VOLUME - IA

Technical Conditions of Contract (TCC) for
"**CONSTRUCTION OF SITE ENABLING WORKS**"

FOR

1x150 MW BTG package for Hindalco Industries Limited (HIL) Aditya Aluminium at Lapanga, Sambalpur, Odisha.

BHARAT HEAVY ELECTRICALS LIMITED

	Technical Conditions Of Contract (TCC) **PROJECT ENGINEERING & SYSTEMS DIVISION** **HYDERABAD**	Ref No: HY/PE&SD/Projects/TCC/2025-26/HIL/150MW/ Enabling works/01 Rev. No. 02

TECHNICAL CONDITIONS OF CONTRACT (TCC)

FOR

"CONSTRUCTION OF SITE ENABLING WORKS"

WORKS IN "1x150 MW BTG package for Hindalco Industries Limited (HIL) Aditya Aluminium at Lapanga, Sambalpur, Odisha"

Revisions: Refer to record of revisions	Prepared By:	Checked By:	Approved By:	Date
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Part I

Contract specific details

Chapter I- Project Information

1.0	**Project Details**		
1	Customer	:	**Hindalco Industries Limited (HIL) Aditya Aluminium**
2	Project Information	:	1X150MW BTG
3	Location	:	Sambalpur, Odisha
4	Address Detail	:	Lapanga, sambalpur district, Odisha
5	Nearest Railway Station	:	Hirakud railway station
6	Road Approach	:	
7	Nearest Air Port	:	Jharsuguda Airport
11	Ambient Air Temperature (Average)	:	a) Maximum : 40^0 C b) Minimum : 11.5^0 C
12	Average Relative Humidity	:	65%
13	Climatic Condition	:	Tropical Climate

Bidder is advised to visit the project site and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

Chapter II- Scope of Work

1) Site development, viz. final dressing to leveling, grading, development of open storage yard, base/foundation preparation for installation of Porta cabins, installation of chain link mesh fencing with gates and storage areas, laying of water distribution network, soak pit, installation of water storage tanks, etc. for the site office area allotted to BHEL.
2) Illumination of the site office area/Porta cabins and open storage yard.
3) Electrical distribution board for providing power connection to E&C contractor & other contractors/vendors.
4) Construction of Pre-engineered Building (One with storage racks another one without storage racks) for closed storage shed.
5) Fabrication, assembly, painting and supply of storage racks and storage stands for storage of materials.
6) The work has to be executed as per the approved drawings & bill of quantities for various items of the work as per the direction & instruction of engineer-in-charge.
7) All the construction materials, tools & tackles are in the scope of the contractor

Detailed scope of works is provided in Part-II “Technical Specification” of TCC

Chapter III- Facilities in the scope of BHEL/Contractor

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.1	**ESTABLISHMENT**			
3.1.1	**FOR CONSTRUCTION PURPOSE**:			
a	Open space for office (as per availability)		Yes	
b	Open space for storage (as per availability)		Yes	
c	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
d	Bidder's all office equipment, office / store / canteen consumables		Yes	
e	Canteen facilities for the bidder's staff, supervisors and engineers etc.		Yes	
f	Firefighting equipment like buckets, extinguishers etc.		Yes	
g	Fencing of storage area, office, canteen etc. of the bidder		Yes	
3.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
a	Open space for labor colony (as per availability)		Yes	
b	Labor Colony with internal roads, sanitation, complying with statutory requirements		Yes	
3.2.0	**ELECTRICITY**			
3.2.1	Electricity For construction purposes		Yes	Electricity shall be provided by BHEL/Hindalco at one point free of cost. Further distribution shall be done by contractor at its own cost.
3.2.2	Electricity for the office, stores, canteen etc. of the bidder		Yes	

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc.		Yes	
3.3.0	**WATER SUPPLY**			
3.3.1	For construction purposes		Yes	Water shall be provided by Hindalco at one point free of cost. Further distribution shall be done by contractor at its own cost .
3.3.2	Water supply for bidder's office, stores, canteen etc.		Yes	
3.3.3	Water supply for Living Purpose		Yes	
3.4.0	**LIGHTING**			
a	For construction work (supply of all the necessary materials) 1. At office/storage area 2. At the preassembly area 3. At the construction site /area		Yes	
b	For construction work (execution of the lighting work/ arrangements) 1. At office/storage area 2. At the preassembly area At the construction site /area		Yes	
c	Providing the necessary consumables like bulbs, switches, etc. during the course of project work		Yes	
d	Lighting for the living purposes of the bidder at the colony / quarters		Yes	
3.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**			
a	Téléphone, fax, internet, intranet, e-mail etc.		Yes	
3.6.0	**COMPRESSED AIR wherever required for the work**		Yes	
3.7.0	**Demobilization of all the above facilities**		Yes	
3.8.0	**TRANSPORTATION**			
a	For site personnel of the bidder		Yes	

S. No.	Description PART I	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
b	For bidder's equipment and consumables (T&P, Consumables etc.)		Yes	

Sl. No	Description PART II 3.9.0 CONSTRUCTION FACILITIES	Scope / to be taken care by		*Remarks*
		BHEL	**Bidder**	
3.9.1	**Engineering works for construction:**			
a	Providing the construction drawings for all the works covered under this scope		**Yes**	Drawings shall be prepared by bidder and shall be approved by BHEL.
b	Drawings for construction works		Yes	
c	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	In consultation with BHEL
d	Shipping lists etc. for reference and planning the activities		Yes	In consultation with BHEL
e	Preparation of construction (Concreting B/W, etc.) schedules and other input requirements		Yes	In consultation with BHEL
f	Review of performance and revision of site construction schedules in order to achieve the end dates and other commitments	Yes	Yes	In consultation with BHEL
g	Weekly construction schedules based on S. No. e. hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL

Sl. No	Description PART II 3.9.0 CONSTRUCTION FACILITIES	Scope / to be taken care by		Remarks
		BHEL	Bidder	
h	Daily construction / work plan based on S. No. g. hard copy to Construction manager, by email to HO.		Yes	In consultation with BHEL
i	Periodic visit of senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two Weeks.		Yes	
j	Arranging the materials required for Work		Yes	
k	Coordination for inspection & checking and getting clearance from customer		Yes	
l	Preparation of formats for completion of activities		Yes	
3.10	**Work Permits, gate pass etc. from customer for manpower, machinery and material**		Yes	

Chapter IV- Tools & plants to be deployed by Contractor

LIST OF TOOLS AND PLANT:

The following tools and equipment but not limited to, are required for the efficient execution of the civil works. The contractor shall make them available for construction purposes, including all consumables likely to be used at his own cost at the time of mobilization.

S.No.	Description	Minimum Quantity	Remarks
1.	Concrete batching plant (Stationary/Movable) or RMC	1 nos.	Need based
2.	Needle Vibrator (Needle type 40mm)	4 nos.	Need based
3.	Needle Vibrator (Needle type 25mm)	2 nos.	Need based
3.	Surface Vibrator	1 no.	Need based
4.	Concrete Pump	1 no.	Need based
5.	Dewatering Pump	2 nos.	Need based
6.	Earth Compactor	2 nos.	Need based
7.	Reinforcement steel cutting & Bending machine	2 nos.	Need based
8.	Welding Machine	2 nos.	Need based
9.	Grinding Machine	4 nos.	Need based
10.	Excavator	1 no.	Need based
11.	Theodolite with staff	1 no.	Need based
12.	Dumpy level with staff	1 no.	Need based
13.	Compression testing machine (for concrete cubes)	1 no.	Need based
14.	Cube mould (15cm x 15cm x 15cm)	6 nos.	Need based
15.	Sieve analysis sieve sets for coarse & fine aggregates	1 set	Need based
14.	Jar/Beaker for Bulk density test of sand	1 no.	Need based
15	All the T & Ps required for Electrical works	1Set	Need Basis

BHEL will not provide any tool, plants, facilities or any testing facility/apparatus for the work. It will be contractor's responsibility to arrange all required tools, plants and other testing apparatus, etc. at their own cost. The prices quoted & finalized are inclusive of the charges towards providing such T&P. No extra payment will be entertained because of this.

However, subject to availability, BHEL may provide few T&P to the contractor for expediting and in larger interest of the project. In case any such facility is provided to the contractor, BHEL will make necessary recovery in the running account/final bills towards the hire charges. A departmental charge @ 5% will also be affected such cases. The decision of BHEL on the hire charges will be final and binding on contractor.

Chapter V- Time Schedule

5.1 TIME SCHEDULE

5.1.1
The entire work as detailed elsewhere in the Tender Specification shall be completed within **4 Months** from the date of commencement of work at site.

5.1.2
During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events.

5.1.3
The work shall be commenced on the mutually agreed date between the bidder and BHEL engineer. The decision of BHEL in this regard shall be final and binding on the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

5.2 COMMENCEMENT OF CONTRACT PERIOD

The date of commencement of contract period shall be from **Dec 2025** tentatively. The commencement date shall be the mutually agreed between the bidder and BHEL engineer. In case of discrepancy, the decision of BHEL engineer will be final.

5.3 MOBILISATION

5.3.1
The activities shall be started as per directions of Construction manager of BHEL.
5.3.2
The contractor should mobilize manpower in order to complete the work in **Four (4) Months.**
5.3.3
Requisite Material, men and machinery should be arranged in order to complete the project within stipulated time.
5.3.4
The contractor has to augment his resources in such a manner that following major milestones of the project are achieved on specified schedules:

In order to meet above schedule in general, and any other intermediate targets set, to meet project, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL.

5.4 CONTRACT PERIOD

For the purpose of contract, the period shall be **Four (4) Months**. Completion of the work shall be as per BHEL Bar Charts revised from time to time. In order to expedite the work, the contractor has to deploy manpower as per site requirement without any extra cost to BHEL.

5.5 GUARANTEE PERIOD

The guarantee period of twelve months shall commence from the date of completion of all works as certified by the BHEL site engineer.

5.6 PROTECTION OF WORK

The contractor shall have total responsibility for protecting his works until it is taken over by the Employer. No claim will be entertained by the Employer or the representative of the Employer for any damage or loss to the Contractor's works and the Contractor shall be responsible for complete restoration of the damaged works to original conditions to comply with the specification and drawings. Should any such damage to the Contractor's Works occur because of other party not being under his supervision or control, the Contractor shall make his claim directly with the party concerned.

If disagreement, conflict, or dispute develops between the Contractor and the other party or parties concerned regarding the responsibility for damage to the Contractor's Works the same shall be rectified. The Contractor shall not cause any delay in the repair of such damaged Works because of any delay in the resolution of such disputes. The Contractor shall proceed to repair the Work immediately and no cause thereof will be assigned pending resolution of such disputes.

Chapter VI- Statutory Regulation

6.1 GST: For All types of works excepting works covered under sl no 6.2

6.2 BUILDING & OTHER CONSTRUCTION WORKERS (REGULATION OF EMPLOYMENT AND CONDITIONS OF SERVICE) ACT, 1996 (BOCW Act) AND RULES OF 1998 READ WITH BUILDING & OTHER CONSTRUCTION WORKERS CESS Act, 1996 & CESS RULES, 1998 and

INTER-STATE MIGRANT WORKMEN ACT, 1979 (IN CASE BIDDER ENGAGE MANPOWER FROM OTHER STATE)

In case any portion of work involves execution through building or construction workers and/or inter-state migrant workers, then compliance to the above titled Acts as applicable shall be ensured by the contractor and contractor shall obtain license and deposit the cess under the Act. In the circumstances, it may be ensured as under:-

It shall be the sole responsibility of the contractor in the capacity of employer to forthwith (within a period of 15 days from the award of work) apply for a license to the Competent Authority under the BOCW Act and/or ISMW Act as applicable and obtain proper certificate thereof by specifying the scope of its work. It shall also be responsibility of the contractor to furnish a copy of such certificate of license / permission to BHEL within a period of one month from the date of award of contract.

It shall be the sole responsibility of the contractor as employer to ensure compliance of all the statutory obligations under these acts and rules including that of payment / deposit of cess as per the applicability under above referred Acts within a period of one month from the receipt of payment.

It shall be the responsibility of the sub-contractor to furnish the receipts / challans towards deposit of the cess together with the number, name and other details of beneficiaries (building/Inter-state Migrant workmen) engaged by the sub-contractor during the preceding month.

It shall be the absolute responsibility of the sub-contractor to make payment of all statutory payments & compensations to its workers including that is provided under the Workmen's Compensation Act, 1923.

Chapter VII- Field quality control plan

1. Work shall be executed as per approved field quality control plan (FQCP). Submitted FQCP shall be reviewed and approved by BHEL.

Chapter VIII: HSE (Health, Safety, Environment) and PPE (personal Protective Equipment) Guidelines

1. Contractor shall follow all the HSE guidelines as mentioned chapter IX off SCC and HIL.
2. Contractor shall deploy one (1) number of qualified and experienced safety officer for the entire period of contract.
3. Contractor shall submit the biodata of safety officer to BHEL/Customer (HIL), for approval.
4. In case of any dispute/ contradiction, HIL HSE rules and guidelines shall prevail.
5. PPEs of Reputed make shall be made available to the workmen as per Chapter IX of SCC.
6. All the vehicle movements/ Loading and unloading shall be done by strictly following the safety norms.
7. FARANA crane shall be used instead of Hydra.

Part II

Chapter 9 : Technical Specifications for Integrated Site Office

1. BIDDER'S SCOPE OF SUPPLY AND ERECTION-COMMISSIONING OF PRE-ENGINEERED BUILDING:

Design, Supply and Erection one Pre Engineered Integrated Office building of 30mX10mX3m & two toilet blocks (Staff & CM) with wooden partitions, required electrical installations, toilet fittings and furniture as per attached drawing.

Major supply and services included in bidder's scope:

S.No	Description	Quantity
1.	Development and submission of required drawings for the approval by BHEL	As per BOQ & drawings provided in subsequent clauses
2.	Supply of PEB structural materials such as columns, rafters, beams, purlins, steel sheets, insulation etc.	
3.	Supply of PEB architectural items such as doors, windows, rolling shutters, etc.	
4.	Supply of all the Furniture as per the attached BOQ	
5.	Supply of Electrical Services	
6.	E&C: Erection of PEB structural materials including the civil and earthworks needed for erection	
7.	E&C: Erection of PEB architectural items.	
8.	E&C: Erection and Commissioning of Electrical Services	
9.	E&C: Erection of all Furniture as per attached drawing	

2 BIDDER'S SCOPE OF SERVICES

2.1 LIST OF MAJOR SERVICES INCLUDED IN BIDDER'S SCOPE:

I. Detailed Engineering, Development of drawings and certification of the design from third party as approved by BHEL

II. Technical services relating to planning, procurement, manufacturing, inspection, expediting, packing, shipping, storing, etc.

III. Submission and obtaining approval of all engineering documents before start of works

IV. Engineering for procurement

V. Preparation of all MTOs and MRs, as required

VI. ORDERING of all materials

VII. Overall Project Management and progress reporting to BHEL

VIII. Expediting suppliers and sub vendors

IX. Procurement

X. Conducting all required earthworks and civil works for erection like trenching, foundations, RCC and PCC works, etc.

XI. Manufacture, fabrication and assembly of all required materials at site

XII. Inspection and testing including third party Inspection

XIII. Painting of all works, painting at site including touch up paint

XIV. Dispatch and transportation of materials, consumables, construction aids etc to site.

XV. Establishment of site office complete with all facilities and communication network, as required

XVI. Storage, loading, unloading, security and handling at site

XVII. Construction at site including earthwork, foundations, backfilling, PCC & RCC works, fabrication, erection and installation and Supervision of work during all the activities for completion of Pre-Engineered buildings.

XVIII. Insulation with cladding and painting

XIX. Engineering for interfacing all inputs and outputs

XX. Site clearing and cleaning

XXI. Total day to day supervision of construction including erection and specialized services, if any

XXII. Clearance for installations from the statutory and other concerned authorities on behalf of Purchaser. The Contractor shall also assist in preparing application forms, providing necessary drawings, documents, test certificates etc including necessary co-ordination with statutory and other concerned authorities.

XXIII. Liaisoning with other contractors in the plant

XXIV. Handing over the completed PEB to BHEL

XXV. Supply of all test reports /certificates

XXVI. Providing as built drawings

Notes:

Bidder to note that the above list is not exhaustive and any other service required as per the intent of this specification / project requirements /good engineering practice shall be

deemed to be included in bidder's scope without any commercial implication to the purchaser.

3. CLARITY OF SCOPE IN OTHER AREAS (In addition to Cl.2.0.0):

S.No	Item	By BHEL	By Vendor	Remarks
1	Complete civil foundation works for all the Pre Engineered Integrated Office building.		YES	Vendor shall submit the loading details for foundation design
2	RCC cable-trenches within the office building		YES	
3	Flooring works within the office building		YES	
4	Plinth protection around the office building		YES	
5	Steps/ ramps on front/back sides of the room as applicable		YES	
6	Composite slab, if adopted by bidder, incl. all shuttering, reinforcement, bolts, decking, formwork, fasteners, painting, finishes, waterproofing, etc		YES	
7	Electrical works including supply and E&C of wiring, room appliances (lights, ceiling fans, exhaust fans, ventilators, etc), switchboards, MCB boxes etc for the office building as specified in clause 9.5. (A)		Yes	
8	Cut out/ provision of supports & fixtures for the room appliances		Yes	
9	Supply and Installation of all furniture including tables, chairs, modular work stations with power ports, Storage Almirahs, etc		Yes	

4.TECHNICAL DETAILS

4.1 Design, supply and erection of Pre-Engineered Buildings

4.1.1. Design and supply of PEB structural materials

a) After receipt of BHEL PO, following documents shall be submitted to BHEL for approval:

1 Structural design calculations including STADD Pro

2 GA drawings along with BOM.

b) Design calculations, checked and certified by IIT/NIT, shall be submitted to BHEL for approval.

c) Vendor shall supply the structural materials such as columns, rafters, beams, purlins, tie rods, sheets, wall cladding/roofing PUF insulation, hardware etc. to the site as per the BHEL approved drawings. Raw materials for steel sections, sheets etc. should be of reputed make of supplier to similar construction / infrastructure projects conform to relevant Indian / International Standards. The Bidder should furnish documentary evidence for the same.

