

TD-106-1  
Rev No. 5

Form No.



PROJECT ENGINEERING & SYSTEMS DIVISION  
BHEL RC PURAM, HYDERABAD -32

Doc.No: **PY60053**

Rev No.: **00**

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## TECHNICAL SPECIFICATION FOR PRE ENGINEERED BUILDING

**PROJECT** : **1X65 MW SPV POWER PLANT, NEYVELI, TAMIL NADU**

**CUSTOMER** : **NEYVELI LIGNITE CORPORATION LIMITED**

Ref.

Doc

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Date:


01.08.16

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Ref. Doc	<p><b>1. INTENT OF SPECIFICATION:</b></p> <p>1.1. The intent of this document is to establish the minimum requirement of design, design certification, engineering, selection, manufacture, assembly, inspection, shop testing, shop painting, delivery FOR site properly packed for transportation suitably protected from weather, unloading, safe storage at site, final painting, erection, testing, final handling over as mentioned hereinafter for the Pre-Engineered Buildings (PEB), which form part of project.</p> <p>1.2. It is not the intent to completely specify all details of design, manufacture and construction. Nevertheless the installations shall conform to high standard of engineering/quality and shall be capable of serving the intended purpose continuously for entire life span of the power plant in a manner acceptable to the purchaser (BHEL) and end customer (NLC).</p> <p><b>2. SPECIAL NOTES TO BIDDERS</b></p> <p>2.1. This specification shall be read in conjunction with all its enclosures. In case of any discrepancy arising between this job specification &amp; its enclosures, Relevant IS standards shall be followed after confirmation from purchaser. Further, if a requirement in this specification or any of the enclosures, calls for a decision from the Purchaser, it shall be bidder’s sole responsibility to clearly bring out/highlight the same distinctively in his pre-bid queries, so as to enable purchaser to furnish their decision/clarification. If such issues/requirements are not duly addressed by bidder during the pre-bid stage and if such issues/requirements have been observed later during order execution stage, it shall be binding on the bidder to comply with the final decision made by the purchaser subsequently, without any cost, delivery, or any other commercial implications.</p> <p>2.2. Any additional equipment, material, services etc., which are not specifically mentioned in this specification, but required to make the PEBs complete in all respects, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and safety shall be deemed to be covered under the scope of this specification.</p> <p>2.3. Any specific hardware/item/ etc. required as indicated in 2.2 above but not listed elsewhere in this specification or its enclosures, shall be deemed to be included in the basic price quoted by the bidder. Also, all mounting hardware/ accessories/fittings etc. required for above and the E&amp;C of the PEBs shall be deemed to be included in the basic price quoted by the bidder. Bidder, at no point of time, shall be eligible to raise any extra claim in this regard.</p> <p>2.4. Bidder shall quote strictly as per the scope of supply and requirements of this specification. Unsolicited or Alternate offers from the bidders will not be entertained.</p> <p>2.5. Any clarifications required by the bidder shall be intimated to BHEL together as a single notice within a week of receipt of enquiry by bidder. In case no such clarifications are sought during pre-bid stage, it will be assumed that bidder has no comments or observations on BHEL’s specification and no deviations to the specifications will be taken by the bidder.</p>			



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- 2.6. Bidder to quote strictly as per BHEL's price format. Failure to do shall make their offer liable for rejection. Any tampering/modification/change of the BHEL's price format is not allowed and is liable for rejection of bidders offer.
- 2.7. Compliance with this specification shall not relieve the bidder of the responsibility of furnishing equipment and accessories/auxiliaries of proper design, materials and workmanship to meet the specified purpose. Accordingly, bidder to furnish their comments if any on this specification as a part of pre-bid query
- 2.8. The design information, specifications and drawings indicate the "Minimum" requirements and are intended to enable Bidders to ascertain the extent of the work involved. Bidders are expected to supplement the information included in this specification as required and submit a comprehensive bid.
- 2.9. Bidder may offload erection works to third party agency with prior approval from BHEL.

### 3. PROJECT DESCRIPTION

- 3.1. Neyveli Lignite Corporation Limited (NLC), a Navratna Government of India Enterprise, functioning under the administrative control of Ministry of Coal is an integrated complex involving in Lignite Mining and Thermal Power Generation. NLC is setting up a 2x65MW solar PV power plant, at Neyveli, Tamil nadu state.
- 3.2. The entire 130 MWp solar PV power plant comprises of two nos. blocks of capacity 65 MWp each. BHEL is setting up one of block of 65 MWp capacity. The 65MW block which is being executed by BHEL is again subdivided into two sub-blocks of 40MW & 25MW blocks which are located 7-8 km apart.
- 3.3. To house the Power Conditioning Units (inverters) employed in the plant (for overview of the plant refer section 5.0.0) Pre-Engineered Buildings are envisaged in accordance with the specification detailed in this document.

### 4. LOCATION OF THE PLANT

Plant Location	:	NEYVELI
State	:	Tamil Nadu
Nearest Important Town	:	Cuddalore District,
Nearest Railway Station	:	Neyveli
Nearest Airport	:	Chennai



## 5. OVERVIEW OF SOLAR PV PLANT

The 1x65 MWp solar photovoltaic power plant for M/S NLC at NEYVELI in Tamil Nadu, comprises of an array of solar PV modules that produce DC output. Power Conditioning Units (inverters) are deployed to convert the electricity from DC to AC. The inverter output is further stepped by outdoor transformers. Power generated is exported to transmission grid. The various electrical panels such as inverters, circuit breakers (VCB), AC/DC distribution boards, UPS panels, Battery & Battery charger etc. are housed in 11 nos. PEB/inverter rooms. Among these 7 nos. PEB rooms are pertaining to 40MW block and 4 nos. PEB rooms are pertaining to 25MW block. 40MW & 25MW blocks which are located 7-8 km apart. For these 11nos. of PEB rooms, foundation up to plinth level is of RCC structure and above plinth, PEB steel structures/sheets shall be used for construction. Generation from each PEB inverter room is 5MWp. All these PEB inverter rooms are located at distributed locations within the power plant. AC outputs from all these rooms are combined at PESS room.

## 6. BIDDER'S SCOPE OF SUPPLY AND ERECTION-COMMISSIONING :

### 6.1. PRE-ENGINEERED BUILDING


Major supply and services included in bidder's scope:


<u>S.No</u>	<u>Description</u>	<u>Quantity</u>
1.	Supply of PEB structural materials such as columns, rafters, beams, purlins, steel sheets, insulation etc for inverter rooms. (Note: 1 set is for one PEB/inverter room).	11 Sets
2.	Supply of PEB architectural items such as doors, windows, rolling shutters, etc for inverter rooms. (Note: 1 set is for one PEB/inverter room).	11 Sets
3.	Supply of Electrical Services as Cl.9.5 & 9.6. (Note: 1 set is for one PEB/inverter room).	11 Set
4.	E&C: Erection of PEB inverter room structural materials. . (Note: 1 set is for one PEB/inverter room).	11 Sets
5.	E&C: Erection of PEB inverter room architectural items . (Note: 1 set is for one PEB/inverter room).	11 Sets
6.	E&C : Erection and Commissioning of Electrical Services as per Cl.9.5 & 9.6 . (Note: 1 set is for one PEB/inverter room).	11Set


## 7. BIDDER'S SCOPE OF SERVICES


### 7.1. LIST OF MAJOR SERVICES INCLUDED IN BIDDER'S SCOPE:


- I. Detailed Engineering and certification of the design from NITs/IITs
- 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

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<p style="text-align: center;"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> <p>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 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  XVIII. Engineering for interfacing all inputs and outputs  XIX. Site clearing and cleaning  XX. Total day to day supervision of construction including erection and specialized services, if any  XXI. 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.  XXII. Liaisoning with other contractors in the plant  XXIII. Handing over the PEBs to the owner  XXIV. Supply of all test reports /certificates  XXV. Providing as built drawings</p> <p><b>Notes:</b>  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.</p> <p><b>8. CLARITY OF SCOPE IN OTHER AREAS (In addition to Cl.7.0.0):</b></p> <table border="1" data-bbox="316 1402 1380 1913"> <thead> <tr> <th>S.No</th> <th>Item</th> <th>By BHEL</th> <th>By Vendor</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Complete civil foundation works for all the PEB inverter rooms</td> <td>Yes</td> <td>No</td> <td>Vendor shall submit the loading details for foundation design</td> </tr> <tr> <td>2</td> <td>RCC cable trenches within all inverter rooms</td> <td>Yes</td> <td>No</td> <td></td> </tr> <tr> <td>3</td> <td>Flooring works within all inverter rooms</td> <td>Yes</td> <td>No</td> <td></td> </tr> <tr> <td>4</td> <td>Plinth protection around all inverter rooms</td> <td>Yes</td> <td>No</td> <td></td> </tr> <tr> <td>5</td> <td>Steps/ ramps on front/back sides of the room as applicable</td> <td>Yes</td> <td>No</td> <td></td> </tr> <tr> <td>6</td> <td>Composite slab, if adopted by bidder, incl. all shuttering,</td> <td>No</td> <td>Yes</td> <td></td> </tr> </tbody> </table>						S.No	Item	By BHEL	By Vendor	Remarks	1	Complete civil foundation works for all the PEB inverter rooms	Yes	No	Vendor shall submit the loading details for foundation design	2	RCC cable trenches within all inverter rooms	Yes	No		3	Flooring works within all inverter rooms	Yes	No		4	Plinth protection around all inverter rooms	Yes	No		5	Steps/ ramps on front/back sides of the room as applicable	Yes	No		6	Composite slab, if adopted by bidder, incl. all shuttering,	No	Yes	
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<b>9. TECHNICAL DETAILS</b>																								
<p><b>9.1. Design, supply and erection of Pre Engineered Buildings</b></p> <p><b>9.1.1. Design and supply of PEB structural materials</b></p> <p>a) After receipt of BHEL PO, following documents shall be submitted to BHEL/NLC for approval:</p> <ol style="list-style-type: none"> <li>1. Structural design calculations including STADD.Pro</li> <li>2. GA drawings along with BOM.</li> </ol> <p>b) Design calculations, checked and certified by IIT/NIT, shall be submitted to BHEL/NLC for approval.</p> <p>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 NLC 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.</p> <p>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 &amp; time, and fully satisfy himself of the suitability of the raw materials for the purpose of the plant &amp; equipment offered by him. The Contractor shall furnish the test results to Purchaser for approval.</p>																								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">S.No</th> <th style="width: 40%;">Item</th> <th style="width: 10%;">By BHEL</th> <th style="width: 10%;">By Vendor</th> <th style="width: 30%;">Remarks</th> </tr> </thead> <tbody> <tr> <td></td> <td>reinforcement, bolts, decking, form work, fasteners, painting, finishes, waterproofing, etc.</td> <td></td> <td></td> <td></td> </tr> <tr> <td>7</td> <td>Electrical works including supply and E&amp;C of wiring, room appliances (lights, ceiling fans, exhaust fans, ventilators, etc), switch boards, MCB boxes etc for the inverter rooms as specified in clause 9.5. (A)</td> <td style="text-align: center;">No</td> <td style="text-align: center;">Yes</td> <td></td> </tr> <tr> <td>8</td> <td>Cut out/ provision of supports &amp; fixtures for the room appliances</td> <td style="text-align: center;">No</td> <td style="text-align: center;">Yes</td> <td></td> </tr> </tbody> </table>					S.No	Item	By BHEL	By Vendor	Remarks		reinforcement, bolts, decking, form work, fasteners, painting, finishes, waterproofing, etc.				7	Electrical works including supply and E&C of wiring, room appliances (lights, ceiling fans, exhaust fans, ventilators, etc), switch boards, MCB boxes etc for the inverter rooms as specified in clause 9.5. (A)	No	Yes		8	Cut out/ provision of supports & fixtures for the room appliances	No	Yes	
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<b>COPYRIGHT AND CONFIDENTIAL</b> The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	<p>d) Vendor shall also supply the J bolts/nuts/washers, alignment plates and other related hardware that are used for positioning and anchoring of the PEB structures to the RCC foundation plinth.</p> <p>e) All the items shall be supplied directly to the project site.</p> <p>f) Relevant clauses of “<b>Detailed specification of PEB inverter room</b>” section shall be adopted.</p> <p><b>9.1.2. Design and supply of PEB architectural items</b></p> <p>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/NLC approval.</p> <p>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.</p> <p>c) 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. Vendor shall take prior approval from BHEL for the make prior to proceeding with procurement action.</p> <p>d) Enclosed room with Aluminium-partition with glass shall be provided for Battery room with separate exhaust system as shown in the Annexure-3 (Inverter room layout drawing).</p> <p>e) Vendor shall supply the items directly to the project site.</p> <p>f) Relevant clauses of “<b>Detailed specification of PEB inverter room</b>” section shall be adopted.</p> <p><b>9.1.3. Erection of structures of PEB inverter room</b></p> <p>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/NLC approved drawings / BoM.</p> <p>b) Vendor shall also carry out necessary finishing activities such as painting etc.</p> <p>c) Vendor shall deploy qualified/competent team at site to carry out the above erection activity.</p> <p>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.</p> <p>e) All necessary labour, tools &amp; 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.</p> <p>f) For the above, relevant clauses of “<b>Detailed specification of PEB inverter room</b>” section shall be adopted.</p>	Ref. Doc	


