ,IP rating, Short Circuit ratings etc.	And	Y	Y	1	Y	N
4	LT Panels with incomer of more than 200 A	GPWD specs. part N/QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc.	Up to 2	Y	Y	0	N	N
			>2 and <t0	y	y	1	y	p
			>10	Y	Y	2	Y	N
5	Capacitor Panel	CPWD specs part N/QA Plan: Check for type of capacitors used, operation of relay, settings. Change the load and its type and check functionality	Any	Y	Y	1	Y	N
6	Rising Main And bus Trucking	IV/QA Plan	upto 500 y	Y	Y	10% length fittings	N	N
			Length > 500 mtr	Y	Y	10% length and fittings	Y	N
7	Cable Tray	CPWD Specs. Part	Length uptog5p00	Y	Y	N	N	N

		I/II: Check for\ Perforation, area, paint/ Galvanising thickness and Material Composition	Length > 500 mtr	Y	Y	One piece for every 500 mtr	N	Y
8	DWC/ Corrugated HDPE Pipe	IS 14930 , Check for thickness, material, Mechanical Strength and smoothness	Length upto 500 mtr	Y	N	N	N	N
			Length > 500 mtr	Y	Y	One piece for every 500 mtr	N	Y
9		CPWD Specs. Part IV/QA Plan: Physical verification of accessories as per agreement and routine tests as per IS:2026flS 11171:1985(whichever applicable), with particular attention to losses meeting ECBC norms /as per agreement, Type test certificate for exact same design for impulse withstand and shorts circuit withstand shall be made available by manufacturer, temperature rise test of one transformer of eachdesign shall be done. Copies of the certificate for pressure test, test forbushings shall be supplied to the department.	Any	Y	Y	100%	Y	N
10	DG Set	Load testing as perCPWD specs	Any	Y	Y	100%	Y	N
11	UPS	Load testing and operation logic as	Any	Y	Y	100%	Y	N

		per CPWD specs Check for input and output power quality as per agreement						
12	HT cable	IS 1554 Part II	Upto 500	Y	Y	1	N	N
			>500 mtr	Y	Y	One piece for every 500 mtr	N	Y
13	LT cable	IS 1554 Part I	Upto 2500 mtr	Y	N	N	N	N
			>2500 mtr	Y	Y	One piece for every 500 mtr	N	Y

D-Fire Fighting								
State / Sr. No.	Material / Process	Standard Applicable / Test Required to be / Done	Total Qty. (each type) reqd. in agreement or lot size whichever is less	Whether proof of dispatch required	Whether manufacturers test certificates required	Sample size	Location of Test	
							At Manufacture	At third Party Lab
1	Pumps	As per tender specs.	Any capacity	Y	Y	100%	N	N
2	MS pipes	To be tested for thickness and weight as per applicable IS	Any	Y	Y	1 for every 100 mtr	N	N
3	Valves	Flow and controls as per data Sheet	up to 20	Y	N	NA	N	N
4	LT Panels With ACB	CPWD specs. part IV / QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit Ratings etc.	Any	Y	Y	1	Y	N
5	LT Panels With incomer of more than 200 A	CPWD specs. Part IV/ QA Plan: Construction, Ratings of SWG, air gaps between phases , phase to body ,IP rating, Short Circuit ratings etc	Up to 2	Y	Y	0	N	N
			>2 and <10	Y	Y	I	Y	N
			>10	Y	Y	2	Y	N

6	Cable Tray	CPWD Specs. Part I/H:Check for perforation area, paint/Galvanising thickness and Material Composition.	Length upto 500 mtr	Y	Y	N	N	N
			Length > 500 mtr	Y	Y	1 piece for ever500 mtr	N	Y

Annexure-V

FORMAT FOR FINANCIAL OFFER

To,

Executive Director
BMTPC,
Core-5A, India Habitat Centre,
Lodi road, New Delhi-110003.