To the extent possible, the Contractor shall consider the standard steel sections and plates available in India. In case the Contractor uses raw materials conforming to standards other than Indian Standards, the contractor should clearly indicate the Indian equivalent of the same and approval from the purchaser is to be obtained for use of such raw materials. In case for any raw materials standards other than Indian Standards is already specified in the Contract, approval as mentioned above is not required. In case of non-availability of raw materials in India, the Contractor shall switch over to import of the required raw materials expeditiously at its own cost and responsibility. The Purchaser shall not grant any time extension, on account of any delay in the procurement of raw materials. The Contractor shall take samples and test them in laboratories in India and/or abroad as may be required at his own cost & time, and fully satisfy himself of the suitability of the raw materials for the purpose of the plant & equipment offered by him. The Contractor shall furnish the test results to Purchaser for approval.

d) Vendor shall also supply the J bots/nuts/washers, alignment plates and other related hardware that are used for positioning and anchoring of the PEB structures to the RCC foundation plinth.

e) All the items shall be supplied directly to the project site.

4.1.2. Design and supply of PEB architectural items

a) After receipt of BHEL PO, vendor shall submit GA drawings along with BOM (item-wise description, quantity, make, model etc) of the architectural items for BHEL approval.

b) The architectural items submitted for approval shall meet the requirements of various aspects of the room such as electrical, illumination, ventilation, exhaust, thermal, safety, security etc.

c) Accordingly, this shall include all items such as windows with shades, doors with shades/lock/key, rolling shutters with lock/key, ventilator provisions, exhaust provisions, rain water gutters/ down comers/ pipes etc. Raw materials for steel sections, sheets etc shall be of reputed make such as Jindal Steel and Power, RINL, SAIL, TISCO, JSW Steel, Essar Steel, Ispat Industries, Lloyd Steel Industries. Vendor shall take prior approval from BHEL for the make prior to proceeding with procurement action.

d) Vendor shall supply the items directly to the project site.

4.1.3. Erection of structures of PEB

a) Vendor shall erect the structural items such as columns, rafters, beams, purlins, tie rods, sheets, wall cladding/roofing insulation, hardware etc as per the BHEL approved drawings / BoM.

b) Vendor shall also carry out necessary finishing activities such as painting etc.

c) Vendor shall deploy qualified/competent team at site to carry out the above erection activity.

d) Vendor shall also deploy their specialized team during plinth casting of J bolts / alignment (base) plates etc in order to provide the needed support/guidance to the BHEL civil construction team at site.

e) All necessary labour, tools & tackles, shuttering materials, measuring instruments, machinery shall be in vendor scope of supply. This shall include spanner sets, drilling machines, welding machines, hydra, JCB, truck, trolley etc as required for the erection work.

4.1.4. Erection of architectural

a) Vendor shall carry out erection of the architectural items such as windows with shades, doors with shades/lock/key, rolling shutters with lock/key, structural provisions for ventilators / exhausts, rain water gutters/ down comers/ pipes etc as per the BHEL approved drawings / BoM.

b) Vendor shall also carry out necessary finishing activities such as painting etc.

c) Vendor shall deploy qualified/competent team at site to carry out the above erection activities.

d) Vendor shall carryout erection of rooms with wooden partitions as shown in the plot layout.

e) Vendor shall supply the items directly to the project site.

f) All necessary labour, tools & tackles, shuttering materials, measuring instruments, machinery shall be in vendor scope of supply. This shall include spanner sets, drilling machines, welding machines, hydra, JCB, truck, trolley etc as required for the erection work.

4.2.1. Structure & Material Specification:

The PEB room shall have a steel frame primary structural members. Primary members fabricated from plates shall conform to IS2062 min Grade E250 Quality BR/ ASTM A572-12 Grade 50 with minimum yield strength of 345 Mpa. Steel shall be semi-killed/killed. Minimum thickness of steel plates shall be 4 mm. Hot rolled primary structural members and Rod/Angle bracing shall conform to IS2062 Grade E250 Quality A. Secondary members for Purlins and Girts shall conform to the specification of IS 811 or ASTM A1003-12 made from steel sheets conforming to ASTM A1011-12b Grade 50 having a minimum yield strength of 345 Mpa. The minimum thickness of secondary members shall be 3.15 mm. All other miscellaneous secondary members shall have minimum yield strength of 250 Mpa.

Insulated wall cladding or roofing shall consist of double skin metal cladding with Poly Urethane Foam (PUF). PUF must be made of continuous method PU foam and must be CFC free, self-extinguishing, fire retardant type with density 40 +/-2 kg/m3 and thermal conductivity 0.019-2.2 W/(m.K) at 10°C. The PUF panels shall be a factory made item ready for installation at site.

4.2.2. Fasteners & Connections:

Special coated self-drilling screws/fastener shall be used conforming to class 3 as per AS: 3566.1 and AS: 3566.2. Steel bolts, nuts and washers complying with AS 1112:2000. High Strength Bolts for Primary Connections IS: 1367 (Part III) Gr. 8.8 / ASTM A325. Bolts for Secondary Connection IS: 1367 (Part III) Gr. 4.6 /ASTM A307. Anchor/foundation Bolts shall conform to IS: 5624 and relevant IS code.

4.2.3. Roof & Wall Cladding:

PUF panels shall be made of troughed permanently colour coated metal sheets of steel for roofing and side cladding (internal and external) shall conform to the requirements of Table1 and IS: 513 for Hot-dip Zinc coated or Al/Zn coated sheets.

The insulation material thickness and details shall be as specified at relevant para in the specification.

PUF insulated panels Metal Sheet for Roofing and side cladding consist of external sheet as troughed permanently colour coated sheet & internal sheet as plain permanently colour coated sheet.

Chemical composition of Troughed permanently colour metal sheet for roofing and side cladding shall conform to the provisions of same reference code to which the mechanical properties conform to.

Plain permanently colour coated steel metal sheet for ridge and hips, flashing, trimming, closure for vertical and horizontal joints, capping etc. shall conform to the same requirements as those of troughed permanently colour coated metal sheet for roof and side cladding.

The maximum spacing of the fastener shall be 390 mm c/c along the length of purlins / runners. However exact spacing shall be as per the design done by the bidder of the fastener considering the wind load, self-load and other associated load. Minimum diameter of the fastener shall be 5.5 mm and at least 3 nos. of fastener shall be used per sheet.]

Fillers blocks as a trough filler shall be used to seal cavities formed between the profiled sheet and the support or flashing. The fillers blocks shall be manufactured from black synthetic rubber or any other material approved by engineer.

4.2.4. Roof Insulation & Type:

Both metal sheets shall have an under insulation of minimum 70 mm thick PUF with density 40 +/- kg/m3 and thermal conductivity 0.019-2.2 W/(m.K) at 10°C with gutters and down take pipes along with Flashing & Top cap of required size and colour complete with all necessary hardware complete. Roof shall be projected at-least 300 mm from the wall.

Stiffening ribs / subtle fluting for effective water shedding and special male/female ends with full return legs on side laps for purlin support and anti-capillary flute in side lap.

Both upper and lower sheets shall be separated through spacers and fastened through zinc /zinc-tin coated self-drilling screws. The fastener size shall be calculated as per the design or manufacturers recommendations.

4.2.5. Wall Insulation:

All voids of external and internal metalled walls shall have an under insulation of minimum 60 mm thick PUF with density 40 +/- kg/m3 and thermal conductivity 0.019-2.2 W/(m.K) at 10°C with proper supports etc. as approved.

Both the walls should be separated by spacers system made up of cold formed steel bars and fastened through zinc /zinc-tin coated self-drilling screws.

The external wall of Inverter room facing the transformer area shall be as per IS: 1646 – Code of practice for fire safety of buildings (general): electrical installations.

4.2.6. Doors Frames:

Door frames shall be of T-iron frame of mild steel Tee-sections as per DSR-2013 item no 10.13. All doors shall be provided necessary fittings like hinges, handles, mortice locks, tower bolts, stopper, hydraulic door closer, etc. of CP brass complete.

Black powder coated aluminium doors shall be with extruded built up standard tubular sections, appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixed to Pre-Engineered structure including necessary filling up of gaps at junctions with required PVC/neoprene felt etc. including hinges /pivots and double action hydraulic floor spring of approved brand and manufacture IS: 6315 marked, lock, handle and all necessary fittings as detailed in tender drawing or submitted by bidder in shop drawing and approved by BHEL.

The door entrance shall include Mild Steel single leaf door. The structural steel shall conform to IS: 7452 and IS: 2062. The holdfasts shall be made from steel flats (50 mm and 5 mm thick).
The fixtures, fastenings and door latch are to be made with same materials.

4.2.7. Windows Frames:

Aluminium black powder coated section, frame shall be of 92x31 mm, minimum 16G thick as per approved design. Tinted glass and aluminium grill shall be provided.

4.2.8. Ventilators:

Aluminium black powder coated frame of minimum size 62x25 mm and 16G thick as per approved design. Ventilators/duct shall be provided with bird guard. Size of opening at wall for ducts shall be as per PCU manufacture and min 18 gauge GI sheet. Ducts shall be supported with suitable means, as approved during detail engineering.

All accessible ventilators and windows of all buildings shall be provided with min. 4mm thick float glass, tinted for preventing solar radiations. Suitable sunshades made out of approved colour sheet will be provided to all external windows and door. The minimum projection for the sunshades will be 450 mm and 300mm wider than the width of the opening

4.2.9. Rolling Shutters:

Not Applicable

4.2.10. Plinth Protection:

1.50 M wide plinth protection of minimum 75mm thick of cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) over 75mm bed of dry brick ballast 40mm nominal size well rammed and consolidated and grouted with fine sand including finishing the top smooth, shall be provided around the Pre-Engineered Building.

4.2.11. Floor Finish:

Flooring, including preparation of surface, cleaning etc. shall be of cement concrete flooring as per IS:2571 with ironite hardener. The PEB Building floor shall be at least 600 mm above the ground level. Necessary ramps shall be provided for equipment entry.

4.2.12. Painting and Coating:

Steel shall be colour coated with total coating thickness of 25 microns (nominal) dry film thickness (DFT) comprising of silicon modified polyester (SMP with silicon content of 30% to 50 %) paint or Super Durable Polyester (XRW) paint of 20 microns (nominal) on one side
(exposed face) on 5 micron (nominal) primer coat and 10 microns (nominal) SMP or Super Durable Polyester paint over 5 micron (nominal) primer coat on other side. SMP and polyester paints system shall conform to Product type 4 as per AS/ANZ 2728.

The structural steel shall be hot-dipped galvanized, conform to IS: 4759 or relevant Indian standard

4.2.13. Lighting:

The PEB Building shall be provided with electric light to achieve average illumination level of 100 Lux. Vendor shall ensure that the room is designed to utilize maximum natural light during the day.

4.2.14. Design Parameters & Loads:

The structure shall be designed for loads and load combination as per Indian Standards (latest revisions) such as IS: 875, IS: 1893, IS: 800, IS: 456 etc.

Dead Load: Self Weight of Structure including Purlins, Sheeting, Girts, Bracings, weight of turbo ventilators to be added as Dead load etc.

Imposed Load (Live Loads) Live loads shall be as per IS – 875. For sloped roofs up to 10 deg. It shall be 0.75 KN/M².
Wind Load: The basic wind speed of the site is taken as 160 km/hr. Design wind load coefficient shall be as per IS: 875-III, however the minimum value of these factors shall be considered as K1=1.0, K2=1.0 & K3 =1.0 for the design of PEB.

Earthquake Load: All PEB structures shall be designed for Seismic forces. Vertical Deflection and Horizontal Sway Limits:

a) Limiting Deflection: The limiting permissible vertical deflection for structural steel members shall be as per IS 800 2007.
b) The limiting permissible horizontal deflection for as per IS 800 2007 code.

4.2.15. Description of PEB Structures:

Primary Members: Primary structural framing shall include the transverse rigid frames, columns, corner columns, end wall wind columns, beams, truss member, base pate.

Secondary Members: Secondary structural framing shall include the purlins, girts, eave struts, bracing, flange bracing, base angles, clips, flashings and other miscellaneous structural parts. Suitable wind bracings sag rods to be reckoned while designing the structure.

Sealant: Sealant used for cladding shall be butyl based, two parts poly sulphide or equivalent approved, non-staining material and be flexible enough not to interface with fit of the sheets.

Closures: Solid or closed cell closures matching the profiles of the panel shall be installed along the eaves, rake and other locations.

Flashing and Trim: Flashing and / or trim shall be furnished at the rake, corners, eaves, and framed openings and wherever necessary to provide weather tightness and finished appearance. Colour shall be matching with the colour of wall. Material shall be 26 gauge thick conforming to the physical specifications of sheeting.

Gutters and Downcomers: Gutters shall be fabricated out of same metal sheet. Material shall be same as that of sheeting. Down comers shall be of galvanized steel pipes or PVC designed to ensure proper roof drainage system.

Table-1

Group	Grade/Ref. Code	Yield Strength (min)	Tensile Strength (min)	Coating Class Designation	BMT	+ve Tole-rance	Upper Limit BMT	-ve Tole-rance	Lower Limit BMT
		Mpa	Mpa		mm	mm	mm	mm	mm
I	G250/ AS1397	250	320	Z275	0.6	0.04	0.64	-0.04	0.56
	SS255/ ASTM A653M	255	360						
	S250GD/ EN10326	250	330						
II	G350/ AS1397	350	420	AZ150	0.5	0.04	0.54	-0.04	0.46
	SS340 Class 4/ ASTM A792 M	340	410						
	S350GD/ EN10326	350	420						
Note: Minimum elongation % shall be as per relevant code & standard									

All steel materials supplied by the Agency shall be in a sound condition, of recent manufacture, free from defects, loose mill scale, slag intrusions, laminations, pitting, flaky, rust, etc. and be of full weight and thickness specified.

4.3. **Applicable Codes & Standards:**

Following codes and standards (latest editions) including their latest addenda shall be followed wherever applicable unless otherwise specified:

Sl No	Code	Description
1	IS:875-I	Code of Practice for Design Dead Loads for Building and Structures
2	IS:875-II	Code of Practice for Design Imposed Loads for Building and Structures
3	IS:875-III	Code of practice for design loads (other than earthquake) for buildings and structures.
4	IS:1893	Criteria for earthquake resistant design of structures.

5	IS:4326	Code of Practice for earthquake resistant design and construction of buildings
6	IS: 800	Code of practice for use of structural steel in general building construction
7	IS: 801	Code of practice for use of cold-formed light gauge steel structure members
8	IS:802	Code of practice for use of structural steel in overhead transmission line towers
9	IS:806	Code of practice for use of steel tubes in general building construction
10	IS:808	Dimensions for hot rolled steel beam, column channel and angle section
11	IS:811	Specification for cold formed light gauge structural steel sections
12	IS:813	Scheme of symbols for welding.
13	IS:1079	Hot rolled carbon steel sheet and strip – specification
14	IS:2062	Hot rolled medium and high tensile structural steel – specification
15	IS:4923	Hollow steel sections for structural use.
16	IS:1161	Steel tubes for structural purpose
17	IS:2721	Galvanized steel chain link fence fabric – specification
18	IS :4736	Hot dip zinc coatings on mild steel tubes
19	IS:4759	Hot dip zinc coatings on structural steel and other allied products – specification
20	IS:1868	Anodic coatings on aluminium and its alloys
21	IS:2395-I	Paintings of concrete, Masonry and plaster surfaces – code of operations and workmanship
22	IS:2995-II	Code of practice for painting concrete, masonry and plaster surfaces: schedule
23	IS:1477-I	Code of practice for painting of ferrous metals in buildings: pre-treatment
24	IS:1477-II	Code of practice for painting of ferrous metals in buildings: painting
25	IS:1905	Code of practice for structural use of un-reinforced masonry
26	IS:3067	Code of practice for general design details and preparatory works for damp/water proofing

27	SP:6	Handbook for structural engineers (all parts)
28	SP:7	National Building Code of India
29	SP:16	Design Aids for reinforced concrete to IS:456
30	SP:20	Handbook on masonry design and construction
31	SP:22	Explanatory handbook on codes for earthquake engineering
32	SP:24	Explanatory handbook on Indian Standard Code of Practice for plain and reinforced concrete
33	SP:25	Handbook on causes and prevention of cracks in buildings
34	SP:32	Handbook on functional requirements of industrial buildings
35	SP:34	Handbook of concrete reinforcement & detailing

For provisions not covered by any of the codes & standards, applicable good engineering practices and norms shall govern.