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<p style="text-align: center;"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p style="text-align: center;">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> <p><b>9.1.4. Erection of architectural</b></p> <p>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/NLC approved drawings / BoM.</p> <p>b) Vendor shall also carry out necessary finishing activities such as painting etc.</p> <p>c) Vendor shall deploy qualified/competent team at site to carry out the above erection activities.</p> <p>d) Vendor shall carryout erection of room with Aluminium-partition with glass for Battery room with separate exhaust system as shown in the Annexure-3 (Inverter room layout drawing).</p> <p>e) Vendor shall supply the items directly to the project site.</p> <p>f) All necessary labour, tools &amp; 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.</p> <p>g) For the above, relevant clauses of “<b>Detailed specification of PEB inverter room</b>” section of this specification shall be adopted.</p> <p><b>9.2. Detailed specification of PEB inverter room</b></p> <p>i. The Inverter room shall be made of Pre-Engineered Buildings (PEB). The PEB shall be made of structural steel construction with double skinned metal roofing and wall cladding of approved profile. It shall be designed, manufactured, supplied and erected by the bidder. PEB shall be complete with painting, metal facia, metal gutter, rain water down comers, sun-shades, openings, etc., along with associated structural steel, cladding and roofing work insulation, Trims &amp; Flashings. Each structural item like columns, rafters, beams, purlins, steel sheets, insulation etc and also each architectural item like doors, windows, rolling shutters etc of PEB shall be suitable for complete life of solar plant. The construction methodology for PEB shall also be submitted for BHEL/NLC approval before start of works.</p> <p>ii. The layout of Inverter room shall be designed so as to divert the heat generated from each inverter outside the room. The inverter room shall be designed for a life of 25 years. The successful bidder shall have to get the structural design done as per the prevailing Indian standard codes and International Standard. The structural design of inverter room of each type shall have to be proof checked by any IIT / NIT and subsequently submitted to BHEL/NLC for approval before actual starts of the work.</p> <p>iii. The architectural drawing of double skin insulated roofing &amp; cladding system are given in the tender relevant drawing to provide general idea about work to be performed under the scope of the contract. The PEB shall have robust water tightness at all joints and connections. The building shall have a high class durability and performance during the adverse weather conditions.</p>			
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<p style="text-align: center;">iv. Bidder shall submit design calculations, duly checked and certified by IITs/NITs for approval of BHEL/NLC</p> <p><b>9.2.1. Structure &amp; Material Specification:</b></p> <p>The PEB inverter 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.</p> <p>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/m<sup>3</sup> 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.</p> <p><b>9.2.2. Fasteners &amp; Connections:</b></p> <p>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.</p> <p><b>9.2.3. Roof &amp; Wall Cladding:</b></p> <p>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 Table-1 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.</p> <p>PUF insulated panels Metal Sheet for Roofing and side cladding consist of external sheet as troughed permanently colour coated sheet &amp; internal sheet as plain permanently colour coated sheet.</p> <p>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.</p> <p>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</p>				
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<p style="text-align: center;"> <b>COPYRIGHT AND CONFIDENTIAL</b>          The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED .          It must not be used directly or indirectly in any way detrimental to the interest of the company.       </p> <p>         requirements as those of troughed permanently colour coated metal sheet for roof and side cladding.       </p> <p>         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.]       </p> <p>         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.       </p> <p> <b>9.2.4. Roof Insulation &amp; Type:</b> </p> <p>         Both metal sheets shall have an under insulation of minimum 70 mm thick PUF with density 40 +/- kg/m<sup>3</sup> and thermal conductivity 0.019-2.2 W/(m.K) at 10°C with gutters and down take pipes along with Flashing &amp; Top cap of required size and colour complete with all necessary hardware complete. Roof shall be projected at-least 300 mm from the wall.       </p> <p>         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.       </p> <p>         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.       </p> <p> <b>9.2.5. Wall Insulation:</b> </p> <p>         All voids of external and internal metalled walls shall have an under insulation of minimum 60 mm thick PUF with density 40 +/- kg/m<sup>3</sup> and thermal conductivity 0.019-2.2 W/(m.K) at 10°C with proper supports etc. as approved.       </p> <p>         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.       </p> <p>         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.       </p> <p> <b>9.2.6. Doors Frames:</b> </p> <p>         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.       </p> <p>         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       </p>				
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<p style="text-align: center;"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p style="text-align: center;">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> <p>and all necessary fittings as detailed in tender drawing or submitted by bidder in shop drawing and approved by NLC/BHEL.</p> <p>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.</p> <p><b>9.2.7. Windows Frames:</b></p> <p>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.</p> <p><b>9.2.8. Ventilators:</b></p> <p>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.</p> <p>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</p> <p><b>9.2.9. Rolling Shutters:</b></p> <p>Rolling shutter (Hand operated) shall be fabricated from 18 gauge steel and machine rolled with 75 mm rolling centres 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.</p> <p><b>9.2.10. Plinth Protection:</b></p> <p>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.</p> <p><b>9.2.11. Floor Finish:</b></p> <p>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.</p> <p><b>9.2.12. Painting and Coating:</b></p> <p>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</p>				
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<b>COPYRIGHT AND CONFIDENTIAL</b> The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.		<p>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.</p> <p>The structural steel shall be hot-dipped galvanized, conform to IS: 4759 or relevant Indian standard</p> <p><b>9.2.13. Lighting:</b></p> <p>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.</p> <p><b>9.2.14. Design Parameters &amp; Loads:</b></p> <p>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.</p> <p><b>Dead Load:</b> Self Weight of Structure including Purlins, Sheeting, Girts, Bracings, weight of turbo ventilators to be added as Dead load etc.</p> <p>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/M<sup>2</sup>.</p> <p><b>Wind Load:</b> 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 &amp; K3 =1.0 for the design of PEB.</p> <p>Earthquake Load: All PEB structures shall be designed for Seismic forces. Vertical Deflection and Horizontal Sway Limits:</p> <p>a) Limiting Deflection: The limiting permissible vertical deflection for structural steel members shall be as per IS 800 2007.</p> <p>b) The limiting permissible horizontal deflection for as per IS 800 2007 code.</p> <p><b>9.2.15. Description of PEB Structures:</b></p> <p><u>Primary Members:</u> Primary structural framing shall include the transverse rigid frames, columns, corner columns, end wall wind columns, beams, truss member, base pate.</p> <p><u>Secondary Members:</u> 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.</p> <p><u>Sealant:</u> 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.</p> <p><u>Closures:</u> Solid or closed cell closures matching the profiles of the panel shall be installed along the eaves, rake and other locations.</p>		
Ref. Doc				



**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 Tolerance	Upper Limit BMT	-ve Tolerance	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.

### 9.3. 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



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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.



### 9.5. 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 Inverter/PEB room			
Nos.	DESCRIPTION (FIXTURES / LAMPS / ACCESSORIES)	UNIT	QTY
1.   1.	40W LED batton type fixture (Bajaj Catalog no. BICDP 40W LED or Equivalent)	Nos	12
2.   u	SSB-2 + R surface mounted swbd with 2 nos 5A piano type switches and one electronic fan regulator. (modular type)	Nos	2
3. m	SSB-2 surface mounted swbd with 2 nos 5A piano type switches (modular type)	Nos	2
4. n	Domestic type 5/15A receptacle with switch (Surface mounted mounted modular)	Nos	2
5. a t i	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. o n	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. L	Ceiling Fan 1200mm blade	Nos	2
9. a	Exhaust Fan with DOL starter (415V, 3 PHASE) (Industrial grade)	Nos	2
10. V	Data connector Box (Surface Mounted)	Nos	1
11. o u t	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. s h	E&C for above items (lumpsum)	Lot	1
<b>MANDATORY SPARE FOR 11 INVERTER ROOMS</b>			
1.   l	40W LED batton type fixture (Bajaj Catalog no. BICDP 40W LED or Equivalent)	Nos	14


be provided by BHEL after order placement. Illumination fixture, conduits etc. as mentioned in above table shall be supplied and erected as per the illumination layout.


- Installation & commissioning of above equipment and its associated cabling work within the PEB shall be in the scope of PEB vendor.
- Above items shall be supplied as per the below makes and technical specification furnished elsewhere in this document.


B. Erection and commissioning of following items for fire detection and alarm system shall be in the scope of PEB vendor. Below item shall be free issued to vendor by BHEL.


B.1) FDA BOQ for each Inverter Room			
Sl. No.	Items	Quantity	Unit
1.	Multi sensor detector	4	No.'s
2.	Hooter cum Strobe	2	No.'s
3.	Isolator Modules	2	No.'s


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<b>COPYRIGHT AND CONFIDENTIAL</b> The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	<table border="1"> <tr> <td>4.</td> <td>MCP</td> <td>2</td> <td>No.'s</td> </tr> <tr> <td>5.</td> <td>Control module for Hooter cum strobe</td> <td>2</td> <td>No.'s</td> </tr> <tr> <td>6.</td> <td>Loop Cable (2C x 1.5 sqmm)</td> <td>50</td> <td>mts.</td> </tr> <tr> <td>7.</td> <td>Power cable (3C x 2.5 sqmm)</td> <td>20</td> <td>mts.</td> </tr> <tr> <td>8.</td> <td>24 Volt power supply for Hooter with battery back up</td> <td>1</td> <td>No.</td> </tr> <tr> <td>9.</td> <td>Zonal repeater panel</td> <td>1</td> <td>No.</td> </tr> <tr> <td>10.</td> <td>E&amp;C for above item</td> <td>1</td> <td>Lot</td> </tr> </table> <p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>FDA layout shall be provided by BHEL after placement of order. Erection of above equipments shall be carried out as per this layout.</li> <li>Above material shall be free issued by BHEL, <b>however supply of erection hardware like saddle, clamps, screws, nut, bolt, cable glands, cable lugs etc. required for E&amp;C of above equipments shall be in the scope of vendor.</b> Installation &amp; commissioning support of above equipments and its associated cabling work within the PEB shall be in the scope of PEB vendor.</li> <li>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.</li> <li>All the cables inside the building shall be directly routed on ceilings/walls.</li> </ol> <p><b>9.6. TECHNICAL SPECIFICATION FOR ELECTRICAL SERVICES</b></p> <p>Lighting panels shall be powder coated with colour shade RAL9002. Lighting panels shall have IP55 degree of protection.</p> <p>Wires of different phase shall normally run in separate conduit.</p> <p>Electrification of all building shall be carried out as per IS 732-1989, IS 4648-1968 and other relevant standards.</p> <p>All luminaries and their accessories and components shall be of type readily replaceable by available Indian makes.</p> <p>Following test reports to be submitted for LED chip/LED luminaires:</p> <ol style="list-style-type: none"> <li>LED parameters like Lumen per watt, CRI, Beam angle from manufacturer.</li> <li>LM 80/IS: 16105 report.</li> <li>LM 79/IS: 16106 report</li> </ol> <p><b>LIGHTING WIRES</b></p> <p>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 &amp; neutral, respectively. Minimum size of wire shall not be less than 1.5 sq.mm Copper for lighting fixture &amp; 4 Sq.mm Copper for receptacles.</p> <p>Lighting panels etc. shall be earthed by two separate and distinct connections with earthing system.</p> <p><b>RECEPTACLE</b></p>				4.	MCP	2	No.'s	5.	Control module for Hooter cum strobe	2	No.'s	6.	Loop Cable (2C x 1.5 sqmm)	50	mts.	7.	Power cable (3C x 2.5 sqmm)	20	mts.	8.	24 Volt power supply for Hooter with battery back up	1	No.	9.	Zonal repeater panel	1	No.	10.	E&C for above item	1	Lot
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<p align="center"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED .          It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> <p>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 polyimide 6.6 grade with adequate current rating and size. The welding receptacles shall be provided with inbuilt ELCB rated for suitable mA sensitivity.</p> <p><b>GALVANISING</b></p> <p>Galvanising of steel components and accessories shall conform to IS:2629 , IS4759 &amp; IS:2633. Additionally galvanising shall be uniform, clean smooth, continuous and free from acid spots.</p> <p>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.</p> <p><b>CONDUITS/PIPES/DUCTS INSTALLATION</b></p> <p>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.</p> <p><b>Ventilation</b></p> <p>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.</p> <p><b>10. GENERAL TECHNICAL REQUIREMENTS:</b></p> <p>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.</p> <p>Equipment design and engineering shall incorporate adequate safety features (as per applicable specifications of respective installation as well as Health, Safety and Environment</p>				
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<p style="writing-mode: vertical-rl; transform: rotate(180deg);"> <b>COPYRIGHT AND CONFIDENTIAL</b>            The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED .            It must not be used directly or indirectly in any way detrimental to the interest of the company.         </p> <p>Codes &amp; Standards applicable for the subject project) to provide protection to operating personnel, equipment and environment.</p> <p>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.</p> <p>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.</p> <p><b>Warranty</b></p> <p>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.</p> <p><b>11. CONSTRUCTION REQUIREMENT:</b></p> <p>Erection &amp; commissioning of all the items supplied by bidder is included in bidder's scope.</p> <p>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.</p> <p>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.</p> <p>b</p> <p>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.</p> <p>Construction water shall be supplied free of cost by the Purchaser to the Contractor at one point at each location of project.</p> <p>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</p>				
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Ref. Doc			

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<p style="text-align: center;"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> <p>12.3. 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.</p> <p>12.4. 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 CD-ROM.</p> <p>12.5. 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.</p> <p>12.6. 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.</p> <p>12.7. 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 / Customer / Customer appointed third party). The inspection agency shall be indicated in the quality plan and shall be as per the approved quality plan.</p> <p>12.8. 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.</p> <p>12.9. 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.</p> <p>12.10. 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.</p> <p>12.11. 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</p>				
Ref. Doc				

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<p style="text-align: center;"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p style="text-align: center;">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> <p>whole lot will be rejected and bidder shall get the entire lot replaced without any time or delivery implication to the purchaser.</p> <p>12.12. 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.</p> <p>12.13. Bidder shall submit, copy of each Inspection Certificate (IC) / Inspection Release Note (IRN) issued by Inspection Agency, along with all attachments mentioned therein.</p> <p>12.14. 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).</p> <p><b>13. MARKING , PACKING AND DESPATCH</b></p> <p><b>MARKING</b></p> <p>13.1. 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.</p> <p>13.2. For ease of identification, the color of painted strip (wherever required) shall be as per the applicable standard.</p> <p>13.3. 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.</p> <p><b>DESPATCH</b></p> <p>13.4. 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.</p> <p>13.5. 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.</p> <p>13.6. 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.</p> <p>13.7. The following minimum packing procedures shall be followed :</p> <p>13.8. All items shall be dry, clean and free from moisture, dirt and loose foreign material of all kind.</p>				
Ref. Doc				

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<p style="text-align: center;"><b>COPYRIGHT AND CONFIDENTIAL</b></p> <p style="text-align: center;">The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.</p> <p>13.9. All items shall be protected from rust, corrosion, and mechanical damage during Transportation, shipment and storage.</p> <p>13.10. Rust preventive on machined surfaces to be welded shall not be harmful to welding and shall be easily removable with a petroleum solvent.</p> <p>13.11. Ends shall be suitably protected, and the protectors shall be securely and tightly attached.</p> <p>13.12. 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.</p> <p>13.13. 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.</p> <p><b>14. DOCUMENTATION:</b>  <b>MASTER DOCUMENT LIST</b></p> <p>14.1. A master documentation shall be prepared during kick off meeting identifying all the DOCUMENTS / DRAWINGS to be submitted by the bidder as part of documentation.</p> <p>14.2. Vendor shall ensure submission of all documentation as per approved Master Document List.</p> <p>14.3. The following minimum documentation shall be submitted by the vendor:</p> <ol style="list-style-type: none"> <li>I. All PEBs GA drgs indicating base plates, anchor bolts connection Detail, purlin, roof panels, wall panels, scope demarcation etc.</li> <li>II. BOM for Structural items.</li> <li>III. BOM of architectural items with detail of item wise make, model Quantity etc.</li> <li>IV. Design analysis in STADD.PRO along with loading detail on Foundation.</li> <li>V. Design certified by NIT/IIT</li> <li>VI. Civil interface details</li> <li>VII. Welding specification charts</li> <li>VIII. Nondestructive Testing specifications</li> <li>IX. Quality plan</li> <li>X. Painting schedule &amp; procedure ( shop painting &amp; site painting)</li> <li>XI. Packing procedure</li> <li>XII. Erection drawings</li> <li>XIII. Site storage procedure</li> <li>XIV. Erection procedure</li> <li>XV. Testing procedure</li> <li>XVI. 'AS BUILT' drawings</li> <li>XVII. Any other document, as deemed necessary BY BHEL, during detail engineering or erection – commissioning stage.</li> </ol>				
Ref. Doc	<p style="text-align: center;">All the drawings / documents shall be submitted as per the following details:</p>			