Sub: **Quotation for the work "Third Party Quality Assurance for Light House Project at……."**

Dear Sir

I/We_____Name of TPQA Organization _____ herewith enclose quotation in response to the Terms of reference of BID for subject TPQA work (BID No. BMT/2020/GHTC-LHP/TPQA).

Yours sincerely,

Signature _____

(Authorized Rep. of the TPQA Organization)

Full Name _____

Designation _____

Address _____

Tele Nos: (O)_____ (R)_____

E-mail: _____

Fax No: _____

Annexure-V-A

A.) Schedule of Quantity

Name of Work: Construction of Light House Project (S+8) on Design & Build basis using Prefabricated Sandwich Panel System including on site Infrastructure Work at Indore, Madhya Pradesh

Tendered Amount of the work: Rs. 1,28,00,00,000/-

1	2	3	4	5	6
S.No	**Description**	**Qty**	**Unit**	**Fee in %age of Tendered Amount of work**	**Amount (Rs.)**
1.	Third party Quality Assurance (TPQA) Services for the work of Construction of Light House Project (S+8) on Design & Build basis using Prefabricated Sandwich Panel System including on site Infrastructure Work at Indore, Madhya Pradesh as per the terms of reference of the BID	1	Each		
2.	GST				
3	Total cost				

Note: the fee in percentage of tendered amount (column 5) and amount mentioned in above in column 6 should be carefully filled, in case any discrepancy is found between quoted amount (Column 6) & percentage quoted (column 5), the amount based on lower value shall be taken as quoted amount.

Name, address & Contact No. of authorized person/ Organization	
Sign of authorized person/Organization	
Seal of authorized person/Organization	

Annexure-V-B

B). Schedule of Quantity

Name of Work: Construction of Light House Project (S+13) on Design & Build basis using Monolithic Concrete Construction-Tunnel Form including on site Infrastructure Work at Rajkot, Gujarat

Tendered Amount of the work: Rs. 1,18,89,36,000/-

1	2	3	4	5	6
S.No	**Description**	**Qty**	**Unit**	**Fee in % age of Tendered Amount of work**	**Amount (Rs.)**
1.	Third party Quality Assurance (TPQA) Services for the work of Construction of Light House Project (S+13) on Design & Build basis using Monolithic Concrete Construction (Tunnel Form) including on site Infrastructure Work at Rajkot, Gujarat as per the terms of reference of the BID	1	Each		
2.	GST				
3	Total cost				

Note: the fee in percentage of tendered amount (column 5) and amount mentioned in above in column 6 should be carefully filled, in case any discrepancy is found between quoted amount (Column 6) & percentage quoted (column 5), the amount based on lower value shall be taken as quoted amount.

Name, address & Contact No. of authorized person/ Organization	
Sign of authorized person/Organization	
Seal of authorized person/Organization	

Annexure-V-C

C. Schedule of Quantity

Name of Work: Construction of Light House Project (G+5) on Design & Build basis using Precast Concrete Construction System including on site Infrastructure Work at Chennai, Tamil Nadu

Tendered Amount of the work: Rs. 1,16,26,96,613/-

1	2	3	4	5	6
S.No	**Description**	**Qty**	**Unit**	**Fee in %age of Tendered Amount of work**	**Amount (Rs.)**
1.	Third party Quality Assurance (TPQA) Services for the work of Construction of Light House Project (G+5) on Design & Build basis using Precast Concrete Construction System including on site Infrastructure Work at Chennai, Tamil Nadu as per the terms of reference of the BID	1	Each		
2.	GST				
3	Total cost				

Note: the fee in percentage of tendered amount (column 5) and amount mentioned in above in column 6 should be carefully filled, in case any discrepancy is found between quoted amount (Column 6) & percentage quoted (column 5), the amount based on lower value shall be taken as quoted amount.