4.5. **ELECTRICAL SERVICES**

A. Supply, erection and commissioning of following electrical services items shall be in the scope of PEB vendor. The following items minimum shall be supplied by PEB vendor to meet the illumination level of 100 lux.

A.1 Electrical services BOQ per PEB room			
SL No.	**DESCRIPTION (FIXTURES / LAMPS / ACCESSORIES)**	**UNIT**	**QTY**
1	40W LED batton type fixture (Bajaj Catalog no. BICDP 40W LED or Equivalent)	Nos	12
2	SSB-2 + R surface mounted swbd with 2 nos 5A piano type switches and one electronic fan regulator. (modular type)	Nos	2
3	SSB-2 surface mounted swbd with 2 nos 5A piano type switches (modular type)	Nos	2

4	Domestic type 5/15A receptacle with switch (Surface mounted mounted modular)	Nos	2
5	6 Way TPN Indoor type Lighting Panel (Surface mounted) with 32A, 4pole RCBO at the incomer & 6 Nos 10A SPN MCB at the outgoing .	Nos	1
6	3 Way 1Ph Indoor type UPS Power distribution board (Surface mounted) with 32A DP RCBO at the incomer & 6 Nos 10A SPN MCB at the outgoing .	Nos	1
7	32A TPN Welding receptacle with Plug & interlock Switch	Nos	1
8	Ceiling Fan 1200mm blade	Nos	2
9	Exhaust Fan with DOL starter (415V, 3 PHASE) (Industrial grade)	Nos	2
10	Data connector Box (Surface Mounted)	Nos	1
11	Flexible Wires 1.5sqmm for fixture & 4sqmm for sockets, cable, conduits (rigid and GI stripped flexible), accessories for Conduits (All conduits shall be 25mm dia heavy duty GI type), ISA/ISMC/GI FLAT and any other accessories for installation of above items - 1 LOT	LOT	1
12	E&C for above items (lumpsum)	Lot	1

Notes:

1. Illumination Layout shall be submitted by bidder and approved by BHEL after order placement. Illumination fixture, conduits etc. as mentioned in above table is indicative only and bidder is required to plan and propose the same to have sufficient illumination in the office.
2. Installation & commissioning of above equipment and its associated cabling work within the PEB shall be in the scope of PEB vendor.
3. Above items shall be supplied as per the below makes and technical specification furnished elsewhere in this document.
4. Vendor's terminal point for cabling inside PEB shall be at the boundary point of PEB at two locations i.e. at loop in and loop out cable route.
5. All the cables inside the building shall be directly routed on ceilings/walls.

4.6. **TECHNICAL SPECIFICATION FOR ELECTRICAL SERVICES**

Lighting panels shall be powder coated with colour shade RAL9002. Lighting panels shall have IP55 degree of protection.

Wires of different phase shall normally run in separate conduit.

Electrification of all building shall be carried out as per IS 732-1989, IS 4648-1968 and other relevant standards.

All luminaries and their accessories and components shall be of type readily replaceable by available Indian makes.

Following test reports to be submitted for LED chip/LED luminaires:

a) LED parameters like Lumen per watt, CRI, Beam angle from manufacturer. b) LM 80/IS: 16105 report.

c) LM 79/IS: 16106 report

LIGHTING WIRES

Lighting wires shall be 1100 V grade, light duty PVC insulated unsheathed, stranded copper/ aluminium wire for fixed wiring installation. Colour of the PVC insulation of wires shall be Red, Yellow, Blue and Black for R, Y, B phases & neutral, respectively. Minimum size of wire shall not be less than 1.5 sq.mm Copper for lighting fixture & 4 Sq.mm Copper for receptacles. Lighting panels etc. shall be earthed by two separate and distinct connections with earthing system.

RECEPTACLE

Receptacles boxes shall be fabricated out of MS sheet of 2mm thickness and hot dipped galvanised or of die-cast aluminium alloy of thickness not less than 2.5 mm. The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection, terminal blocks for loop-in loop-out for cable of specified sizes, mounting brackets suitable for surface mounting on wall/column/structure, gland plate etc. The ON-OFF switch shall be rotary type heavy duty, double break, AC23 category, suitable for AC supply. Plug and Socket shall be shrouded Die-cast aluminium. Socket shall be provided with lid safety cover. Robust mechanical interlock shall be provided such that the switch can be put ON only when the plug is fully engaged and plug can be withdrawn only when the switch is in OFF position. Also cover can be opened only when the switch is in OFF position. Wiring shall be carried out with 1100 V grade PVC insulated stranded aluminium/copper wire of adequate size. The Terminal blocks shall be of 1100 V grade. The Terminal blocks shall be of 1100 V grade made up of unbreakable polymide 6.6 grade with adequate current rating and size. The welding receptacles shall be provided with inbuilt ELCB rated for suitable mA sensitivity.

GALVANISING

Galvanising of steel components and accessories shall conform to IS:2629 , IS4759 & IS:2633.

Additionally galvanising shall be uniform, clean smooth, continuous and free from acid spots. The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per IS:1367. The removal of extra zinc on threaded portion of components shall be carefully done to ensure that the threads shall have the required zinc coating on them as specified.

CONDUITS/PIPES/DUCTS INSTALLATION

GI pull wire of adequate size shall be laid in all conduits before installation. Metallic conduit runs at termination shall have two lock nuts wherever required for junction boxes etc. Conduit runs/sleeves shall be provided with PVC bushings having round edge at each end. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed with Glass wool/Cement Mortar/Putty to prevent entrance of moisture and foreign material. Exposed conduit/pipe shall be adequately supported by racks, clamps, straps or by other approved means. Conduits /pipe support shall be installed square and true to line and grade with an average 1Meter spacing between the supports.

Ventilation

Provision shall be made to allow fresh air from outside to enter the compartment through suitable filter capable of preventing entry of sand during severe sand storms. The ventilation system fans shall be mounted on side walls with suitable sand filter / louver having easy access for cleaning and maintenance.

10. OFFICE FURNITURE & FURNISHINGS

The bidder is required to procure & install office furniture & furnishings as per the attached “Office Layout Drawings” and BOQ provided below. Any changes must be with the approval of BHEL.

All Furniture in the BOQ shall be of Godrej or Equivalent make

Sl No.	Description	Units	Dimensions	Quantity
1	RCM Table	mm	2400X900	1
2	RCM cabin Side credenza	mm	1000X500	1
3	RCM Chair (Executive)	No.		1
4	Visitors chairs			17
5	Central Table in waiting area	mm	2000X900	1

6	Table and Chairs for 17+1 sitting capacity in conference room. (Executive chair for presiding officer + 17 conference chairs)	Set		1
7	Storage cabinet	mm	900X450X1500	2
8	HOD Table	mm	1200X900	3
9	HOD cabin Side credenza	mm	900X450	3
10	HOD chair (Executive)			3
11	Twin sharing Modular Workstation for engineers, half partitioned at 1.5m height of pre lam board fitted in frame	Nos	3000mmX1500mm	10
12	Employee sitting chairs	No s		27
13	Full height storage Almirah	Nos	900mmX450mmX1800mm	6
14	Rectangular work stations for supervisors	Nos	1200mmX450mm	7
15	Curtain Blinds	Nos.	1200mm X 900mm	14

10.1 Modular Work Station :

The modular workstation for engineers comprises two (2) L-shaped tables, each measuring 1.5 m × 1.5 m**,** providing sufficient workspace for engineering tasks, documentation, and equipment placement. Each unit includes two (2) ergonomically designed, height-adjustable chairs suitable for prolonged use.

For collaboration and display needs, the setup features two (2) whiteboards for writing, planning, and brainstorming, along with two (2) notice boards equipped with pinning facilities for posting schedules, drawings, and important information.

Each workstation is equipped with appropriately positioned electrical ports, including power sockets and data/charging points, to support laptops, peripherals, instrumentation, and other electronic equipment required for engineering operations.

This modular arrangement ensures efficient workflow, space optimization, and seamless accessibility to both communication and power utilities.

10.2 Pantry :

Pantry provision has to be given as per the drawing containing :

1. **Almirahs (2 Nos.)**
   - Two almirahs to be provided, each fabricated from **powder-coated CRCA sheet steel** or **commercial plywood with laminate finish**, as specified in drawings.
   - Minimum dimensions per almirah: **900 mm (W) × 450 mm (D) × 1800 mm (H)** or as shown on approved layout.
   - Each almirah to include adjustable shelves, lockable shutters with SS hinges, and necessary hardware.
   - Finish: **1 mm laminate** on external surfaces; internal surfaces with balancing laminate or enamel paint.
2. **Granite Countertop**
   - Countertop made of **20–25 mm thick polished granite slab**, colour and shade approved by Engineer-in-Charge.
   - Granite to be machine-cut, edge chamfered/bevelled, and fixed over a rigid base with cement mortar (1:4) including necessary supports.
   - Joints to be filled with matching epoxy/stone adhesive.
3. **Stainless-Steel Sink With Drain Board**
   - One **SS sink with integrated drainboard**, **standard size** (approximately **37"–45" x 18"–20"**), heavy-gauge **304 grade** stainless steel (1.0–1.2 mm thick).
   - Sink to be mounted to the Granite slab as per design, with proper sealing and supports.
   - Includes CP waste coupling, bottle trap, and connections to inlet/outlet plumbing.
4. **Plumbing & Fixtures**
   - Hot and cold water lines in CPVC or as specified, including angle valves, unions, and flexible connection pipes.
   - Proper slope for drainage and secure connections to existing plumbing lines.
5. **General Requirements**
   - All work to conform to manufacturer specifications, relevant IS standards, and directions of the Engineer-in-Charge.
   - All edges, joints, and fixtures to be finished neatly and free from defects.
   - Site to be cleaned and all debris removed after completion.

10.4 Toilets

One toilet block of3000 mmX2000mm attached to RCM cabin fitted with one EWC along with all accessories and one wash basin with accessories should be made in brickwork.

One toilet block made of brick walls & RCC roof and having

- One cubicle for bathing fitted with a shower, tap, wall hanger, soap box, etc and door of 750mm doorway.
- Two cubicles one EWC and other IWC , each with a flush tank, tap and door (D75 i.e., 750mm as per drawing)
- one common area with two wash basins fitted with tap and other required provisons.
- Three urinal commodes fitted with a proper flush systemsas shown in the drawing
- Anti-skid ceramic/vitrified tiles, minimum **10 mm thick**, laid over cement mortar (1:4) flooring and Tile joints filled with epoxy grout; slopes provided towards floor trap
- Full-height wall tiling in glazed ceramic tiles (300×600 mm or as approved).
- Cement-based waterproofing behind wet walls prior to tiling.
- Moisture-resistant gypsum board or PVC panel ceiling with access panel for maintenance

- **Cubicle Partitions** are Pre-laminated compact laminate/FRP/GRP partitions, 12 mm thick, mounted on SS hardware of Height approx. **2100 mm** with ground clearance of 150–200 mm.
- **Doors** are to be Laminate/compact laminate door shutter with SS hinges, handle, latch & door closer. Occupancy indicator latch may be provided.
- **WC Fixtures** will be one European-type floor-mounted or wall-hung WC pan with seat cover with soft-close hinges and one Indian-type floor mounted WC pan (as per drawing). Concealed or exposed flush valve/flush tank with required CP fittings.

- **Wash Basin with CP Brass pillar taps, bottle traps, and waste couplings provided for each**

- Full-length mirror above counter with aluminum frame and backing is to be provided.

Plumbing Works include,

for Water Supply **- CPVC piping for hot and cold water lines with proper supports and clamps, CP angle valves, flexible connections for fixtures.**

For Drainage: UPVC/SWR pipes for waste lines with proper slope towards floor traps. Floor traps provided in each cubicle and under counter areas.

Electrical & Ventilation

- **Lighting**: Moisture-resistant LED ceiling lights above washbasins and cubicles.
- **Exhaust Fan**:
  - Adequately sized exhaust fan installed in external wall/shaft for ventilation.
- **Switches & Wiring**:
  - Modular IP-rated switches; wiring in concealed conduits.

General Requirements

- All workmanship to conform to IS standards and manufacturer specifications.
- All fixtures to be installed plumb, level, and securely anchored.
- Contractor shall test water supply, drainage, and flushing systems before handing over.
- Cleaning and removal of debris after completion.

10.5 CIVIL & INTERIOR WORKS

10.5.1 Flooring

- Vitrified tiles 600×600/800×800 mm (premium grade), machine-cut.
- Skirting of 100 mm height, matching tile.
- Toilet area: Anti-skid ceramic tiles with slope towards floor traps.

10.5.2 Partition Work

For cabins and conference room:

- Panelled partition in Aluminium frame with panels of 18 mm thick prelaminated board18 mm thick prelaminated particle board with both side lamination.

For other areas:

- Panelled partition in Aluminium frame with panels of 18 mm thick prelaminated board & glass partitions:
  - 18 mm thick prelaminated particle board with both side lamination upto 1200 mm in bottom panel.
  - 6 mm thick clear glass on top panel.

10.5.3 **Doors, Windows & Ventilators**

- Doors annotated **D1, D2, D75** as per drawing mean a door way of 1000mm, 2000mm and 750mm respectively.
- Panelled doors in Aluminium frame with panels of 18 mm thick prelaminated board (Bottom panel 1200mm) & glass (6 mm thick clear glass on top panel)partitions for all doors except D75
- Solid core flush doors with laminate finish.
- Aluminium Glass windows (14 X 1200mm X 900mm) & Ventilators (6 X 300 mm X 150 mm)
- SS hinges, handles, door closers, locks.

10.5.4 False Ceiling

The false ceiling shall be made out of anti-corrosive painted 19mm square hollow section design to fix to the roof frame with suitable hangers. **The clear height of ceiling shall be 2.70M. from the finished floor level.** Cut out should be made properly wherever necessary for fixing electrical fitting. False ceiling shall be done with 8mm thick hollow extruded polymeric section (syntax or Equivalent) with tongue and grove arrangement. The colour of Ceiling should match with inner wall panels All vertical & Horizontal corners shall be neatly and smoothly finished with Aluminium sections & L-angles

10.6 ELECTRICAL WORKS

10.6.1 Cabling & Conduits

- FRLS/FR-LSH cables (IS: 7098/IS:694).
- PVC conduits concealed in walls/ceilings.

10.6.2 Power Distribution

- Main DB & Sub DBs installed in electrical room.
- Earthing as per IS:3043; minimum 3 earth pits.

10.6.3 Lighting

- LED panel lights for workstation, cabin, conference, and corridors.
- Task lights above workstations.
- Emergency lights near exit passage.

10.6.4 Server Room

- Dedicated UPS power circuit.
- Separate earth pits for server load.

10.7 HVAC (Heating, Ventilation & Air-Conditioning)

- Split AC units as per heat load calculation.
- Copper refrigerant piping with insulation.
- Fresh air ventilation for toilets and server room.
- Grilles, diffusers, dampers as required.

5.2 Pantry

- Granite countertop (20 mm thick) with edge chamfer.

- Stainless steel sink with drainboard (standard size).
- Two almirahs per pantry with laminate finish.
- CPVC water lines.
- UPVC/SWR drainage lines.

10.8 IT & NETWORKING

- CAT6A cables.
- 24-port/48-port network switches.
- Patch panels mounted in server rack.
- WLAN access point locations as shown.

10.9. SAFETY & EMERGENCY SYSTEMS

FIRE SAFETY

- Supply & Installation of Fire Extinguishers : following items shall be in the scope of the contractor.

Sl. No.	Items	Quantity	Unit
1.	50 Lit. Foam type Fire Extinguisher	4	No's
2.	25 kg DCP type Fire Extinguisher	4	No's
3.	25 kg CO2 type Fire Extinguisher	4	No's
4.	Sand Buckets (Stand with 4 buckets in each set)	4	Sets

- Emergency exit signage

10.10. PAINTING & FINISHES

- Plastic emulsion paint for walls.
- Enamel paint for metalworks.
- Textured paint (optional) in feature walls.

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10. 10 TESTING & COMMISSIONING

- Contractor shall test:
  - Electrical circuits
  - Plumbing lines
  - AC performance
  - Network connectivity

As-built drawings to be submitted.

11. GENERAL TECHNICAL REQUIREMENTS:

For the design of the plant, it is necessary to consider the requirements (by suitably planning the layout) of the convenience of inspection, cleaning, maintenance and repair.

Equipment design and engineering shall incorporate adequate safety features (as per applicable specifications of respective installation as well as Health, Safety and Environment Codes & Standards applicable for the subject project) to provide protection to operating personnel, equipment and environment.

No claim in terms of cost or relaxation in time shall be entertained for any redesign, rework and for the safety measures provided. If at any stage of work, any dismantling or modification or relocation of any facilities is required to be done to complete the work in bidder's scope and which has been agreed by the Owner, the same shall be done by the bidder at no extra cost or time implication to the Owner. All such changes will be executed only after the proposed drawings and work plan are approved by the purchaser.

The Bidder shall take all necessary precautions to protect all the existing equipment, structures, facilities and buildings etc. from damage. In case any damage occurs due to the activities of the Bidder on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be immediately made good by the Bidder at his own cost to the satisfaction of the Owner. The Bidder shall also take all necessary safety measures at his own cost, to avoid any harm or injury to his workers and staff from the equipment and facilities of the power station.

Warranty

Vendor shall provide warranty for 12 months for the supply and erection of PEB rooms from the date of start of erection or 18 months from the date of completion of erection whichever is earlier.

