Figure 11

4. Electrical Connections Procedure:

A. While forming each row of the array of floaters, one must interconnect the module to module looping of DC Cables and use UV resistant cable ties on the hole provided on the supporting float or on the modules based on the available cabling length
B. Ensure to complete the module to module earthing looping during the connection of each row on the ground

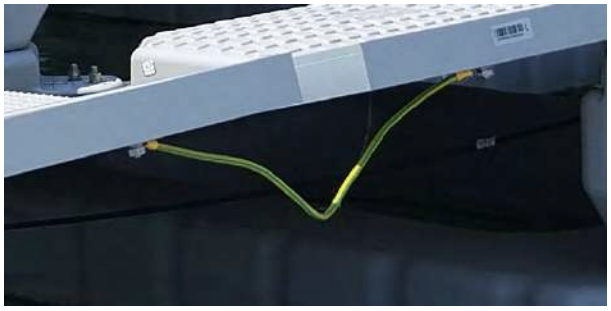


Figure 12

C. Take care to ensure that the loose ends of the cables do not touch with water when floated out and also to ensure the cables are properly tied using UV resistant cable ties to ensure no cables touch the water surface

Figure 13

D. The cables can then be taken on either cable tray or flexible conduits to the shore through equipment floats

Figure 14

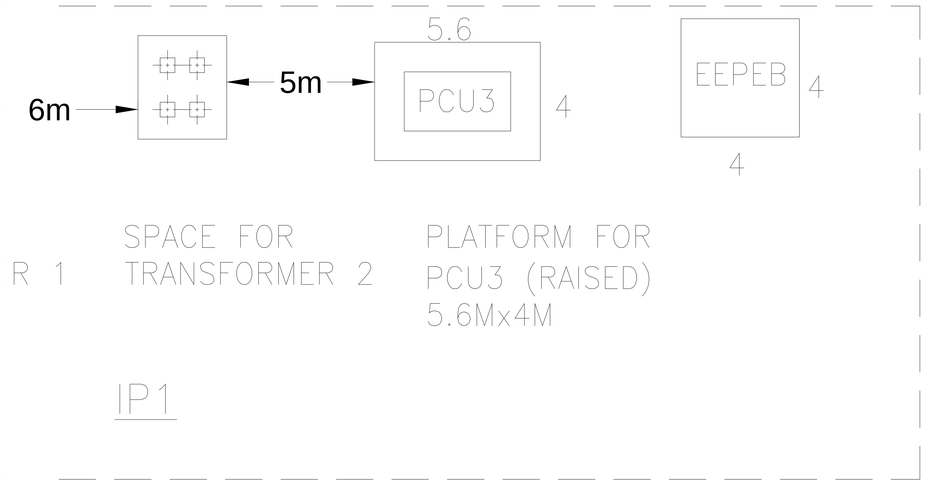
5. Installation Checklist:

- Check the connection of the injection nut with support piece on the connecting float
- Check if the solar panel is aligned to the centre of each connecting float so as to have equal overhang on both sides
- Check if aluminium clamps are tightened properly using the M8 hardware to the panel
- Check if aluminium clamps are tightened properly using the M8 hardware with the float
- Check that all interconnection ears are connected as per this manual
- Check the correct tightening of the M12 hardware at each interconnecting point
- Check the if the anchoring / mooring spreader bars are connected as per design to the peripheral floats using interconnection ears
- Check to ensure that the module to module looping of the DC cable and Earthing is done properly before pushing the floats into the water
- Check to ensure the cables are sufficiently spaced above the water by use of cable ties to ensure no damages to the cable
- Check the floats for any damages during assembly before pushing the arrangement into the water

6. Safety Recommendations:

A. It is recommended to always use life jackets while boarding and walking on the floating platform
B. While connecting the floats please ensure to always connect the floats properly before floating into the water
C. During regular maintenance ensure that the connections of the floats are checked for any disparity
D. All cables being used in the solar system must have sufficient slack to prevent damage due to motions and variations in level of water
E. Follow the relevant standards for lighting protection and system earthing
F. All cables used must be water proof as complete contact with water may not be avoided. Having this in mind, please ensure cable management systems are used to provide sufficient distance from water by use of cable ties
G. Cable conduits used to take cables from the floating island to the shore shall be water proof to avoid unnecessary risk during evacuation

H. The floating structure shall not be approached by untrained manpower and shall not be approached without personal safety equipment such as jackets and helmets



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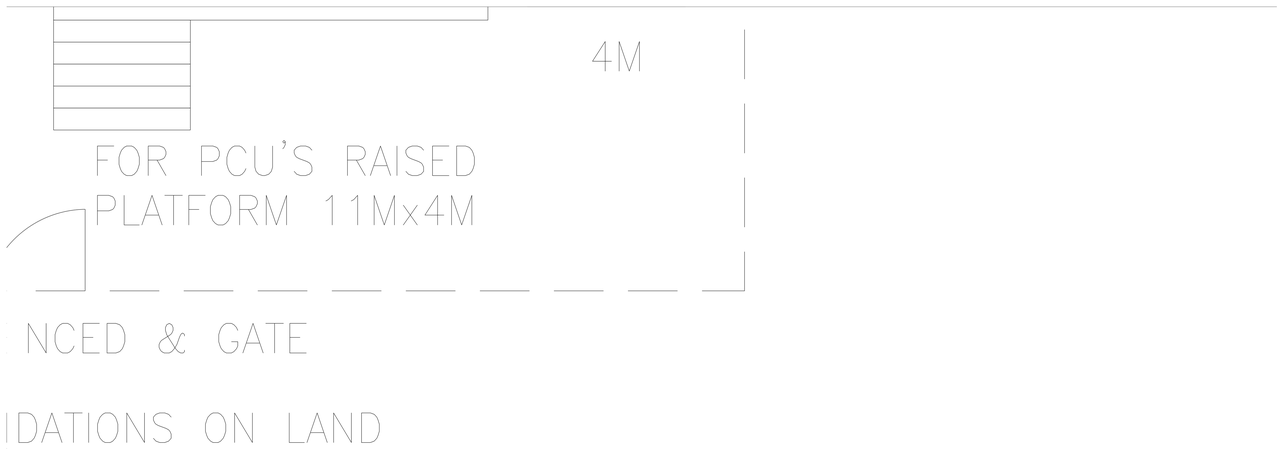

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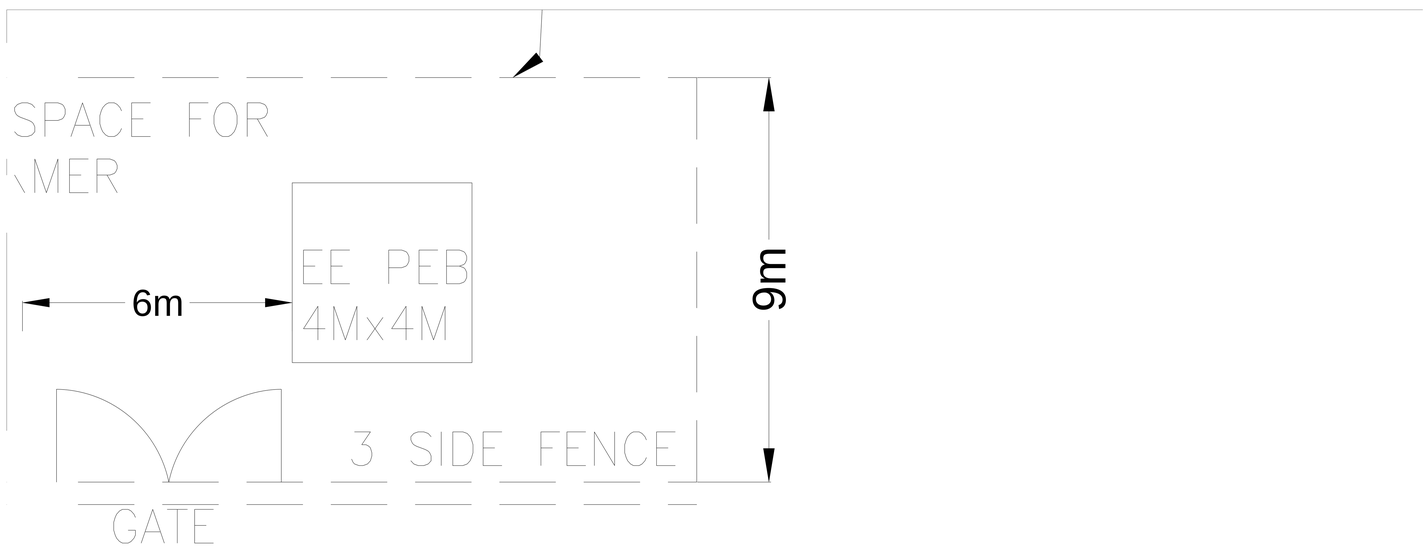

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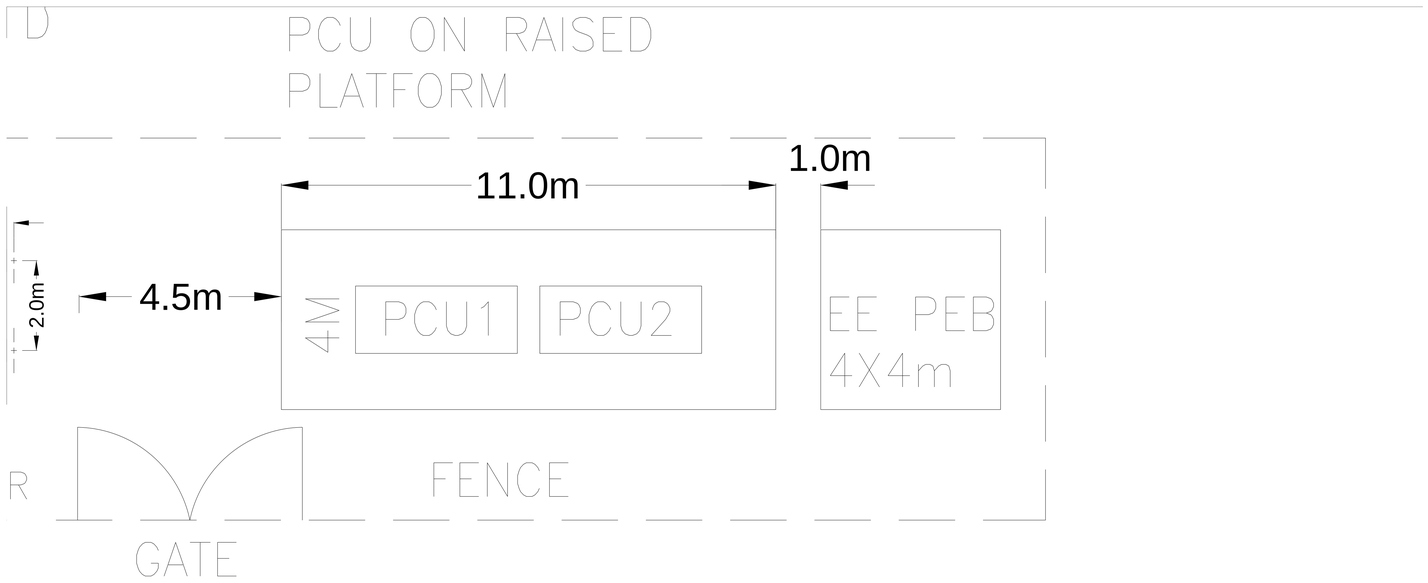

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D-3 GENERAL CIVIL WORKS

1. GENERAL

This chapter covers the Specific technical and functional requirements.

The design calculations and drawings for RCC structure, PEB Inverter Rooms, Steel structure, foundation system, road work, drainage, etc. shall be submitted for prior approval of NTPC before commencement of construction. The construction methodology for road works, drains shall be also be submitted for NTPC approval before start of works.

All design of RCC and Steel structures shall be carried as per IS: 456 and IS 800 respectively and other specific code as applicable to specific structures.

2. CMCS, INVERTER ROOMS, SECURITY ROOM:

The following structures shall be designed and provided by the bidder:

(I) **CMCS Building**: For the operation and maintenance of SPV Plant one Central Monitoring and Control Station (CMCS) with 33 KV switchgear room shall be provided. The CMCS building shall consist of the following:

1. Air conditioned SCADA Room
2. Inverter, battery room, ACDB and 33 KV Switchgear Room,
3. Store Room.
4. Supervisor room.
5. Toilets (Male and female).
6. Pantry.

Inverter(s), battery room, ACDB and 33 KV Switchgear room shall be based on manufacturer recommendation, easy passage of O&M persons and cable trench layout required. The CMCS shall be RCC framed structure with bricks/concrete blocks masonry walls. The CMCS shall have entry lobby and portico with roof for vehicle stoppage.

The minimum size & requirements of the CMCS Building & all items shall be as per tender drawing **5742-004-POC-A-003**.

(II) **Inverter Rooms**: Inverter rooms consist of PCU's, LT panels, batteries, etc. shall be provided based on manufacturer recommendation, easy passage of O&M persons and cable trench layout required. The inverter rooms shall be RCC building.

The battlery and its associated equipment shall be suitably segregated inside the Inverter room with proper ventilation arrangement.

The equipment inside the inverter room shall be placed so as to provide sufficient space for their maintenance.

The layout, design and drawings for all RCC structure, etc. and foundation system shall be approved from NTPC before start of works. The buildings and allied works shall be designed to meet national building code **2005** requirements.