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Sl. No.	Document Name / Type	To Contain	Required With Offer	Required After P.O	
			Compliances from Bidder	No. of Sets Required – Engg. & Approval/Review Activities.	No. of Sets Required- For Site & Customer Submission
5	Master Document List	List of all Documents & Drgs., Spares Items etc. which are applicable for the Project. They shall be group wise enlisted in MDL Doc.	-	3	3
6	(a) Drgs , Data Sheets , Catalogues. BOM etc.	While carrying out Detailed Engg. during Post-Ordering Stage.	-	3	3
10	Bidder's "Bill of Material" Doc. This Doc. shall be Enlisted in MDL Doc.	<ol style="list-style-type: none"> <li>1. Submission of this Document is essential during initial Submission stage of Engg. Docs. &amp; the same to be progressively updated as the Detail Engg. progresses.</li> <li>2. All Dispatchable Units shall be identified in this Doc with "Dispatch Tag-No</li> <li>3. Dispatch tag number philosophy will be finalized during kick of meeting.</li> <li>4. The Dispatch Tag no. shall be written on an 'AI- Strip' and tied to the dispatchable Unit or be prominently painted on each Item with washable paint.</li> </ol> <p><b>PL. NOTE</b> – This Standard Unified System shall be followed being an essential part of Field Quality Assurance Practices &amp; for proper</p>	-	3	3

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Ref. Doc			Identification of Items at Site.			
	11	Quality Assurance Plan (QAP ) & Factory Testing Procedure Documents	1. Approval from BHEL required. 2. Submission along with the Engg. Docs. 3. Will be reviewed and finalized during detail engineering stage	Y	3	4
	12	FQAP (Field Quality Assurance Plan) & Site Erection, Testing & Commissioning Procedure documents	1) Approval from BHEL required 2) Submission along with the Engg. Docs.	same as for SI-11 above	3	4
	13	<u>Erection Documents &amp; Drawings:-</u>	1) To contain final MDL, BOM, Handling & Storage Instructions Doc., Initial-Fill & Consumables Items list, Erection & Commissioning Spares List, Operation & Maintenance spares list / Mandatory Spares List etc. 2) Submission well before eqpt. schedule dispatch. 3) The drgs. shall be kept in plastic pouches and neatly arranged, submitted in an aesthetic, appropriate & durable folder(s). Documents filed appropriately in Folder in – seriatim of MDL.	-	-	4
			<b>vii)</b> Operational & Maintenance s / Items with adequate etc., Catalogue information Model no. marked therein ),  <b>viii)</b> Initial-Fill Items List <b>ix)</b> Approved QAP's Shop Tests & Calibration Reports. <b>x)</b> Approved FQAP - along with related docs. , with site testing & commissioning Protocols etc.			

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<b>COPYRIGHT AND CONFIDENTIAL</b> The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	15	“As –Built” Drawings & Documents	Submission within three weeks - after commissioning at site	-	-	6
	16	Compact Disc (CD)	1) MDL, All drawings, Documents, Data sheets – as Listed in Approved MDL Doc. , all applicable Catalogues (Scanned), BOM & all items covered in the O&M Manuals & the “As-built” Drgs. 2) To submit along with the submission of “As-built” drgs. & docs.	-	-	3
	<p><b>15. DOCUMENTS SUBMISSION PROCEDURE</b></p> <p>15.1. All Drawings/Datasheet/Design calculation etc. shall be submitted in soft as well as hard copy.</p> <p>15.2. Soft submission of all drawings/documents is mandatory.</p> <p>15.3. All drawings/ shall be submitted in AutoCAD format &amp; all documents in MS office/PDF</p> <p>15.4. It has been observed that at times mails fail to deliver because of problem in sender’s /receiver’s server. Hence it will be mandatory on the part of bidder to intimate concerned BHEL personal about any soft copy submission over phone immediately after any drawing / document is submitted for BHEL’s review / approval.</p> <p>15.5. Hard copies of all the documents shall be forwarded to the following address:          Name: (Name will be intimated during detail engineering)          Address: Bharat Heavy Electrical Limited          2<sup>nd</sup> Floor, New PE&amp;SD Building          RC Puram, Hyderabad- 502032</p> <p>15.6. Date of receipt of hard copies shall be considered as date of submission of any document. Soft copy submission shall be considered as advance submission of drawing/document</p> <p>15.7. BHEL’s normal working hour is 8.00 AM to 4.30 PM from Monday to Saturday.</p> <p>15.8. Bidder to ensure that all documents are received with in BHEL working hours. Any submission done after normal office hour/ weekly Off/Public Holidays shall be deemed as submitted on next working day.</p> <p>15.9. BHEL shall furnish Approval/Observation of Drawings/Datasheet/Design calculation etc. on Soft Copy only.</p> <p><b>16. DRAWINGS REVIEW AND APPROVALS</b></p> <p>16.1. Review of drawings and documents issued by vendor shall be carried out by Purchaser / PMC /End customer.</p> <p>16.2. Approval/ review of the drawings/ documents by the Purchaser / PMC /End customer would be only limited to the review of compatibility with basic designs and concepts.</p> <p>16.3. The approval and /or review by the Purchaser / PMC /End customer 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.</p>					
Ref. Doc						



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- 16.4. 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 the Purchaser / PMC /End customer.
- 16.5. The bidder shall correct all faulty designs & constructions detected at any stage of work, without any cost and time implication to the Purchaser.
- 16.6. The Bidder shall be responsible for and shall pay for any alterations of the Work to be accrued out by other agencies 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/ End customer or not.
- 16.7. 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.
- 16.8. The bidder shall thoroughly review and approve all drawings including sub-vendor documents, before forwarding to Purchaser.
- 16.9. Only the approved drawings duly stamped and signed by a competent engineer of bidder shall be submitted to purchaser for review.

**17. REVIEW MEETINGS & KICK OFF MEETING:**

- 17.1. A kick off meeting shall be held at Purchaser's office, preferably within one week of receipt of order
- 17.2. An agenda shall be prepared for this meeting and would include the following points related to technical aspects.
- a. Any clarifications required by the Bidder on purchaser's order.
  - b. Bidder Data Index & Schedule.
  - c. Bidder Data Review/approval modalities.
  - d. Sub-Bidder lists proposed by Bidder.
  - e. Utility requirements.
  - f. List of input drawings required from BHEL
  - g. Preliminary General Arrangement & layout drawings
- 17.3. As and when required, the bidder will be called upon to attend design co-ordination meeting / review meeting with the end customer/PMC /BHEL during the period of the Contract. The Contractor shall attend such meetings at his own cost at venues decided by BHEL.

**18. DELIVERY SCHEDULE (TENTATIVE) & PRICE BID FORMAT**

Please find below the indicative delivery schedule for supply and site execution of PEBs. However, Same will be discussed and mutually agreed during Kick Off meeting.

**i. Schedule of Delivery:**

- a. Drawings/documents Submission : 7 days from PO date  
(BHEL will furnish their approvals / comments within 7 days after submission of drawings/documents)
- b. Supply & E&C : vendor to supply & execute in

Sl. No.	PEB Qty'	Delivery date	E&C date completion
1.	3 nos. (Refer Note-2)	7 weeks from date of PO	12 weeks from date of PO



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2.	4 nos. (Refer Note-2)	10 weeks from date of PO	16 weeks from date of PO
3.	4 nos. (Refer Note-2)	13 weeks from date of PO	20 weeks from date of PO

## Notes:-

- Prices shall be quoted strictly as per price format attached as Annexure-6
- 1 no. PEB room constitutes following items as per price format (annexure-6)**

- PY9760053004: supply of one set of structural materials as per clause 9.1.1 this specification.
- PY9760053012: Supply of one set of architectural items such as doors, windows, rolling shutters etc. required for PEB inverter rooms as per clause 9.1.2 of this specification
- PY9760053020: Supply of electrical services as per clause 9.5 & 9.6 of this specification
- PY9860053030: I&C: Erection of one set of structural materials all required for PEB inverter room as per clause 9.1.3 of this spec.
- PY9860053049: I&C: Erection of one set of architectural items all required for PEB inverter room as per clause 9.1.4 of this specification
- PY9860053057 E&C for Electrical Services as per clause 9.5 & 9.6 of this specification.

**19. DEVIATIONS TO SPECIFICATIONS:**

- 19.1. Bidders are advised to quote strictly as per BHEL's specification requirements. In case bidder excludes some components of scope of supply or some features of specification requirements, the bidder will be required to include the same in the scope during offer evaluation stage /contract execution stage without any additional commercial and price implications on account of the same. Bidder to note that they won't be entitled for any price impact on account of withdrawal of deviation taken from BHEL spec during technical scrutiny stage. Price impact will be allowed by BHEL only to the extent of change of specification during tender evaluation stage, if any, from BHEL end.
- 19.2. In case bidder feels that it is necessary to exclude some components of scope of supply & some features of specification requirements, due to genuine constraints if any, bidder has to clearly bring out the same to the notice of BHEL and take their prior approval before submission of bid. Bidders are requested to bring out only those deviations which are impractical to meet (or) not technically advisable as per the experience of bidder, for BHEL's review before the submission of bid. All such clarifications required by the bidder shall be intimated to BHEL together as a single notice within a week of receipt of enquiry by bidder.
- 19.3. All such deviation or variation from the scope, requirement and/or intent of this specification shall be clearly defined under relevant attachment of the Bid forms irrespective of the fact that such deviations/ variations may be standard practice or a possible interpretation of the specification by the Bidder. Except for those deviations/ variations covered as a part of pre bid clarification, it will be the responsibility of the bidder to fully meet the intent and the requirements of the specification within the



quoted price. No other deviation whatsoever from this specification, except for those that have been specifically agreed by purchaser as a part of pre-bid clarification shall be considered.

- 19.4. Bidder to note that all such applicable deviations /clarification shall be listed separately in the format attached with this specification (Annexure -5) and submitted to BHEL as a part of pre-bid query. All such applicable deviations /clarification shall have cross reference to page number /section / clause /para etc. of this specification or its annexure with proper reasons for the deviations for purchaser's consideration. Any such applicable deviations /clarification not listed under the above section, even if reflected in any other portion of the bidder's proposal shall not be considered applicable.

#### 20. 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
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, Sonapat	
	Krugar, Singapore	
	TCH Nadi, Chennai	
	Almonard, Chennai	

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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	

**21. ANNEXURES:**

Following input documents and specifications are enclosed to facilitate the bidder to furnish the offer:

Annexure No.	Document/ Drawing Title
1.	General Conditions for Erection and civil works
2.	Safety Code for Contractor
3.	Indicative Invertor room (PCSS) Layout (tender purpose only)
4.	Pre-Bid Queries format
5.	No deviation format
6.	Price bid format
7.	Quality Assurance

Notes: In case if bidder found any document/annexure no. listed in the technical specification and is missing from the attachment, it is bidder's responsibility to highlight the missing attachment.

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**ANNEXURE-I**

**GENERAL CONDITIONS FOR ERECTION AND CIVIL WORKS  
CONTENTS**

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## **GENERAL CONDITIONS FOR ERECTION WORKS**

### **1.0 General**

- 1.1 The following shall supplement the conditions already contained in the other parts of these specifications and documents and shall govern that portion of the work of this 'Contract' to be performed at 'site'.
- 1.2 The Contactor upon issue of LOA shall, in addition to a Project Coordinator, nominate another responsible officer as his representative at site suitably designated for the purposes of overall responsibility and co-ordination of the Works to be performed at site. Such person shall function from the site office of the Contractor during the execution of 'Contract'. This representative shall have full technical capability and complete administrative and financial powers to expeditiously and efficiently execute the work under this 'Contract'.
- 1.3 The Contractor shall proceed with the work to be performed under this 'Contract' and each and every part and detail thereof, in the best and most workman like manner by engaging qualified, careful and efficient workers, and do the several parts thereof, at such time and in such order as the Purchaser/Consultant may direct, and finish such work in strict conformity with the plans, drawings and/or specifications, and any changes, modifications or amplifications thereof made by the Purchaser/Consultant.
- 1.4 The Contractor shall not sell, assign, mortgage hypothecate or remove equipment or materials or materials which have been installed or which may be necessary for the completion of the 'Contract' without the written consent of the Purchaser.

### **2.0 REGULATION OF LOCAL AUTHORITIES AND STATUTES**

- 2.1 The Contractor shall ensure compliance with all statutes, laws, rules and regulations of the Central or State Government or any other authority such as the Workmen's Compensation Act 1923, Payment of Wages Act, Minimum Wages Act 1948, Employees State Insurance Act, Employees Provident Fund Act, etc. and any and all statutory modifications thereof in connection with employees engaged by him or his Sub-Contractors in the work.
- 2.2 The Contractor shall conform to the provisions of MNRE, RREC, RRVPNL, DISCOMs, Rajasthan Electricity authorities, State Government Factory Laws, Indian Electricity Act and rules made there under, and any other acts of legislature relating to the work and to the regulations and bye-laws of any authority and of any water, lighting and other companies and/or authorities with whose systems the plant/structure is proposed to be connected and shall before making any variations from the drawings or specifications that may be necessitated by so conforming, giving to the Purchaser/Consultant written notice, specifying the variations proposed to be made and the reason for making it and apply for instructions thereof.
- 2.3 The Contractor shall arrange to give all notice required by the said Acts, Regulations or Bye-laws to be given to any Authority or to any Public Officer and pay all fees that may be properly chargeable in respect of the 'Works' and lodge the receipts with the Purchaser/Consultant, unless otherwise, specified in the specification. Obtaining all permits and licenses required there upon is the responsibility of the Contractor.