Name, address & Contact No. of authorized person/ Organization	
Sign of authorized person/Organization	
Seal of authorized person/Organization	

Annexure-V-D

D). Schedule of Quantity

Name of Work: Construction of Light House Project (G+8) on Design & Build basis using 3 D Volumetric Precast construction including on site Infrastructure Work at Ranchi, Jharkhand

Tendered Amount of the work: Rs. 1,33,99,88,537/-

1	2	3	4	5	6
S.No	**Description**	**Qty**	**Unit**	**Fee in %age of Tendered Amount of work**	**Amount (Rs.)**
1.	Third party Quality Assurance (TPQA) Services for the work of Construction of Light House Project (G+8) on Design & Build basis using 3 D Volumetric Precast construction including on site Infrastructure Work at Ranchi, Jharkhand as per the terms of reference of the BID	1	Each		
2.	GST				
3	Total cost				

Note: the fee in percentage of tendered amount (column 5) and amount mentioned in above in column 6 should be carefully filled, in case any discrepancy is found between quoted amount (Column 6) & percentage quoted (column 5), the amount based on lower value shall be taken as quoted amount.

Name, address & Contact No. of authorized person/ Organization	
Sign of authorized person/Organization	
Seal of authorized person/Organization	

Annexure-V-E

E). Schedule of Quantity

Name of Work: Construction of Light House Project (G+6) on Design & Build basis using Light Gauge Steel Structural System including on site Infrastructure Work at Agartala, Tripura

Tendered Amount of the work: Rs. 1,62,50,00,000/-

1	2	3	4	5	6
S.No	**Description**	**Qty**	**Unit**	**Fee in %age of Tendered Amount of work**	**Amount (Rs.)**
1.	Third party Quality Assurance (TPQA) Services for the work of Construction of Light House Project (G+6) on Design & Build basis using Light Gauge Steel Structural System including on site Infrastructure Work at Agartala, Tripura as per the terms of reference of the BID	1	Each		
2.	GST				
3	Total cost				

Note: the fee in percentage of tendered amount (column 5) and amount mentioned in above in column 6 should be carefully filled, in case any discrepancy is found between quoted amount (Column 6) & percentage quoted (column 5), the amount based on lower value shall be taken as quoted amount.

Name, address & Contact No. of authorized person/ Organization	
Sign of authorized person/Organization	
Seal of authorized person/Organization	

Annexure-V-F

F). Schedule of Quantity

Name of Work: Construction of Light House Project (G+13) on Design & Build basis using Stay in Place Formwork System including on site Infrastructure Work at Lucknow, Utter Pradesh

Tendered Amount of the work: Rs. 1,30,90,00,000/-

1	2	3	4	5	6
S.No	**Description**	**Qty**	**Unit**	**Fee in %age of Tendered Amount of work**	**Amount (Rs.)**
1.	Third party Quality Assurance (TPQA) Services for the work of Construction of Light House Project (G+13) on Design & Build basis using Stay In Place Formwork System including on site Infrastructure Work at Lucknow, Utter Pradesh as per the terms of reference of the BID	1	Each		
2.	GST				
3	Total cost				

Note: the fee in percentage of tendered amount (column 5) and amount mentioned in above in column 6 should be carefully filled, in case any discrepancy is found between quoted amount (Column 6) & percentage quoted (column 5), the amount based on lower value shall be taken as quoted amount.

Name, address & Contact No. of authorized person/ Organization	
Sign of authorized person/Organization	
Seal of authorized person/Organization	

No. I-11019/05/2019–HFA-V-UD (FTS-9058698)
Government of India
Ministry of Housing and Urban Affairs
(HFA-V Section)
*****

Room No.3, Technical Cell, Gate No. 7,
Nirman Bhawan, New Delhi-110011,
Dated: 28.05.2019.