2.1 **Specification for RCC Building for CMCS and Inverter room.**

The CMCS building shall be made of RCC framed structure with bricks/concrete blocks masonry walls. The thickness of outer masonry walls shall be minimum 230mm in case of bricks and minimum 200mm thick in case of concrete blocks. The following detailed specification shall also be followed for RCC works:

2.1.1 **Floor Finishes**

Switchgear/Inverter rooms	: Cement concrete flooring with ironite hardener.
SCADA room	: Heavy duty vitrified ceramic tiles
Battery room	: Acid Alkali resistance tile flooring or acid alkali resistant epoxy coating over concrete flooring with ironite hardener
Lobby	: Heavy duty vitrified ceramic tiles and skirting
Toilet	: Heavy duty anti-skid ceramic Tiles and dodo 210 mm
Steps	: Kota stone/Granite- 20 mm thick
Store room	: Cement concrete flooring with ironite hardener.

Flooring for air conditioned areas area shall be provided with vitrified ceramic tiles of size 600X 600 mm of min 9 mm thickness, laid with 3 mm ground joints as per approved pattern. Cement concrete flooring shall conform to IS 2571.

The floor finish for toilet shall be vitrified ceramic anti-skid tiles and Dado glaze ceramic tiles upto 2.1m shall be used. The normal size of Ceramic tiles shall be 300 mm X 300 mm X 9 mm and shall comply IS: 15622.

Finish floor level of all building shall be minimum 600 mm above from Finish graded level.

2.1.2 **False Celling**

The SCADA room shall be provided with false ceiling of 15 mm thick mineral fiber board, in tile form of size 600mm x 600mm, along with galvanized light gauge rolled form supporting system in double web construction pre painted with steel capping, of approved shade and color, to give grid of maximum size of 1200x600 mm as per manufacturers details including supporting grid system, expansion fasteners for suspension arrangement from RCC, providing openings for AC ducts(if required), return air grills(if required), light fixtures, etc., all complete.

2.1.3 **Roof Finishes**

Roof of the Building shall consist of Cast-in-situ RCC slab with decking sheet (RCC slab with permanent formwork) The slab formwork decking sheet shall be permanently colour coated profile sheet with minimum 0.6mm thickness of grade SS255 as per ASTM A653M / grade G250 as per AS 1397 coated with zinc of class designation Z275 or aluminium zinc alloy of class designation AZ150 or similar. The decking sheet shall meet the strength, deflection and other functional requirements.

Bidder can also provide Roof of the building as Cast-in-situ RCC slab conforming to Indian code.

The roof of the building shall be water proof with Polymeric membrane type waterproofing as per DSR 2013, Items no. 22.16. The roof shall be designed for minimum superimposed load to 150 kg/m2.

For efficient disposal of rainwater, the run off gradient for the roof shall not be less than 1:100 and the roof shall be provided with PVC/RCC water gutter, wherever required. Gutter shall be made water tight using suitable watertight treatment. This gradient can be provided either in structure or subsequently by screed concrete 1:2:4 (using 12.5 mm coarse aggregate) and/or cement mortar (1:4). However, minimum 25 mm thick cement mortar (1:4) shall be provided on top to achieve smooth surface. The roof of all building shall be projecting out by at least 750 mm all around the building for its external walls protection from rain water and parapet wall above the roof beam. Height of parapet wall shall be minimum 300 mm above top of roof level. Structural steel hand railings of minimum 700mm height shall also be provided over the parapet wall.

The bidder shall also provide rain water harvesting system consisting of ground water recharge pits for CMCS building roof.

2.1.4 **View point**

RCC terrace of CMCS building shall also work as view point. View point shall be used for security purposes and viewing gallery. Suitable RCC half landing staircase shall be provided for access to roof of the RCC CMCS building.

2.1.5 **Windows, Doors, Ventilators and Rolling Shutters**

Doors, windows and ventilators of air-conditioned areas, entrance lobby of all buildings, and all windows and ventilators of CMCS building shall have, powder coated (minimum thickness of powder coating 50 micron) aluminum framework with glazing. Window shall be provided with suitable aluminum grill.

All doors of toilet areas shall be of steel framed solid core flush shutter as per IS 2202. Minimum size of door provided shall be 2.1 m high and 1.2 m wide. However, for toilets minimum width shall be 0.75 m and office areas minimum width shall be 1.20 m.

Doors and windows on external walls of the buildings (other than areas provided, with insulated metal claddings) shall be provided with RCC sunshade over the openings with 300 mm projection on both side of the openings. Projection of sunshade from the wall shall be minimum 450 mm over window openings and 750 mm over door openings except for main entrance door to the control room where the projection shall be 1500 mm.

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

2.1.6 **Glazing**

All accessible ventilators and windows of all buildings shall be provided with min. 4mm thick float glass, tinted for preventing solar radiations, unless otherwise specified.

For single glazed aluminium partitions and doors, toughened float glass of 10 mm thickness shall be used. All glazing work shall conform to IS: 1083 and IS: 3548.

The glass to used should be from reputed brand / manufacturer and as approved by NTPC. The glass should be free from distortion and thermal stress.

2.1.7 **Paintings of wall and ceilings**

Internal wall surfaces: SCADA room All other rooms in plant buildings	 -Acrylic Emulsion -Acrylic Distemper
External faces of walls:	-Exterior emulsion paint
Walls of battery room	-Acid alkali resistant paint, an exposed wall above Dado -2100 mm high Dado of acid alkali resistant tiling.
All Ceiling	-Acrylic Distemper

The paint shall be anti-fungal quality of reputed brand suitable for masonry. All painting on masonry or concrete surface shall preferably be applied by roller. If applied by brush, then same shall be finished off with roller. For painting on concrete, masonry and plastered surface, IS: 2395 shall be followed. Minimum 2 finishing coats of paint shall be applied over a coat of primer.

For painting on steel work and ferrous metals, BS: 5493 and IS: 1477 shall be followed. The type of surface preparation, thickness and type of primer, intermediate and finishing paint shall be according to the painting system adopted.

Ceiling of all rooms except Battery room shall be white washed. The ceiling of Battery room (if provided) shall be acid/alkali resistant paint. CMCS building outside colors of paining shall be similar to PEB painting colors.

A standard color scheme for the different buildings/structures shall be prepared by the Contractor and the approval of the Owner shall be obtained, before commencement of work.

2.1.8 **Plumbing and sanitary**

CMCS building room shall have attached toilet for both gender. Each toilet shall have the following minimum fittings of ISI approved of reputed brand (subject to approval from Engineer in charge).

a) Wall mounted WC (Western type) 390 mm high with toilet paper roll holder and all fittings.
b) Wall mounted Urinal (430 x 260 x 350 mm size) with all fittings for male toilet only.
c) Wash basin (550 x 400 mm) above platform with all fittings.
d) Bathroom mirror (600 x 450 x 6 mm thick) hard board backing.
e) CP brass towel rail (600 x 20 mm) with C.P. brass brackets.
f) Soap holder and liquid soap dispenser.

Wash basin provision for hand wash shall also be provided in **battery room**.

All fittings, fastener, grating shall be brass with chromium plated as per relevant IS code. Necessary plumbing lines shall be provided for CMCS room building and Security room near main gate.

The bidder shall design & provide packaged sewerage treatment plant/septic with soak pit for CMCS and Security room assuming that a total of 15 people shall use the facility. The waste water/effluents from the sewerage plants/septic tank shall meet the state pollution board requirement.

2.2 **Water Supply**

GI pipes of Medium quality conforming to IS 1239 (Part I-1990) or CPVC pipes conforming to IS 15778 shall be used for all portable hot and cold water distribution supply and plumbing works.

The Syntax or equivalent make PVC storage water storage tank conforming to IS: 12701 shall be provided over the roof of the CMCS with adequate capacity for 10 No person and 24 hr requirement, complete with all fitting including float valve, stop cock etc. The capacity of the tank shall be minimum 500 liters.

2.3 **Plastering**

All external surfaces shall have 18 mm cement plaster in two coats, under layer 12 mm thick cement plaster 1:5 and finished with a top layer 6 mm thick cement plaster 1:6 (DSR 2013-13.11).

White cement primer shall be used as per manufacturer's recommendation.

At least one coat of plaster shall be applied to interior walls by hand or mechanically, to a total thickness of 12 mm using 1:6, 1 cement and 6 sand. Plastering shall comply to IS: 1542, IS: 1661, IS: 1630. Oil bound washable distemper on smooth surface applied with minimum 2 mm thick Plaster of Paris putty for control room. Plaster of Paris (Gypsum Anhydrous) conforming to IS: 2547 shall be used for plaster of paris punning.

2.4 **Masonry Work**

Brick works shall be using at least class designation 7.5 of approved quality as per IS: 1077, IS: 2212 and IS: 3495. Concrete blocks shall be of minimum compressive strength of 7.5 N/mm2 and shall be of Grade-A as per IS: 2185. Stone masonry work with hard stone in building works, foundation, plinth and drains shall be Coursed Rubble or Random Rubble masonry work with stone of good quality and durability. The masonry surface shall be plastered with minimum 18mm plaster in case of CMCS walls. The stone masonry work shall be in line with IS: 1597, IS: 1122 and IS: 1126.

The cement mortar for all kind of masonry work shall be in the ratio 1 cement and 6 sand by weight.

Bricks/blocks required for masonry work shall be thoroughly soaked in clean water tank for approximately two hours. Brick shall be laid in English bond style. Green masonry work shall be protected from rain. All masonry work shall be kept moist on all the faces for a period of seven days.

Bricks of class designation 50 and 35 may be permitted to have slight distorted & rounded edges provided no difficulty shall arise on this account in laying of uniform courses in non-load bearing structures and shall be subjected to approval of NTPC. Tolerances on dimensions up to +/- 8% shall be permitted. Dimension test to be carried out as per IS code.

The external wall for the building shall be 230 mm thick walls and internal wall 230/115 thick as per requirements. The external wall of CMCS facing the transformer area shall be as per IS: 1646 - Code of practice for fire safety of buildings (general): electrical installations.

Use of fly ash brick for masonry shall be subjected to approval of NTPC.

Suitable damp proof course shall be provided the proportion of cement, sand & aggregate shall be 1:2:4 using 6 mm down stone chips with a water proofing admixtures. The thickness of damp-proof course shall be minimum 40 mm.

2.5 **Reinforced Concrete Structure, Allied Works and Foundation**

All RCC works shall be design mix as per IS: 456-2000. For structural concrete items, Ordinary Portland cement (43 Grade) conforming to IS: 8112 and Fly ash based Portland pozzolana cement conforming to IS: 1489 (Part-1) shall be used for superstructure. Type of cement for sub-structures shall be decided based on the final Soil Investigation report.

Coarse aggregate for concrete shall be crushed stones chemically inert, hard, strong, durable against weathering of limited porosity and free from deleterious materials. It shall be properly graded. It shall meet the requirements of IS: 383.

Sand shall be hard, durable, clean and free from adherent coatings of organic matter and clay balls or pellets. Sand, when used as fine aggregate in concrete shall conform to IS: 383. For plaster, it shall conform to IS: 1542 and for masonry work to IS: 2116

Reinforcement steel shall be of high strength deformed TMT steel bars **with corrosion inhibitors, Corrosion Resistant Steel (CRS) re-bars, Fusion Bonded Epoxy Coated (FBEC) re-bars or Zinc Coasted re-bars** of grade minimum Fe-500 shall conform to IS: 1786. Ductile detailing in accordance with IS: 13920 shall be adopted for superstructure and substructure of all RCC buildings / structures. Dense concrete around reinforcement, provision of thick covers, and addition of corrosion protection with re-bars shall be provided to the RCC structures.

The following minimum grades of concrete for design mix and nominal mix shall be adopted for the type of structures noted against each unless not specified elsewhere.

M 30 - All RCC structural elements above and below ground level, precast concrete, foundation, cable trench, oil pit, Grade Slab, Paving, culverts & road.

M-20 (Equivalent nominal Mix of 1:1.5:3) * - Plain Concrete Cement

The bidder shall carry out the design mix of M-30 grade concrete on priority. The design mix shall be approved from NTPC before start of work.

In case Geotechnical investigations requires any special kind of cement or higher grade of concrete, the same shall be provided.

The foundation system shall be made which transfer loads safely to the soil for the module mounting structures, depending on soil conditions, geographical condition, regional wind speed, bearing capacity, slope stability etc. All foundation system and foundation depth shall be decided based on the approved geotechnical investigation report. No foundation allowed on back filled soil and the foundation depth to reach upto NGL.

All loads shall be considered in line with IS: 875. Seismic loads for design shall be in accordance with IS: 1893 and relevant Standards.

IS: 2502 Code of Practice for Bending and Fixing of Bars for concrete Reinforcement must be complied for reinforcements. IS: 5525 and SP: 34 shall be followed for reinforcement detailing.

A minimum 75 mm thick PCC shall be provided below RCC wherever RCC is laid over the ground. Proper and sufficient formwork/shuttering shall be provided for the required period as per IS: 456.

2.6 **Structural Steel**

All structural steel design shall be carried out as per IS 800. Structural steel shall conform IS 2062, Pipe shall be as per medium/high grade of IS 1161, Chequered plates shall conformed to 3502 and Hollow steel sections for structural use shall conform to IS: 4923.

2.7 **Grouting**

Cement mortar (1:2) grout with non-shrink additives shall be used for grouting below base plate of column. The grout shall be high strength grout having a minimum characteristic compressive strength of min 30 N/mm2 at 28 days.

3.0 **Transformer Yard Civil Works**

Transformer and equipment's foundations shall be founded on piles/isolated spread footings depending on the final geotechnical investigation report.