2.4 All registration and statutory inspection fees, if any, in respect of his work pursuant to this 'Contract' shall be to the account of the Contractor. However, any registration, statutory inspection fees and any other statutory laws and its amendments from time to time during erection in respect of the plant and equipment ultimately to be owned by the Purchaser shall be to the account of the Purchaser. Should any such inspection or registration need to be re-arranged due to the fault of the Contractor or his Sub-Contractor, the additional fees for such inspection and/or registration shall be borne by the Contractor.

### 3.0 **CONTRACTOR'S HEALTH AND SAFETY PROGRAM**

Refer Technical specification.

### 4.0 **PURCHASER'S LIEN ON EQUIPMENT**

The Purchaser shall have lien on all equipment including those of the Contractor brought to the site for the purpose of erection, testing and commissioning of the plant. The Purchaser shall continue to hold the lien on all such equipment throughout the period of 'Contract'. No material brought to the site shall be removed from the site by the Contractor and/or his Sub-Contractor's without the prior written approval of the Purchaser/Consultant.

### 5.0 **INSPECTION, TESTING AND INSPECTION CERTIFICATES**

5.1 The provisions of the clause entitled Inspection, Testing and Inspection Certificates shall also be applicable to the erection portion of the 'Works'. The Purchaser / Consultant shall have the right to re-inspect any equipment (though previously inspected and approved by him, at the Contractor's works) before and after the same are erected at Site. If by the above inspection, the Purchaser / Consultant rejects any equipment, the Contractor shall make good for such rejections either by replacement or modifications / repairs as may be necessary, to the satisfaction of the Purchaser / Consultant. Such replacements will also include the replacements or re-execution of such of those works of other Contractor's and/or agencies, which might have got damaged or affected by the replacements or re-work done to the Contractor's work.

5.2 Any work, which proves faulty, shall be corrected by the Contractor without delay. The fact that the Purchaser / Consultant or their representatives have not pointed out faulty work or work which is not in accordance with plans and specifications shall not relieve the Contractor from correcting such work as directed by the Purchaser / Consultant without additional compensation.

5.3 When finished work is taken down for the purpose of re-inspection, the Contractor shall bear the entire expenses incident thereto in the event that said work is found to be defective. The Purchaser shall pay the cost incident thereto in the event that the work inspected is found to be in accordance with the 'Specification'. In the latter case, the replacing of the covering or the making good of any of the parts removed shall be paid for by the Purchaser at the Contract price for the class of work done and the uncovering or taking out of materials or parts shall be paid for on the basis of actual direct cost of material, layout and incidental expense, plus reasonable rental prices for transportation of equipment, except that no percentage for the Contractor's fees shall be added to

actual direct cost of material, labour and incidental expenses. However, no extension of time shall be given for completion of works on this account. If the Contractor shall fail to repair any defective work or replace any defective materials after reasonable notice, the Purchaser / Consultant may cause such defective work to be repaired or defective material to be replaced and the expenses thereof shall be deducted from the amount to be paid to the Contractor.

5.4 The Purchaser / Consultant, their representatives and employees shall, at all reasonable times, have free access to the works and/or to the workshops, factories or other places where materials are being prepared or constructed for the 'Contract' and also to any place where the materials are lying or from where they are being obtained, and the Contractor shall give every facility to the Purchaser / Consultant and his representatives for inspection and examination and test of the materials and workmanship even to the extent of discontinuing portions of the work temporarily, or of uncovering or taking down portions of finished work.

#### **6.0 ACCESS TO SITE AND WORKS ON SITE**

6.1 Suitable access to and possession of the site shall be afforded to the Contractor by the Purchaser in reasonable time.

6.2 The Purchaser shall have the necessary foundations to be provided by him ready, as per the agreed schedule for the execution of the individual phases of 'Works'.

6.3 In the execution of the 'Works', no persons other than the Contractor or his duly appointed representative, Sub-Contractor and workmen shall be allowed to do work on the site, except by the special permission, in writing of the Purchaser / Consultant or his representative.

6.4 Access to the site at all times shall be accorded to the Purchaser / Consultant and other authorized officials and statutory Public Authorities. Nevertheless, the Contractor shall not object to the execution of the work by other Contractors or tradesmen whose names shall have been previously communicated in writing to the Contractor by the Purchaser / Consultant and afford them every facility for the execution of their several functions simultaneously with his own.

#### **7.0 CONTRACTOR'S SITE OFFICE ESTABLISHMENT**

7.1 The Contractor shall establish a Site Office at the site and keep posted an authorized representative for the purposes of the 'Contract'. Any written order or instruction of the Purchaser / Consultant or his duly authorized representative, shall be communicated to the authorized representative of the Contractor at the Site Office and the same shall be deemed to have been communicated to the Contractor at his legal address.

7.2 The Contractor shall employ at least one competent representative whose name or names shall have previously been communicated in writing to Purchaser/Consultant by

the Contractor, to supervise the erection of the plant and to carry out the work. The said representative or if more than one shall be employed, then one of such representatives shall be present at the site during working hours, and any written orders or instructions which the Purchaser/Consultant may give to the said representatives of the Contractor shall be deemed to have been given to the Contractor. It is essential that the supervisory personnel shall be capable of speaking and writing in English language.

#### **8.0 CO-OPERATION WITH OTHER CONTRACTORS IF ANY**

8.1 The Contractor shall cooperate with all other Contractors or tradesmen of the Purchaser, who may be performing other works on behalf of the Purchaser and the workmen who may be employed by the Purchaser and doing work in the vicinity of the 'Works' under the 'Contract'. The Contractor shall also so arrange to perform his work as to minimize, to the maximum extent possible, interference with the work of other Contractors and his workmen. Any injury or damage that may be sustained by the employees of the other Contractors and the Purchaser due to the Contractor's work shall promptly be made good at his one expense. The Purchaser/Consultant shall determine the resolution of any difference or conflict that may arise between the Contractor and other Contractors or between the Contractor and the Workmen of the Purchaser in regard to their Work. If the 'Works' of the Contractor is delayed because of any acts or omissions of another Contractor, the Contractor shall have no claim against the Purchaser on that account.

8.2 The Purchaser/Consultant shall be notified promptly by the Contractor of any defects in the other Contractor's works that could affect the Contractor's 'Works'. The Purchaser/Consultant shall determine the corrective measures, if any, required to rectify this situation after inspection of the 'Works' and such decisions by the Purchaser/Consultant shall be binding on the Contractor. If a part of the Contractor's work depends, for proper execution, upon the work of any other Contractor, the Contractor shall inspect and promptly report in writing to the Purchaser/Consultant any defect in such work of other Contractors that render it unsuitable for proper execution of the work under this 'Contract'. His failure to so inspect and report shall constitute an acceptance of 'Others' work as fit and proper for the reception of his work, except as to defects which may develop in the work of 'Others' after the proper execution of the work. To ensure proper execution of his sub-subsequent work, the contractor shall inspect work already in place and shall at once report to the Purchaser/Consultant any discrepancy between the executed work and the drawings.

#### **9.0 DISCIPLINE OF WORKMEN**

The Contractor shall adhere to the disciplinary procedure set by the Purchaser/Consultant in respect of his employees and workmen at site. The Purchaser/Consultant shall be at liberty to object to the presence of any representative or employee of the Contractor at the site, if in the opinion of the Purchaser/Consultant such employee has misconduct himself or be incompetent or negligent or otherwise undesirable and then the Contractor shall remove such a person and provide in his place a competent replacement at his own expense.

## **10.0 CONTRACTOR'S FIELD OPERATION**

- 10.1 The Contractor shall keep the Purchaser/Consultant informed in advance regarding his field activity plans and schedules for carrying out each part of the 'Works'. Any review of such plan or schedule or method of work by the Purchaser/Consultant shall not relieve the Contractor of any of his responsibility towards the field activities. Such reviews shall also not be considered as an assumption of any risk or liability by the Purchaser/Consultant or any of his representatives and no claim of the Contractor will be entertained because of the failure or inefficiency of any such plan or schedule or method of work reviewed. The Contractor shall be solely responsible for the safety, adequacy and efficiency of plant and equipment and his erection methods.
- 10.2 The Contractor shall have the complete responsibility for the conditions of the work site including the safety of all persons employed by him or his Sub-Contractor and all the properties under his custody during the performance of the work. This requirement shall apply continuously till the completion of his 'Contract' and shall not be limited to normal working hours. The construction review by the Purchaser/Consultant is not intended to include review of Contractor's safety measures in, on or near the work-site, and their adequacy or otherwise.
- 10.3 The work so far as it is carried out on the Purchaser's premises shall be carried out at such time as the Purchaser may approve consistent with the construction schedule and so as not to interfere unnecessarily with the conduct of the Purchaser's business and the Purchaser will give the Contractor all reasonable facilities for carrying out the work.

## **11.0 PHOTOGRAPHS AND PROGRESS REPORT**

Refer relevant Clauses of Technical Specification and Schedule-10 of Volume II.

## **12.0 MANPOWER REPORT**

- 12.1 The Contractor shall submit to Purchaser/Consultant on the first day of every week, a man-power schedule for the next week, detailing the man-power scheduled skill-wise and area-wise.
- 12.2 The Contractor shall also submit to the Purchaser/Consultant on the first day of every month, a manpower report of the previous month detailing the number of persons scheduled to have been employed and actually employed, skill-wise and the areas of employment of such labour.

## **13.0 PROTECTION OF WORK**

- 13.1 The Contractor shall have total responsibility for protecting his 'Works' till it is finally accepted by the Purchaser/Consultant. No claim will be entertained by the Purchaser/Consultant for any damage or loss to the Contractor's 'Works' and the Contractor shall be responsible for the complete restoration of the damaged 'Works' to its original condition to comply with the specifications and drawings. Should any such damage to the Contractor's 'Works' occur because of other party not under his supervision or control, the Contractor shall make his claim directly with the party concerned. If disagreement or 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 resolved as per the provisions of the Clause 8.0

above entitled 'Cooperation with other Contractors'. 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 dispute.

- 13.2 The Contractor and his Sub-Contractors shall be responsible during work for protection of the work, which has been completed by Others. Necessary care shall be taken to see that no damage to the same is caused by his own men during the course of execution of their work.
- 13.3 All other work completed or in progress as well as machinery and equipment that are liable to be damaged by the Contractor's work shall be protected by the Contractor and such protection shall remain and be maintained until its removal is directed by the Purchaser.
- 13.4 The Contractor shall effectively protect all the works from action of weather and from damages or defacement and shall cover finished parts where required for their thorough protection. Face work shall be perfectly clean and free from defects.
- 13.5 The work shall be carried out onto completion without damage to any work and property adjacent to the area of his work, to whomsoever it may belong, without interference with the operation of their existing machines or equipment.
- 13.6 The Contractor shall provide the necessary temporary roadways, footways, guards as may be rendered necessary by reason of his work, for the protection and accommodation of foot passengers of other traffic of the Purchaser or occupier of adjacent property and of public. The Contractor shall at the times provide sufficient temporary barriers, notice boards and lights to protect and warn the public and post necessary watchman to guard the site and equipment. He shall take all precautions necessary and shall be responsible for the safety of the work to be performed by him. The Contractor shall also observe and display Safety First signs and shall have proper safety and fire protection equipment.
- 13.7 Adequate lighting at and near all the storage, handling, fabrication, pre-assembly and erection sites for properly carrying out the work and for safety and security shall be provided by the Contractor. The Contractor's work area would be adequately lighted during nighttime also. The Contractor should also engage adequate electricians/wiremen, helpers, etc., to carry out and maintain these lighting facilities. If the Contractor fails to provide all the above listed facilities, the Purchaser may provide such facilities as he may deem necessary and charge the cost thereof to the Contractor. In any case the Contractor shall be liable for all damages and consequences arising out of his neglect in this regard.

#### 14.0 **EMPLOYMENT OF LABOUR**

- 14.1 The Contractor/Sub-Contractors will be expected to employ on the work skilled employees with experience of his particular work. No person below the age of eighteen years shall be employed.
- 14.2 The Contractor shall furnish details of the qualifications and experience of his senior supervisors and Consultants assigned to the work, including their experience in

supervising erection and commissioning of plant and equipment of comparable capacity.

- 14.3 All traveling expenses including provisions of all necessary transport to and from site, loading allowances and other payments to the Contractor's employees shall be the sole responsibility of the Contractor.
- 14.4 The hours of work on the site shall be decided by the Purchaser and the Contractor shall adhere to it. Working hours for each employee will normally be eight (8) hours per day.
- 14.5 The Contractor's employees shall wear identification badges while on work at site.
- 14.6 The Contractor shall ensure that he pays his men regularly their wages, overtime and other compensations. The attendance register and the wage register shall be submitted to the Purchaser for verification at regular intervals. The Contractor shall also furnish the Purchaser at fortnightly intervals a certificate that he has paid all the dues to his workmen. In case such payment is not made regularly by the Contractor, the Purchaser will be in his right to make such payments and deduct the same from the Contractor's progress payments.
- 14.7 In case the Purchaser becomes liable to pay any wages or dues to the labour or to any Government agency under any of the provisions of the Minimum Wages Act, Workmen's Compensation Act or any other law due to act of omission of the Contractor, the Purchaser may make such payments and shall recover the same from the Contractor's bills.
- 14.8 None of the Contractor's superintendents, supervisors, Consultants or labour may be withdrawn from the work without due notice being given to the Purchaser/Consultant. Further, no such withdrawal shall be made if, in the opinion of the Purchaser/Consultant, it will jeopardize the required pace of progress and/or the successful completion of the work.
- 14.9 In connection with the performance of work under this 'Contract', the Contractor shall agree not to discriminate because of race, religion, colour or national origin. It is also expected that the Contractor in his selection of personnel will give due regard to their ability to co-operate with the Purchaser/Consultant. Suggestions and recommendations made by the Purchaser/Consultant relating to the work and coordination thereof are to be carefully and courteously considered.

#### **15.0 FACILITIES TO BE PROVIDED BY THE PURCHASER**

- 15.1 Refer relevant clauses in Technical Specification

#### **16.0 FACILITIES TO BE PROVIDED BY THE CONTRACTOR**

- 16.1 Tools, Tackles and Scaffoldings

- 16.1.1 The Contractor shall provide at his own expense, all the construction equipment, false work, erection tools, machine tools, power tools, tackles, hoists, cranes, derricks, cables, slings, skids, scaffolding work benches, tools for rigging, cribbing and blocking, welding machines preheating and stress relieving equipment, X-ray and all associated

protective equipment, instruments, appliances, materials, and supplies required for unloading, transporting, storing, erection, testing and commissioning that may be required to accomplish the work under the 'Contract' unless otherwise provided for. Adequacy of such tools will be subject to final determination of the Purchaser/Consultant. He shall submit a list of all such materials to the Purchaser / Consultant before the commencement of pre-assembly at site. These tools and tackles shall not be removed from the site without the written permission of the Purchaser/Consultant.