OFFICE MEMORANDUM

Sub: **Technical Evaluation Committee (TEC) report for shortlisting of Proven Technologies for Participation in bidding for construction of Light House Projects (LHPs) – reg.**

The undersigned is directed to state that the Ministry of Housing and Urban Affairs (MoHUA) has conceptualized the Global Housing Technology Challenge – India (GHTC-India) as a platform with which a holistic eco-system can be facilitated such that appropriate technologies from around the world and relevant stakeholders can be catalyzed towards effecting a technology transition in the country's housing and construction sectors. The challenge has three components i.e. (i) Conduct of a biennial Construction Technology India, Expo-cum-Conference, to provide a platform for all stakeholders to exchange knowledge and business, (ii) Identifying Proven Demonstrable Technologies from across the world, and mainstreaming them through use in Light House Projects (LHPs), (iii) Promoting Potential Future Technologies through the establishment of Affordable Sustainable Housing Accelerators- India (ASHA-India) for incubation and accelerator support.

2. GHTC-India was launched by Hon'ble Minister of State (Independent Charge), MoHUA on 14.01.2019 at Press Conference Hall, National Media Centre, Press Information Bureau, New Delhi. Subsequently, Construction Technology India – 2019 (CTI-2019): Expo-cum-Conference was held at Vigyan Bhawan, New Delhi during 02-03 March, 2019 to bring together multiple stakeholders involved in innovative and alternative housing technologies, for exchange of knowledge and business opportunities through an exhibition, thematic sessions, panel discussions and master classes. The Expo was inaugurated by Hon'ble Prime Minister of India in the presence of Hon'ble MoS (I/C), MoHUA.

3. The applications were invited online globally through a dedicated websitefrom proven technology providers, potential technology providers, Indian partners and delegates consisting representatives from various Academic Institutes, representatives of technology providers and Government officers/ officials. The last date for submission of forms online for Proven Technology was 28 February 2019.

4. CTI-2019 had about 3500 visitors including 2500 delegates from 32 countries. The exhibition had 188 stalls in which 60 Proven Technology Providers, 72 Potential Technology Providers and 51 Indian Partners applied and participated in CTI-2019. 23 States/ UTs also exhibited progress of PMAY(U) in the Expo through showcasing prototypes of housing projects constructed. The stalls of various Missions such as Smart City,Atal Mission for Rejuvenation and Urban Transformation(AMRUT), Heritage City Development and Augmentation Yojana(HRIDAY), Swachh Bharat Mission (SBM) and National Urban Livelihoods Mission (DAY-NULM) of MoHUA were also exhibited in the Expo.

5. A Technical Evaluation Committee (TEC) under the chairmanship of the Director General, CPWD has been constituted for detailing the technical parameters for inviting and evaluating the eligibility of applicants for the various streams including LHPs. TEC interacted with applicants, who submitted online applications under Proven Demonstrable Technology category for GHTC-India. Technical presentations of their technologies were made before the TEC during CTI-2019. Out of 60 applications, 54 applications were for Proven Technologies, which were finally evaluated as per eligibility criteria. The remaining 6 applicants were mainly equipment/product manufacturers which did not qualify under Proven Technology.

6. Based on the TEC recommendations, 54 technology providers were found eligible for participating in bidding for construction of LHPs. The list of 54 eligible technology providers is attached herewith.

7. This issues with the approval of competent authority.

28/5/19

(B.K. Mandal)
Under Secretary to the Government of India
Tel: 23061825
E-mail: clsshfa5@yahoo.com

Encl: As above.

To:

All the concerned technology providers

Copy for information to:

i. PS to Hon'ble MoS (I/C), MoHUA
ii. PSO to Secretary, MoHUA
iii. PS to JS&MD (HFA), MoHUA
iv. PA to Director (HFA-V), MoHUA
v. GHTC-India website for information

TEC's recommendations on technologies along with recommended locations for Light House Projects:

S. No.	Technology broad specification	Applicants	Recommendations	Recommended Locations for Lighthouse Projects
A. Precast Concrete Construction System - 3D Precast volumetric (4)				
1	Pre-cast concrete system with columns, beams, walls, slabs, hollow core slabs & also 3D Volumetric components	Katerra	Suitable up to seismic zone IV.	1.Lucknow, Uttar Pradesh 2.Rajkot, Gujarat 3.Ranchi, Jharkhand 4.Indore, Madhya Pradesh, 5.Chennai, Tamil Nadu(with external wall insulation)
2	Vertical structural modules cast in Plant/Casting yard are assembled together through casting of floor panel. The unit is transported & installed at site.	Moducast Pvt. Ltd	Suitable up to seismic zone IV. Requires proper access to site & special transport logistics. Suitable up to G+3 due to limited hoisting capacity	
3	3D Modular casting using steel mould and high performance concrete of building modules in factory. These pods are transported to the construction site & assembled	Magicrete Building Solutions,	Suitable up to seismic zone IV. Site must have accessibility & technology needs special transport logistics	
4	Modules with 3D Volumetric Precast concrete unit, various units make on house	Ultratech Cement Ltd,	Suitable up to seismic zone IV. Site must have accessibility & technology needs special transport logistics	
B. Precast Concrete Construction System – Precast components assembled at site (8)				
5	Precast Large Concrete Panel (PLCP) System with structural members (wall, slab etc.) cast in a factory/ casting yard and brought to the building site for erection & assembling	Larsen & Toubro	Suitable up to seismic zone IV.	1.Lucknow, Uttar Pradesh 2.Rajkot, Gujarat 3.Ranchi, Jharkhand 4.Indore, Madhya Pradesh, 5.Chennai, Tamil Nadu (external wall insulation needed in case brick/block masonry not used in external walls)
6	Pre-cast Concrete Structural system comprising of pre-cast column, beam, precast concrete / light weight slab, AAC blocks/ infill concrete walls.	B.G. Shirke Construction Technology Pvt. Ltd	Suitable up to seismic zone IV.	
7	Optimal Pre-cast concrete System through structural Analysis, design & equipment support	Elematic India,	Suitable up to seismic zone IV. The firm needs to tie up with a construction Agency.	
8	Precast concrete construction system using precast walls with precast plank floor	PG Setty Construction Technology Pvt Ltd,	Suitable up to seismic zone IV	
9	Pre cast components comprising of beams, coloumns, staircase, slab, hollow core slab etc. manufactured in plant & erected on site	Teemage		
10	Pre-cast sandwich panel system & Light weight Pre cast Light Weight concrete slab	Nordicflex		
11	Prefabricated Interlocking Technology (without mortar) with Roofing as Mechnized Precast R.C. Plank & Joist system	Adalakha Associates Pvt. Ltd	Suitable up to G+3 storeys & Seismic Zone – IV	