Transformer foundations shall have its own pit which would cover the area of the transformer and cooler banks, so as to collect any spillage of oil or oil drainage in case of emergency. The oil pit shall be filled with granite stones of 40 mm size uniformly graded.

The bidder can propose soak pit under Transformer or Burnt oil pit at a distance connected to transformer soak pit depending upon oil quantity in Transformers. It shall be sized to accommodate oil volume of the transformer connected to it, without backflow. Gravel filled level under transformer shall be in accordance with FGL outside pit and transformer bottom level.

The area around the transformer and equipment's shall be covered with gravel and galvanized chain link fence of height min 1.8 m with fence posts and gates shall be provided. All fence posts shall be 50X50X6 MS angles spaced at 2.5m c/c distance and all other specification mentioned in Tender drawing **5742-004-POC-A-004** shall be followed. M.S. angle posts shall conform to IS: 2062. The portion of the fence covering towards rail track shall be made of removable type for movement of transformer during erection /removal. In addition, a small gate, 1.2 m wide shall be provided for man entry. The transformer yard fencing work shall conform to CEIG requirements.

Transformer track rails shall conform to IS: 3443. The requirement of fire barrier wall between transformers shall be as per Electricity Rules and IS: 1646 recommendations.

4.0 **Pipe /Cable Racks & Trenches**

Trenches shall be constructed in reinforced cement concrete of M-20 grade of wall thickness min 150 mm. The top of trenches shall be kept at least 100 mm above the gravel level so that rain water does not enter the trench. Trench walls shall not foul with the foundations.

Outdoor Cable Trenches: RCC cable trenches shall be constructed in the switchyard and pre-cast RCC removable covers with lifting arrangement, edge protected with suitable galvanized angle iron designed to withstand self-weight of top slab + concentrated load of 150 kg at center of span on each panel.

Indoor Cable Trenches: RCC indoor cable trenches shall be provided with 50X50X4 mm angles grouted on the top edge of the trench wall for holding minimum 6 mm thick mild steel checkered plate covers (600 mm in length except at ends & bends) conform to IS: 3502 with lifting arrangement. Angle or channels shall also be grouted at distances of 600 mm across the indoor cable trenches to support the checkered plates.

Trench Drainage: The trench bed shall have a slope of approx. 1/500 along the run & 1/250 perpendicular to the run. In case straight length exceeds 30 m, suitable expansion joint shall be provided at appropriate

distances. The expansion joint shall run through vertical wall and base of trench. All expansion joints shall be provided with approved quality PVC water stops. Suitable drainage at lowest point of the trench shall be provided.

5.0 **ROAD AND PATHWAY**

5.1 **Road:** The approach road to the Solar Power Plant shall originate from the main approach road and connect to all Inverter rooms, CMCS building and gates. Approach road shall be 3.0 meter wide with 1meter wide shoulder on both side. Red moorum/brick, minimum 100 mm thick shall be provided for shoulder. The crown of the road shall be minimum 150 mm above FGL. The final finished roads shall have a camber of 1 in 50.

The minimum road section shall be as follows:

1) Topping: Wearing course of premix carpet 20 mm thick.
2) WBM, compacted 75 mm thick (Grade-III).
3) WBM, compacted 100 mm thick (Grade-II).
4) Granular Sub-base, compacted 150mm thick granular sub-base (Gr-I).
5) Sub-grade under road and its shoulders shall be compacted to achieve 95% or more of standard proctor's MDD. CBR value of the sub grade level should be minimum 4%. If actual CBR is less than 4% in a particular stretch then GSB thickness shall be increased suitably.

The methodology of road construction with material specifications shall be in line with IRC/MORTH and shall be submitted for approval before starts of works. Road works shall be carried out as per tender drawing **5742-004-POC-A-002**

6.0 **DRAINAGE SYSTEM:**

Surface drainage system shall be designed considering “maximum hourly rainfall intensity” at the site area considering latest 25 years return period however the minimum value of “maximum hourly rainfall intensity” shall be maintained as 60 mm in the drainage system design. The minimum value of surface run off coefficient shall be considered as 0.6 in the design of drainage system. The drainage system shall be designed as per the IRC specifications and prevailing industry practices. The drainage scheme shall be designed considering the bidder’s plot area and nearby catchment area contributing to the plot drains. Drainage scheme with detention ponds which allows for groundwater recharge & maintains the existing drainage pattern as far as possible is desired. A network of open drains shall be designed & provided to carry surface run off. The drains shall be trapezoidal or rectangle section lined with concrete slabs/brick

masonry/stone masonry/stone slabs. The minimum thickness of these lining shall be 115mm for brick masonry, 75mm thick for concrete slab, 150mm thick for stone masonry and 100mm thick for stone slab.

Grade level shall be fixed with due reference to highest high flood level of the receiving body of water. Laying of Hume pipe shall be in line with IS: 783.

7.0 ELECTRIFICATION OF BUILDING

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

8.0 LIST OF APPLICABLE INDIAN STANDARDS:

Indian codes, and/or standards shall govern, in all the cases wherever they are available. In case of a conflict between such codes and/or standards and the specifications, the stringent provisions shall govern. Such codes and/or standard referred to shall mean the latest revision, amendments/changes adopted and published by the relevant agencies. In case of any further conflict in this matter the same shall be referred to the Engineer-in-charge, whose decision shall be final and binding.

Other internationally acceptable standards shall be accepted, only if, no Indian Standards are existing. However, other standards also will be accepted if the Contractor establishes that the works are meeting the requirements of Indian Standards also.

A brief list of Indian Standards applicable to these works is as below:

General

IS: 875-I	Code of Practice for Design Dead Loads for Building and Structures
IS: 875-II	Code of Practice for Design Imposed Loads for Building and Structures
IS: 875-III	Code of practice for design loads (other than earthquake) for buildings and structures.
IS: 1893	Criteria for earthquake resistant design of structures.
IS: 4326	Code of Practice for earthquake resistant design and construction of buildings

Foundations

IS: 1080	Code of practice for design and construction of shallow foundations in soils (other than raft, ring and shell)
IS: 1904	Code of practice for structural safety of building foundations
IS: 2950	Code of practice for design and construction of raft foundations.
IS: 4091	Code of Practice for Design and Construction of Foundations for Transmission Line Towers and Poles
IS: 6403	Code of Practice for determination of bearing capacity of shallow foundations
IS: 8009	Code of Practice for foundation settlement calculations
IS: 2911	Design & Construction of Pile Foundation - Code of Practice

Concrete Structures

IS: 456	Code of practice for plain and Reinforced concrete
IS: 3370	Code of practice for concrete structures for the storage of liquids.
IS: 3414	Code of Practice for design and installation of joints in buildings
IS: 5525	Recommendation for detailing of reinforced concrete works
IS: 6313	Code of practice for anti-termite measures in buildings
IS: 13920	Ductile detailing of Reinforced Concrete Structures subjected to Seismic forces
IS: 1904	Code of practice for design and construction of foundations in soils general requirements

Steel Structures

IS: 800	Code of practice for use of structural steel in general building construction
IS: 801	Code of practice for use of cold-formed light gauge steel structure members
IS: 802	Code of Practice for use of Structural Steel in over Head Transmission Line Towers.
IS: 806	Code of practice for use of steel tubes in general building construction.
IS: 808	Dimensions for hot rolled steel beam, column channel and angle section
IS: 811	Specification for Cold Formed Light Gauge Structural Steel Sections

IS: 813	Scheme of symbols for welding
IS: 1079	Hot Rolled carbon Steel Sheet and Strip - Specification
IS: 2062	Hot Rolled Medium and High Tensile Structural Steel - Specification
IS: 4923	Hollow steel sections for structural use.
IS 1161	Steel tubes for structural purpose
IS: 2721	Galvanized steel chain link fence fabric - Specification

Painting and Coating

IS: 4736	Hot-dip zinc coatings on mild steel tubes
IS: 4759	Hot-dip zinc coatings on structural steel and other allied products – Specification
IS:1868	Anodic coatings on aluminum and its alloys
IS 2395-I	Painting of Concrete, Masonry and Plaster Surfaces - Code of: Operations and Workmanship
IS 2395-II	Code of practice for painting concrete, masonry and plaster surfaces: Schedule
IS 1477-I	Code of Practice for Painting of Ferrous Metals in Buildings: Pre-treatment
IS:1477-II	Code of practice for painting of ferrous metals in buildings: Painting

Water supply and sanitary

IS: 1239	Mild steel tubes and tubulars and other wrought steel fittings
IS: 1172	Code of basic requirements for water supply, drainage and sanitation
IS: 1742	Code of Practice for building drainage
IS: 2527	Code of practice for fixing rainwater gutters and down pipes for roof drainage.
IS: 15778	Chlorinated polyvinyl chloride pipes for potable hot and cold water distribution supplies
IS: 16088	Chlorinated polyvinyl chloride pipes for automatic sprinkler fire extinguishing system
IS: 10124	Fabricated PVC fittings for potable water supplies
IS: 4985	Un-plasticized PVC pipes for potable water supplies

IS: 13592	Un-plasticized Polyvinyl Chloride (PVC-U) Pipes for Soil and Waste Discharge System Inside and Outside Buildings Including Ventilation and Rainwater System
IS: 12818	Un-plasticized polyvinyl chloride (PVC-U)screen and casing pipes for bore/tubewell
IS: 2470	Code of Practice for installation of septic tanks

Miscellaneous

IS: 1905	Code of Practice for structural use of un-reinforced masonry
IS: 3067	Code of Practice for general design details and preparatory works for damp proofing and water proofing of buildings
SP: 6	Handbook for structural engineers (all parts)
SP: 7	National Building Code of India
SP: 16	Design Aids for reinforced concrete to IS:456
SP: 20	Handbook on masonry design and construction
SP: 22	Explanatory handbook on codes for earthquake engineering
SP: 24	Explanatory handbook on Indian Standard Code of Practice for plain and reinforced concrete
SP: 25	Handbook on causes and prevention of cracks in buildings
SP: 32	Handbook on functional requirements of industrial buildings
SP: 34	Handbook of concrete reinforcement & detailing
IRC: 37	Guidelines for design of flexible pavements
IRC: 42	Guidelines on Road Drainage
IRC: 58	Guidelines for the design of rigid pavements for highways
IRC: 73	Geometric design of roads

GENERAL DESIGN DATA

A. **VICINITY MAP**:

B. **WIND**: Basic wind speed shall as per Cl. 2.0 of Chapter A-2.

C. **SEISMIC** shall be as per IS: 1893 (Part-1)

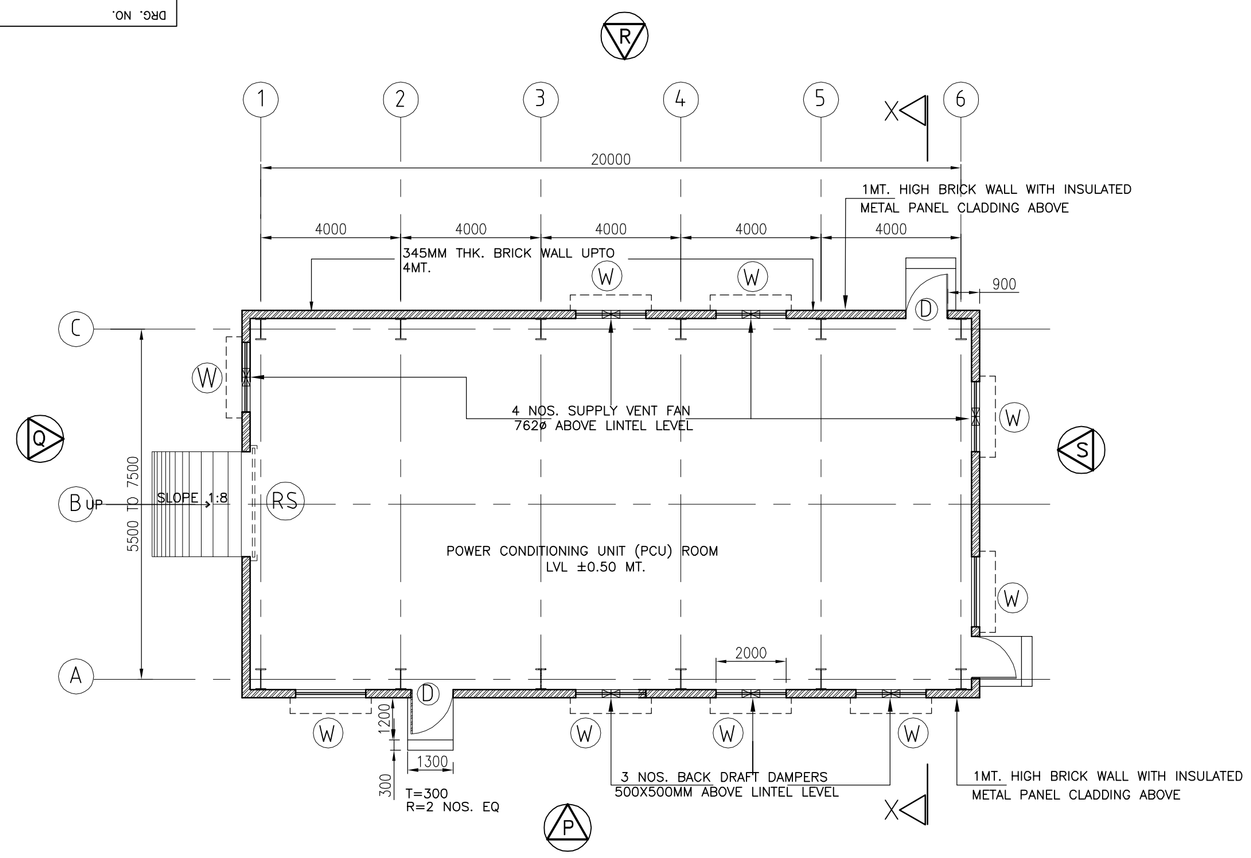
D. The **CMCS building** shall consist of the following with area:

Sl No:	Room	Minimum Area
1	Air conditioned SCADA Room	16 sqm
2	Inverter, battery room, ACDB and 33 KV Switchgear Room	manufacturer recommendation
3	Store Room	25 sqm
4	Supervisor room	12 sqm
5	Toilets (Male and female)	16 sqm
6	Pantry	05 sqm

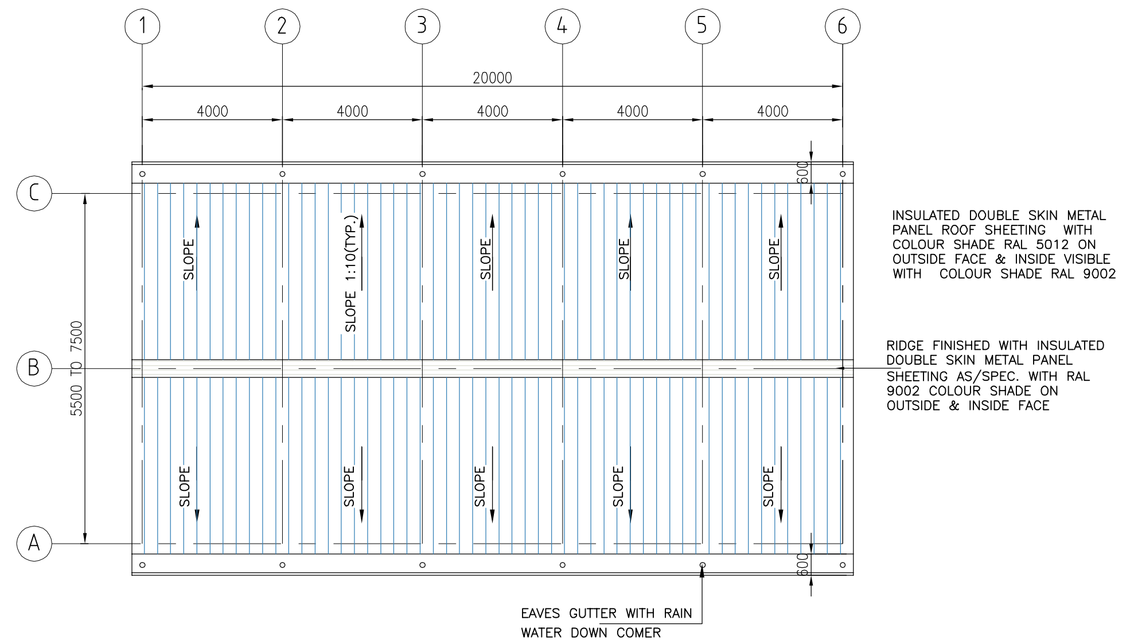
E. ALL BUILDINGS ARE OF RCC.

Rooms: Inverter rooms. All buildings are of **RCC/PEB.**

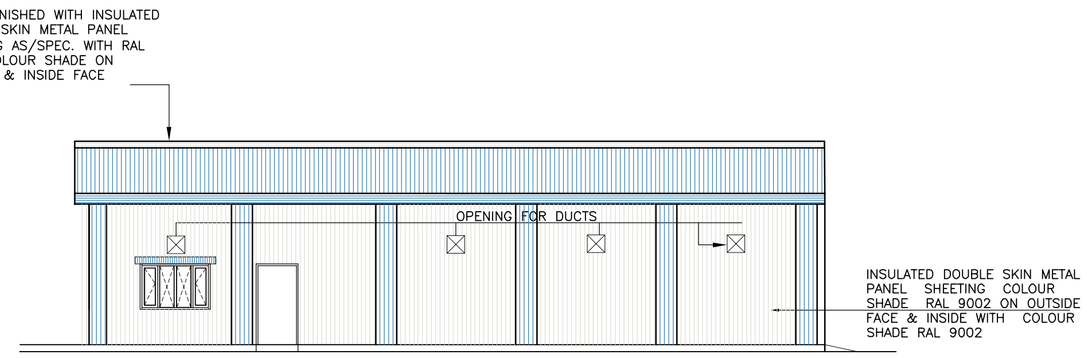
As per NTPC Technical Amendment



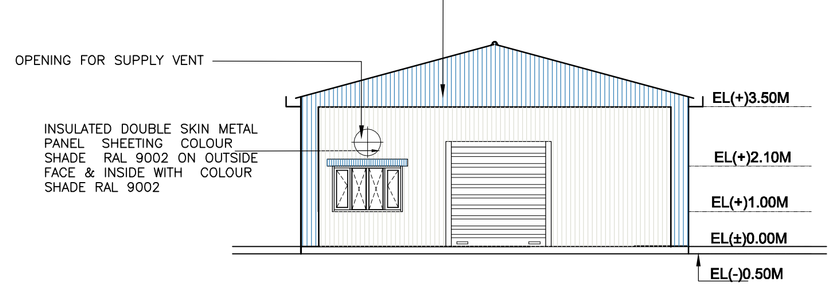
PLAN AT ± 0.0 MTS. LVL.



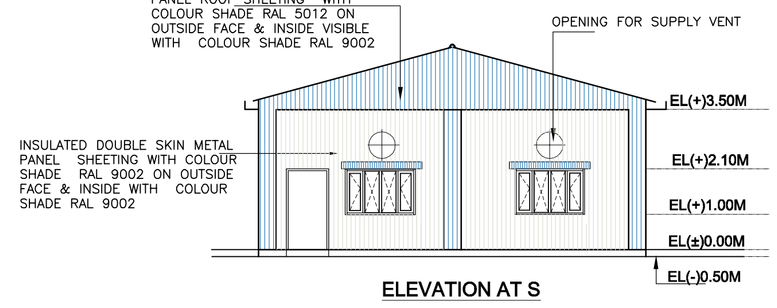
ROOF PLAN



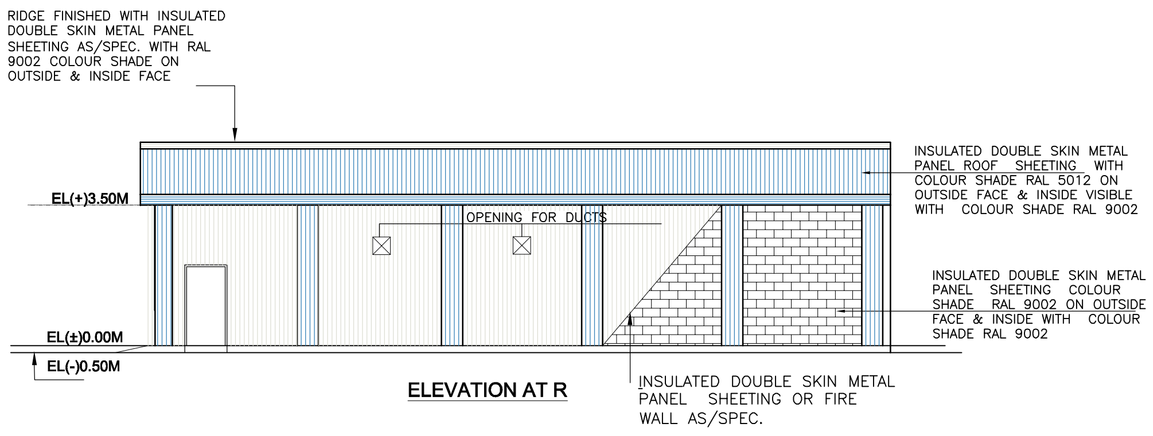
ELEVATION AT P



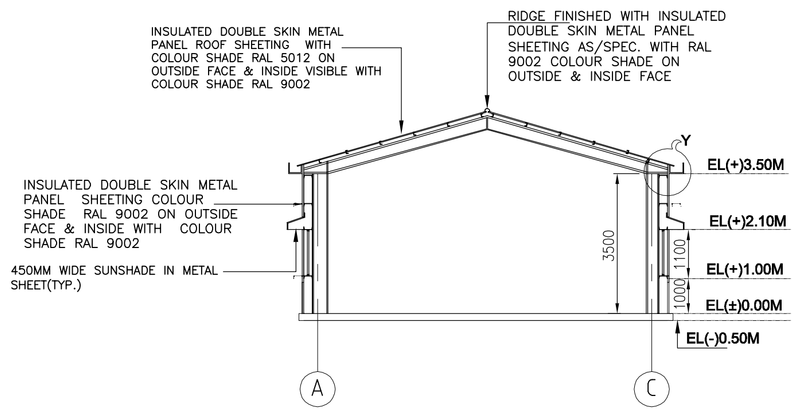
ELEVATION AT Q



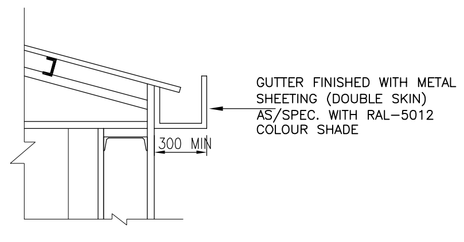
ELEVATION AT S



ELEVATION AT R



SECTION AT X-X



DETAIL AT Y

DOOR/ROLLING SHUTTER/WINDOWS/VENTS/DUCTS

TYPE	SIZE	CILL LVL.	LINTEL LVL.	DESCRIPTION
D	1200X2100	0.00	2100	
RS	**REFER NOTE 5 & 6**	0.00	H	
WINDOWS VENTILATORS DUCTS	**REFER NOTE 5 AND 6.**			

NOTES:-

1. ALL DIMENSIONS ARE IN MM & LEVELS ARE IN METERS.
2. DRAWING SHALL NOT BE SCALED ONLY WRITTEN DIMENSIONS SHALL BE FOLLOWED.
3. ANY DOUBT OR DISCREPANCY IN THE DRAWING SHALL BE BROUGHT TO THE NOTICE OF THE ENGINEER-IN-CHARGE BEFORE EXECUTING THE WORK.
4. WORK SHALL BE CARRIED OUT BASED ON DETAIL WORKING DRAWINGS TO BE PREPARED BY THE VENDOR & GOT APPROVED FROM NTPC, BEFORE EXECUTION.
5. OPENING FOR ROLLING SHUTTER, DUCT'S AND VENTILATOR'S SHALL BE AS PER INVERTER (PCU) MANUFACTURER RECOMMENDATIONS AND VENDOR DESIGN SUBJECT ON NTPC APPROVAL.
6. LOCATIONS OF DOOR, ROLLING SHUTTER, WINDOWS, VENTS & DUCTS ARE INDICATIVE ONLY. VENTILATIONS AND DUCTS SHALL BE DESIGN CONSIDERING HEAT CALCULATION OF PEB ROOM.
7. REFER TECHNICAL SPECIFICATION FOR PEB-INVERTER ROOM IN CIVIL WORKS.

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	GEOTECH	REDG	ELEC.	APPD.	DATE
A		RAM	AT						14.08.18
		CLEARED BY							

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NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)
(ENGINEERING DIVISION)