16.1.2 The Contractor shall also furnish all necessary expandable devices like anchors, grinding and abrasive wheels, raw plugs, hacksaw blades, taps, dies, drills, reamers, chisels, files, carborandum stones, oil stones, wire brushes, necessary scaffolding, ladders, wooden planks, timbers, sleepers and consumable material like welding electrodes, oxygen, acetylene, argon, lubricating oils, greases, cleaning fluids, cylinder oil, graphite powder and flakes, fasteners, gaskets, temporary supports, stainless steel shims of various thickness as required, cotton waste, cheese cloth and all other miscellaneous supplies of every kind required for carrying out the work under the 'Contract'.

16.1.3 The Contractor shall provide all reasonable facilities including tools, personnel, etc. and ensure coordination with the Purchaser / Consultant and the Sub-Contractor's erection supervisors to enable them to carry out all supervision, measurements, checks, etc. in a satisfactory manner.

16.1.4 The Contractor shall not dispose of, transport or withdraw any tools, tackles, equipment and material provided by him for the 'Contract' without taking prior written approval from the Purchaser/Consultant, and the Purchaser/Consultant at all times shall have right to refuse permission for disposal, transport or withdrawal of tools, tackles, equipment and material if, in his opinion, the same will adversely affect the efficient and expeditious completion of the 'Project'.

## 16.2 **Communication**

The Contractor will make his own arrangement for all his communication needs such as telephone, email etc. at his Site Office. The Purchaser will assist the Contractor in getting the above facilities, in case he finds difficulty.

## 16.3 **First-aid**

16.3.1 The Contractor shall provide necessary first-aid facilities for all his employees, representatives and workmen at the site.

## 16.4 **Cleanliness**

16.4.1 The Contractor shall be responsible for keeping the entire area allotted to him clean and free from rubbish, debris etc. during the period of 'Contract'. The Contractor shall employ enough number of special personnel to thoroughly clean his work area at least once in a day. All such rubbish and scrap material shall be stacked or disposed in a place to be identified by the Purchaser / Consultant. Materials and stores shall be so arranged to permit easy cleaning of the area. In areas where equipment might drip oil and cause damage to the floor surface, a suitable protective cover of a flame resistant, oil-proof sheet shall be provided to protect the floor from such damage.

16.4.2 Similarly, the offices of the Contractor shall be kept clean and neat to the entire satisfaction of the Purchaser/Consultant. Proper sanitary arrangements shall be provided by the Contractor in the work areas and office of the Contractor.

## 17.0 **LINES AND GRADES**

17.1 All the 'Works' shall be performed to the lines, grades and elevations indicated on the drawings. The Contractor shall be responsible to locate and layout the 'Woks'. Basic horizontal and vertical control points will be established and marked by the Purchaser / Consultant at site at suitable points. These points shall be used as datum for the 'Works' under the Contract. The Contractor shall inform the Purchaser / Consultant well in advance of the times and places at which he wishes to do work in the area allotted to him, so that suitable datum points may be established and checked by the Purchaser / Consultant to enable the Contractor to proceed with his 'Works'. Any work done without being properly located may be removed and/or dismantled by the purchaser/Consultant at Contractor's expense.

17.2 Where the Purchaser/Consultant had already established the base lines and bench marks adjacent to the various sections of work, the same must be carefully preserved by the contractor, and in case of their unnecessary destruction by him or any of his employees, these will be re-established by the Purchaser/Consultant at the Contractor's expense.

17.3 The Contractor shall be responsible for the accuracy of all dimensions within the various sections of the work according to the figures of dimensions in the drawings.

## 18.0 **FIRE PROTECTION**

Refer relevant clauses in Technical Specification.

## 19.0 **SECURITY**

Watch towers shall be provided by the Contractor around the periphery of Solar PV Power Plant and shall be designed and constructed considering the safety and security requirements of the Solar PV Power Plant as per the Technical Specification.

## 20.0 **CONTRACTOR'S AREA LIMITS**

The Purchaser/Consultant will mark-out the boundary limits of access roads, parking, spaces, storage and construction areas for the Contractor and the Contractor shall not tress-pass areas not so marked out for him. The Contractor shall be responsible to ensure that none of his personnel move out of the areas marked out for his operations. In case of such a need for the Contractor's personnel to work out of the areas marked out for him, the same shall be done only with the written permission of the Purchaser/Consultant.

## **21.0 CONTRACTOR'S COOPERATION WITH THE PURCHASER**

- 21.1 In cases where the performance of the erection work by the Contractor affects the operation of the system facilities of the Purchaser/Consultant or other agencies such erection work of the Contractor shall be scheduled to be performed only in the manner stipulated by the Purchaser/Consultant and the same shall be acceptable at all times to the Purchaser/Consultant. The Purchaser/Consultant may impose such restrictions on the facilities provided to the Contractor such as electricity, water etc. as he may think fit in the interest of the Purchaser and the Contractor shall strictly adhere to such restrictions and co-operate with the Purchaser/Consultant. It will be the responsibility of the Contractor to provide all necessary temporary instrumentation and other measuring devices required during start-up and operation of the equipment systems, which are erected by him. The Contractor shall also be responsible for consumables required for the equipment furnished and erected by him, so as to make such equipment ready for operation. The Contractor shall be responsible for supplying such consumables.
- 21.2 The Contractor at all times shall work in coordination with the Purchaser's Consultants and offer them all reasonable facilities to become familiar with the erection, operation and maintenance of the equipment.
- 21.3 In respect of observations of local rules, administrative orders, working hours and the like, the Contractor and his personnel shall cooperate with the Purchaser.

## **22.0 COMMISSIONING**

The 'Commissioning' of the equipment supplied and erected by the Contractor shall be the responsibility of the Contractor as detailed in Tender specification. The Contractor shall provide in addition, test instruments, calibrating devices etc. and the labour required for the successful performance of these tests. If it is anticipated that the above tests may prolong for a long time, the Contractor's workmen required for the above tests shall always be present at site during such tests.

## **23.0 MATERIAL HANDLING AND STORAGE**

- 23.1 All the equipment furnished under the Contract and arriving at site shall be promptly received, unloaded and transported and stored in the storage spaces by the Contractor.
- 23.2 The Contractor shall be responsible for examining all the shipment and notify the Purchaser/Consultant immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's / Consultant's information only. The Contractor shall submit to the Purchaser / Consultant every week a report detailing all the receipts during the week. However, the Contractor shall be solely responsible for any shortages or damage in transit, handling and/or in storage and erection of the equipment at the site (Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor).
- 23.3 The Contractor shall maintain an accurate and exhaustive record detailing out the list of all equipment received by him for the purpose of erection and keep such record open for the inspection of the Purchaser/Consultant at any time.

- 23.4 All equipment shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc shall be used for unloading and/or handling of the equipment without the specific written permission of the Purchaser/Consultant. The equipment stored shall be properly protected to prevent damage either to the equipment or to the floor where they are stored. The equipment from the store shall be moved to the actual location at the appropriate time so as to avoid damage for such equipment at site.
- 23.5 All electrical panels, control gears, motors and such other devices, shall be properly dried by heating before they are installed and energized. These equipments shall be protected against moisture ingress and corrosion during storage and periodically inspected. Heavy rotating parts in assembled condition shall be periodically rotated to prevent corrosion due to prolonged storage and shall also be periodically inspected.
- 23.6 All critical electrical equipments shall be tested for insulation resistance at least once in three months from the date of receipt till the date of commissioning and a record of such measured insulation values shall be maintained by the Contractor. Such records shall be open for inspection by the Purchaser/Consultant.
- 23.7 The Contractor shall ensure that all the packing materials, and protection devices used for the various equipments during transit and storage are removed before the equipments are installed.
- 23.8 The consumables and other supplies likely to deteriorate due to storage must be thoroughly protected and stored in a suitable manner to prevent damage or deterioration in quality by storage.
- 23.9 All the materials stored in the open or dusty locations must be covered with suitable weatherproof and flameproof and flame proof covering material wherever applicable.
- 23.10 If the materials belonging to the Contractor are stored in areas other than those earmarked for him, the Purchaser/Consultant will have the right to get it moved to the area earmarked for the Contractor at Contractor's cost.
- 23.11 The Contractor shall be responsible for making suitable indoor storage facilities to store all equipment which require indoor storage. Normally all the electrical equipments shall be stored in the closed storage space. The Purchaser/Consultant in addition, may direct the Contractor to move certain other materials which in his opinion will require indoor storage, to indoor storage areas which the Contractor shall strictly comply with.
- 23.12 The Contractor shall arrange for periodic inspection of material/equipment in his custody until taken over by the Purchaser and shall carry out all protective and preservative measures required thereupon.
- 23.13 The Contractor shall also keep a check on the deliveries of the equipment/material covered in his scope of erection and shall advise the Purchaser well in advance regarding possible hold-ups in his work due to expected delays in delivery of equipment, to enable the Purchaser to expedite the deliveries if supplier is different from the Contractor.

23.14 All materials of Contractors should be received only during normal working hours. Damage of any of the roads due to movement of heavy trucks, trailers, crane and other equipment of the Contractor shall be made good by the Contractor. Otherwise same shall be got rectified by the Purchaser at the risk and cost of the Contractor.

23.15 All the I & C electronic equipment shall be stored in Air-Conditioned storage.

#### **24.0 CONSTRUCTION MANAGEMENT**

24.1 The field activities of the Contractor working at site will be coordinated by the Purchaser/Consultant and the Purchaser's/ Consultant's decision shall be final in resolving any disputes or conflicts regarding scheduling and co-ordination of work. Such decision by the Purchaser/Consultant shall not be a cause for extra compensation or extension of time for the Contractor.

24.2 The Purchaser/Consultant shall hold weekly meetings at site with Contractor. The Contractor shall attend such meetings and take notes of discussions during the meeting and the decisions of the Purchaser / Consultant and shall strictly adhere to those decisions in performing his 'Works'. In addition to the above weekly meetings, the Purchaser / Consultant may call for other meetings and in such a case the Contractor, if called, will also attend such meetings.

24.3 Time is the essence of the 'Contract' and the Contractor shall be responsible for performance of his Works in accordance with the specified construction schedule. If at any time, the Contractor is falling behind the schedule, he shall take necessary action to make good for such delays by increasing his work force or by working overtime or otherwise accelerate the progress of the work to comply with the schedule and shall communicate such action in writing to the Purchaser / Consultant satisfying that his action will compensate for the delay. The Contractor shall not be allowed any extra compensation for such action.

24.4 The Purchaser / Consultant shall however not be responsible for provision of additional labour and/or materials or supply or any other services to the Contractor except for the co-ordination work between various Contractors as set out earlier.

#### **25.0 FIELD OFFICE RECORDS**

25.1 The Contractor shall maintain at his site Office up-to-date copies of all drawings, specifications and other Contract Documents and any other supplementary data complete with all the latest revisions thereto. The Contractor shall also maintain in addition the continuous record of all changes to the above Contract Documents, drawings, specifications, supplementary data, etc. effected at the field and on completion of his total assignment under the 'Contract' shall incorporate all such changes on the drawings and other Consultant data to indicate as installed conditions of the equipment furnished and erected under the 'Contract'. Such drawings and Engineering, data shall be submitted to the Purchaser / Consultant in required number of copies. A record of all readings taken during the testing and inspection shall be maintained by the Contractor. This shall be signed by the erection supervisor and the Purchaser/Consultant as a token of their acceptance of the same. All such records shall be handed over to the Purchaser on completion of the 'Works'.

## **26.0 CONTRACTOR'S MATERIAL BROUGHT TO SITE**

- 26.1 The Contractor shall bring to site all equipment, components, parts, materials including construction equipment, tools and tackles for the purpose of the 'Works under intimation to the Purchaser/Consultant. All such goods shall, from the time of their being brought vest in Purchaser, but may be used for the purpose of the 'Works' only and shall not on any account be removed or taken away by the Contractor without the written permission of the Purchaser/Consultant. But the Contractor shall nevertheless be solely liable and responsible for any loss or destruction thereof and damage thereto.
- 26.2 The Purchaser shall have a lien on such goods for any sum or sums, which may at any time, be due or owing to him by the Contractor, under, in respect of or by reasons of the 'Contract'. After giving a fifteen (15) days notice in writing of his intention to do so, the Purchaser shall be at liberty to sell and dispose of any such goods, in such manner as he shall think fit including public auction or private treaty and to apply the proceeds in or towards the satisfaction of such sum or sums due as aforesaid.
- 26.3 After the completion of the 'Works', the Contractor shall remove from the site under the direction of the Purchaser/Consultant the materials such as construction equipment, erection tools and tackles, scaffolding, etc. with the written permission of the Purchaser / Consultant. If the Contractor fails to remove such materials, within fifteen (15) days of issue of a notice by the Purchaser/Consultant to do so, then the Purchaser/Consultant shall have the liberty to dispose of such materials as detailed under Clause 26.2 above and credit the proceeds to the account of the Contractor.
- 26.4 On completion of the work, all rubbish materials and temporary structures of any sort or kind used for the purpose or connected with the construction/erection work and heaps are to be removed by the Contractor and all pits and excavations filled up and the site handed over in a tidy and workmanlike condition and no final payment or settlement of the account for the said work shall held or due shall be made to the Contractor till such site clearance shall have been effected by him and such clearance shall be made by the Purchaser at the expense of the Contractor in the event of his failure to comply with this provision within 7 (seven) days after receiving notice in writing from the Purchaser to that effect. If it becomes necessary for the Purchaser to have the site cleared as indicated above at the expense of the Contractor, the Purchaser shall under no circumstances be held liable for any losses of damages to such of Contractors property as may be on such site due to such removal there from, which removal may be effected by means of public sale of such materials and property in such a way as deemed fit and convenient to the Purchaser.
- 26.5 The Contractor must take sufficient care in moving his construction/erection plant and equipment from one place to another so that they may not cause any damage to the property of the Purchaser, particularly of the existing structures and overhead and underground services and in the event of the Contractors failure to do so, the cost of such damages shall be borne by the Contractor.