S. No.	Technology broad specification	Applicants	Recommendations	Recommended Locations for Lighthouse Projects
12	Large Hollow wall prefab concrete Panel (lightweight, interlocking, concrete panel) using factory produced large standard hollow interlocking concrete block	William Ling,	Suitable up to seismic zone IV.	
C. Light Gauge Steel Structural System & Pre-engineered Steel Structural System (16)				
13	LGS Framing with various walling & roofing options	Mitsumi Housing Pvt. Ltd,	Suitable for G+ 3 storeys. Hybrid with steel frame for high rise Panelling materials to be used should meet the site specific quality and durability requirements .	1.Lucknow, Uttar Pradesh 2.Rajkot, Gujarat 3.Ranchi, Jharkhand 4.Agartala, Tripura 5.Indore, Madhya Pradesh, 6.Chennai, Tamil Nadu
14	LGS Framing with various walling & roofing options	Everest Industries Ltd,		
15	LGS Framing with various walling & roofing options	JSW Steel Ltd.,		
16	LGS Framing with various walling & roofing options	Society for Development of Composites,		
17	LGS Framing with various walling & roofing options	Elemente Designer Homes,		
18	LGS Framing with various walling & roofing options	MGI Infra Pvt. Ltd.,		
19	LGS Framing with various walling & roofing options	RCM Prefab Pvt. Ltd,		
20	LGS Framing with various walling & roofing options	Nipani Infra and Industries Pvt. Ltd.,		
21	LGS Framing with various walling & roofing options	Strawcture Eco		
22	LGS Framing with various walling & roofing options	Visakha Industries Ltd.		
23	Prefabricated steel structural system with Dry wall system as AAC panels, Puf panels etc	RCC Infra Ventures Ltd.	Suitable technology	
24	Hot rolled steel frame with speed floor	Jindal Steel & Power Ltd.	Suitable technology with accepted walling components.	
25	Hot rolled steel section with AAC Panels as floor & slab	HIL Ltd.		
26	AAC wall and roof panel system to provide integrated solution. AAC products are reinforced and used in both load and non-load bearing applications.	Biltech Building Elements Ltd	Suitable up to G+1 (Load bearing) Suitable with steel frame for high rise	
27	AAC Panels are Wire mesh/ steel reinforced for use as wall & slab. Appears to be non load bearing panels to be used with structural framing.	SCG International India Pvt Ltd		
28	Precast Light Weight Hollow-core wall Panel is a non-structural construction material with framed structures.	Pioneer Precast Solutions Private Limited	Suitable with steel frame	
D. Prefabricated Sandwich Panel System (9)				
29	Reinforced Expanded Polystyrene sheet core Panel with sprayed concrete as wall & slab	Worldhaus	Suitable for G+ 3 storeys.	1.Lucknow, Uttar Pradesh 2.Rajkot, Gujarat 3.Ranchi, Jharkhand 4.Agartala, Tripura 5.Indore, Madhya Pradesh, 6.Chennai, Tamil Nadu
30	EPS Cement sandwich Panel): wall & slab with EPS Cement sandwich Panel to be used with RCC or Steel structural frame. Load bearing upto G+1 storey	Bhargav Infrastructure Pvt.Ltd	Suitable up to G+1 (Load bearing) Hybrid with Steel/RCC frame for multi storey	

S. No.	Technology broad specification	Applicants	Recommendations	Recommended Locations for Lighthouse Projects
31	EPS Cement sandwich Panel): wall & slab with EPS Cement sandwich Panel to be used with RCC or Steel structural frame. Load bearing upto G+1 storey	Rising Japan Infra Private Limited		
32	Reinforced Expanded Polystyrene sheet core Panel with sprayed concrete as wall & slab	Bau Panel Systems India Pvt Ltd,	Suitable for G+ 3 storeys.	
33	Reinforced Expanded Polystyrene sheet core Panel with sprayed concrete as wall & slab	BK Chemtech Engineering		
34	Reinforced Expanded Polystyrene sheet core Panel with sprayed concrete as wall & slab	MSN Construction		
35	Reinforced Expanded Polystyrene sheet core Panel with sprayed concrete as wall & slab	Beardshell Ltd.		
36	Pre-fab PIR (Poly-isocyanurate) based Dry Wall Panel System" as non-load bearing wall	Covestro India Pvt. Ltd.,	Suitable with steel frame	
37	Sandwich panels as wall & slab	Project Etopia Group	Suitable for G+ 3 storeys.	
E. Monolithic Concrete Construction (9)				
38	Aluminium form work system for Monolithic Concrete construction	Maini Scaffold Systems	Suitable technology	1.Lucknow, Uttar Pradesh 2.Rajkot, Gujarat 3.Ranchi, Jharkhand 4.Agartala, Tripura 5.Indore, Madhya Pradesh, 6.Chennai, Tamil Nadu(with external wall insulation)
39	Aluminium form work system for Monolithic Concrete construction	KumkangKind India Pvt. Ltd		
40	Aluminium form work system for Monolithic Concrete construction	S-form India Pvt. Ltd.,		
41	Aluminium form work system for Monolithic Concrete construction	ATS Infrastructure Ltd.		
42	Aluminium form work system for Monolithic Concrete construction	Innovative housing & Infrastructure Pvt. Ltd		
43	Aluminium form work system for Monolithic Concrete construction	MFS formwork Systems Pvt. Ltd.		
44	Aluminium form work system for Monolithic Concrete construction	Knest Manufacturers LLP		
45	'Tunnel form' construction technology, an cast in situ RCC system, based on the use of high-precision, re-usable, room-sized, steel forms or moulds for monolithic concrete construction	Outinord Formworks Pvt. Ltd.	Suitable technology	
46	Aluminium form work system for Monolithic Concrete construction	Brilliant Etoile	Suitable technology	
F. Stay In Place Formwork System (8)				
47	Expanded-Steel Panel reinforced with all-galvanised Steel Wire-Struts serving both as the load-bearing steel structure and as the stay-in-place steel formwork filled with EPS-alleviated concrete	JK Structure	Suitable for G+3 storeys	1.Lucknow, Uttar Pradesh 2.Rajkot, Gujarat 3.Ranchi, Jharkhand 4.Agartala, Tripura 5.Indore, Madhya Pradesh,