PROJECT: DEVELOPMENT OF 22MW FLOATING SOLAR AT RGCCPP KAYAMKULAM

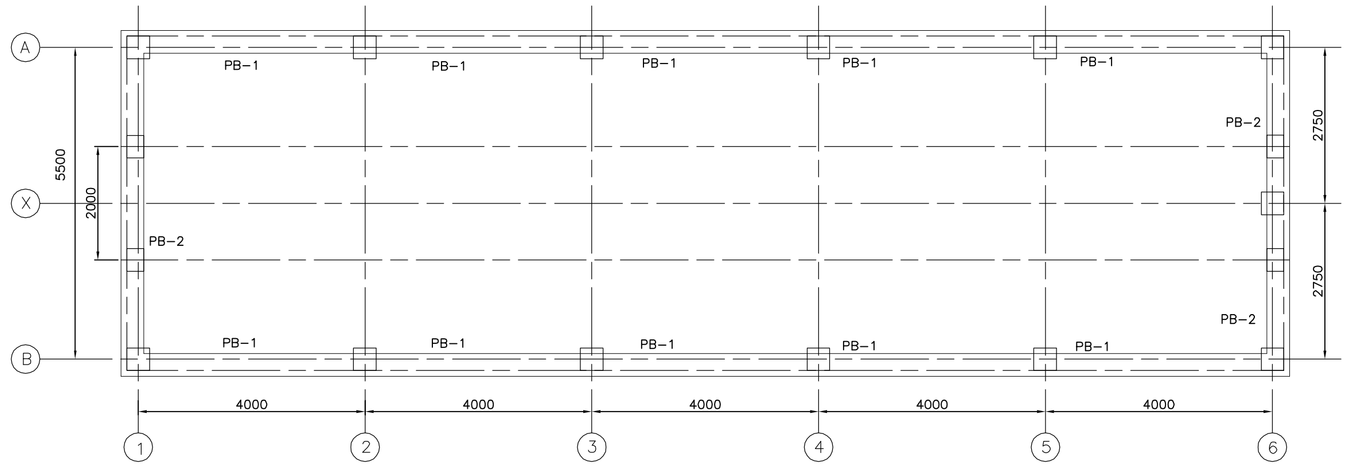
TITLE: PEB INVERTOR ROOM

SIZE	SCALE	DRG. NO.	REV.NO.
		5742-004-POC-A-005	A

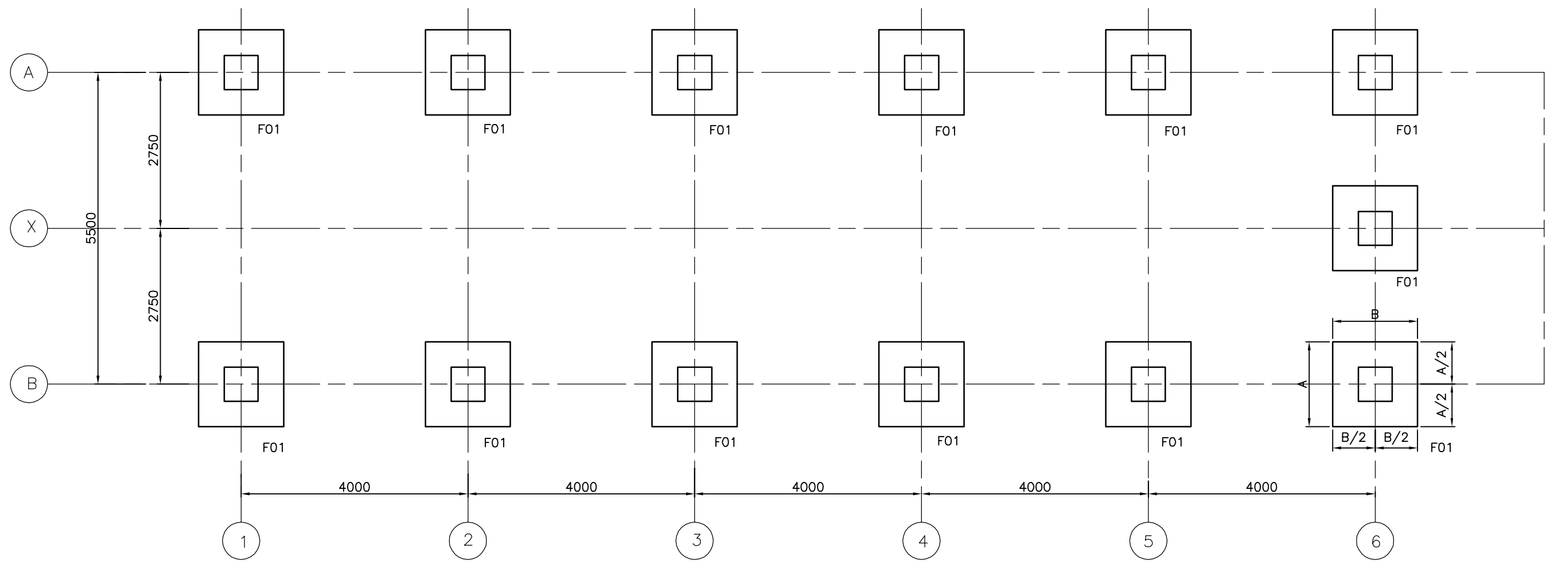
SHEET 1 OF 3

DRG. NO.

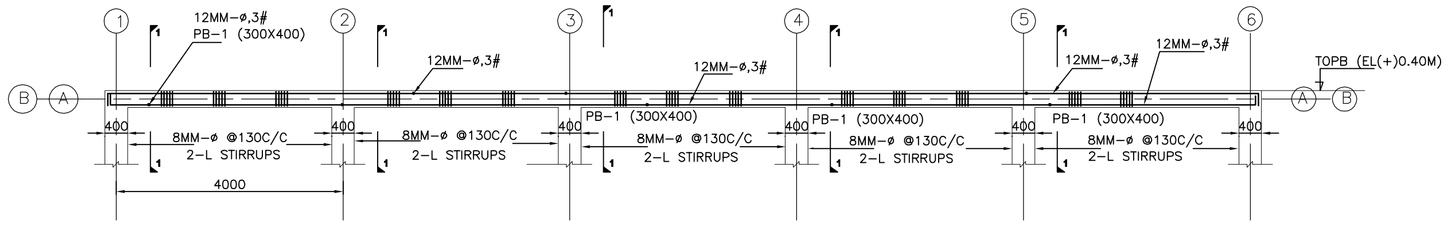
REV. NO.



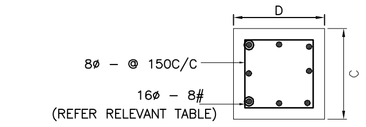
PLINTH BEAM PLAN AT ELEVATION +0.40M



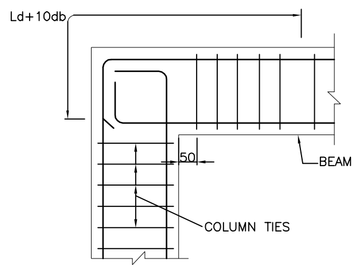
FOUNDATION FOR INVERTER ROOM
AT EL. (- 1.20M)



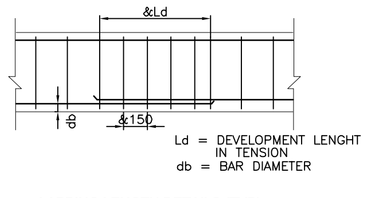
ALONG GRID A & B



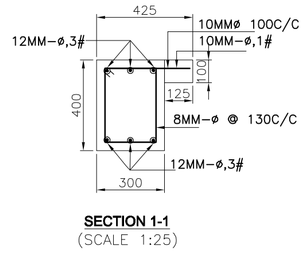
COLUMN
SECTION 2-2



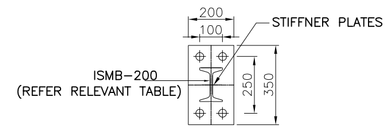
FIXED EAND JOINT IN A COLUMN (TYP)



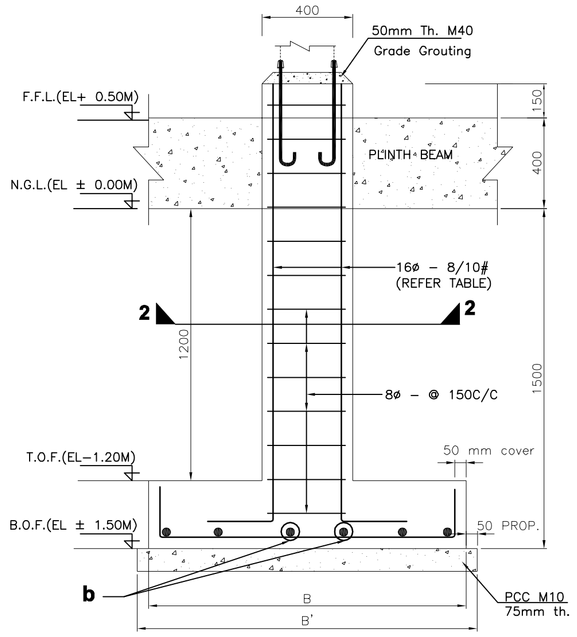
LAPPING LENGTH DETAILS (TYP)



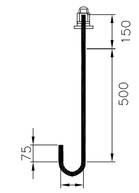
SECTION 1-1
(SCALE 1:25)



BASE PLATE DETAILS
(18ø - HOLE, 4#)



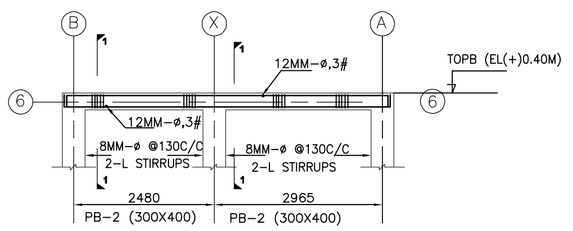
SECTION 1-1
FOUNDATION DETAILS



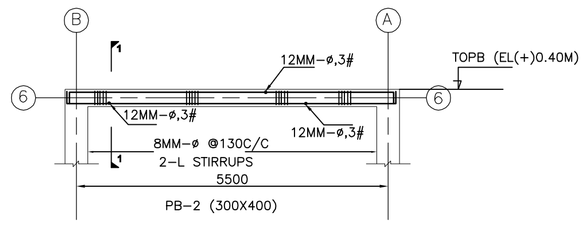
J-BOLT (M16) 4#
HDG MINIMUM 5.6 GRADE
(TYPICAL)

NOTES

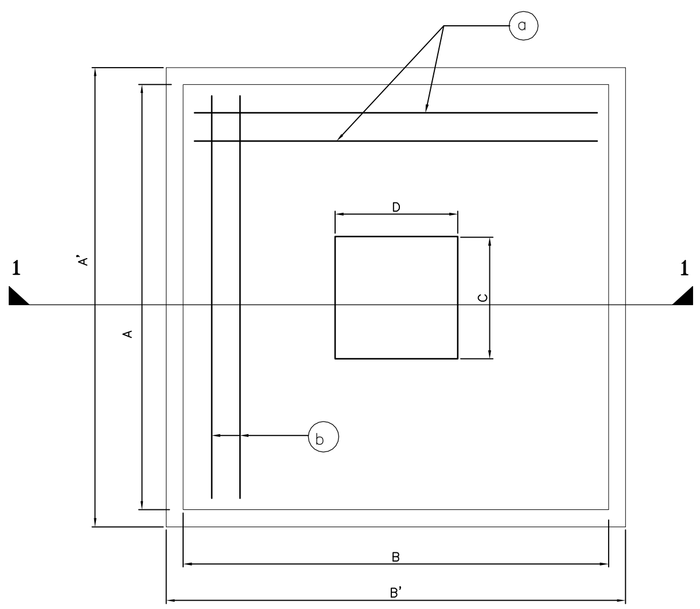
1. ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS OTHERWISE SPECIFIED.
2. GRADE OF CONCRETE SHALL BE M-30 WITH 20mm DOWN GRADED AGGREGATES
3. REINFORCEMENT SHALL BE OF HIGH YIELD STRENGTH DEFORMED BAR OF GRADE Fe500 CONFORMING TO IS:1786
4. MIN CLEAR COVER TO MAIN REINFORCEMENT SHALL BE AS FOLLOWS FOOTING - 50MM , COLUMN - 50MM, PLINTH BEAM-50MM, SLAB-20MM.
5. LAP LENGTH SHALL BE 50D WHERE D IS THE DIA OF THE SMALLER BAR BEING LAPPED
6. LAPPING OF BARS SHALL BE SUITABLY STAGGERED AND IN NO CASE MORE THAN 50% BARS SHALL BE LAPPED AT ANY SECTION.
7. ALL HOOKS, BENDS, LAPS AND SPLICES SHALL BE AS PER RELEVANT IS CODE
8. BIDDER MAY CHOOSE BUILDING SPAN (C/C) FROM 5.5M TO 7.5M. FOUNDATION DETAILS HAVE BEEN MENTIONED FOR DIFFERENT RANGES OF SAFE BEARING CAPICITY(SBC). FOUNDATION COLUMN PEDESTAL, BASE PLATE, REINFORCEMENT DETAILS. SIZES ETC.SHALL BE DECIDED BASED ON TABLE-1 & TABLE-2 CONSIDERING THE SBC AND C/C SPAN. IN CASE OF SBC LESS THEN 5 T/SQM, FOUNDATION SHALL BE DESIGN BY BIDDER CONSIDERING PROJECT SPECIFIC CONDITIONS AND SHALL BE SUBMITTED FOR NTPC APPROVAL.
9. NO FOUNDATION SHALL BE LAID ON BACK FILLED SOIL.
10. IF ROCK IS ENCOUNTERED AT SHALLOW DEPTH THEN FOUNDATION MAY BE PLACED AT TOP OF ROCKY STRATA, HOWEVER IN NO CASE DEPTH OF FOUNDATION SHALL BE LESS THAN 1M. SBC SHALL BE DECIDED BY GEOTECHNICAL INVESTIGATION WORK CARRIED OUT BY CONTRACTOR AND APPROVAL BY NTPC IN GEOTECHNICAL INVESTIGATION REPORT.
11. DRAWING SHALL NOT BE SCALED. ONLY WRITTEN DIMENSION SHALL BE FOLLOWED.
12. PERIPHERAL GARLAND DRAIN SHALL BE MADE ALL AROUND THE PEB INVERTOR ROOMS AND CONNECTED TO NEAR BY DRAINS.
13. 750MM WIDE PLINTH PROTECTION WITH 75MM THK. PCC LAID OVER WELL COMPACTED 75MM DRY BRICK BALLAST ALL AROUND THE PEB ROOM IN LINE WITH TECHNICAL SPECIFICATION.
14. THE FGL OF PEB ROOM SHALL BE MINIMUM 500MM ABOVE SURROUNDING NGL.
15. ALL STRUCTURAL STEEL MEMBERS SHALL BE GALVANISED.THE THICKNESS OF GALVANIZATION SHALL BE IN LINE WITH IS4759. HOWEVER MINIMUM THICKNESS OF GALVANIZATION SHALL BE MAINTAINED AS 85 MICRON FOR ALL MEMBERS.
16. BIDDER SHALL SUBMIT THE DETAILED FABRICATION DRAWING AND PUFF PANAL DETAILS (DEVLOPED BASED ON NTPC TENDER DRAWING AND TECHNICAL SPECIFICATION) FOR NTPC INFORMATION BEFORE START OF WORK. ALL WORKS SHALL BE EXCUTED IN LINE WITH APPROVED DRAWING'S.
15. ALL BRACINGS LIKE BRC-1,BRC-2 SHALL BE CONTINUED IN EVERY ALTERNATE BAY IN CASE THE NO. OF BAYS ARE INCREASED. THE NO OF BAYS MAY BE REDUCED BASED ON BIDDER REQUIREMENT MAINTAINING THE BRACING IN EVERY ALTERNATE BAY. BIDDER SHALL ENSURE THAT THE BRACING IN BOTH THE DIAGONAL DIRECTIONS ARE PORVIDED IN PEB.
18. THE OPENINGS SHOWN IN PEB ARE TENTATIVE VENDOR SHALL FINALIZE THE SAME DURING DETAILED ENGG. BASED ON NTPC APPROVAL. VENTILATIONS AND DUCTS SHALL BE DESIGN CONSIDERING HEAT CALCULATION AND SUBMIT FOR NTPC APPROVAL BEFORE EXECUTION/MANUFACTURING.
19. THE SIZES OF FOUNDATION MENTIONED IN TABLE-1 FOR DIFFERENT RANGES OF SBC ARE MINIMUM SIZE TO BE ADOPTED BY BIDDER.
20. THE SIZES OF STRUCTURAL STEEL MEMBERS IN TABLE-2 ARE MINIMUM SIZES TO BE ADOPTED FOR DIFFERENT RANGES OF SPAN.