## **27.0 PROTECTION OF PROPERTY AND CONTRACTOR'S LIABILITY**

- 27.1 The Contractor shall be responsible for any damage resulting from his operations. He shall also be responsible for protection of all persons including members of public and employees of the Purchaser/Consultant and the employees of other Contractors and

Sub-Contractors and all public and private property including structures, buildings, other plants and equipment and utilities either above or below the ground.

- 27.2 The Contractor will ensure provision of necessary safety equipment such as barriers, signboards, warning lights and alarms, etc. to provide adequate protection to persons and property. The Contractor shall be responsible to give reasonable notice to the Purchaser/Consultant and the Owner of public or private property and utilities when such property and utilities are likely to get damaged or injured during the performance of his 'Works' and shall make all necessary arrangements with such owners, related to removal and/or replacement or protection of such property and utilities.

## 28.0 PAINTING

- 28.1 All exposed metal parts of the equipment including pipings, structures, railings, etc. after installation, unless otherwise surface protected, shall be first painted with at least one coat of suitable primer which matches the shop primer paint used, after thoroughly cleaning all such parts of all dirt, rust, scales, greases, oils and other foreign materials by wire brushing, scraping or sand blasting, and the same being inspected and approved by the Purchaser for painting. Afterwards, the above parts shall be finished with two coats of alloyed resin machinery enamel paints. The quality of the finish paint shall be as per the standards of ISI or equivalent and to be of the colour as approved by the Purchaser/Consultant.

## 29.0 INSURANCE

Refer relevant Clauses under Schedule – 10 of Volume – II

## 30.0 UNFAVOURABLE WORKING CONDITIONS

The Contractor shall confine all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects, during inclement weather conditions, like monsoon, storms, etc. and during other unfavorable construction conditions. No field activities shall be performed by the Contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the Contractor in a proper and satisfactory manner in the performance of such works and with the concurrence of the Purchaser/Consultant. Such unfavorable construction conditions will in no way relieve the Contractor of his responsibility to perform the 'Works' as per the schedule.

## 31.0 PROTECTION OF MONUMENTS AND REFERENCE POINTS

- 31.1 The Contractor shall ensure that any finds such as relic, antiquity, coins, fossils, etc. which he may come across during the course of performance of 'Works' either during excavation or elsewhere are properly protected and handed over to the Purchaser/Consultant.

Similarly the Contractor shall ensure that the bench marks, reference points, etc., which are marked out either with the help of Purchaser/Consultant or by the Purchaser/Consultant shall not be disturbed in any way during the performance of his 'Works'. If any work is to be performed which may disturb such references, the same shall be done only after these are transferred to other suitable locations under the

direction of the Purchaser/Consultant. The Contractor shall provide all necessary materials and assistance for such relocation of reference points, etc.

### **32.0 WORK & SAFETY REGULATIONS**

Refer Technical Specification.

### **33.0 ELECTRICAL SAFETY REGULATIONS**

Refer Technical Specification..

### **34.0 PURCHASER'S INSTRUCTIONS**

34.1 The Purchaser/Consultant may, in his absolute discretion, from time to time, issue further drawings and/or written instructions, details, directions and explanations, which are collectively referred to as "Purchaser's Instructions", in regard to :

34.1.1 Any additional drawings and explanations to exhibit or illustrate details.

34.1.2 The variation or modification of the design, quality or quantity of work or the additions or omission or substitution of any work.

34.1.3 Any discrepancy in the drawings or between the Schedule of Quantities and/or specification.

34.1.4 The removal from the site of any materials brought thereon by the Contractor and the substitution of other materials thereof.

34.1.5 The removal and/or re-execution of any work executed by the Contractor.

34.1.6 The dismissal from the work of any persons employed thereupon.

34.1.7 The opening up for inspection of any work covered up.

34.1.8 The amending and making good of any defects.

34.2 The Contractor shall comply with and duly execute any work covered in such 'Purchaser's Instructions' provided always that verbal instructions, directions, and explanations given to the Contractor or his foreman upon the work by the Purchaser/Consultant shall, if involving a variation, be confirmed in writing by the Purchaser/Consultant within seven (7) days.

34.3 If compliance with the 'Purchaser's Instructions' as aforesaid involves work and scope beyond that contemplated by the 'Contract', unless the same were issued owing to some breach of this 'Contract' by the Contractor, the Purchaser shall pay to the Contractor the price of the said work as hereinafter provided.

34.4 If the Contractor after receipt of written notice from the Purchaser/Consultant requiring compliance, with such further drawings and/or 'Purchaser's Instructions' fails to comply with the same within seven (7) days the Purchaser may employ and pay other

agencies to execute any such work whatsoever, as may be necessary to give effect thereto, and all costs incurred in connection therewith shall be recoverable from the Contractor by the Purchaser on a certificate by the Consultant as a debt or may be deducted by the Purchaser from any money that may become due to the Contractor.

## 35.0 **RIGHTS OF THE PURCHASER/CONSULTANT**

### 35.1 **Right to Illustrate and Explain Plans**

35.1.1 The various parts of the 'Contract' are intended to be complementary to each other but should any discrepancy appear or any misunderstanding arise as to the import of anything contained therein, the explanation of the Purchaser/Consultant shall be final and binding.

35.1.2 The correction of any errors or omissions of the Drawings and Specifications may be made by the Purchaser/Consultant, when such correction is necessary to bring out clearly the intention which is indicated by the reasonable interpretation of the Drawings and Specifications as a whole.

36.1.2 Whenever in the Specifications or on the Drawings which are a part of the 'Contract' or which may be furnished to the Contractor for directing this work, the terms and descriptions of various qualities of workmanship, material, structures, processes, plant or other features of the 'Contract' are described in general terms, the meaning or fulfillment of which must depend upon individual judgment, then in all such cases the question of fulfillment of such specifications or requirements shall be decided by the Purchaser / Consultant and said material shall be furnished, said work shall be done, and said structure, process, plant or feature shall be constructed, furnished or carried on in full and complete accordance with his interpretation of the same and to his full satisfaction and approval, provided such interpretation is not in direct conflict with the Drawings and Specifications and generally accepted good engineering practice.

36.1.3 Details shown either on the Drawings or in the Specifications shall be done and furnished as if shown in both except where expressly excepted either in the Specifications or on the Drawings. Figured dimensions shall in all cases be taken in preference to scale measurements and detailed drawings consistent with general drawings shall be taken in preference to the general drawings of the same part of the work.

36.1.4 The Purchaser / Consultant may, from time to time, prepare for his own use estimates of quantities or bills of materials required for the work. Copies of such estimates or bills of materials which may be given to the Contractor for his convenience, or any lists, weights or quantities of materials or structures which may appear on the drawings may not be considered as finally correct, sufficiently complete or accurately covering any portion or all of the work to be done under the 'Contract'. Such bills or estimates may be carefully assembled and prepared but their accuracy is not guaranteed. They may not be accurate as to any particular details and are given only as the best information available at the time of issue of the information. It is understood that any such lists or estimates are furnished to the Contractor for his convenience only and not

as lists or estimates of work to be done and many necessary items of work might have been omitted.

36.1.5 Additional drawings and explanations to exhibit or illustrate details may be provided by the Purchaser / Consultant whenever necessary and if so provided, and if consistent with the Drawings and Specifications, it shall be binding upon the Contractor to take cognizance of the same. The written decision of the Purchaser / Consultant as to the true construction and meaning of the Drawings and Specifications and of such additional drawings and explanations shall be binding upon the Contractor.

### **36.2 Right to Direct Work**

36.2.1 The Purchaser / Consultant shall have the right to direct the manner in which all work under this 'Contract' shall be conducted, in so far as it may be necessary to secure the safe and proper progress and the specified quality of the work, and all work shall be done and all material shall be furnished to the satisfaction and approval of the Purchaser / Consultant.

36.2.2 Whenever, in the opinion of the Purchaser / Consultant, the Contractor has made marked departures from the schedule of completion laid down in the 'Contract' or when untoward circumstances force a departure from the said schedule, the Purchaser / Consultant, in order to assure the compliance with the schedule and the provisions of the 'Contract', shall direct the order, pace and method of conducting the work, which shall be adhered to by the Contractor.

36.2.3 If, in the judgment of the Purchaser / Consultant, it becomes necessary at any time to accelerate the overall plant erection work, the Contractor, when ordered and directed by the Purchaser / Consultant, shall cease work at any particular point and transfer his men to such other point or points, and execute such portion of his work, as may be required, to enable others to hasten and properly engage and carry on their work, all as directed by the Purchaser / Consultant.

36.2.4 Night work will be permitted only with prior approval of the Purchaser / Consultant. The Purchaser / Consultant may also direct the Contractor to operate extra shifts over and above normal day shift to completion of 'Contract' on schedule if, in his opinion, such work is required.

### **36.3 Right to Order Modifications of Methods and Equipment**

If at any time the Contractor's methods, materials or equipment appear to the Purchaser / Consultant to be unsafe, inefficient or inadequate for securing the safety of the workmen or the public, the quality of work or the rate of progress required, he may order the Contractor to ensure their safety and increase their efficiency and adequacy, and the Contractor shall promptly comply with such orders. If at any time, the Contractor's working force and equipment are in the opinion of the Purchaser / Consultant, inadequate for securing the necessary progress, as herein stipulated, the Contractor shall, if so directed, increase the working force and equipment to such an

extent as to give reasonable assurance of compliance with the schedule of completion. The absence of such demands from the Purchaser / Consultant shall not relieve the Contractor of his obligations to secure the quality, the safe conducting of the work, and the rate of progress required by the 'Contract', and the Contractor alone shall be and remain liable and responsible for the safety, efficiency and adequacy of his methods, materials, working force and equipment, irrespective of whether or not he makes any change as a result of any order or orders received from the Purchaser / Consultant.

#### **36.4 Right to Perform**

The Purchaser reserves the right to perform or have performed in and about the 'Works' during the time when the Contractor is performing his work hereunder, such other work as the Purchaser desires, and the Contractor shall make all reasonable effort to perform his work hereunder in such a manner as will enable such other work to be performed without hindrance and shall make no claim for damage against the Purchaser arising out of such other work to be performed against hindrance and shall make no claim for damage against the Purchaser arising out of such other work or interference there from. The Contractor shall work in harmony with such other Contractor's regardless of race, religion, colour or national origin and any dispute between Contractors shall be arbitrated by the Purchaser / Consultant.

#### **37.0 MEASUREMENT OF WORK AND PROGRESS PAYMENTS**

- 37.1 The Purchaser / Consultant may, from time to time, intimate the Contractor that he requires the works to be measured and the Contractor shall attend or send a qualified agent to assist the Purchaser / Consultant or his representative in taking such measurements and calculations and to furnish all particulars as may be required by him.
- 37.2 Where the erection of equipment, steel structures panels are involved, the basis of such measurements and progress evaluation shall be weights specified in the shipping documents or invoices or drawings as decided by the Purchaser / Consultant. Should the Contractor not attend or neglect or omit to send such agents, then the measurement taken by the Purchaser / Consultant or approved by him shall be taken to be the correct measurements of the work. The Contractor or his Agent may, at the time of measurement, take such notes of measurements as he may require.
- 37.3 When measurements are effected by conditions already established, the Contractor shall take field measurements notwithstanding scale or dimensions shown on the drawings.
- 37.4 The measurements so taken and certified correct by the Purchaser / Consultant shall be the basis for the progress payment to the Contractor. Where the break-up of 'Contract on unit basis Price' is difficult to arrive at, the Purchaser / Consultant and the Contractor shall work out at the commencement of the 'Contract', the weightages or the cost or the cost break-ups to arrive at a mutually agreeable basis for computation of the progress estimates.
- 37.5 To the value so arrived at on the basis of the Contractor's monthly progress evaluated, shall be added the amounts earned by the Contractor under supplemental Contracts and orders if any, till date of the progress estimate. From the total thus computed, all previous payments plus any amounts due to the Purchaser in accordance with the terms

of this Contract shall be deducted. The remainder shall be paid by the Purchaser to the Contractor under Interim Certificates from the Consultant.

37.6 In case work is nearly suspended or in case only unimportant progress is being made, or in case it is apparent that Contractor is about to forfeit his 'Contract' or that the money yet due to him shall not complete his 'Contract', the Purchaser may at his discretion withhold any payment which may be due to the Contractor.

37.7 The Purchaser may withhold part or whole of any payment for erection claimed by the Contractor, which in opinion of the Purchaser, is necessary to protect himself from loss on account of :

- a) Defective work not remedied or guarantees not met.
- b) Claims filed against the Contractor.
- c) Failure of the Contractor to make due payment for materials supplied or labour employed by him.
- d) Damage to other Agencie's/Contractor's or Purchaser's or Others' property.
- e) Failure to meet the mutually agreed schedules.

37.8 When the grounds for withholding payments are removed, payments of the amount due to the Contractor shall be made by the Purchaser within a reasonable period.

37.9 The Contractor shall not demand nor be entitled to receive payment for the work of portion thereof, except in the manner set forth in this 'Contract' and only after the Purchaser / Consultant shall have given a certificate for such payment.

### 38.0 **ADHERENCE TO MANUFACTURER'S INSTRUCTION**

Adherence to instructions of the Manufacturer's supervisory Consultants, is compulsory. The Contractor shall work under the guidance of the Manufacturer's supervisors to ensure that erection procedures adopted by the Contractor as well as completed erection of equipment is such as not to interfere with or prevent equipment from functioning as intended, as well as to the entire satisfaction of the Manufacturer's supervisor / Purchaser / Consultant. The Contractor shall also permit and provide all facilities for the Manufacturer's erection supervisors to carry out all checks that they may wish to, and approve any erection procedure and/or final setting and alignment of components, in order to satisfy themselves that erection has not been carried out as intended by them. This shall, however, in no way relieve the Contractor of his responsibility for providing adequate and competent supervision and quality workmanship.

### 39.0 **MODIFICATIONS**

The Contractor shall carry out all modifications at site as directed by the Purchaser / Consultant to complete the work covered in this 'Contract'. It is the responsibility of the Contractor to get the prior approval for such modifications from the Purchaser / Consultant before such works are taken up. The Contractor shall also get the estimates and the actual time sheets certified by the Purchaser/Consultant, and these certified time

sheets will be the basis for processing his bills for such modification works which are required to be carried out for no fault of the Contractor.

#### **40.0 DEFECTIVE WORK**

If the work or any portion thereof shall be damaged in any way excepting by the acts of the Purchaser or if defects not readily detected by prior inspection shall develop before the final completion and acceptance of the whole work, the Contractor shall forthwith make good, without compensation, such damage or defects in a manner satisfactory to the Purchaser / Consultant. In no case shall defective or imperfect work be retained.