12. CONSTRUCTION REQUIREMENT:

Erection & commissioning of all the items supplied by bidder is included in bidder's scope.

Bidder is advised to visit the project site and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

The Contractor shall make all necessary arrangements to deliver the equipment at the NLC site by wagons/trucks/trailers and receive the material at site, build his own stores for the proper storage of equipment, maintain the stores and all related documents and records, transport the equipment to site for erection purpose. Necessary security arrangements also shall be made by the Contractor. Area only for construction of stores and construction site office shall be made available, free of cost, to the Contractor by the Purchaser.

b

The Contractor shall be provided with construction power at 415 V, three phase, 50 Hz for the purpose of the construction and erection at free of charge. The Contractor shall make his own arrangements for further distribution.

Construction water shall be supplied free of cost by the Purchaser to the Contractor at one point at each location of project.

All machinery such as cranes, hydra, JCBs, forklifts, transport trucks, trolleys, concrete mixers, Ajax machines etc necessary for movement and installation of materials shall be organized by the bidder. Bidder shall arrange all the items required like scaffolding, rope, sling etc. for construction of the facilities in their scope.

All necessary tools and tackles such as screw driver set, power screw drivers, cutting pliers, nose pliers, spanner sets, adjustable spanners, hole saw cutter set, bending tools, torque wrenches, hack saw blades, pipe wrenches, flat / round files, drilling machines, welding machines, steel bar bending tools / templates for RCC works, spade, shovel, hammer etc shall be organized by the bidder.

All necessary measuring instruments such as measuring tapes, digital multimeters, electrical testers, meggers etc shall be organized by the bidder.

The contractor shall submit to the employer, draft instruction manual specifically compiled for the project, containing full detail required for E&C and Maintenance if any. The E&C manuals/checklists shall be submitted prior to the commencement of erection activities.

Bidder shall make their own arrangements for necessary food, drinking water and accommodation for their labour and employees posted at the site. Similarly, food and drinking water required at the site, during the construction operations, shall also be in scope of the bidder.

Bidder shall organize all necessary steps to meet statutory requirements such as labour license, PF, ESI, insurance etc and also ensure compliance with relevant acts such as minimum wages act, income tax act, employee insurance act etc for their labour deployed at site.

Bidder shall maintain updated labour register, with name, age, qualification, salary, attendance details etc at the site.

It is advised to Bidders to visit the site and ascertain all site intensive requirements such as Health, Safety and Environment (HSE) requirement, work permits and other special requirements of site etc. Bidder shall ensure safety of man and machinery during work at site. For this necessary safety measures like use of PPEs, use of danger board/tapes etc to be ensured by the bidder. It is the ultimate responsibility of the bidder in all respect to prevent accidents at the site and safeguard man and machinery from accidents.

Bidder shall, at the completion of every work, clear off the debris, which resulted out of the work.

13. QUALITY ASSUARANCE:

13.1 All materials, components, and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages as per a comprehensive Quality Assurance Program (QAP). It is bidder's responsibility to draw such QAP duly approved by the purchaser. Schedule of finalization of such quality plans will be finalized before award on enclosed format

13.2 Bidder shall submit their comprehensive Manufacturing Quality Plan (MQP) and Field Quality Plan (FQP) on enclosed format for approval of BHEL.

13.3 It will be the responsibility of the bidder to adhere to the approved Quality Plans. The bidder shall further identify specific hold points beyond which work will not proceed without purchaser's consent so as to further ensure that he performs the above quality functions effectively.

13.4 MQP will detail out for all the components, various tests/inspection, to be carried out as per the requirements of this specification and standards mentioned therein and quality practices and procedures followed by contractor's/subcontractor's/sub-

supplier's Quality Control Organization, the relevant reference documents raised etc., during all stages of material procurement, manufacture, assembly and final testing/performance testing. The quality Plan shall be submitted on electronic media e.g. email in addition to hard copy, for review and approval. After approval the same shall be submitted in compiled form on CDROM.

13.5. Field Quality Plans will detail out for all the items, the quality practices and procedures etc. to be followed by the bidder at site, during various stages of site activities starting from receipt of materials at site.

13.6. Bidder to note that all the cost involved in the various Inspection and testing as per approved QAPs /ITPs shall be deemed to be included in bidder's quoted price. Bidder at no point of time shall be eligible to raise any extra claim on account of any requirement necessitated as a part of approval of QAPs/ ITPs.

13.7. At various stages of manufacturing, procurement, construction, as per approved QAP inspection/testing shall be carried out by Inspection Agency (BHEL / Third Party appointed by BHEL / BHEL appointed third party). The inspection agency shall be indicated in the quality plan and shall be as per the approved quality plan.

13.8. Bidder shall notify in writing to the Purchaser, at least two weeks (Ten working days) in advance of the date and the place at which the items will be ready for witnessing of inspection / testing by Purchaser and / or PMC. In case any postponement becomes necessary, the CONTRACTOR shall provide written notification at least 48 hours prior to the original scheduled date.

13.9. In case bidder find any deviation or non- conformity with respect to the agreed specifications, during manufacturing of the item and where corrective action is not feasible, the bidder shall report the same to Purchaser and / or PMC in the designated "Waiver / Deviation Request" format and seek prior approval from Purchaser /PMC before proceeding with the job.

13.10. Bidder after satisfying that all inspection requirements as per approved ITP and applicable specifications / documents have been taken care by Inspection Agency, shall submit copy of the Inspection Certificate and all Quality control records to Purchaser in requisite copies along with Statutory Certificates if any, duly endorsed by their Quality Control Manager.

13.11. Purchaser and / or PMC – End customer reserve the right to carry out surprise checks on all material either at manufacturer's works or at site. In case of any rejection at site, the whole lot will be rejected and bidder shall get the entire lot replaced without any time or delivery implication to the purchaser.

13.12. Inspection Agency shall check the calibration status and traceability of all instruments used by the supplier, for testing. In case, TPIA uses their own instruments for testing purposes, similar certification shall be ensured.

13.13. Bidder shall submit, copy of each Inspection Certificate (IC) / Inspection Release Note (IRN) issued by Inspection Agency, along with all attachments mentioned therein.

13.14. No material shall be dispatched from the manufacturer's works before the same is accepted, subsequent to pre-dispatch final inspection including verification of records of all previous test/inspections by authorized Inspection Agency and duly authorized for dispatch by issuance of Material Dispatch Clearance Certificate (MDCC).

14. MARKING , PACKING AND DESPATCH

MARKING

14.1 All items shall be marked (stamped/etched) in accordance with the applicable Code/standard/specification. In addition, the item code, if available, shall also be marked.

14.2 For ease of identification, the color of painted strip (wherever required) shall be as per the applicable standard.

14.3 Paint or ink for marking shall not contain any harmful metal or metal salts which can Cause corrosive attack either ordinarily or in service. Special items/smaller items shall have attached corrosion resistant tag providing salient features.

DESPATCH

14.4 All the materials shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by hip/rail or trailer.

14.5 Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO Nos.' etc. shall be clearly marked on the package together with other details as per purchaser order.

14.6 The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.

14.7 The following minimum packing procedures shall be followed :

14.8 All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kind.

14.9 All items shall be protected from rust, corrosion, and mechanical damage during Transportation, shipment and storage.

14.10 Rust preventive on machined surfaces to be welded shall not be harmful to welding and shall be easily removable with a petroleum solvent.

14.11 Ends shall be suitably protected, and the protectors shall be securely and tightly attached.

14.12 Each variety and size of item shall be supplied in separate packaging marked with the purchase order no., item code (if available), and the salient specifications.

Prior to shipment components of the unit shall be completely cleaned, Flange faces, threaded portion and other machined surfaces shall be protected by coating with easily removable rust preventive. All the items shall be properly packed to prevent damage during transit damage, loading, unloading and storage.

15 **DOCUMENTATION:**

MASTER DOCUMENT LIST

15.1 A master documentation shall be prepared during kick off meeting identifying all the DOCUMENTS / DRAWIGS to be submitted by the bidder as part of documentation.

15.2 Vendor shall ensure submission of all documentation as per approved Master Document
List.

15.3 The following minimum documentation shall be submitted by the vendor:

15.3.1 All PEBs GA drgs indicating base plates, anchor bolts connection Detail, purlin, roof panels, wall panels, scope demarcation etc.

15.3.2 BOM for Structural items.

15.3.3 BOM of architectural items with detail of item wise make, model Quantity etc.

15.3.4 Design analysis in STADD.PRO along with loading detail on Foundation.

15.3.5 Design certified by NIT/IIT

15.3.6 Civil interface details
15.3.7 Welding specification charts
15.3.8 Nondestructive Testing specifications
15.3.9 Quality plan
15.3.10 Painting schedule & procedure (shop painting & site painting)
XI. Packing procedure
XII. Erection drawings
XIII. Site storage procedure
XIV. Erection procedure XV. Testing procedure
XVI. 'AS BUILT' drawings
XVII. Any other document, as deemed necessary BY BHEL, during detail engineering or erection – commissioning stage.

16 DOCUMENTS SUBMISSION PROCEDURE

16.1 All Drawings/Datasheet/Design calculation etc. shall be submitted in soft as well as hard copy.

16.2 Soft submission of all drawings/documents is mandatory.

16.3 All drawings/ shall be submitted in AutoCAD format & all documents in MS office/PDF

16.4 BHEL shall furnish Approval/Observation of Drawings/Datasheet/Design calculation etc. on Soft Copy only.

17 DRAWINGS REVIEW AND APPROVALS

17.1 Review of drawings and documents issued by vendor shall be carried out by BHEL.

17.2 Approval/ review of the drawings/ documents by the BHEL would be only limited to the review of compatibility with basic designs and concepts.

17.3 The approval and /or review by BHEL shall not be construed by the bidder as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

17.4 The sole responsibility of the correctness of Design, Engineering & construction shall lie with the bidder, irrespective of the fact that the Drawings / Documents submitted are reviewed or not by BHEL.

17.5 The bidder shall correct all faulty designs & constructions detected at any stage of work, without any cost and time implication to the Purchaser. The Bidder shall be responsible for and shall pay for any alterations of the Work to be accrued due to any discrepancies, errors or omissions in the Drawings or other Particulars

supplied by him whether such drawings or particulars have been approved by the BHEL or not.

16.6. Revisions in drawings/documents shall be clearly marked within clouds. No revision without clouding shall be recognized and the same shall not be considered reviewed and approved.

16.7. Only the approved drawings duly stamped and signed by a competent engineer of BHEL shall be used for final erection.

17 Sub Vendor List:

A.1 For structural steel:

1. It should conform to relevant Indian / International Standards.
2. It should be of reputed make of supplier to similar construction /infrastructure projects.
3. The Bidder should furnish documentary evidence to prove (1) and (2) above **A.2**

Makes of Electrical and mechanical items

Item	Vendor	Remark
LED Lamp fixtures for indoor		
	BAJAJ	
	CGL	
	Havells	
	Philips	
	Wipro	
Lighting panel	Havels India Limited	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
	Indo Asian Fusegear	
	STANDARD ELECTRICALS LTD	
	C&S Electric Limited	
	ABB Limited	
Cable Lugs	Dowell, Mumbai	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
	Electromac Industries	
	Chenta Engineering Co	
	Forward Engineering Industries	
MCB	Any make-Model shall have mark of CE/VDE/UL/CSA/BIS with CML no.	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from

		purchaser before finalization of make.
Furnitures	Godrej	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
Sanitary & Plumbing Items	Cera/Parryware/Aashirwad	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
Furnishing	NewTech	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
Axial flow Fans	Khaitan, Kolkata Marathon Electric, Kolkata CB-Doctor, Ahmedabad Solyvent Flakt, Kolkata Advance ventilation, Sonepat Krugar, Singapore TCH Nadi, Chennai Almonard, Chennai	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
Propeller Fan (Up to 2 HP)	Khaitan, Kolkata Marathon Electric, Kolkata CB-Doctor, Ahmedabad Solyvent Flakt, Kolkata	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.

Part II

Chapter 10: Technical Specifications for

Design, Manufacture and Installation of Pre-Engineered Building for Site Store Building

10.1. SCOPE OF SUPPLY AND ERECTION-COMMISSIONING OF PRE-ENGINEERED STORE BUILDING:

The bidder is required to Design, Manufacture, Supply and Install two Pre-Engineered closed store Buildings sized 15mx30mx6m (approximately).

Bidder will submit the design (Including foundation, plinth beams & flooring) for approval of BHEL.

Structural steel framed structure for the building to be considered as per basic engineer design.

One closed shed pre engineered building is to be provided with rack facilities for storage and stacking, design of which is to be finalized and drawings of the same have to be submitted.

Supply and Fixing of external sheet of Permanent colour coated metal cladding with troughed M.S. sheets manufactured out of 0.55 mm TCT(Total coated thickness) permanently colour coated zincalume sheet (150 gsm zinc-aluminium alloy coating total of both sides as per AS 1397:1993) having 300 Mpa yield strength. The colour coating shall comprise of 20 microns finish coat over a 5-micron primer coat on the exposed side and a back coat of 5 microns over a primer coat of 5 micron on the reverse side. The metal cladding shall have 500 mm cover width, 47 mm high crests at 250 mm centers with special male/female side laps and anti-siphoning feature to prevent leakage. The sheet shall be fixed with the help of concealed compatible interlocking clips and wafer head zinc cotted self-drilling fastener/screws 4.2X25 mm long on to the sub-girts. The clips shall be concealed and no fastner are to be penetrate the external sheeting all complete as per specification. Measurement of cladding shall be of the elevation/plan area of side covered by cladding as per approved drawing. No overlap shall be considered in measurement for the purpose of payment.

Major supply and services included in bidder's scope:

S.No	Description	Quantity
1.	Supply of PEB structural materials such as columns, rafters, beams, purlins, steel sheets, insulation etc. (Note: 1 set is for one PEB).	2 Set
2.	Supply of PEB architectural items such as doors, windows, rolling shutters, etc . (Note: 1 set is for one PEB).	2 Set
3.	Supply of Electrical Services as mentioned earlier (Note: 1 set is for one PEB).	2 Set
4.	E&C: Erection of PEB structural materials (Note: 1 set is for one PEB).	2 Set
5.	E&C: Erection of PEB architectural items. (Note: 1 set is for one PEB).	2 Set
6.	E&C: Erection and Commissioning of Electrical Services (Note: 1 set is for one PEB).	2 Set

7.	Storage Racks for Closed storage	1 set

10.2 LIST OF MAJOR SERVICES INCLUDED IN BIDDER'S SCOPE:

i. DETAILED Engineering
ii. Technical services relating to planning, procurement, manufacturing, inspection, expediting, packing, shipping, storing, etc.
iii. Submission and obtaining approval of all engineering documents before start of works
iv. Engineering for procurement
v. Preparation of all MTOs and MRs, as required
vi. ORDERING of all materials
VII. Overall Project Management and progress reporting to owner/consultant
VIII. Expediting suppliers and sub vendors
IX. Procurement
X. Manufacture, fabrication and assembly at works and site
XI. Inspection and testing including third party Inspection
XII. Painting at works, painting at site including touch up paint
XIII. Dispatch and transportation of materials, consumables, construction aids etc to site.
XIV. Establishment of site office complete with all facilities and communication network, as required
XV. Storage, loading, unloading, security and handling at site
XVI. Construction at site including minor fabrication, erection and installation. Supervision of work during fixation of foundation bolts. Grouting, alignment and necessary activities for installation of complete Pre-Engineered buildings. XVII. Insulation with cladding and painting
XVII. Engineering for interfacing all inputs and outputs
XVIII. Site clearing and cleaning
XIX. Total day to day supervision of construction including erection and specialized services, if any
XX. Clearance for installations from the statutory and other concerned authorities on behalf of Purchaser. The Contractor shall also assist in preparing application forms, providing necessary drawings, documents, test certificates etc including necessary co-ordination with statutory and other concerned authorities.
XXI. Liaisoning with other contractors in the plant
XXII. Handing over the PEBs to purchaser
XXIII. Supply of all test reports /certificates
XXIV. Providing as built drawings for storage rack.

Notes:

Bidder to note that the above list is not exhaustive and any other service required as per the intent of this specification / project requirements /good engineering practice shall be deemed to be included in bidder's scope without any commercial implication to the purchaser.

10.3.CLARITY OF SCOPE IN OTHER AREAS :

S.No	Item	By BHEL	By Vendor	Remarks
1	Complete civil foundation works for all the PEB store rooms		Yes	Vendor shall submit the loading details for foundation design
2	RCC cable trenches, if any, within all PEB store rooms		Yes	
3	Flooring works within all PEB rooms		Yes	
4	Plinth protection around all PEB rooms		Yes	
5	Steps/ ramps on front/back sides of the room as applicable		Yes	
6	Composite slab, if adopted by bidder, incl. all shuttering, reinforcement, bolts, decking, formwork, fasteners, painting, finishes, waterproofing, etc		Yes	
7	Electrical works including supply and E&C of wiring, room appliances (lights, ceiling fans, exhaust fans, ventilators, etc), switchboards, MCB boxes etc as specified in clause 7.3. (A)		Yes	
8	Cut out/ provision of supports & fixtures for the room appliances		Yes	

10.4. TECHNICAL DETAILS

Design, supply and erection of Pre-Engineered Buildings

10.4.1. Design and supply of PEB structural materials

b) After receipt of BHEL PO, following documents shall be submitted to BHEL for approval:

1.GA drawings along with BOM.

b) Vendor shall supply the pre-fabricated structural materials such as columns, rafters, beams, purlins, tie rods, sheets, wall cladding/roofing PUF insulation, hardware etc. to the

site as per approved drawings. Raw materials for steel sections, sheets etc. should be of reputed make of supplier to similar construction / infrastructure projects conform to relevant Indian / International Standards. The Bidder should furnish documentary evidence for the same.