PLINTH BEAM ALONG GRID-6



PLINTH BEAM ALONG GRID-1



FOOTING PLAN (TYPE F01)

TABLE -1, PART-A (FOR SPAN S=5.5M)

FOUNDATION REINFORCEMENT SCHEDULE										
S.NO.	SBC (IN T/SQM)	COLUMN	A	A'	B	B'	T	a	b
1	20 < = SBC	F01	1400	1500	1400	1500	300	12ø - @250c/c	12ø - @250c/c
2	10 <=SBC < 20	F01	1800	1900	1800	1900	325	12ø - @250c/c	12ø - @250c/c
3	7 <=SBC < 10	F01	2000	2100	2000	2100	350	12ø - @200c/c	12ø - @200c/c
4	5 <=SBC < 7	F01	2200	2300	2200	2300	375	12ø - @200c/c	12ø - @200c/c

TABLE -1, PART-B (FOR 5.5M < SPAN < = 6.5M)

FOUNDATION REINFORCEMENT SCHEDULE										
S.NO.	SBC (IN T/SQM)	COLUMN	A	A'	B	B'	T	a	b
1	20 < = SBC	F01	1500	1600	1500	1600	325	12ø - @250c/c	12ø - @250c/c
2	10 <=SBC < 20	F01	1900	2000	1900	2000	350	12ø - @250c/c	12ø - @250c/c
3	7 <=SBC < 10	F01	2100	2200	2100	2200	375	12ø - @200c/c	12ø - @200c/c
4	5 <=SBC < 7	F01	2300	2400	2300	2400	400	12ø - @200c/c	12ø - @200c/c

TABLE -1, PART-C (FOR 6.5M < SPAN < = 7.5M)

FOUNDATION REINFORCEMENT SCHEDULE										
S.NO.	SBC (IN T/SQM)	COLUMN	A	A'	B	B'	T	a	b
1	20 < = SBC	F01	1600	1700	1600	1700	350	12ø - @250c/c	12ø - @250c/c
2	10 <=SBC < 20	F01	2000	2100	2000	2100	375	12ø - @250c/c	12ø - @250c/c
3	7 <=SBC < 10	F01	2200	2300	2200	2300	400	12ø - @200c/c	12ø - @200c/c
4	5 <=SBC < 7	F01	2400	2500	2400	2500	400	12ø - @200c/c	12ø - @200c/c

TABLE -2

SPAN (S)	COLOUMN / RAFTER	BASE PLATE SIZE	PEDESTAL SIZE	MAIN RAINFORCEMENT OF PEDESTAL
S = 5.5M	ISMB 200	350X200	400X400	16ø-8NOS
5.5M< S <=6.5M	ISMB 250	400X225	450X400	16ø-8NOS
6.5M< S <= 7.5M	ISMB 300	450X250	500X400	16ø-10NOS

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	GEOTECH	REDG	ELEC.	APPD.	DATE
A		RAVI	AT						14.08.18
			CLEARED BY						

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(ENGINEERING DIVISION)

PROJECT: DEVELOPMENT OF 22MW FLOATING SOLAR AT RGCCPP KAYAMKULAM

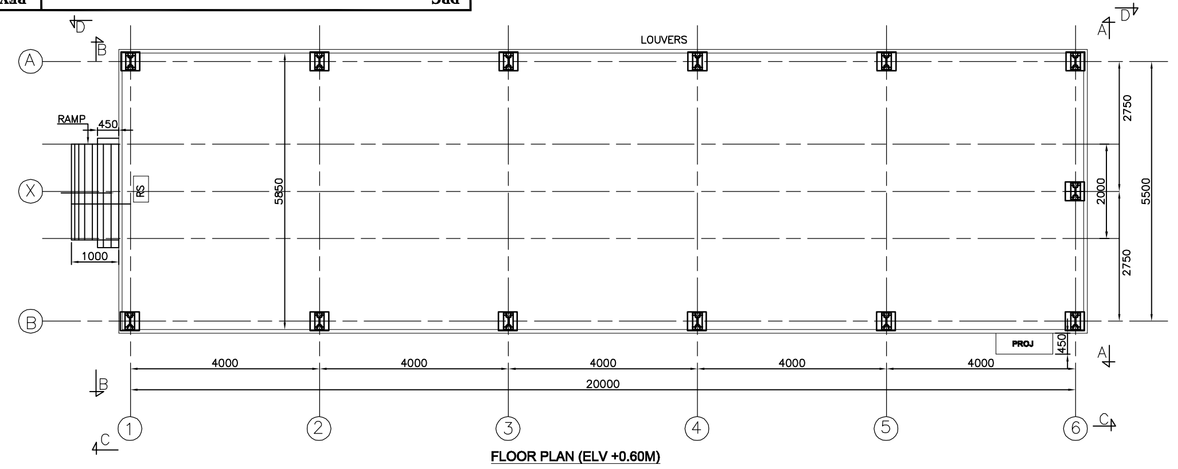
TITLE: PEB INVERTOR ROOM

SIZE | SCALE | DRG. NO. 5742-004-POC-A-005 | REV.NO. A

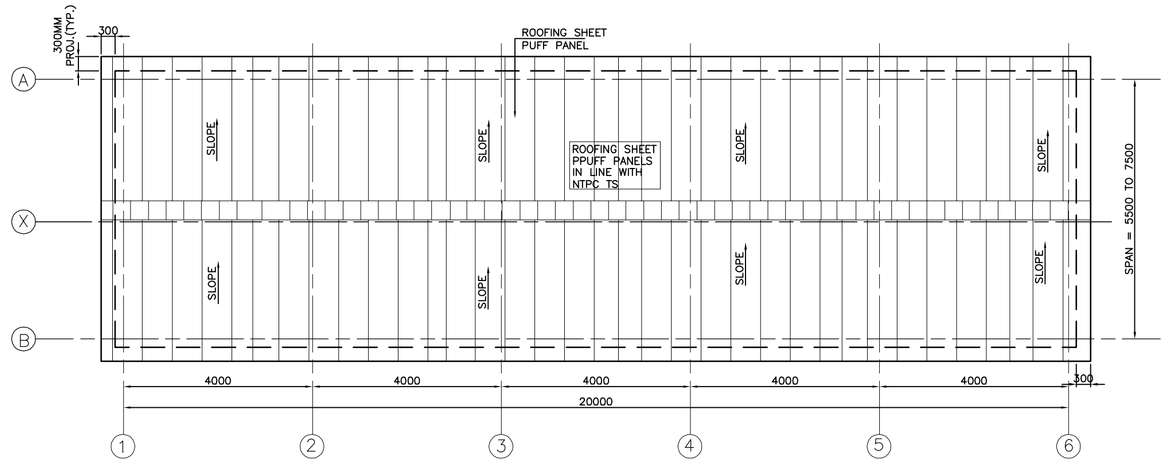
SHEET 2 OF 3

DRG. NO.

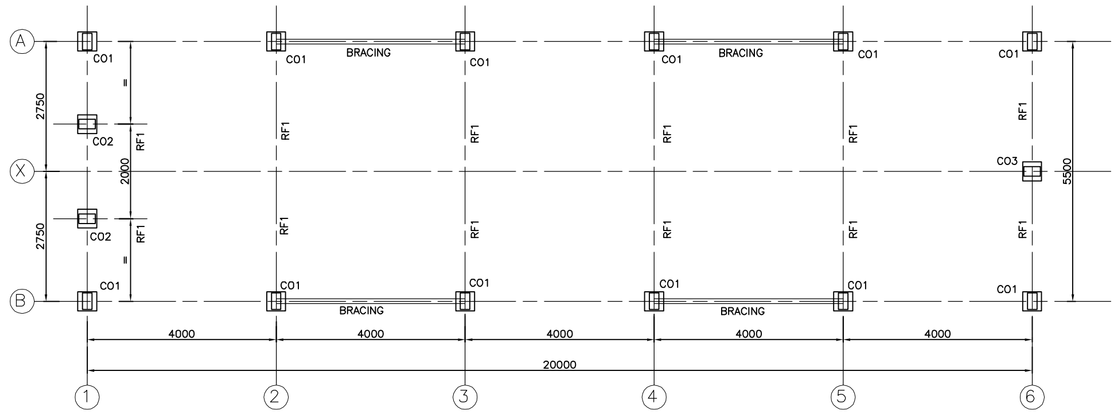
REV. NO.



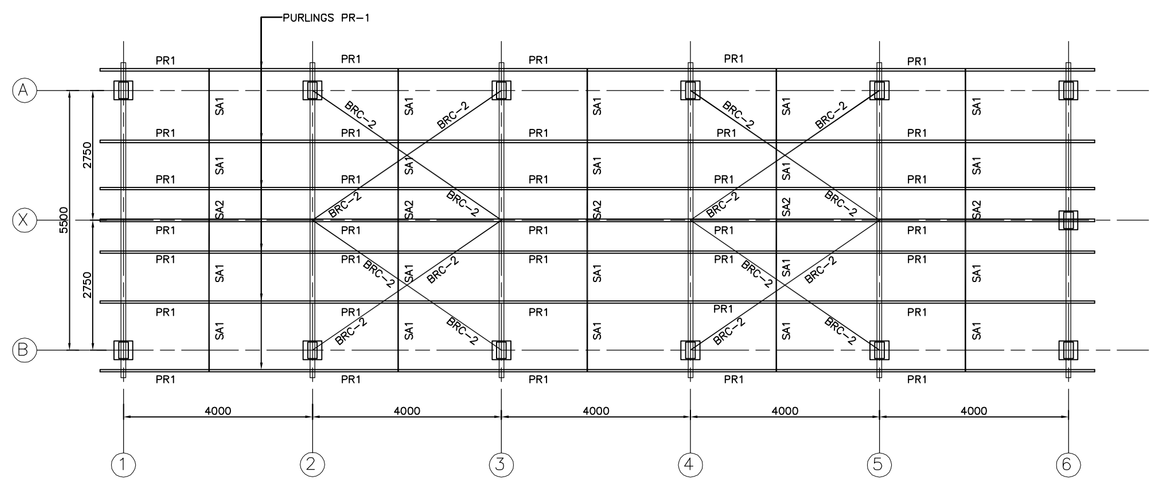
FLOOR PLAN (ELV +0.60M)