#### **41.0 WORK OF OTHERS**

If any part of the Contractor's work depends, for proper execution, upon the work of any other Agency/ any other Contractor, the Contractor shall inspect and promptly report in writing to the Purchaser / Consultant any defect in such work of other agencies/other Contractors that render it unsuitable for proper execution of the work under this 'Contract'. His failure to so inspect and report shall constitute an acceptance of the other agency's/ other Contractor's work as fit and proper for the reception of his work, except as to defects which may develop in the work of other Agencies/other Contractors after the proper execution of the work. To ensure proper execution of his subsequent work, the Contractor shall inspect work already in place and shall at once report to the Purchaser / Consultant any discrepancy between the executed work and the drawings.

## **GENERAL CONDITIONS FOR CIVIL WORKS**

- 1.0 The Contractor shall make his own arrangement for all labour, construction equipment, tools and tackles and construction materials. All temporary approach roads to the site for carrying out construction work shall be constructed and maintained by the Contractor at his own cost.
- 2.0 The Contractor shall take all necessary precautions to avoid damage to any property of the Purchaser or any third party. The Contractor shall also ensure that the progress of work of other Contractors in the adjoining areas is not hindered. Any damage occurring should then be made good by the Contractor at his own expense.
- 3.0 The Contractor shall take all precautions during execution, especially while excavating to avoid interference with or, damage to underground works, such as cables, pipe lines, drains etc. and provide all possible protection to these works and in case they are damaged, rebuild/divert them at his own cost.
- 4.0 The Contractor shall carry out necessary precision survey to set out and check the setting of all works including foundation & anchor bolts etc. to required tolerances using the grid reference points available in the plant site. The Contractor shall make and maintain proper bench mark and reference points and check lines and levels periodically.
- 5.0 Materials brought to the site shall not be removed from the site without the written consent of the Purchaser. The Contractor shall submit well in advance for approval, all samples and specimens as the Purchaser may demand from time to time. Any material brought to site and rejected by the Purchaser shall be removed by the Contractor from the site of work immediately within the time limit specified by the Purchaser. In case, the Contractor is not removing the rejected materials, the same will be removed by the Purchaser and cost thereof shall be recovered from the bills of the Contractor.
- 6.0 The Purchaser may during the progress of work, order the removal of part or whole of the work executed, found not in accordance with the approved drawings/ specifications/ written instructions. No extra claims shall be entertained for removal & re-execution of such work.
- 7.0 No work shall be covered up or put out of view without the approval of the Purchaser. In the event of failing to do so, the Contractor shall uncover any part of the work or make openings in or through the works as the Purchaser may direct and they shall be made good with materials approved by the Purchaser and should match with workmanship of the surrounding work.
- 8.0 The Contractor shall dismantle and remove the stagings and other temporary facilities like stores, offices, etc. on completion of work, clear and clean the site where such temporary facilities were built and restore the same to original condition at his own cost.

- 9.0 The Contractor shall provide all necessary storage at the site in specified areas for all materials such as timber, cement, lime and such other materials which are likely to deteriorate by the action of sun, winds, rain, coastal conditions or other natural cause due to exposure in the open in such manner that all such materials shall be duly -protected from damage by weather or any other cause. All such stores shall be cleared away and the whole site left in good order on completion of the contract. All materials, shall be stacked in such a manner as to facilitate rapid and easy checking of such materials. The Contractor will not be permitted to store any of his material in the buildings under construction or already constructed by him without prior approval of the Purchaser.
- 10.0 After completion of work, the Contractor shall carry out micro-levelling of the site within plant area ensuring proper grades and slopes to achieve efficient drainage of the site. The Contractor shall remove all debris, surplus earth etc. and dump the same at places/place as directed by the Purchaser within a distance of 8 km from the site.
- 11.0 The Contractor shall be held responsible for proper performance for buildings and structures including all other civil work during the guarantee period. Any defect found during this period will be made good by the Contractor at his own cost failing which the Purchaser reserves the right to take remedial measures at the Contractor's risk and cost.
- 12.0 All excavated materials shall remain the property of the Purchaser. In case the Contractor wishes to utilise the boulders excavated by him during the excavation work at the site, the same may be issued to him at prevailing rates on cost recovery basis. Percentage of voids on stack measurement shall be mutually agreed. Contractor shall have to account for all excavated hard rock.
- 13.0 In respect of any portion of works which is to be embedded or covered up by other works, the Contractor shall submit them to Purchaser for technical inspection and have the necessary clearance certificates duly signed by the Purchaser and Contractor before letting such portion to be embedded or covered.
- 14.0 Wherever works are to be carried out in proximity or within existing facilities, contractor may have to adopt special methodology of construction suited to prevailing conditions. He shall make necessary schemes in advance and finalise the same with the approval of the Purchaser/Consultant.
- 15.0 On progressive completion of work, the Contractor shall submit to the Purchaser the following documents for the passing of the work:
- a) Certificate on control checking.
  - b) A copy of each of the concerned working drawings showing thereon all approved additions and alterations, if any, in the process of execution.
  - c) Clearance certificates for embedded/covered up works.
  - d) Manufacturer's certificates, guarantees and test certificates, as relevant.

- 16.0 The Contractor shall carry out structural load check with structure test, concrete sieve test as per IS 456 for equipment foundation & pedestal at locations specified by the Purchaser on any part of the building/structure at his own cost if so directed by the Purchaser.
- 17.0 As the works under the contract are to be carried out within the protected area, the Contractor shall abide by all the security regulations promulgated from time to time by the Purchaser/other concerned authorities.
- 18.0 No blasting is allowed. If required it shall be done with prior approval of Purchaser without any extra cost.

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## ANNEXURE-II

### SAFETY CODE FOR THE CONTRACTOR

#### GENERAL

- 1.00 Safety is the responsibility of every employee individually and collectively.
- 1.01 The Contractor shall submit Safety Code and handed over a copy to all sub- Contractors working under his control and he should in turn display all rules on the office notice board for the benefit of all the men working under him.
- 1.02 The Contractor shall provide adequate guards, illumination, fencing and watching wherever necessary at the construction site & working area, for the safety & convenience of public or others.
- 1.03 Fire extinguishers adequate in number shall be kept by the Contractor at the site of works where there is risk of fire hazard, especially near the site stores.
- 1.04 Adequate washing facilities with proper drainage shall be provided properly maintained near the place of work but at a safe distance from approach roads, Electrical HT Lines etc.
- 1.05 When work is to be done near any place, where there is risks of drowning, arrangements to be made for safe barricading of such areas. All necessary equipment shall be provided and kept ready for use and necessary steps taken for prompt rescue of any person in danger and adequate provision shall be made for prompt first-aid treatment of all injuries likely to be sustained during the course of the work in case of mishap.
- 1.06 To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangements made by the Contractor shall be open to inspection by the Safety Engineer, the Labour Officer, Engineer-in-charge of the department or their representatives.
- 1.07 Notwithstanding the above clauses, there is nothing in those to exempt the Contractor from the operation of any other Act or Rule in Republic of India for the safety of men and materials.
- 1.08 An injury sustained in the plant, must be reported to the First-Aid Station no matter how slight it is, the injured person will inform Supervisor/Officer in-charge.
- 1.09 In case of a fatal accident, the Contractor must inform the Engineer in-charge of the department for which he is working and report in writing should be made in the form.
- 1.10 Smoking or keeping of naked light is strictly prohibited near gas lines, valves and any other equipment connected with the gas distribution.
- 1.11 Smoking and carrying of matches, lighters and other spark producing devices is strictly prohibited within the area where inflammable liquids are stored, handled or used or where loading or unloading operations are performed. Any tank or container containing flammable liquid should be properly grounded for preventing ignition due to static

electricity spark. Contractor should ear-mark such areas and provide necessary warning signals.

- 1.12 Contractors should ensure that employees do not come to work while still under the influence of intoxicants. Any employee found on duty under the influence of liquor or of intoxicating drugs, will be liable to severe disciplinary action.
- 1.13 Work surrounds should be kept clean, free from oil, grease and other obstructions or fallen objects like nuts bolts etc.
- 1.14 After a job or work is completed, all left-over junk and other scrap materials should be cleared from the area immediately.
- 1.15 Drums or other make-shift arrangement must not be used in place of ladders or as work benches or supports for any job.
- 1.16 Employees must not walk through or across any systems that is brought into operation unless their duties require them to do so or they are authorised to do so.
- 1.17 Compressed air should not be used for removing dust from one's clothes. Compressed air should not be blown against anyone as it may injure or even kill him.
- 1.18 If an employee, in the course of his work, encounters condition of unusual hazard with which he is not familiar, he should contact the supervisor for advice before proceeding further. He should also inform the Contractor as well as the Engineer in-charge.
- 1.19 Contractors should particularly ensure that they or their employees do not meddle with any equipment and see that they keep away from such equipment.
- 1.20 It should be ensured that no one takes rest/shelter below any under cut pit/excavation or near any stock of materials or under Solar PV arrays.
- 1.21
  - i For any work involving repair & maintenance underground work the Contractor shall follow the safety procedural orders/instruction issued by the Purchaser.
  - ii The Contractor shall exercise supervision of such jobs by competent persons within the meaning of factories act & rules.
  - iii All persons engage on such jobs shall have to have before hand proper training instructions as required under Factories Act & Rules.
- 1.22 The site is in the vicinity of desert area with sand dunes. Contractor has to caution his employees at site against the associated hazards. If considered necessary, he shall arrange for a properly equipped team for taking care of contingencies.

## 2.00 **SAFETY MEASURES IN CONTRACTUAL WORK**

Whereas, it is necessary to take steps to ensure safety at work sites by the executing contractual agency, it is incumbent of the Purchaser to introduce all measures to guide, induce, train and bind the agencies concerned to adopt remedial steps to prevent accidents. Problem gets aggravated in contractual zones due to lack of training, in-adequate supply of personal protective equipment, shortage of skilled labour changing deployment of works etc. Accordingly, the following measures are intended to be introduced and the salient clauses will be included in the contract documents.

- 2.01 The Contractor shall take all safety precautions and provide adequate supervision in order to carryout the job safely and without damage to equipment.
- 2.02 Any special safety precautions, if required to be followed by the Contractor, such clauses shall be added.
- 2.03 The executing department would take necessary shut-downs wherever there are hazards of gases, electricity, moving machinery etc. The Contractor shall ensure that the shut-down/clearance are taken before sending workers to such locations.
- 2.04 The Contractor shall supply safety appliance like shoes, safety belts, ladies chappals, helmets, gloves etc. to his workers depending on working conditions and Life saving jackets shall be kept in readiness always at the site. The Contractor shall not deploy any workmen without safety boot and safety helmet and the safety applicable to the specific work conditions.
- 2.05 Before starting the day's job, the Purchaser's Supervisor/representatives will ensure that safety briefing has been done to the Contractor's supervisor who has been imparted safety induction earlier.
- 2.06 HOD/Zonal in-charge will nominate Engineer in-charge of the contractual work under reference who will be fully responsible for the safe execution of the work at site.
- 2.07 In case of injury to persons, the Contractors shall first take the injured person to the NLC Dispensary hospital with the necessary forms. In no case the Contractors are allowed to take injured persons directly to their own Doctors.
- 2.08 The Contractor shall abide by the provisions of Factories Act, State Factory Rules, Workmen's Compensation Act, Payment of Wages Act, Contract Labour (Regulation) Act etc. and keep the Purchaser indemnified of provisions of the above Acts and Rules.
- 2.09 The Head of Deptt. Executing the contract upon the satisfaction that the Contractor is not conforming to the Safety requirements may direct stoppage of work and require the Contractor to remedy the defects. The Contractor shall not proceed with the work until he has complied with each direction to the satisfaction of such Head of the Department.
- 2.10 The Contractor shall be fully responsible for accidents caused due to him or his agents or workmen's negligence or carelessness in regard to the observance of the safety requirements and shall be liable to pay compensation for injuries.
- 2.11 Without prejudice to the right conferred by the clause 2.09 above for stoppage of work for violations of safety requirements the Contractor shall be liable for penalty as deemed fit for violation of safety rules & regulations upto first two instances. For the third violation he shall be liable to be debarred from further contracts upto a period of one year from the date of issue of debarring notice.

- 2.12 The Head of the Safety Engg. Deptt. Or the Head of the Deptt. Executing the contract will assess the penalty amount having regard to the circumstances, in particular, the nature and gravity of the violation. After issuing a notice to the Contractor to show cause why the amount specified therein shall not be imposed as a penalty and considering the cause shown by the Contractors, if any, he shall pass final orders which shall then be final and binding on the Contractor. The penalty amount will be recoverable from any bill and/or EMD/SD of the Contractor without any further reference to him.
- 2.13 Whenever work, at height is involved, Contractor must obtain height passes from Safety Engg. Deptt. For those persons required to do work at height.
- 2.14 Contractor must insure all the workmen against “Workmen Compensation Act.”

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ANNEXURE-5

**DEVIATION FROM SPECIFICATION**

If the proposal submitted has got any deviation from the technical stipulations in the bidding document, the Bidder shall tabulate below the full particulars of such deviations and shall sign below. Additional sheets may be enclosed, if necessary. Deviation is to be furnished with mention of specific clause numbers. Technical and commercial deviations to scope of supply and services, shall be indicated separately. Bidders shall bring put only those deviations which are impractical to meet (or) not advisable

SI.No	CLAUSE NO.	DESCRIPTION AS PER SPECIFICATION	DEVIATION BY BIDDER

We confirm that all the deviations/exceptions to the Technical Specification PY51084, Job Specification and enclosures including reference documents attached are listed in this Annexure only. No other deviations or exceptions even if mentioned elsewhere shall be considered for any technical/ commercial evaluation or for ordering.

Signature of Bidder's  
Authorized representative .with date.....

Date .....