To the extent possible, the Contractor shall consider the standard steel sections and plates available in India. In case the Contractor uses raw materials conforming to standards other than Indian Standards, the contractor should clearly indicate the Indian equivalent of the same and approval from the purchaser is to be obtained for use of such raw materials. In case for any raw materials standards other than Indian Standards is already specified in the Contract, approval as mentioned above is not required. In case of non-availability of raw materials in India, the Contractor shall switch over to import of the required raw materials expeditiously at its own cost and responsibility. The Purchaser shall not grant any time extension, on account of any delay in the procurement of raw materials. The Contractor shall take samples and test them in laboratories in India and/or abroad as may be required at his own cost & time, and fully satisfy himself of the suitability of the raw materials for the purpose of the plant & equipment offered by him.

f) Vendor shall also supply the J bots/nuts/washers, alignment plates and other related hardware that are used for positioning and anchoring of the PEB structures to the RCC foundation plinth.

g) All the fabricated items, fasteners & materials required for complete assembly etc. shall be supplied to the project site.

10.4.2 Design and supply of PEB architectural items

e) After receipt of BHEL PO, vendor shall submit GA drawings along with BOM (item-wise description, quantity, make, model etc) of the architectural items for BHEL approval.

f) The architectural items submitted for approval shall meet the requirements of various aspects of the room such as electrical, illumination, ventilation, exhaust, thermal, safety, security etc.

g) Accordingly, this shall include all items (except the electrical wiring and appliances as listed under BHEL scope) such as windows with shades, doors with shades/lock/key, rolling shutters with lock/key, ventilator provisions, exhaust provisions, rain water gutters/ down comers/ pipes etc. Raw materials for steel sections, sheets etc shall be of reputed make such as Jindal Steel and Power, RINL, SAIL, TISCO, JSW Steel, Essar Steel, Ispat Industries, Lloyd Steel Industries

10.4.3 Erection of structures of PEB

f) Vendor shall erect the structural items such as columns, rafters, beams, purlins, tie rods, sheets, wall cladding/roofing insulation, hardware etc as per the BHEL approved drawings / BoM.

g) Vendor shall also carry out necessary finishing activities such as painting etc.

h) Vendor shall deploy qualified/competent team at site to carry out the above erection activity.

i) Vendor shall also deploy their specialized team during plinth casting of J bolts / alignment (base) plates etc in order to provide the needed support/guidance to the BHEL civil construction team at site.

j) All necessary labour, tools & tackles, shuttering materials, measuring instruments, machinery shall be in vendor scope of supply. This shall include spanner sets, drilling machines, welding machines, hydra, JCB, truck, trolley etc as required for the erection work.

10.4.5 Erection of architectural

a) Vendor shall carry out erection of the architectural items such as windows with shades, doors with shades/lock/key, rolling shutters with lock/key, structural provisions for ventilators / exhausts, rain water gutters/ down comers/ pipes etc as per the BHEL approved drawings / BoM.

g) Vendor shall also carry out necessary finishing activities such as painting etc.

h) Vendor shall deploy qualified /Competent team at site to carry out the above erection activities.

i) All necessary labour, tools & tackles, shuttering materials, measuring instruments, machinery shall be in vendor scope of supply. This shall include spanner sets, drilling machines, welding machines, hydra, JCB, truck, trolley etc as required for the erection work.

10.5 Structure & Material Specification:

The PEB room shall have a steel frame primary structural member. Primary members fabricated from plates shall conform to IS2062 min Grade E250 Quality BR/ ASTM A572-12 Grade 50 with minimum yield strength of 345 Mpa. Steel shall be semi-killed/killed. Minimum thickness of steel plates shall be 4 mm. Hot rolled primary structural members and Rod/Angle bracing shall conform to IS2062 Grade E250 Quality A. Secondary members for Purlins and Girts shall conform to the specification of IS 811 or ASTM A1003-12 made from steel sheets conforming to ASTM A1011-12b Grade 50 having a minimum yield strength of 345 Mpa. The minimum thickness of secondary members shall be 3.15 mm. All other miscellaneous secondary members shall have minimum yield strength of 250 Mpa.

10.5.1 Fasteners & Connections:

Special coated self-drilling screws/fastener shall be used conforming to class 3 as per AS: 3566.1 and AS: 3566.2. Steel bolts, nuts and washers complying with AS 1112:2000. High Strength Bolts for Primary Connections IS: 1367 (Part III) Gr. 8.8 / ASTM A325. Bolts for Secondary Connection IS: 1367 (Part III) Gr. 4.6 /ASTM A307. Anchor/foundation Bolts shall conform to IS: 5624 and relevant IS code.

10.5.2 **Roof & Wall Cladding:**

Permanent color coated metal cladding with troughed M.S. sheets manufactured out of 0.55 mm TCT(Total coated thickness) permanently color coated zincalume sheet (150 gsm zinc-aluminium alloy coating total of both sides as per AS 1397:1993) having 300 Mpa yield strength. The color coating shall comprise of 20 microns finish coat over a 5-micron primer coat on the exposed side and a back coat of 5 microns over a primer coat of 5 micron on the reverse side. The metal cladding shall have 500 mm cover width, 47 mm high crests at 250 mm centers with special male/female side laps and anti-siphoning feature to prevent leakage .The sheet shall be fixed with the help of concealed compatible interlocking clips and wafer head zinc coated self-drilling fastener/screws 4.2X25 mm long on to the sub-girts. The clips shall be concealed and no fastener are to be penetrate the external sheeting all complete as per specification. Measurement of cladding shall be of the elevation/plan area of side covered by cladding as per approved drawing. No overlap shall be considered in measurement for the purpose of payment.

10.5.3. Doors Frames:

Door frames shall be of T-iron frame of mild steel Tee-sections as per DSR-2013 item no 10.13. All doors shall be provided necessary fittings like hinges, handles, mortice locks, tower bolts, stopper, hydraulic door closer, etc. of CP brass complete.

Black powder coated aluminum doors shall be with extruded built up standard tubular sections, appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixed to Pre-Engineered structure including necessary filling up of gaps at junctions with required PVC/neoprene felt etc. including hinges /pivots and double action hydraulic floor spring of approved brand and manufacture IS: 6315 marked, lock, handle and all necessary fittings as detailed in tender drawing or submitted by bidder in shop drawing and approved by BHEL.

The door entrance shall include Mild Steel single leaf door. The structural steel shall conform to IS: 7452 and IS: 2062. The holdfasts shall be made from steel flats (50 mm and 5 mm thick). The fixtures, fastenings and door latch are to be made with same materials.

10.5.4 Rolling Shutters:

Rolling shutter (Hand operated) shall be fabricated from 18-gauge steel and machine rolled with 75 mm rolling centers with effective bridge depth of 12 mm lath sections, interlocked with each other and ends locked with malleable cast iron clips to IS:2108 and shall be designed to withstand a wind load without excessive deflection. Metal rolling shutters and rolling grills as IS: 6248.

10.5.6 Painting and Coating:

Steel shall be color coated with total coating thickness of 25 microns (nominal) dry film thickness (DFT) comprising of silicon modified polyester (SMP with silicon content of 30% to 50 %) paint or Super Durable Polyester (XRW) paint of 20 microns (nominal) on one side

(exposed face) on 5-micron (nominal) primer coat and 10 microns (nominal) SMP or Super Durable Polyester paint over 5-micron (nominal) primer coat on other side. SMP and polyester paints system shall conform to Product type 4 as per AS/ANZ 2728.

The structural steel shall be hot-dipped galvanized, conform to IS: 4759 or relevant Indian standard

10.5.7 Lighting:

The PEB Building shall be provided with electric light to achieve average illumination level of 100 Lux. Vendor shall ensure that the room is designed to utilize maximum natural light during the day.

10.5.8 Description of PEB Structures:

Primary Members: Primary structural framing shall include the transverse rigid frames, columns, corner columns, end wall wind columns, beams, truss member, base pate.

Secondary Members: Secondary structural framing shall include the purlins, girts, eave struts, bracing, flange bracing, base angles, clips, flashings and other miscellaneous structural parts. Suitable wind bracings sag rods to be reckoned while designing the structure.

Sealant: Sealant used for cladding shall be butyl based, two parts poly sulphide or equivalent approved, non-staining material and be flexible enough not to interface with fit of the sheets.

Closures: Solid or closed cell closures matching the profiles of the panel shall be installed along the eaves, rake and other locations.

Flashing and Trim: Flashing and / or trim shall be furnished at the rake, corners, eaves, and framed openings and wherever necessary to provide weather tightness and finished appearance. Color shall be matching with the color of wall. Material shall be 26-gauge thick conforming to the physical specifications of sheeting.

Gutters and Down comers: Gutters shall be fabricated out of same metal sheet. Material shall be same as that of sheeting. Down comers shall be of galvanized steel pipes or PVC designed to ensure proper roof drainage system.

All steel materials supplied by the Agency shall be in a sound condition, of recent manufacture, free from defects, loose mill scale, slag intrusions, laminations, pitting, flaky, rust, etc. and be of full weight and thickness specified.

10.6. **ELECTRICAL SERVICES**

A. Supply, erection and commissioning of following electrical services items shall be in the scope of PEB vendor. The following items minimum shall be supplied by PEB vendor to meet the illumination level of 100 lux.

A.1 Electrical services BOQ per PEB room			
SL No.	**DESCRIPTION (FIXTURES / LAMPS / ACCESSORIES)**	**UNIT**	**Tentative QTY as min required**
1	22W LED tube lights with frame, of standard manufacturer, for illumination	Nos	20
2	SSB-2 + R surface mounted swbd with 2 nos 5A piano type switches and one electronic fan regulator. (modular type)	Nos	6
3	SSB-2 surface mounted swbd with 2 nos 5A piano type switches (modular type)	Nos	6
4	Domestic type 5/15A receptacle with switch (Surface mounted mounted modular)	Nos	6
5	6 Way TPN Indoor type Lighting Panel (Surface mounted) with 32A, 4pole RCBO at the incomer & 6 Nos 10A SPN MCB at the outgoing .	Nos	1
6	32A TPN Welding receptacle with Plug & interlock Switch	Nos	1
7	Industrial Wall mounted Fan of 18 Inch to 24 Inch	Nos	4
8	Flexible Wires 1.5sqmm for fixture & 4sqmm for sockets, cable, conduits (rigid and GI stripped flexible), accessories for Conduits (All conduits shall be 25mm dia heavy duty GI type), ISA/ISMC/GI FLAT and any other accessories for installation of above items - 1 LOT	LOT	1
9	Exhaust Fan with DOL starter (415V, 3 PHASE) (Industrial grade)	Nos	5

Notes:

6. Illumination Layout & BOQ shall be prepared by the bidder and submitted for approved by BHEL after order placement. Illumination fixture, conduits etc. as mentioned in above table are tentative and final nos. and position shall be supplied and fixed as pe approved “Illumination Layout” and BOQ.
7. Installation & commissioning of above equipment and its associated cabling work within the PEB shall be in the scope of PEB vendor.

B. Supply & Installation of Fire Extinguishers: following items shall be in the scope of PEB vendor

Sl. No.	Items	Quantity	Unit
1.	45 Lit. Foam type Fire Extinguisher	8	No.s

2.	25 kg DCP type Fire Extinguisher	8	No.s
3.	4.5 kg CO2 type Fire Extinguisher	8	No.s
4.	Sand Buckets (Stand with 4 buckets in each set)	4	Sets

10.7 **TECHNICAL SPECIFICATION FOR ELECTRICAL SERVICES**

Lighting panels shall be powder coated with color shade RAL9002. Lighting panels shall have IP55 degree of protection.

Wires of different phase shall normally run in separate conduit.

Electrification of all building shall be carried out as per IS 732-1989, IS 4648-1968 and other relevant standards.

All luminaries and their accessories and components shall be of type readily replaceable by available Indian makes.

Following test reports to be submitted for LED chip/LED luminaires:

a) LED parameters like Lumen per watt, CRI, Beam angle from manufacturer. b)

LM 80/IS: 16105 report.

c) LM 79/IS: 16106 report

LIGHTING WIRES

Lighting wires shall be 1100 V grade, light duty PVC insulated unsheathed, stranded copper/ aluminium wire for fixed wiring installation. Color of the PVC insulation of wires shall be Red, Yellow, Blue and Black for R, Y, B phases & neutral, respectively. Minimum size of wire shall not be less than 1.5 sq.mm Copper for lighting fixture & 4 Sq.mm Copper for receptacles. Lighting panels etc. shall be earthed by two separate and distinct connections with earthing system.

RECEPTACLE

Receptacles boxes shall be fabricated out of MS sheet of 2mm thickness and hot dipped galvanised or of die-cast aluminium alloy of thickness not less than 2.5 mm. The boxes shall be provided with two nos. earthing terminals, gasket to achieve IP55 degree of protection, terminal blocks for loop-in loop-out for cable of specified sizes, mounting brackets suitable for surface mounting on wall/column/structure, gland plate etc. The ON-OFF switch shall be rotary type heavy duty, double break, AC23 category, suitable for AC supply. Plug and Socket shall be shrouded Die-cast aluminium. Socket shall be provided with lid safety cover. Robust mechanical interlock shall be

provided such that the switch can be put ON only when the plug is fully engaged and plug can be withdrawn only when the switch is in OFF position. Also cover can be opened only when the switch is in OFF position. Wiring shall be carried out with 1100 V grade PVC insulated stranded aluminium/copper wire of adequate size. The Terminal blocks shall be of 1100 V grade. The Terminal blocks shall be of 1100 V grade made up of unbreakable polymide 6.6 grade with adequate current rating and size. The welding receptacles shall be provided with inbuilt ELCB rated for suitable mA sensitivity.

GALVANISING

Galvanising of steel components and accessories shall conform to IS:2629 , IS4759 & IS:2633. Additionally galvanising shall be uniform, clean smooth, continuous and free from acid spots. The amount of zinc deposit over threaded portion of bolts, nuts, screws and washers shall be as per IS:1367. The removal of extra zinc on threaded portion of components shall be carefully done to ensure that the threads shall have the required zinc coating on them as specified.

CONDUITS/PIPES/DUCTS INSTALLATION

GI pull wire of adequate size shall be laid in all conduits before installation. Metallic conduit runs at termination shall have two lock nuts wherever required for junction boxes etc. Conduit runs/sleeves shall be provided with PVC bushings having round edge at each end. All conduits/pipes shall have their ends closed by caps until cables are pulled. After cables are pulled, the ends of conduits/pipes shall be sealed with Glass wool/Cement Mortar/Putty to prevent entrance of moisture and foreign material. Exposed conduit/pipe shall be adequately supported by racks, clamps, straps or by other approved means. Conduits /pipe support shall be installed square and true to line and grade with an average 1 Meter spacing between the supports.

Ventilation

Provision shall be made to allow fresh air from outside to enter the compartment through suitable filter capable of preventing entry of sand during severe sand storms. The ventilation system fans shall be mounted on side walls with suitable sand filter / louver having easy access for cleaning and maintenance.

10.8 **GENERAL TECHNICAL REQUIREMENTS:**

For the design of the plant, it is necessary to consider the requirements (by suitably planning the layout) of the convenience of inspection, cleaning, maintenance and repair.

Equipment design and engineering shall incorporate adequate safety features (as per applicable specifications of respective installation as well as Health, Safety and Environment Codes & Standards applicable for the subject project) to provide protection to operating personnel, equipment and environment.

No claim in terms of cost or relaxation in time shall be entertained for any redesign, rework and for the safety measures provided. If at any stage of work, any dismantling or modification or relocation of any facilities is required to be done to complete the work in bidder's scope and which has been agreed by the Owner, the same shall be done by the bidder at no extra cost or

time implication to the Owner. All such changes will be executed only after the proposed drawings and work plan are approved by the purchaser.

The Bidder shall take all necessary precautions to protect all the existing equipment, structures, facilities and buildings etc. from damage. In case any damage occurs due to the activities of the Bidder on account of negligence, ignorance, accidental or any other reason whatsoever, the damage shall be immediately made good by the Bidder at his own cost to the satisfaction of the Owner. The Bidder shall also take all necessary safety measures at his own cost, to avoid any harm or injury to his workers and staff from the equipment and facilities of the power station.

10.9.CONSTRUCTION REQUIREMENT:

Erection & commissioning of all the items supplied by bidder is included in bidder's scope.

Bidder is advised to visit the project site and appraise himself about the local conditions and infrastructure available in the area for fulfilling their commitments under the contract. BHEL will not admit any claims whatsoever on account of Contractor's non-familiarization of local conditions.

The Contractor shall make all necessary arrangements to deliver the equipment at the site by wagons/trucks/trailers and receive the material at site, build his own stores for the proper storage of equipment, maintain the stores and all related documents and records, transport the equipment to site for erection purpose. Necessary security arrangements also shall be made by the Contractor. Area only for construction of stores and construction site office shall be made available, free of cost, to the Contractor by the Purchaser.