S. No.	Technology broad specification	Applicants	Recommendations	Recommended Locations for Lighthouse Projects
48	Factory made prefab Glass fibre reinforced Gypsum cage panels suitable for wall & slab with reinforcement & concrete as infill as per the requirement	FACT RCF Building Products Limited,	Suitable up to 10 storeys in seismic zone–III, & up to 6 storeys in seismic zone-V if conforming to design requirements.	6.Chennai, Tamil Nadu
49	Structural Stay In Place Galvanized Steel formwork system for walling with the same bottom single layer formwork for slabs/ in-situ slab	Coffor Construction Technology Pvt.Ltd	Suitable for G+3 storeys.	
50	Factory produced PVC Stay in place formwork with concrete & reinforcement in walling units with cast in-situ RCC Slab	Joseph Jebastin (Novel Assembler Private Limited),	Suitable Technology	
51	Fully load bearing walls with 150 mm monolithic concrete core sandwiched inside two layers of EPS as walling The forms are open ended hollow polystyrene iterlocking blocks which fits together to form shuttering system	Reliable Insupack	Suitable up to G+3 in Seismic Zone V and higer storeys in Seismic Zone IV as per design	
52	Ready to use Stay in place polymer formwork, light weight, with flooring slab (combination of ferro cement and natural stone) placed on RCC precast joists)	Kalzen Realty Pvt. Ltd	Not suitable as the system presented by the applicant does not qualify as a proven technology. However, it is suitable Technology as Stay in place preassembled PVC wall forms along with cast in-situ RCC slab.	
53	Fast Bloc, Insulated Concrete Form (ICF), acts as formwork for concrete and rebar, Coloumn/post and beam construction, creating an strong skeleton in the walls.	Fastbloc Building Systems	Suitable up to G+3 in Seismic Zone V and higher storeys in Seismic Zone IV as per design	
54	Formwork system "Plaswall" with Two fibre cement boards (FCB) & HIMI (High Impact Molded Inserts) bonded between two sheets of FCB in situ and erected to produce a straight-to-finish wall with in-situ concrete	FTS Buildtech Pvt.Ltd	Suitable up to G+3 in Seismic Zone V and higher storeys in Seismic Zone IV as per design	

Eligible technologies grouped by TEC in six broad categories

S. No.	Broad Technologies	Number of Applicants
A.	Precast Concrete Construction System - 3D Precast volumetric	04
B.	Precast Concrete Construction System – Precast components assembled at site	08
C.	Light Gauge Steel Structural System & Pre-engineered Steel Structural System	16
D.	Prefabricated Sandwich Panel System	09
E.	Monolithic Concrete Construction	09
F.	Stay In Place Formwork System	08
	Total	**54**

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