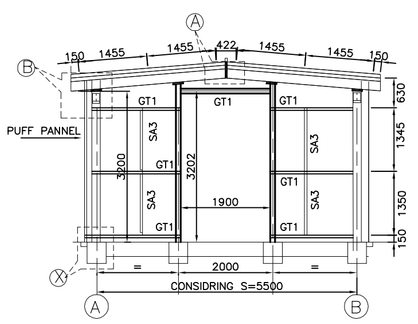
ROOF PLAN



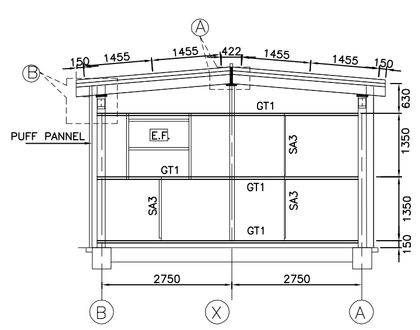
SIDE BRACING PLAN



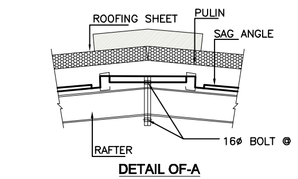
PURLINGS PLANS & TOP BRACING PLAN



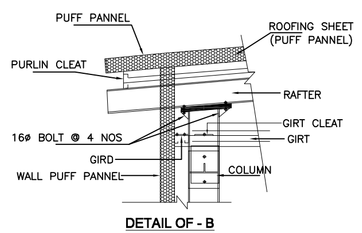
GABLE END ELEVATION ALONG GRID-1



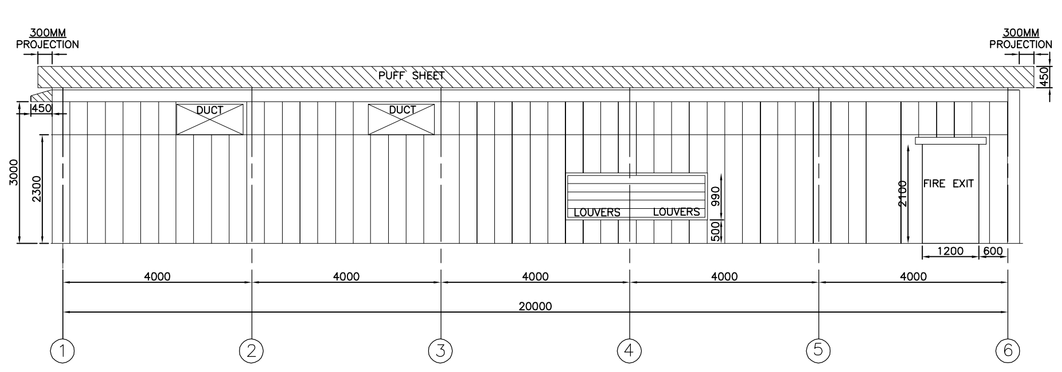
GABLE END ELEVATION ALONG GRID-6



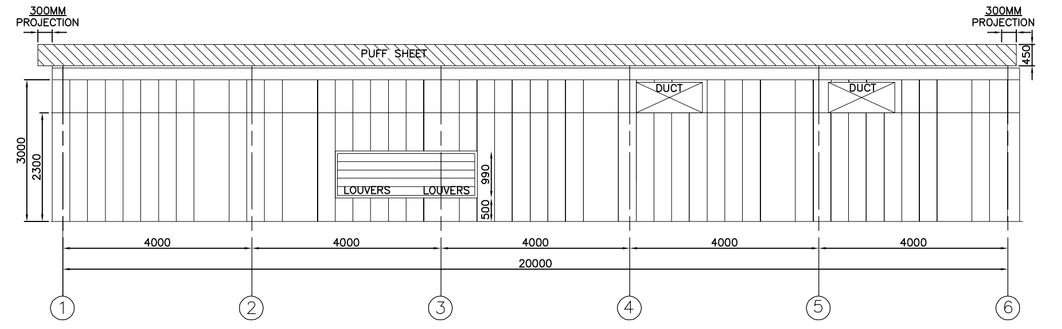
DETAIL OF-A



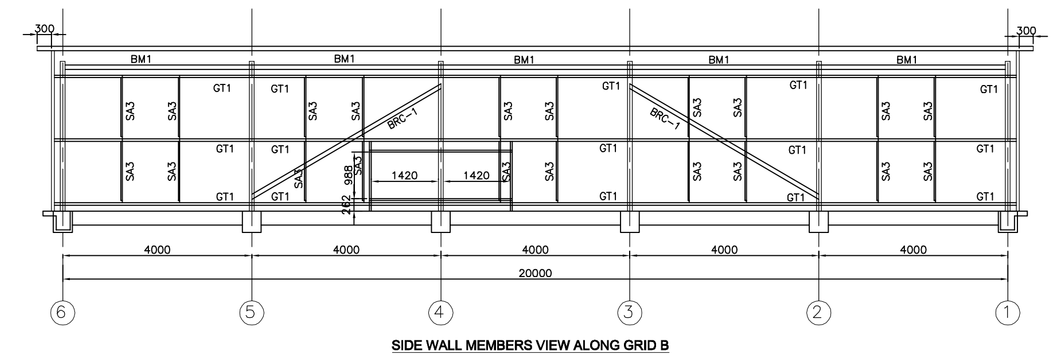
DETAIL OF - B



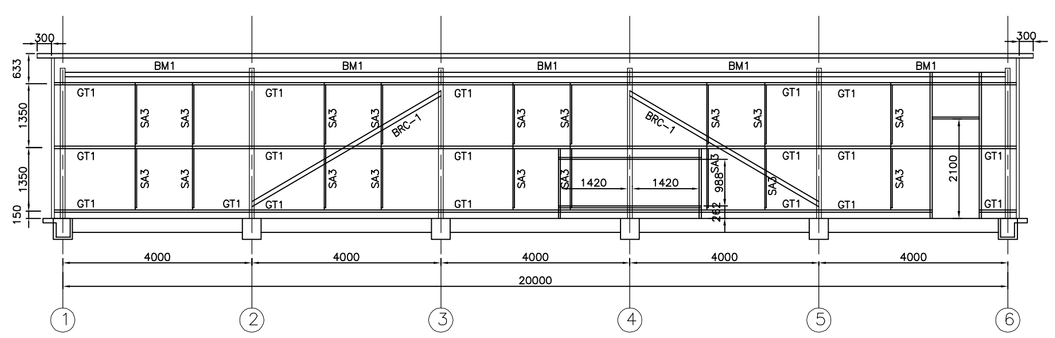
SIDE WALL ELEVATION ALONG GRID-B



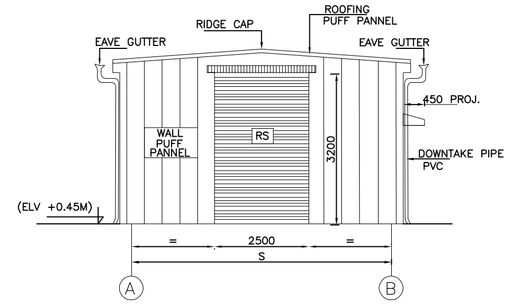
SIDE WALL ELEVATION ALONG GRID-A



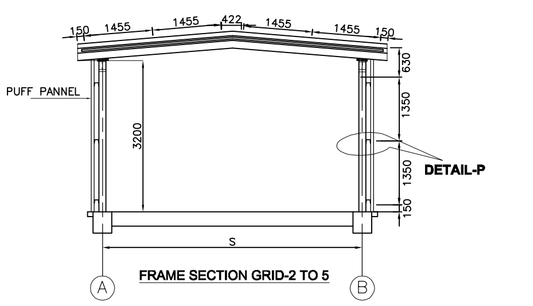
SIDE WALL MEMBERS VIEW ALONG GRID B



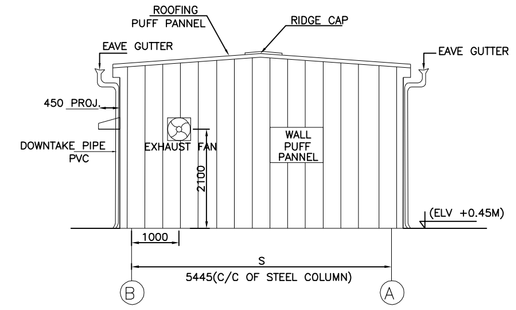
SIDE WALL MEMBERS VIEW ALONG GRID A



GABLE END ELEVATION ALONG GRID-1



FRAME SECTION GRID-2 TO 5



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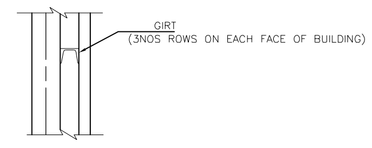
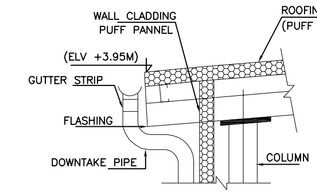
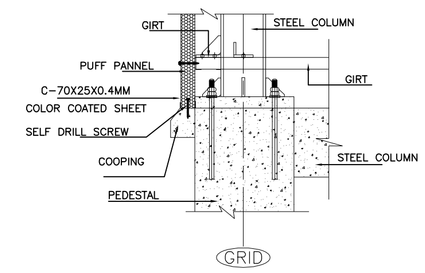


DETAIL-P



DETAIL OF - B



DETAILS OF -X
FLOOR & PUFF PANEL CONNECTION DETAIL

TENTATIVE DETAIL OF OPENING

R.S.	ROLLING SHUTTER	1900X3200	1. NOS
F.E.	DOOR	1200X2100	1. NOS
E.F..	EXHUAST FAN	1500X3000	3. NOS
	LOUVERS	3000X970	2. NOS

TABLE -2, BILL OF MATERIAL

S.NO.	PART MARK	DESCRIPTION	SPAN (S)			SHAPE	MATERIAL SPECIFICATION	GRADE OF MATERIAL	GALVANIZATION COATING THICKNESS
			S = 5.5M	5.5M< S <=6.5M	6.5M< S <= 7.5M				
1	PR1	C-PURLIN *	100x50x20x3.15	100x50x20x3.15	100x50x20x3.15		COLD FORM	350	AS PER IS 4759
2	GT1	C-GIRT	100x50x20x3.15	100x50x20x3.15	100x50x20x3.15		COLD FORM	350	AS PER IS 4759
3	RF1	RAFTER	ISMB-200	ISMB-250	ISMB-300		HOT ROLLED	250	AS PER IS 4759
4	CO1	COLUMN	ISMB-200	ISMB-250	ISMB-300		HOT ROLLED	250	AS PER IS 4759
5	CO2	COLUMN	ISMB-200	ISMB-250	ISMB-300		HOT ROLLED	250	AS PER IS 4759
6	CO3	COLUMN	ISMB-200	ISMB-250	ISMB-300		HOT ROLLED	250	AS PER IS 4759
7	SP1	STRUT ANGLE	ANGLE-65x65x5	ANGLE-65x65x5	ANGLE-65x65x5		HOT ROLLED	250	AS PER IS 4759
8	BM1	BEAM HEADER	ISMB-150	ISMB-150	ISMB-150		HOT ROLLED	250	AS PER IS 4759
9	SA-1	SAG ANGLE	50X50X3	50X50X3	50X50X3		HOT ROLLED	250	AS PER IS 4759
10	SA-2	SAG ANGLE	50X50X3	50X50X3	50X50X3		HOT ROLLED	250	AS PER IS 4759
11	SA-3	SAG ANGLE	50X50X3	50X50X3	50X50X3		HOT ROLLED	250	AS PER IS 4759
12	BRC-1,BRC-2	STRUT PIPE	89MM (OD)	89MM (OD)	89MM (OD)		HOT ROLLED	250	AS PER IS 4759

* PURLIN SPACING SHALL BE MAINTAINED AS MAXIMUM 1450 MM FOR ALL SIZES OF SPANS.

NOTES

1 ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS OTHERWISE SPECIFIED.
2 GRADE OF CONCRETE SHALL BE M-30 WITH 20mm DOWN GRADED AGGREGATES
3 REINFORCEMENT SHALL BE OF HIGH YIELD STRENGTH DEFORMED BAR OF GRADE Fe500 CONFORMING TO IS:1786
4 MIN CLEAR COVER TO MAIN REINFORCEMENT SHALL BE AS FOLLOWS FOOTING - 50MM , COLUMN - 50MM, PLINTH BEAM-50MM, SLAB-20MM.
5 LAP LENGTH SHALL BE 50D WHERE D IS THE DIA OF THE SMALLER BAR BEING LAPPED
6 LAPPING OF BARS SHALL BE SUITABLY STAGGERED AND IN NO CASE MORE THAN 50% BARS SHALL BE LAPPED AT ANY SECTION.
7 ALL HOOKS, BENDS, LAPS AND SPLICES SHALL BE AS PER RELEVANT IS CODE
8 BIDDER MAY CHOOSE BUILDING SPAN (C/C) FROM 5.5M TO 7.5M. FOUNDATION DETAILS HAVE BEEN MENTIONED FOR DIFFERENT RANGES OF SAFE BEARING CAPICITY(SBC). FOUNDATION COLUMN PEDESTAL, BASE PLATE, REINFORCEMENT DETAILS. SIZES ETC.SHALL BE DECIDED BASED ON TABLE-1 & TABLE-2 CONSIDERING THE SBC AND C/C SPAN. IN CASE OF SBC LESS THEN 5 T/SQM, FOUNDATION SHALL BE DESIGN BY BIDDER CONSIDERING PROJECT SPECIFIC CONDITIONS AND SHALL BE SUBMITTED FOR NTPC APPROVAL.
9 NO FOUNDATION SHALL BE LAID ON BACK FILLED SOIL.
10 IF ROCK IS ENCOUNTERED AT SHALLOW DEPTH THEN FOUNDATION MAY BE PLACED AT TOP OF ROCKY STRATA, HOWEVER IN NO CASE DEPTH OF FOUNDATION SHALL BE LESS THAN 1M. SBC SHALL BE DECIDED BY GEOTECHNICAL INVESTIGATION WORK CARRIED OUT BY CONTRACTOR AND APPROVAL BY NTPC IN GEOTECHNICAL INVESTIGATION REPORT.
11 DRAWING SHALL NOT BE SCALED. ONLY WRITTEN DIMENSION SHALL BE FOLLOWED.
12 PERIPHERAL GARLAND DRAIN SHALL BE MADE ALL AROUND THE PEB INVERTOR ROOMS AND CONNECTED TO NEAR BY DRAINS.
13 750MM WIDE PLINTH PROTECTION WITH 75MM THK. PCC LAID OVER WELL COMPACTED 75MM DRY BRICK BALLAST ALL AROUND THE PEB ROOM IN LINE WITH TECHNICAL SPECIFICATION.
14 THE FGL OF PEB ROOM SHALL BE MINIMUM 500MM ABOVE SURROUNDING NGL.
15 ALL STRUCTURAL STEEL MEMBERS SHALL BE GALVANISED.THE THICKNESS OF GALVANIZATION SHALL BE IN LINE WITH IS4759. HOWEVER MINIMUM THICKNESS OF GALVANIZATION SHALL BE MAINTAINED AS 85 MICRON FOR ALL MEMBERS.
16 BIDDER SHALL SUBMIT THE DETAILED FABRICATION DRAWING AND PUFF PANAL DETAILS (DEVLOPED BASED ON NTPC TENDER DRAWING AND TECHNICAL SPECIFICATION) FOR NTPC INFORMATION BEFORE START OF WORK. ALL WORKS SHALL BE EXCUTED IN LINE WITH APPROVED DRAWING'S.
15 ALL BRACINGS LIKE BRC-1,BRC-2 SHALL BE CONTINUED IN EVERY ALTERNATE BAY IN CASE THE NO. OF BAYS ARE INCREASED. THE NO OF BAYS MAY BE REDUCED BASED ON BIDDER REQUIREMENT MAINTAINING THE BRACING IN EVERY ALTERNATE BAY. BIDDER SHALL ENSURE THAT THE BRACING IN BOTH THE DIAGONAL DIRECTIONS ARE PORVIDED IN PEB.
18 THE OPENINGS SHOWN IN PEB ARE TENTATIVE. VENDOR SHALL FINALIZE THE SAME DURING DETAILED ENGG. BASED ON NTPC APPROVAL. VENTILATIONS AND DUCTS SHALL BE DESIGN CONSIDERING HEAT CALCULATION AND SUBMIT FOR NTPC APPROVAL BEFORE EXECUTION/MANUFACTURING.
19 THE SIZES OF FOUNDATION MENTIONED IN TABLE-1 FOR DIFFERENT RANGES OF SBC ARE MINIMUM SIZE TO BE ADOPTED BY BIDDER.
20 THE SIZES OF STRUCTURAL STEEL MEMBERS IN TABLE-2 ARE MINIMUM SIZES TO BE ADOPTED FOR DIFFERENT RANGES OF SPAN.