The Contractor shall be provided with construction power at 415 V, three phase, 50 Hz for the purpose of the construction and erection at free of charge. The Contractor shall make his own arrangements for further distribution.

Construction water shall be supplied free of cost by the Purchaser to the Contractor at one point at each location of project.

All machinery such as cranes, hydra, JCBs, forklifts, transport trucks, trolleys, concrete mixers, Ajax machines etc necessary for movement and installation of materials shall be organized by the bidder. Bidder shall arrange all the items required like scaffolding, rope, sling etc. for construction of the facilities in their scope.

All necessary tools and tackles such as screw driver set, power screw drivers, cutting pliers, nose pliers, spanner sets, adjustable spanners, hole saw cutter set, bending tools, torque wrenches, hack saw blades, pipe wrenches, flat / round files, drilling machines, welding machines, steel bar bending tools / templates for RCC works, spade, shovel, hammer etc shall be organized by the bidder.

All necessary measuring instruments such as measuring tapes, digital multimeters, electrical testers, meggers etc shall be organized by the bidder.

The contractor shall submit to the employer, draft instruction manual specifically compiled for the project, containing full detail required for E&C and Maintenance if any. The E&C manuals/checklists shall be submitted prior to the commencement of erection activities.

Bidder shall make their own arrangements for necessary food, drinking water and accommodation for their labour and employees posted at the site. Similarly, food and drinking water required at the site, during the construction operations, shall also be in scope of the bidder.

Bidder shall organize all necessary steps to meet statutory requirements such as labour license, PF, ESI, insurance etc and also ensure compliance with relevant acts such as minimum wages act, income tax act, employee insurance act etc for their labour deployed at site.

Bidder shall maintain updated labour register, with name, age, qualification, salary, attendance details etc at the site.

It is advised to Bidders to visit the site and ascertain all site intensive requirements such as Health, Safety and Environment (HSE) requirement, work permits and other special requirements of site etc. Bidder shall ensure safety of man and machinery during work at site. For this necessary safety measures like use of PPEs, use of danger board/tapes etc to be ensured by the bidder. It is the ultimate responsibility of the bidder in all respect to prevent accidents at the site and safeguard man and machinery from accidents.

Bidder shall, at the completion of every work, clear off the debris, which resulted out of the work.

10.11 QUALITY ASSUARANCE:

10.11.1 All materials, components, and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages as per a comprehensive Quality Assurance Program (QAP) to be submitted by bidder and approved by the purchaser.

10.11.2 It will be the responsibility of the bidder to adhere to the approved Quality Plans. The bidder shall further identify specific hold points beyond which work will not proceed without purchaser's consent so as to further ensure that he performs the above quality functions effectively.

10.11.3. Field Quality Plans will detail out for all the items, the quality practices and procedures etc. to be followed by the bidder at site, during various stages of site activities starting from receipt of materials at site.

10.11.4. Bidder to note that all the cost involved in the various Inspection and testing as per approved QAPs /ITPs shall be deemed to be included in bidder's quoted price. Bidder at no

point of time shall be eligible to raise any extra claim on account of any requirement necessitated as a part of approval of QAPs/ ITPs.

10.11.5. At various stages of manufacturing, procurement, construction, as per approved QAP inspection/testing shall be carried out by Inspection Agency (BHEL / Third Party appointed by BHEL). The inspection agency shall be indicated in the quality plan and shall be as per the approved quality plan.

10.11.6. Bidder shall notify in writing to the Purchaser, at least two weeks (Ten working days) in advance of the date and the place at which the items will be ready for witnessing of inspection / testing by Purchaser. In case any postponement becomes necessary, the CONTRACTOR shall provide written notification at least 48 hours prior to the original scheduled date.

10.11.7 In case bidder find any deviation or non- conformity with respect to the agreed specifications, during manufacturing of the item and where corrective action is not feasible, the bidder shall report the same to Purchaser and / or PMC in the designated "Waiver / Deviation Request" format and seek prior approval from Purchaser /PMC before proceeding with the job.

10.11.8. Bidder after satisfying that all inspection requirements as per approved ITP and applicable specifications / documents have been taken care by Inspection Agency, shall submit copy of the Inspection Certificate and all Quality control records to Purchaser in requisite copies along with Statutory Certificates if any, duly endorsed by their Quality Control Manager.

10.11.9. Purchaser reserve the right to carry out surprise checks on all material either at manufacturer's works or at site. In case of any rejection at site, the whole lot will be rejected and bidder shall get the entire lot replaced without any time or delivery implication to the purchaser.

10.11.10. Inspection Agency shall check the calibration status and traceability of all instruments used by the supplier, for testing. In case, TPIA uses their own instruments for testing purposes, similar certification shall be ensured.

10.11.11. Bidder shall submit, copy of each Inspection Certificate (IC) / Inspection Release Note (IRN) issued by Inspection Agency, along with all attachments mentioned therein.

10.11.12. No material shall be dispatched from the manufacturer's works before the same is accepted, subsequent to pre-dispatch final inspection including verification of records of all previous test/inspections by authorized Inspection Agency and duly authorized for dispatch by issuance of Material Dispatch Clearance Certificate (MDCC).

10.12.0 MARKING, PACKING AND DESPATCH

10.12.1

1. All items shall be marked (stamped/etched) in accordance with the applicable Code/standard/specification. In addition, the item code, if available, shall also be marked.

2. For ease of identification, the color of painted strip (wherever required) shall be as per the applicable standard.

3.Paint or ink for marking shall not contain any harmful metal or metal salts which can Cause corrosive attack either ordinarily or in service. Special items/smaller items shall have attached corrosion resistant tag providing salient features.

10.13.0 DESPATCH

1.All the materials shall be divided into several sections for protection and ease of handling during transportation. The equipment shall be properly packed for transportation by hip/rail or trailer.

2.Special notations such as 'Fragile', 'This side up', 'Center of gravity', 'Weight', 'Owner's particulars', 'PO Nos.' etc. shall be clearly marked on the package together with other details as per purchaser order.

3.The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains/high ambient temperature, unless otherwise agreed.

4.The following minimum packing procedures shall be followed :

a. All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kind.

b. All items shall be protected from rust, corrosion, and mechanical damage during Transportation, shipment and storage.

c. Rust preventive on machined surfaces to be welded shall not be harmful to welding and shall be easily removable with a petroleum solvent.

d. Ends shall be suitably protected, and the protectors shall be securely and tightly attached.

e. Each variety and size of item shall be supplied in separate packaging marked with the purchase order no., item code (if available), and the salient specifications.

f. Prior to shipment components of the unit shall be completely cleaned, Flange faces, threaded portion and other machined surfaces shall be protected by coating with easily removable rust preventive. All the items shall be properly packed to prevent damage during transit damage, loading, unloading and storage.

10.14.0 DOCUMENTATION:

1. A master documentation list shall be prepared during kick off meeting identifying all the DOCUMENTS / DRAWIGS to be submitted by the bidder as part of documentation.

2.Vendor shall ensure submission of all documentation as per approved Master Document List.

3.The following minimum documentation shall be submitted by the vendor:

i. All PEBs GA drgs indicating base plates, anchor bolts connection detail, purlin, roof panels, wall panels, scope demarcation etc.
ii. BOM for Structural items.
iii. BOM of architectural items with detail of item wise make, model Quantity etc.
iv. Civil interface details
v. Welding specification charts
vi. Nondestructive Testing specifications
vii. Quality plan
viii. Painting schedule & procedure (shop painting & site painting) X
ix. Packing procedure
x. Erection drawings
xi. Site storage procedure
xii. Erection procedure
xiii. Testing procedure
xiv. 'AS BUILT' drawings
xv. Any other document, as deemed necessary BY BHEL, during detail engineering or erection – commissioning stage.

10.15.0 Sub Vendor List:

A.1 For structural steel:

4. It should conform to relevant Indian / International Standards.
5. It should be of reputed make of supplier to similar construction /infrastructure projects.
6. The Bidder should furnish documentary evidence to prove (1) and (2) above

A.2 Makes of Electrical and mechanical items

Item	Vendor	Remark
LED Lamp fixtures for indoor		
	BAJAJ	
	CGL	
	Havells	
	Philips	
	Wipro	

Lighting panel	Havels India Limited	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
	Indo Asian Fusegear	
	STANDARD ELECTRICALS LTD	
	C&S Electric Limited	
	ABB Limited	
Cable Lugs	Dowell, Mumbai	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
	Electromac Industries	
	Chenta Engineering Co	
	Forward Engineering Industries	
MCB	Any make-Model shall have mark of CE/VDE/UL/CSA/BIS with CML no.	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
Axial flow Fans	Khaitan, Kolkata	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
	Marathon Electric, Kolkata	
	CB-Doctor, Ahmedabad	
	Solyvent Flakt, Kolkata	
	Advance ventilation, Sonepat	
	Krugar, Singapore	
	TCH Nadi, Chennai	
	Almonard, Chennai	
Propeller Fan (Up to 2 HP)	Khaitan, Kolkata	Equivalent other make also may be proposed by bidder and prior approval shall be obtained from purchaser before finalization of make.
	Marathon Electric, Kolkata	
	CB-Doctor, Ahmedabad	
	Solyvent Flakt, Kolkata	

Part II

Chapter 11 : Technical Specifications for

General Civil and Electrical Works for Development of Open storage Yard.

Chapter-I: SCOPE OF WORK

1. Earthwork, cutting, filling and levelling in proposed open storage yard of 30,000 Sq Meters approximately in which 2 Nos of PEB has to be developed of size 450 Sq Meter (15m X 30m X 6m) each. Chain Link Fencing of the proposed Open Storage Yard including installation of 3 No of MS Gates.

2. Micro Grading:

The entire area shall be micro graded up to required levels by the contractor to achieve the ground profile as per pavement level requirement. Filling/ cutting required to bring the site up to the required finished levels is in the scope of the contractor. Extra earth required to

make up to paved levels shall be arranged by the contractor at his own cost from approved borrow areas.

3. The bidder is required to comprehensively Design, Manufacture, Supply and Install two numbers of Pre-Engineered closed store Building sized 15mx30mx6m (approximately). Bidder will submit the design (Including foundation, plinth beams & flooring) for approval of BHEL.

4. The work to be performed under the scope of this tender mainly consists of but not limited to complete underground civil works including excavation for foundations, backfilling, leveling and grading, RCC foundation works, and other miscellaneous structures and services.
   1. Construction of WBM approach roads, Fencing, Drain laying and Hume pipe installation, flooring, foundation, pedestal etc including providing and installing foundation bolts, templates, inserts, lugs, pockets etc for foundations etc. as per drawings.
   2. Providing and laying 150 mm thick plane cement concrete (1:2:4 mix) flooring over 150m m thick well compacted GSB on properly compacted subgrade, including surface finishing curing and all necessary preparations as per drawings and specifications as a part of PEB Flooring.

   For building/ structure sizes and number of equipment refer plot plan, please note that these are tentative and likely to change.

1.0 Construction of following services

1) Storm Water drain system
2) Soak Pits.
3) Road Crossings
4) Strengthening of existing roads for crane movement if required.
5) All approach roads from existing main roads as per detailed engineering requirement for maintenance and operation.
6) Maintenance and erection approach roads/ by strengthening of roads.
7) Preparation of basic/ detailed engineering drawings for construction, and getting approval of the same from PMC/ Owner/ Licensor.
8) Any temporary activities required to complete the work.
9) Micro grading & disposal of surplus and unserviceable material beyond Site complex's compound wall. Contractor to assess the lead by physically visiting the Plant site.
10) Approval from statutory and local authorities.
11) The sub-grade for roads & pavements and soil improvement/ preparation below foundation level of drains, culverts, pipe way bridges, manholes, etc. shall be carried out as per Geo- Technical recommendation.
12) The plot for construction area/ fabrication yard/ field office/ construction stores has to be developed by the contractor of its own and the Client shall only identify the space on as in where is basis if the same is available else bidder to develop plot on

his own. All the infrastructure facilities which include roads, approaches, drainage system, pavements etc. shall be developed & provided by the contractor of its own.

1.1 THE WORK WILL INVOLVE

All civil, structural and architectural works connected with the above mentioned structures such as earth work, concrete work, brick work, steel work, embedment, plastering and painting, waterproofing, flooring, plumbing, road work, drainage, grouting etc.

1.2 CIVIL AND ARCHITECTURAL AND ELECTRICAL WORKS

The scope covers all Civil and Architectural within the battery limits. The important works covered are as below.

1) Excavation of earth and backfilling including dewatering of excavations for foundations, trenches, tunnels pits, etc. till the construction of the same is completed and disposal of surplus.
2) Construction of foundation footing for lightly loaded structures, trenches, Sumps, grade beams, tie beams at foundation level, etc.
3) Complete civil and architectural works such as brick work, plastering, painting, all types of floor/roof finishes, all types joinery etc.
4) Preparation and submission of detailed calculations, arrangement drawings and detail drawings of formwork, staging and scaffolding for all reinforced concrete structures and foundations as directed by the Engineer for his checking and approval.
5) Preparation of detailed working drawings and bar bending schedules for all reinforced concrete work and getting them approved by the BHEL Engineer.
6) Supply, fabrication and fixing structural steelwork including MS Gates as per approved drawing (Approximately 3 Gates).
7) Supply, fabrication and fixing of anchor bolts, sleeves, fixing frames, embedment etc. in concrete.
8) Supply of all instruments and personnel for conducting necessary tests at site as specified/as directed by the Engineer.
9) Making appropriate fabrication drawing as per agreed schedule before starting fabrication work for any structural GA drawing.
10) Preparation of bar bending schedules for all reinforced concrete work and getting them approved by the BHEL Engineer.
11) Supply of all equipment/ instruments and personnel for conducting necessary tests at site as specified/as directed by the Engineer.
12) Type of cement shall be one of the following:
    a. 43 or 53 grade ordinary portland cement (OPC) as per IS:8112 / IS:12269.
    b. Portland slag cement (PSC) conforming to IS:455.
    c. Portland pozzolona (fly ash based) cement conforming to IS:1489 part-1
    d. Portland pozzolona (calcined clay based) conforming to IS:1489 part-2

13) All the Electrical and Illumination works shall be carried out as per BOQ following standard operating Procedures. Main work includes Poles Erection, Cable laying, Lights fixing, Feeder pillar installation. Sufficient illumination shall be ensured in the completed Open Storage Yard.

1.3 STRUCTURAL WORKS

The work involves:

1) Supplying and/or Taking delivery from BHEL stores fabrication and erection of structural steel work including all interfacing work and miscellaneous work. Supply of steel will be made by BHEL. The nature of work shall include columns, beams, splicing of steel works as needed, bracings, purling, sheeting runners, sag rods, ties, struts walkways, galleries, stairs, ladders, handrails, floor gratings, chequered plate work, M.S, pipes, equipment supporting platforms and all other structures required for successful completion of project.
2) Supplying and providing reinforcement HYSD - TMT Fe 500D, Fe500D CRS (AS PER IS 1786), Mild Steel as detailed elsewhere in the contract/BOQ (Bill of Quantities).
3) Supplying and providing of M.S pipes, fabrication and erection of handrail as per drawing and specifications. (if required)
4) Supply and fixing of floor gratings as per Specifications.
5) Supply of high tensile bolts, mild steel bolts, nuts, plain/taper and spring washers, all electrodes required for shop and field work.
6) Shop and final painting as per Technical Specification after properly cleaning the Steel surfaces.

1.4 ALSO INCLUDED IN THE SCOPE

Unless otherwise specified, the work to be provided by the contractor for the items mentioned in the “Schedule of items” shall include but not be limited to the following.

1) Furnishing all labour, materials, supervision, construction plans, equipment, supplies, transport, to and from the site, fuel, electricity, compressed air, water, transit and storage insurance and all other incidental items and temporary works not shown on specified but reasonably implied or necessary for the proper completion, maintenance and handling over the works, except in accordance with the stipulations laid down in the contract documents and additional stipulations as may be provide by the engineer during the course of works.
2) Furnishing samples of all materials required by the engineers for testing/inspection and approval for use in the works. The samples may be retained by the engineer for final incorporation in the works.
3) Furnishing test reports for the products used or intended to be used, if called for the specifications or if so desired by the engineer.
4) Giving all notices, paying all fees, taxes etc., in accordance with the general conditions of contract, that are required for all works including temporary works.

5) Arranging manufacturer's supervision for items of work done as per manufacturer's specifications when so specified.
6) Carrying out topographic survey of the entire and establish levels and coordinates at suitable intervals from existing grid levels and coordinates furnished by the owner established bench marks, setting out the locations and levels of proposed structures, constructions and marking of reference pillars and other identification works etc., The contractor shall provide the owner/BHEL such a assistance, instruments, machines, labour and materials as are normally required for examining, measuring and testing any work and the quality, weight or quantity of any material used.
7) Providing all incidental items not shown or specified but reasonably implied or necessary for the successful completion of the work in accordance with contract.
8) Sample testing of reinforcement.

2.0 GENERAL

1) The drawings enclosed with this tender are intended to give the tenderer a general idea of the type and extent of work involved. The drawings are as such only indicative and not to be considered as the exact construction drawings.
Further this is to be noted that the drawings and the documents furnished along with this specification are the sole property of BHEL. It must not be used directly or indirectly in any way detrimental to the interest of the company.

a) The scope of work will also include such other related works although they may not be specifically mentioned in the above paragraph and all such incidental items not specified but reasonably imply and necessary for completion of the job as a whole all as desired and as directed by the engineer.

b) The detail scope of work covered above is not a comprehensive list of items of work involved. The detail scope of work may vary considerably depending on the actual construction requirements.