Ref.  
Doc

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ANNEXURE-6 PRICE BID FORMAT												
		RFQ No. _____		Dt. _____		Due Date(Tech Bid): _____						
S.No	Short Text	Floor area of each PEB (sq.m.) 'A'	UNIT RATE per sq.m./ per activity (Rs.) 'B'	Qty 'C'	Unit	TOTAL RATE (UNIT RATE*QTY) (Rs.) 'D=A x B x C'	Taxes					Total (incl. of taxes)
							ED %	CST %	VAT%	Service Tax%	Others	
SUPPLY												
1	<b>PY9760053004:</b> Supply of one set of structural materials such as columns, rafters, beams, purlins, steel sheets, insulation etc. all required for construction of PEB inverter room as per clause 9.1.1 of BHEL spec PY60053 (Note: 1 set is for one PEB/inverter room).	107.575		11	SET						NA	
2	<b>PY9760053012:</b> Supply of one set of architectural items such as doors, windows, rolling shutters etc all required for PEB inverter rooms as per clause 9.1.2 of BHEL spec PY60053 (Note: 1 set is for one PEB/inverter room).	107.575		11	SET						NA	
3	<b>PY9760053020:</b> Supply of electrical services as per clause 9.5 & 9.6 of BHEL spec PY60053 (Note: 1 set for one PEB/inverter room).	NA		11	SET						NA	

INSTALLATION & COMMISSIONING												
4	PY9860053030: I&C: Erection of one set of structural materials all required for PEB inverter room as per clause 9.1.3 of BHEL spec PY60053 (Note: 1 set is for one PEB/inverter room).	107.575		11	SET		NA	NA	NA			
5	PY9860053049 : I&C: Erection of one set of architectural items all required for PEB inverter room as per clause 9.1.4 of BHEL spec PY60053 (Note: 1 set is for one PEB/ inverter room).	107.575		11	SET		NA	NA	NA			
6	PY9860053057: E&C for Electrical Services as per clause 9.5 & 9.6 of BHEL spec PY60053 (Note: 1 set for one PEB/inverter room).	NA		11	SET		NA	NA	NA			
FREIGHT CHARGE												
7	Freight Charge including Service Tax on Freight	LUMPSUM										
INSURANCE												
8	Insurance	LUMPSUM										
										Grand Total (in Rs.)		
<b>NOTES:</b>												
1	Offer will be evaluated on the overall L1 basis for the sizes (floor area) indicated under column 'A' .											
2	Column 'A'(Floor Area of each PEB) may change $\pm$ 10%, which will be finalised during detailed engineering. Floor Area is 'L'x 'W' as indicated in the drawing no.- Indicative inverter room layout (refer Annexure no. 2 )											
3	The payment for the above items mentioned shall be on actual size 'L'x'W' of PEB, finalized during detailed engineering using the unit rate quoted under column 'B'											
4	The quoted prices shall be on "free on road" basis to project site: NLC,TAMILNADU where in freight to be quoted separately as indicated.											
5	Please indicate taxes : ED, VAT/CST, Service Tax,Other Taxes clearly applicable as on date.											
6	Use this format for compliance( reproducing on your letter head is acceptable).											
7	Bidder to quote strictly as per BHEL's NIT requirements.											
8	Bidder to note that this is a LUMP SUM Turn-Key Order. Any additional claim after placement of order will not be entertained under any circumstances.											
9	Successful vendor shall submit the billing break up for supply & E&C for approval and implementation											
10	Successful vendor shall provide bom along with make model, test certificate, calibration report & qty of each item shall be furnished to BHEL/NLC.											
11	Prices quoted by the bidder shall remain firm till the successful handing over of PEBs to end customer. Any request for upward revision of price during any intermediate stage before handing over the plant to end customer will be summarily rejected by BHEL											



## QAP GUIDELINES & FORMAT

( ANNEXURE-7)


The QAP format and guidelines for filling up the format shall be used by vendor for preparation and submission of QAP after order placement.


**Note :**

1. Typical /Indicative /Standard QAP(s) for equipment /package attached is reference document and to use by successful bidder in future for preparation and submission of QAP for BHEL /CUSTOMER approval.
2. No deviation to reference document is acceptable.

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Form No.	 <b>HYDERABAD</b>	<b>PRODUCT STANDARD</b> PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE  Page 2 of 3
<b>COPYRIGHT AND CONFIDENTIAL</b> The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	<p><b><u>GUIDELINES TO VENDORS FOR PREPARATION OF QUALITY ASSURANCE PLAN</u></b></p> <ol style="list-style-type: none"> <li>1. QAP shall be made in landscape mode on A4 size paper as per the format enclosed. Font size shall be minimum 10.</li> <li>2. Each page of QAP shall contain the following information.           <ol style="list-style-type: none"> <li>a) Vendor's name &amp; address.</li> <li>b) Customer: BHEL, Hyderabad.</li> <li>c) Project.</li> <li>d) BHEL Product Standard Number/revision number as referred in P.O.</li> <li>e) BHEL Purchase Order Number &amp; Date.</li> <li>f) Product as per P.O. description.</li> <li>g) QAP Number (unique and shall not repeat)/revision number/date.</li> <li>h) Page number and number of pages</li> </ol> </li> <li>3. QAP shall contain four parts / stages as follows.           <ol style="list-style-type: none"> <li>a) Raw materials and bought out items.</li> <li>b) In process Control / Inspection.</li> <li>c) Final assembly, Inspection &amp; Testing.</li> <li>d) Painting, preservation &amp; packing.</li> </ol> </li> <li>4. Under 'Component', indicate name of the component (say casing, rotor, pressure gauge, etc).</li> <li>5. Under 'Characteristics', indicate appropriately (say chemical analysis, mechanical properties, NDT (UT,DP etc.), hydrostatic test, calibration check etc.)</li> <li>6. Under 'Class', indicate minor, major or critical depending on the importance of characteristic.</li> <li>7. Under 'Type of check', indicate appropriately (say chemical, mechanical, UT, DP etc.)</li> <li>8. Under 'Quantum of check', indicate appropriately (say 100%, 10%, sample, per melt, per heat, all pieces etc.)</li> <li>9. Under 'Reference document' and 'Acceptance norms', appropriate National &amp; International standards, BHEL standards, approved drawing references etc. should be indicated. It is not correct to mention as "Vendor's internal standards or Vendor's standard practice etc.". If vendors' internal standards are referred, same shall be in line with BHEL Spec. indicated in the P.O. These may require review &amp; approval by our Engineering dept.</li> <li>10. Under 'Format of record', indicate appropriately supplier's test certificate, calibration certificate, lab report, inspection report etc.</li> </ol>		
Ref. Doc	<ol style="list-style-type: none"> <li>11. Please refer 'Agency' in QAP format.            Under P: Perform, W: Witness, V: Verify            Indicate against each characteristic 1: (BHEL CQS/Nominated inspection agency), OR            2: (Vendor / Sub vendor)</li> </ol>		

Form No.	 HYDERABAD	<b>PRODUCT STANDARD</b> PROJECT ENGINEERING & SYSTEMS DIVISION HYDERABAD	ANNEXURE  Page 3 of 3
<b>COPYRIGHT AND CONFIDENTIAL</b> The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED . It must not be used directly or indirectly in any way detrimental to the interest of the company.	<p>Note: Performing agency is normally vendor or his sub vendor (Legend 2). Where witness points are indicated in specification, P.O., Drawing etc., for such operations, Under Witness (W) column use 1. Under 'Verify' column, use code 1.</p> <p>12. Under 'D' please put ( <input type="checkbox"/> Tick) against each characteristic where vendor proposes to submit test certificate/report etc. OR as required as per BHEL Specification.</p> <p>13. Vendor's signature &amp; stamp should be available on each page of QAP.</p> <p>14. Vendor should read the BHEL Product Standard thoroughly and QAP should be made only inline and relevant to the Specification &amp; Approved Drawings.</p> <p>15. The following operations/characteristics/check points may be included (AS APPROPRIATE)</p> <ol style="list-style-type: none"> <li>a) Visual check</li> <li>b) Dimensional check</li> <li>c) Mechanical and Chemical properties.</li> <li>d) Surface preparation before painting (by chemical cleaning, sand blasting, shot blasting etc. as the case may be.)</li> <li>e) Painting check for shade, Dry Film Thickness (DFT), Adhesion/ peel off test etc.</li> <li>f) Check for correctness for all components mounted as per General arrangement Drawing, Bill Of Materials (BOM), etc. for range, rating, make, color, size, location as per GA, quantity, label description including tag nos., annunciator facia, loose components, accessories, spares etc.</li> <li>g) Verification of test certificate for protection class for the enclosures.</li> <li>h) Mechanical functioning of switches.</li> <li>i) Continuity of earthing and provision of earth points.</li> <li>j) Colour coding of wiring, size, tightness &amp; dressing of wiring.</li> <li>k) Review of test certificates of assembled items, raw materials, internal test reports etc.</li> <li>l) Witness of functional checks, which may include mechanical run &amp; electrical run, H.V.test, IR measurement, Electrical and Mechanical tests etc.</li> <li>m) PQR, WPS, Welder Qualification Record, welding records (fit up, DP) etc.</li> <li>n) Material identification ( for punch marks of serial numbers, Heat No, Melt No, Inspector's stamp etc.)</li> <li>o) Hydraulic Pressure Test, Pneumatic Pressure Test, Liquid Penetration Examination and other Non-Destructive Tests.</li> <li>p) Tests on Galvanised items (Visual, Hammer Test, Knife Test, Thickness, Pierce Test (Copper sulphate test), Hydrogen evaluation test, Stripping test (for Mass of Zinc coating)</li> <li>q) All tests as per BHEL Product Standard &amp; approved drawings including Type tests and Routine tests on individual items and on System as a whole.</li> <li>r) Packing and Preservation.</li> </ol> <p>16. <b>QAP Format enclosed.</b></p> <p>17. <b>Typical Manufacturing QAP(s) is /are attached.</b></p>		
Ref. Doc			



VENDOR,S NAME & ADDRESS		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:						
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032		PROJECT: PACKAGE: SUPPLY PORTION OF PEB BHEL TECH SPEC:				REV NO:		DATE:				
		PAGE 1 OF 8												
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS	
										D	P	W	V	
<b>A. PEB STRUCTURES</b>														
<b>1.0 RAW MATERIALS &amp; BOUGHT OUT ITEMS</b>														
1.1	frames, columns, columns, beams, truss member, base pate, purlins, girts, eave struts, bracing, flange bracing, base angles, clips, sealant, flashings, Gutters and Down comers, door & window frame, ventilator, rolling shutter	Mechanical & Chemical Properties	Major	Mech., Chem. Analysis	One per Lot/Batch /Heat	BHEL Spec / Approved Drawing	MTC	✓	2	-	1			
<b>2.0 INPROCESS INSPECTION</b>														
2.1	Welding & Welder qualification	WPS,PQR,WPQ	Major	Test	100%	ASME SEC IX	WPS, WPQ, PQR	✓	2	2	1			

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. \* FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

VENDOR,S NAME & ADDRESS		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: SUPPLY PORTION OF PEB BHEL TECH SPEC:			REV NO:		DATE:			
		PAGE 2 OF 8											
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
2.2	frames, columns, columns, beams, truss member, base pate, purlins, girts, eave struts, bracing, flange bracing, base angles, clips, sealant, flashings, Gutters and Down comers, door & window frame, ventilator, rolling shutter	Visual, Dimensions, Markings, Finish etc.	Major	Measure & visual	100%		BHEL Spec / Approved Drawing	IR	✓	2	2	1	
<b>3.0</b>	<b>FINAL INSPECTION &amp; TESTING</b>												
3.1	frames, columns, columns, beams, truss member, base pate,	Visual, BOM check, Dimensions, Markings, Finish etc.	Major	Visual, Measurement	10%		BHEL Spec / Approved Drawing	IR	✓	2	1	-	
3.3	purlins, girts,	Straightness	Major	Measure & visual	10%			IR	✓	2	1	-	

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VENDOR,S NAME & ADDRESS		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: SUPPLY PORTION OF PEB BHEL TECH SPEC:			REV NO:		DATE:			
		PAGE 3 OF 8											
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	* D	AGENCY			REMARKS
										P	W	V	
3.2	eave struts, bracing, flange bracing, base angles, clips, flashings, Gutters and Down comers, door & window frame, ventilator, rolling shutter	Galvanization# (Uniformity, Thickness of Coating)	Major	Measurement	One per Lot/Batch /Heat			TC/IT R	✓	2	1	-	# for Galvanized items
<b>4.0</b>	<b>PRESERVATION &amp; PACKING</b>												
4.1		Painting (Shade, DFT)#	Major	Visual	Random	BHEL Spec / Approved Drawing		TC	✓	2		1	# as applicable
4.2		Packing	Major	Visual	100%			Packing Slip	✓	2	-	1	
<b>B. FINAL INSPECTION &amp; TESTING (ILLUMINATION)</b>													
		BOM CHECK	Major	VISUAL	100%	BHEL Spec / Approved Drawing		TC	✓	2		1	
		ALL TEST CERTIFICATES	Major	VISUAL	100%	BHEL Spec / Approved Drawing		TC	✓	2		1	
<b>C. FINAL INSPECTION &amp; TESTING (FDA SYSTEM)</b>													
		BOM CHECK	Major	VISUAL	100%	BHEL Spec / Approved Drawing		TC	✓	2		1	
		ALL TEST CERTIFICATES	Major	VISUAL	100%	BHEL Spec / Approved Drawing		TC	✓	2		1	

LEGEND: P: PERFORM, W: WITNESS, V: VERIFICATION. INDICATE 1 FOR BHEL CQS (OR BHEL NOMINATED INSPECTION AGENCY) & 2 FOR VENDOR/SUB VENDOR AS APPROPRIATE AGAINST EACH COMPONENT /CHARACTERISTIC UNDER P, W & V COLUMNS. \* FOR ITEMS MARKED ✓ (TICK) IN COLUMN 'D', TEST CERTIFICATES SHALL BE SUBMITTED TO BHEL FOR RECORDS.

VENDOR,S NAME & ADDRESS		TYPICAL MANUFACTURING QUALITY PLAN						MQP. NO.:					
		PROJECT ENGINEERING & SYSTEMS DIVISION BHEL, RC PURAM, HYD-502032			PROJECT: PACKAGE: SUPPLY PORTION OF PEB BHEL TECH SPEC:			REV NO:		DATE:			
		PAGE 4 OF 8											
SL NO	COMPONENTS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
									D	P	W	V	

**Notes:-**

1. This Standard MQP should be read along with specification (Latest revision as per PO), approved drawings & approved datasheet (as applicable).
2. Specification/drawing/datasheet shall prevail over quality plan for contradiction if any.
3. Any project/customer specific requirements which shall be notified have to be fulfilled by the vendor at the time of execution of order.

**Abbreviations:-**

MTC	-	Material Test certificate	TC	-	Test Certificate
IR	-	Inspection Report	ITR	-	Internal Test Report
UTS	-	Ultimate Tensile Strength	YS	-	Yield Strength
EL.	-	Elongation	PMI	-	Positive Material Identification
MPI	-	Magnetic Particle Inspection	LPT	-	Liquid Penetrant Test
IBR	-	Indian Boiler Regulations	NDE	-	Non Destructive Examination

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