2) The Measurement of quantities for items 13.1, 13.2, 13.3 of the BOQ should be length X breadth X height and then reduced by 7.5% (as per CPWD guidelines)

3) Rates will be applicable to net quantities approved by the BHEL Engineer/Supervisor at site.

WORK BY OTHERS.

No work under the specification will be provided by any agency other than the contractor unless specifically mentioned elsewhere in the contract.

Part II

Chapter 12: Technical Specifications for

Design, Manufacture and Installation of Safety Park

SPECIFICATION FOR CIVIL WORK, PLUMBING WORK, SANITARY WORK, ELECTRIFICATION WORK FOR SAFETY PARK .

- SAFETY PARK: Preliminary Details

i. SIZE: 75 SQM (01 NO.)
ii. Clear Height: 3 M Dimensions
iii. A-15M
iv. B-10M
v. L-10M
vi. W-7.5M

D**etails: Safety park** shall be constructed as Pre-Engineered, Pre-fabricated, Removable and Re erectable type building. Detailed construction drawings shall be prepared by bidder in consideration of the technical / construction specifications as mentioned hereafter and submitted to BHEL for approval.

FRAME STRUCTURE: PEB shall be constructed as frame structure with Structural Columns, Trusses, Foundations and Plinth Beam for supporting self-loads, live-loads, wind loads, seismic loads etc. Works shall be carried out as per the detail drawings to be prepared by contractor and approved from BHEL.

MAIN EXTERNAL WALLS: The main structural walls shall be made out of PUF Panel with color coated GI sheet of 0.5 mm thickness on Inner and Outer Side and 60 mm thick PUF of 38 Kg /m3 sandwiched between the sheets. The fixture should be joined together by tongue and groove method to ensure 100% leak proof. The base frame for PUF panels shall be fabricated with ISMC 75x40x3mm or as per approved design, MS "T" welded for securing panels. The above panels with base frame shall be grouted to the Plinth / Floor by means of expansion fasteners. To maintain the aesthetic look of office, PUF Panels should be flushed with Inner face of columns and columns shall be covered with the color coated GI sheet. The entrance will be provided with portico made up of PUF Panels, of approx. 4m X 3m

ROOF: Roof should be made up of structural steel truss using sections as per approved drawing to suit roof structure and permanently color coated galvanized MS troughed roof sheet fixed with fasteners including rain water gutters etc. all complete. False ceiling shall be done in the safety park area of 10 X 7.5 Meter area. Office roof shall be leak proof and gaps (if any) shall be filled with sealants.

FLOORING: As per approved drawing. 100 mm thick RCC floor covered with 1.8 mm thick PVC vinyl sheets. RCC Floor shall be made for entire area of 150 Sq m (15m X 10M) Note: Final design of PEB shall be as per approved drawings.

AIR CONDITIONING: Split/ Window Air-conditioner (2T) shall be provided as per requirement and direction of Engineer-In-charge with complete installation including ancillary works, voltage stabilizer, testing and commissioning as per manufacturers guidelines and specification

SALIENT TECHNICAL REQUIREMENTS: • Contractor shall submit two sets of proposed drawings of office and safety park along with foundation, furniture arrangements, Electrical, Plumbing & other fittings etc., to BHEL before commencement of work for approval within twenty (20) days from the receipt of LOA.

• Since these are detachable sheds & to be in repetitive use at other locations, proper marking (permanent) shall be made for identification to ease of re erection. The shed shall be so designed that it can be dismantled at any time and may be transported to be re-erected at other location

. • The roof truss should have bolted joints at crown /at both ends. Both roof and side cladding are to be made "Water Tight".

• The bidder should submit a guarantee for 1 year of operations for the materials supplied and erected by him.

• Bidder shall submit two sets of proposed drawings of the Office to BHEL before commencement of work. Two sets of final drawings, along with one soft copy, shall be handed over to BHEL immediately after finalization of design

. • Bidders should take care of all Indian site conditions, prevailing local laws etc

. • No claim shall be entertained to lack of knowledge of site condition.

• After completion of work, the building and areas around it should be cleared of all rubbish, debris etc. and handed over in fit condition for occupation.

• Design & Execution of civil works shall be carried out as per latest IS codes, standard specification and drawings as per the instruction of BHEL Engineer.

The materials and workmanship must be of good quality and accepted standards and specifications. The BHEL Engineer reserves the right to reject any material not up to the specification

TYPICAL SAFETY PARK LAYOUT ALONG WITH VERTIGO TEST STRUCTURE DRAWINGS-Attached

	ROOFING / SIDE CLADDING/MAIN STRUCTURAL WALL : Roofing / side cladding/ main structural wall work including all labour, material (unless otherwise specified in BOQ/contract specification), equipment, transportation, handling, scaffolding, laps, hooks, washers, corner	QTY	
1	Supply and Fixing of external sheet of Permanent colour coated metal cladding with troughed M.S. sheets manufactured out of 0.55 mm TCT(Total coated thickness) permanently colour coated zincalume sheet (150 gsm zinc-aluminium alloy coating total of both sides as per AS 1397:1993) having 300 Mpa yield strength. The colour coating shall comprise of 20 microns finish coat over a 5-micron primer coat on the exposed side and a back coat of 5 microns over a primer coat of 5 micron on the reverse side. The metal cladding shall have 500 mm cover width, 47 mm high crests at 250 mm centres with special male/female side laps and anti siphoning feature to prevent leakage .The sheet shall be fixed with the help of concealed compatible interlocking clips and wafer head zinc coated self drilling fasteners/screws 4.2X25 mm long on to the sub-girts. The clips shall be concealed and no fastener are to be penetrate the external sheeting all complete as per specification. Measurement of cladding shall be of the elevation/plan area of side covered by cladding as per approved drawing. No overlap shall be considered in measurement for the purpose of payment	As Per approved Drawing	
2	Main structural walls shall be made out of Insulated Sandwich Panels 60 mm thick, of desired height, suitable width panels with colour coated GI sheet of of 0.5 mm thickness on inner and outer side using pre coated galvanised iron profile sheets (size, shape and pitch of corrugation as approved by engineer-in-charge) 0.50 mm (+ 0.05 %) total coated thickness with zinc coating 120 grams per sqm as per IS: 277, in 240 MPA steel grade, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns. Sheet should have protective guard film of 25 microns minimum to avoid scratches during transportation. insulation shall be done using 60 mm thick PUF of 38 kg /m3 (min.) sandwiched between the sheets. Insulated sandwich panels shall be pre-fabricated and supplied at site for installation. The fixture should be joined together by tongue and groove method, joints shall be sealed with silicon sealant or other suitable sealant to ensure 100% leak proof. The outer framing structure shall be fabricated with ISMC 75x40x3mm or as per approved design, MS “T” welded for securing panels. the above columns will be grouted to the plinth beam / floor by means of expansion fasteners. The entrance will be provided with 1no-portico made up of PUF panels should have an aesthetic look of size min. 4m x 3m.	As Per approved Drawing	
3	Providing and fixing pre coated galvanised steel sheet roofing accessories 0.47 mm (+ 0.05 %) total coated thickness, zinc coating 120 grams per sqm		

	as per IS: 277, in 240 MPA steel grade, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns using self-drilling/ self-tapping screws complete		
4	Providing, erection and fixing permanently color coated galvanised MS troughed metal 0.47mm thick roof sheet of approved colour as per relevant IS code and specification. Minimum galvanisation of 275 gsm total on both sides including fixing of sheet to purlin with self drilling screws, stich screws between two adjacent sheets and sealing with epoxy sealant. Measurement of profile sheeting shall be of the plan area of roof covered by sheet as per approved drawing. No overlap shall be considered in measurement for the purpose of payment..		
5	The false ceiling shall be made out of anti-corrosive painted 19mm square hollow section design to fix to the roof frame with suitable hangers. **The clear height of ceiling shall be 8 ft. from the finished floor level.** Cut out should be made properly wherever necessary for fixing electrical fitting. False ceiling shall be done with 8mm thick hollow extruded polymeric section (syntax or Equivalent) with tongue and grove arrangement. The colour of Ceiling should match with inner wall panels All vertical & Horizontal corners shall be neatly and smoothly finished with Aluminium sections & L-angles		
	Note-The quantity must be sufficient for Construction of the size mentioned against the safety park		
6	BHEL Safety Park Board shall be provided at the entrance.		
7	Earthwork – excavation for foundations		
8	Sub-grade compaction for floor		
9	100 mm thick TCC/PCC floor (1:4:8)		
10	Reinforced concrete for strip footings		
11	Painting (emulsion, 2 coats)		
12	Doors (flush/metal 900×2100 mm)	Nos	1
13	Windows (aluminium/MS grill 1200×1200 mm)	Nos	2
14	HSE Display board	Nos	1
15	Flooring - The top layer of the fibre board will again be covered with 1.8 mm thick PVC vinyl sheets.		**Vinyl**
16	Horticulture (in front of Safety park) As directed by Engineer Incharge		

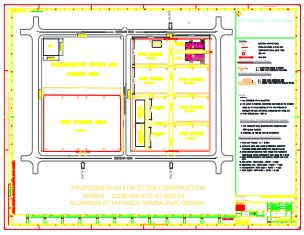
Electrical Tentative BOQ for Safety Park		
SL NO	**DETAILS**	**QTY**

1	40W LED Tube light (Make: Surya Roshni / Bajaj / Wipro or any equivalent reputed make	15
2	12W surface mounted LED for toilets Make: Surya Roshni / Bajaj / Wipro or on equivalent reputed make	5
3	30W street lighting fixture for Safety park building periphery Make: Surya Roshni / Bajaj / Wipro	3
4	150 deg GI bend 50NB pipe suitable for street light fixture Make: Surya Roshni / Bajaj / Wipro	3
5	Ceiling fan (Reputed/approved make) 1200 sweep 5 star type	4
6	Fan regulator of reputed / Approved Make	4
7	Exhaust fan (450mm)-For Toilet of reputed make	2
8	Split AC (2 ton),3 star including stabilizer approved/Reputed make.	2
9	Flush mounted 12 way lighting panel	1
10	Flush mounted 6 way small power Distribution board	1
11	Flush mounted 3 way UPS MCB junction box: approved make	3
12	16A, 1 Ph, 5 pin switch socket outlet module type	2
13	63A TPN 415V welding receptacle with MCB enclosure	2
14	6A modular type switch	20
15	Flush mounted module switch box with 3 module	4
16	Steel chain (galvanised) for supporting recess mounting fixture	As required
17	Wires, cable, conduits (rigid and flexible), accessories for above (All conduits (embedded in wall / floor) shall be 25mm dia heavy duty rigid PVC type)	As required

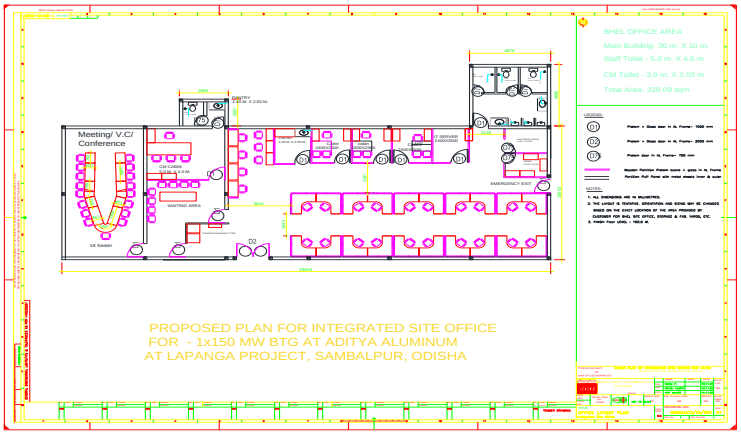
Miscellaneous BOQ For safety park			
SL no-	**Details of Items**	**UOM**	**QTY**
1	Training Chairs of approved make and specifications as per directions of Engineer- In-charge.	Nos	30
2	Instructor table & chair of approved make and specifications as per directions of Engineer- In-charge.	Set	1
3	Staff Table (pc/laptop connectivity)& chair of approved make and specifications as per directions of Engineer- In-charge.	Set	1
4	Projector (min 1500 lumens) of approved make and specifications as per directions of Engineer- In-charge.	Nos	1
5	Projector screen (6X4ft) of approved make and specifications as per directions of Engineer- In-charge.	Nos	1
6	HSE Display cabinet / digital display	Nos	1
7	CPR training dummy mannequin	Nos	1
8	PPE kits (helmet, gloves, shoes, vest, goggles, mask, IFR suits, Harnesses)	Sets	5
9	Demo mannequins / PPE display	Nos	1

10	First aid boxes	Nos	2
11	Fire extinguishers (CO2/ABC)	Nos	4
12	Safety signage boards	Nos	5
13	Waste bins (covered)	Nos	4
14	UPS with tall tubular battery of minimum 220 AH	Set	1
15	Mic and speaker system	Set	1
16	laser pen and slide changer	set	1
17	Laptop or PC with minimum core 2 Duo with Microsoft windows, MS-office	Nos	1
18	Plain cupboard with shelves - 1800 MM of approved make and specifications as per directions of Engineer- In-charge.	Nos	2

Chapter XII- Plot Plan for Enabling Works



Chapter XIII- Office Layout Plan



Chapter XIV- Technical Specification for Safety Park.

Specifications of On-Site Safety Park

Date: 27.09.2019

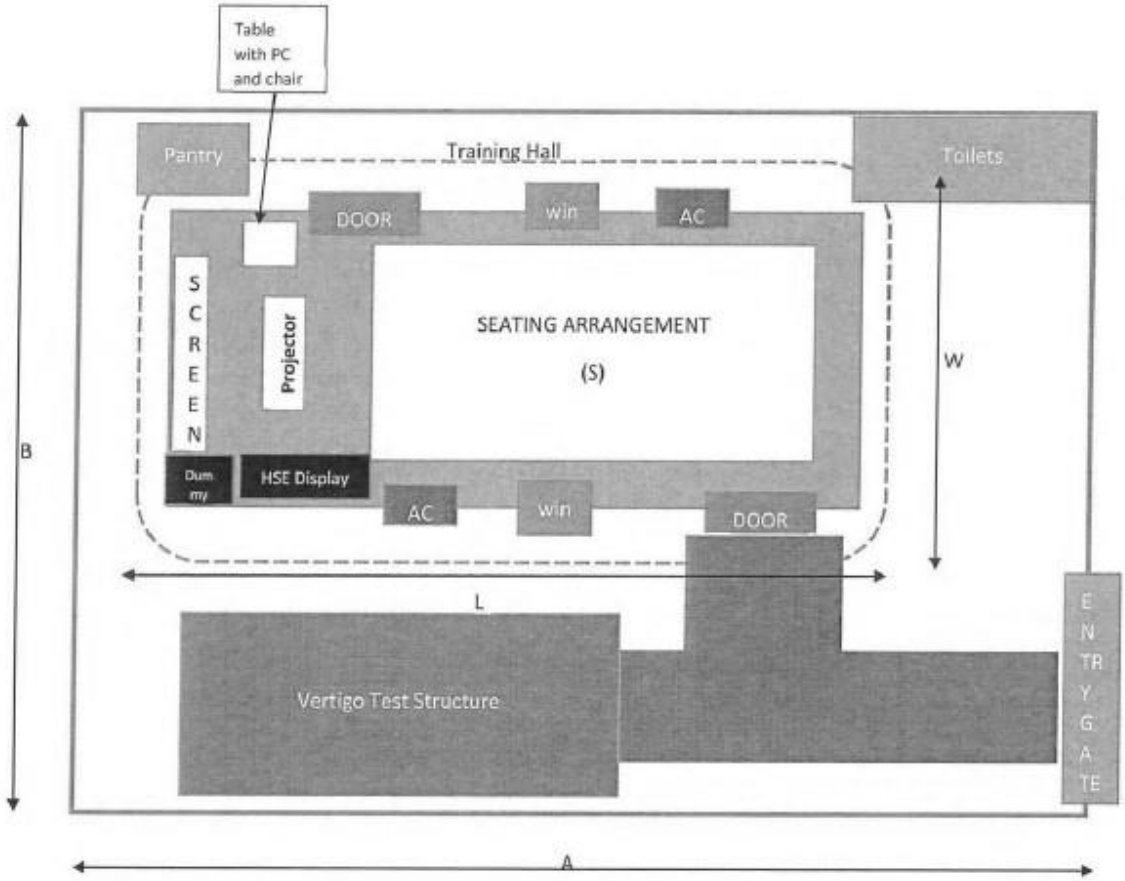


Figure 1: Layout of Site Safety Park

Legend:

win – window
AC – Air conditioner – As per cooling requirement
Dummy – Worker Dummy wearing all PPEs for display
HSE Display- Display of all HSE Devices, Equipment etc. on a table/ wall. For example, Safety PPEs, Lifelines, Flashback arrestors, fall arrestors, Safety Nets...
Pantry – Small kitchen for tea/snacks to participants

Doc. No. PSHQHSE/SPSPEC

Rev. 00

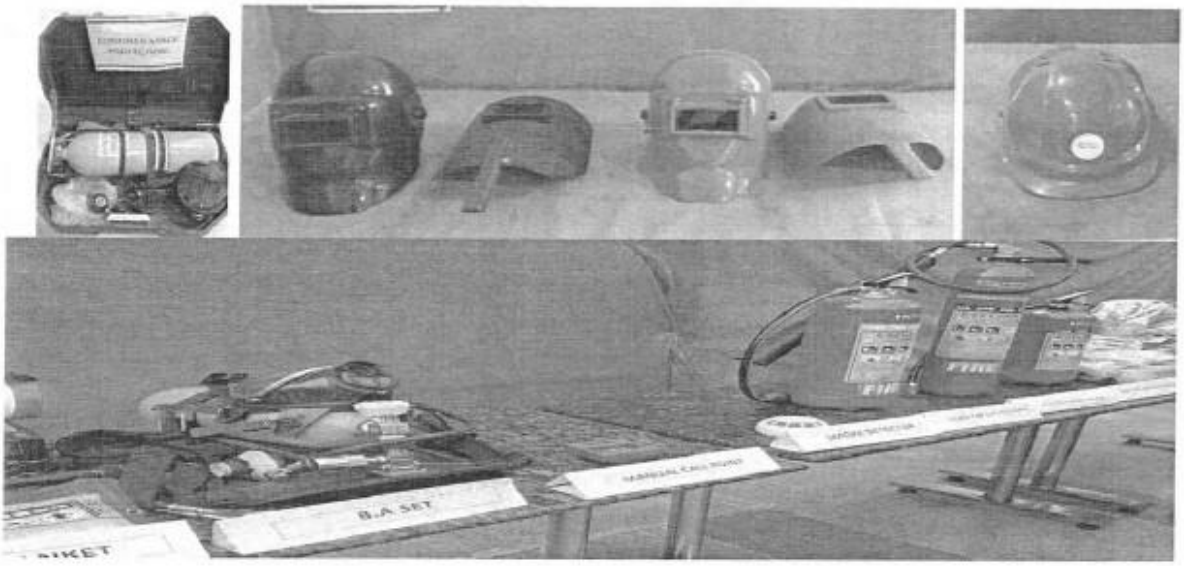
Specifications of On-Site Safety Park

Date: 27.09.2019

Images of a Typical Safety Park

Vertigo Test Structure

Training Hall with PPE wearing dummies



PPE & HSE Equipment Display

Health, Power | Safety & Environment Sector Headquarters

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BHEL Regd. Office: BHEL House, Sirifort, New Delhi - 110049

ANNEXURE 01

Vertigo Test Structure Specifications

Page 1 of 4

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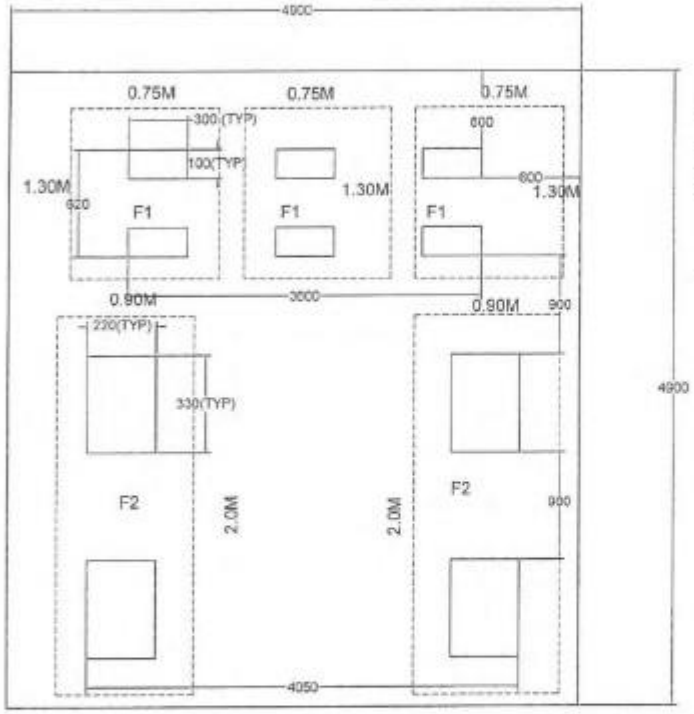
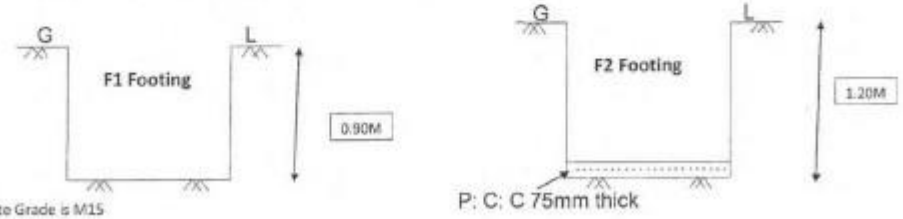
Table 1	
Pg. No.	Topic
1	Vertigo Test Structure Layout – Illustrative/ Sample
2, 3	Structure Layout Sketch
3	Actual Photo of a typical structure
4	Guidelines for Conducting the Test



Note:

- All dimensions are in mm
- Drawing is not to scale
- Inside boundary area to be filled with sand to level with road (external)
- Details of F1 and F2 are shown below

Figure 1: Vertigo / Height Work Test Structure Layout



Note:

- Concrete Grade is M15
- Drawing is not to scale
- TOC is at Road Level
- G L refers to Ground Level

Figure 2

ANNEXURE 01

Vertigo Test Structure Specifications

4

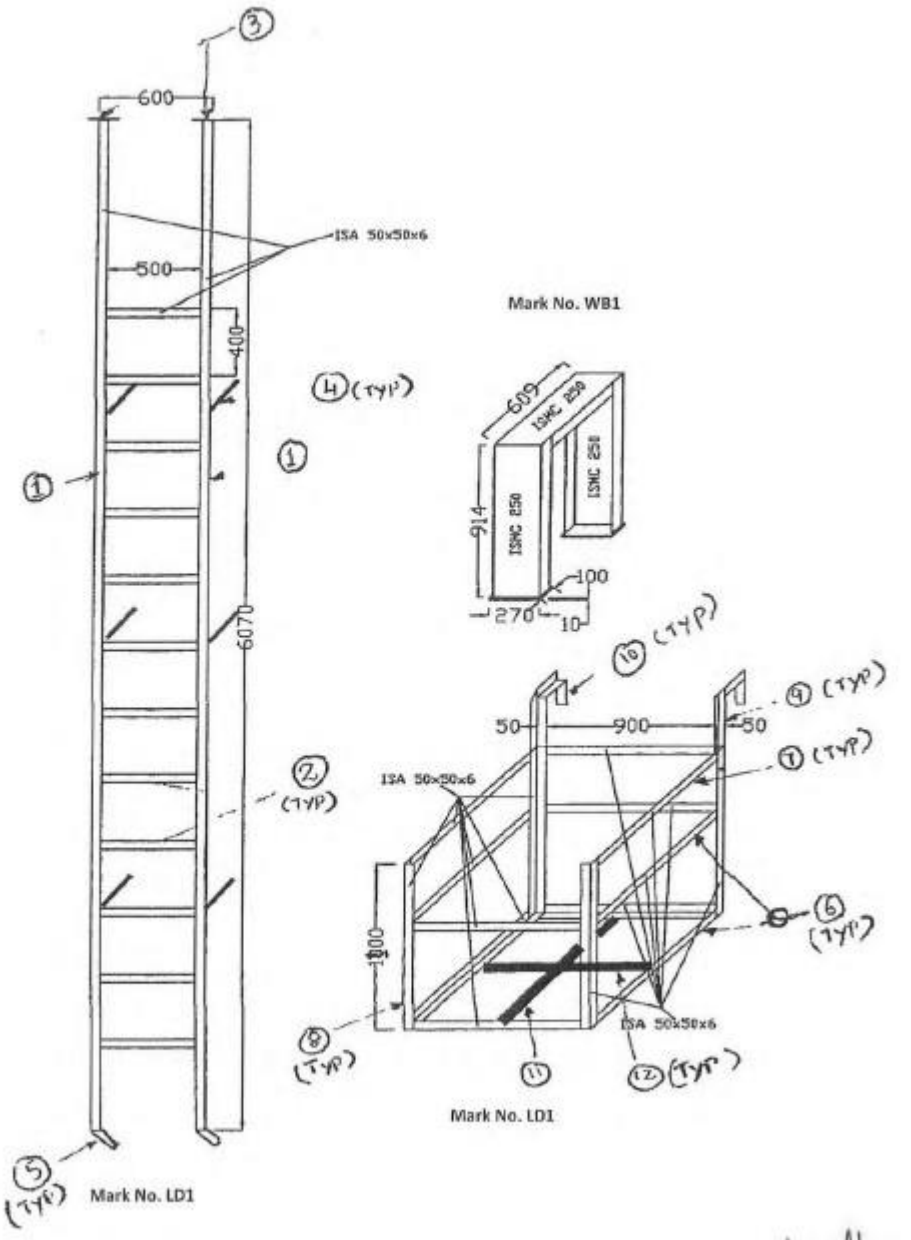


Figure 3

ANNEXURE 01

3

Vertigo Test Structure Specifications

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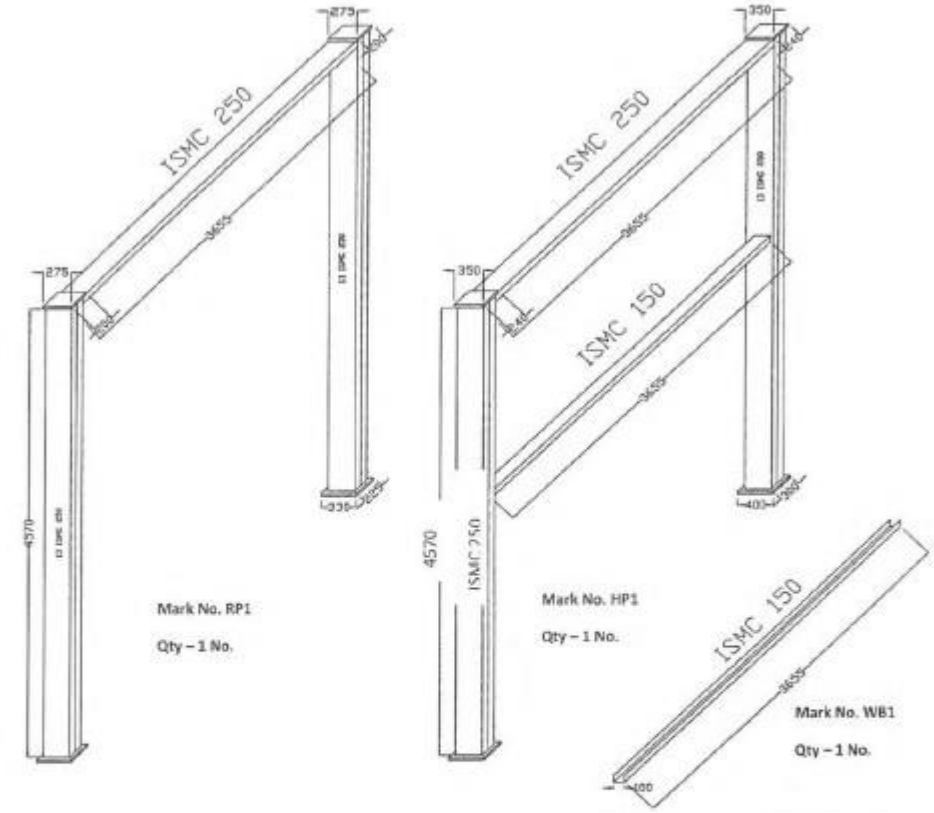
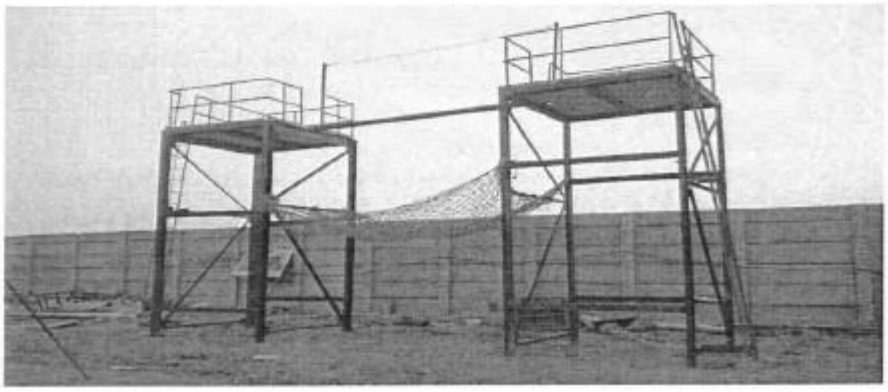
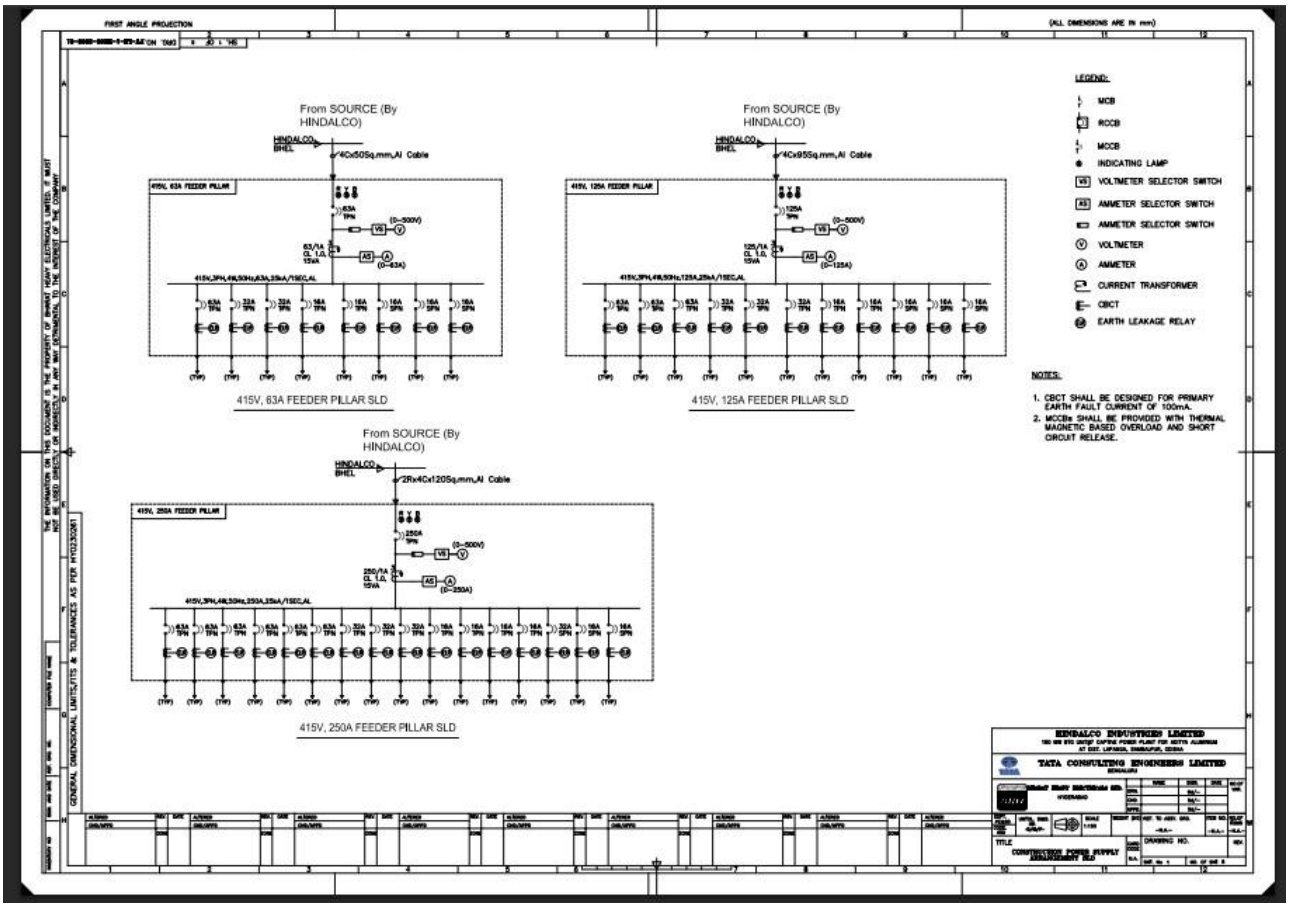
Figure 4:





Pic-1: Actual Photo of a Typical Vertigo Test Structure

Chapter XV- SLD for Feeder Pillar



Chapter XVI- List of Documents

Work shall be performed as per below listed documents, customer/ BHEL specifications, standard engineering practices/specificationand approved drawings issued by BHEL:

Sl No	Description	Reference	Remarks
1	Plot Plan for Enabling Works	Drawing no. HINDALCO/ENAB/001 Rev. 01	
2	Office Layout Plan	Drawing No. HINDALCO/IO/001 Rev. 01	
3	Specification on On-site Safety Park	Doc. No. PSHQHSE/SPSSPEC Rev. 0, Pages 2 & 4 and Ann. 1 (4 Pages)	
4.	SLD for Feeder Pillar		
5.	CPWD Specification(Latest) for Civil & Electrical Works		

Note: In case of any contradiction between two documents following order of precedence shall be applicable:

1. Price Schedule
2. Customer Specification
3. BHEL Specification
4. CPWD Specification
5. Standard engineering Practices/specifications