एन टी पी सी लिमिटेड
NTPC Limited
(A GOVERNMENT OF INDIA ENTERPRISE)
(ENGINEERING DIVISION)

PROJECT: DEVELOPMENT OF 22MW FLOATING SOLAR AT RGCCPP KAYAMKULAM

TITLE: PEB INVERTOR ROOM

REV.NO.	DESCRIPTION	DRAWN	DESIGN	CHKD.	GEOTECH	REDG	ELEC.	APPD.	DATE
A		RAVI	AT						14.08.18
			CLEARED BY						

SIZE | SCALE | DRG. NO. 5742-004-POC-A-005 | REV.NO. A
SHEET 3 OF 3

SAFETY PLAN

PROJECT- 22 MW FLOATING SOLAR PV PROJECT
NTPC, KAYAMKULAM

Doc ref. No.: BHEL:NTPCKYM:HSE:01 Rev. 00 Dated 12.03.2020

Rev. 01 dated 19.05.2020

PREPARED BY:

PV SYSTEM ENGINEERING

AND

HSE DEPARTMENT

BHEL EDN BANGALORE

HSE POLICY

In BHEL, Health, Safety and Environment (HSE) responsibilities are driven by our commitment to protect our employees and people we work with, community and environment. BHEL believes in zero tolerance for unsafe work/non-conformance to safety and in minimizing environmental footprint associated with all its business activities. We commit to continually improve our HSE performance by:

- Developing safety and sustainability culture through active leadership and by ensuring availability of required resources.
- Ensuring compliance with applicable legislation, regulations and BHEL systems.
- Taking up activities for conservation of resources and adopting sound waste management by following Reduce/Recycle/Reuse approach.
- Continually identifying, assessing and managing environmental impacts and Occupational Health & Safety risks of all activities, products and services adopting approach based on elimination/ substitution/reduction/control.
- Incorporating appropriate Occupational Health, Safety and Environment criteria into business decisions, design of products & systems and for selection of plants, technologies and services.
- Imparting appropriate structured training to all persons at workplace and promoting awareness amongst customers, contractors and suppliers on HSE issues.
- Reviewing periodically this policy and HSE Management Systems to ensure its relevance, appropriateness and effectiveness.
- Communicating this policy within BHEL and making it available to interested parties.

Atul Sobti
Chairman & Managing Director

June 5, 2018

Creating BHEL of tomorrow

BHARAT HEAVY ELECTRICALS LIMITED

TABLE OF CONTENTS

1.0 INTRODUCTION

The purpose of this Safety Plan is to provide for the systematic identification, evaluation, prevention and control of general workplace hazards, specific job hazards, potential hazards and environmental impacts that may arise from foreseeable conditions during execution of the 22 MW Floating Solar Project. This document shall be followed by M/s BHEL, Sub-Contractors & all persons at site at all installation and servicing sites. In case customer specific documents are to be referred, the same will be followed in conjunction with this document.

2.0 APPLICATION

The document is applicable for execution of the 22 MW Floating Solar Project and it is expected that Client and Sub-contractor are committed to the following guidelines:

- Ensure that the Health and Safety of all persons at work site is not adversely affected by the work.
- Ensure protection of environment at the worksite.
- Ensure compliance at all times with the relevant statutory and contractual Safety requirements.
- Provide trained, experienced and competent personnel. Ensure medically fit personnel only are engaged at work.
- Provide and maintain plant, places and systems of work that are safe and without risk to health and the environment.
- Provide all personnel with adequate information, instruction, training and supervision.
- Effectively control, co-ordinate and monitor the activities of all personnel on the Project sites including contractors in respects of Safety.
- Establish effective communication on SAFETY matters with all relevant parties involved in the Project works.
- Ensure that all work planning takes into account all persons that may be affected by the work.
- Ensure fitness testing of all T&Ps. Lifting appliances like cranes, chain pulley blocks etc. are to be certified by competent authority.
- Ensure timely provision of resources to facilitate effective implementation of SAFETY requirements.
- Ensure continual improvements in SAFETY performance
- Ensure conservation of resources and reduction of wastage.
- Capture the data of all incidents including near misses, process deviation etc. Investigate and analyze the same to find out the root cause.
- Ensure timely implementation of correction, corrective action and preventive action.

3.0 TERMINOLOGIES

❖ INCIDENT

Work- related event(s) in which an injury or ill health (regardless of severity) or fatality occurred, or could have occurred.

❖ **NEAR MISS**

An incident where no ill health, injury, damage or other loss occurs, but it had a potential to cause, is referred to as “Near-Miss incident”.

❖ **MAN-HOURWORKED**

The total number of employee hours worked by all employees including subcontractors working in the premises. It includes managerial, supervisory, professional, technical, clerical and other workers including contract labors. Man-hours worked shall be calculated from the payroll or time clock recorded including overtime. When this is not feasible, the same shall be estimated by multiplying the total man-days worked for the period covered by the number of hours worked per day. The total number of workday for a period is the sum of the number of men at work on each day of period. If the daily hours vary from department to department separate estimate shall be made for each department and the result added together.

❖ **FIRST AID CASES**

First aids are not essentially all reportable cases, where the injured person is given medical treatment and discharged immediately for reporting on duty, without counting any lost time. Please refer Format 03 for requirement of items with respect to treatment for First Aid Cases.

❖ **LOST TIME INJURY**

Any work injury which renders the injured person unable to perform his regular job or an alternative restricted work assignment on the next scheduled work day after the day on which the injury occurred.

❖ **MEDICAL CASES**

Medical cases come under non-reportable cases, where owing to illness or other reason the employee was absent from work and seeks Medical treatment.

❖ **TYPE OF INCIDENT / ACCIDENT & THEIR REPORTING:**

The three categories of Incident / accident are as follows:

- **Non-Reportable Cases:**
  An accident, where the injured person is given medical help and discharged for work without counting any lost time.

- **Reportable Cases:**

  In this case the injured person is disabled for 48 hours or more and is not able to perform his duty.

- **Injury Cases:**

  These are covered under the heading of non-reportable cases. In these cases the accident caused injury to the person, but he still continues in his duty.

❖ **TOTAL REPORTABLE FREQUENCY RATE**

Frequency rate is the number of Reportable Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula read as:

$$\frac{\text{Number of Reportable LTI}}{\text{Total Man Hours Worked}} \times 1{,}000{,}000$$

❖ **SEVERITY RATE**

Severity rate is the Number of days lost due to Lost Time Injury (LTI) per one Million Man hours worked. Mathematically, the formula reads as:

$$\frac{\text{Days lost due to LTI}}{\text{Total Man Hours Worked}} \times 1{,}000{,}000$$

❖ **INCIDENCE RATE**

Incidence Rate is the Number of LTI per one thousand manpower deployed.

$$\frac{\text{Number of LTI} \times 1000}{\text{Average number of manpower deployed}}$$

❖ **MANAGEMENT REPRESENTATIVE:** Representative from Project Head

❖ **OCP:** Operation Control Procedures

❖ **PPE:** Personal Protective Equipment

4.0 ROLES & RESPONSIBILITIES

4.1 SAFETY CO-ORDINATOR

- Carry out safety inspection of Work Area, Work Method, Men, Machine & Material, and other tools and tackles. Record observations as per Format 01 on a weekly basis.
- Facilitate inclusion of safety elements into Work Method Statement.
- Highlight the requirements of safety through Tool-box / other meetings.
- Conduct investigation of all accident/dangerous occurrences & recommend appropriate safety measures.
- Advice & co-ordinate for implementation of SAFETY permit systems & OCPs. Convene SAFETY meeting & minute the proceedings for circulation & follow-up action.
- Plan procurement of PPE & Safety devices and inspect their healthiness.
- Facilitate administration of First-Aid
- Facilitate screening of workmen and safety induction.
- Conduct fire drill and facilitate emergency preparedness
- Design campaigns, competitions & other special emphasis programs to promote safety in the workplace.
- Notify site personnel for non-conformance to safety norms observed during site visits / site inspections.
- Recommend to Site In charge for immediate discontinuance of work until rectification, of such situations warranting immediate action in view of imminent danger to life or property or environment.
- To decline acceptance of such PPE / safety equipment that do not conform to specified requirements.
- Encourage raising Near Miss Report on safety along with, improvement initiatives on safety.

4.2 ALL EMPLOYEES

- To adopt safe working practices
- To take corrective action and preventive action in case any non-conformity is observed on product / process / system with respect to Occupational Health, Safety and Environment.
- To report all incidents including near miss to Safety Coordinator.
- In case any particular activity / work has extremely high consequential risk or high environmental impact, the employee shall bring it to the notice of Site In charge before starting the work.

- To ensure that the workers are engaged by the contractor for the job after undergoing induction training.
- To ensure that the persons engaged in his area, follow the safety rules like using appropriate PPEs.
- To get involved in exercises like Job Safety Analysis and Work Permit System.
- To engage licensed electricians for site electrical works.
- To report any incident including near misses or safety lapses immediately to Safety Coordinator
- To support/co-operate with audit team members as & when safety audits are carried out.
- To involve in investigation, if any incident occurs in his work area.
- To participate in safety promotional programmers'.
- To attend the safety committee meeting, if he is a member/invitee
- To ensure that only suitable Tackles & Plants and qualified persons are engaged.

5.0 SUB-CONTRACTOR REPRESENTATIVE AT SITE

- Shall fill-up agreement form for compliance to relevant safety Plan for Site Operations.
- Shall ensure fulfillment of relevant safety requirements of 22 MW floating solar Project and practice very strictly in his area of work in consultation with his concerned engineer and the Safety Coordinator.
- Shall screen all workmen for health and competence requirement before engaging for the job and periodically thereafter as required.
- Shall not engage any employee below 18 years.
- Shall arrange for all necessary PPEs like life jackets, safety helmets, belts, safety shoes, face shield, high visibility vest, hand gloves etc. before starting the job. Shall ensure that no working men/women carry excessive weight more than stipulated in BOCW Rules and Regulations.
- Shall ensure that all Tackles & Plants engaged are tested for fitness and have valid certificates from competent authorities.
- Shall adhere to the instructions laid down in Operation Control Procedures (OCPs Point No 8)
- Shall ensure that person working above 3.3 meter should use Safety Harness tied to a life line/stable structure.
- Shall ensure that materials are not thrown from height. Caution to be exercised to prevent fall of material from height.
- Shall report all incidents (Fatal/Major/Minor/Near Miss) to the Site engineer /Safety Coordinator of the 22 MW floating solar Project.
- Shall ensure that adequate illumination is arranged during all the time.
- Shall ensure that all personnel working under subcontractor are working safely and do not create any Hazard to self and to others.
- Shall ensure display of adequate signage/posters on HSE.
- Shall ensure that mobile phone is not used by workers while working.
- Shall ensure conductance of mock drill, induction training and training on the site.
- Shall ensure good housekeeping.
- Shall ensure adequate valid fire extinguishers are provided at the worksite.

- Shall ensure adequate drinking water at work site
- Shall ensure adequate emergency preparedness.

5.1 DEPLOYMENT OF TOOLS & PLANTS

- As a measure to ensure that machinery, equipment and tools being mobilized to the construction site are fit for purpose and are maintained in safe operating condition and complies with legislative and owner requirement, inspection shall be arranged by in-house competent authority for acceptance as applicable.
- The machinery and equipment to be employed for this purpose shall include but not limited to the following:

o Mobile cranes.
o Side Booms.
o Forklifts.
o Grinding machine.
o Drilling machine.
o Air compressors.
o Welding machine.
o Generator sets.
o Dump Trucks, tractors.
o JCBs,Excavators.
o Hand tools.
o Road Rollers
o Vibration Compacters
o Boring Machine
o Chipping Machines
o Hammer Machines
o Breakers
o Boats
o Floating Machinery

5.2 DEPLOYMENT OF MANPOWER

- As a measure to ensure that manpower being mobilized to the construction site is fit and competent for safe working, screening arrangement shall be made by the sub-contractors to fulfill contractual as well as legislative requirement.
- Examination of medical fitness shall be conducted through qualified medical professional for all workers to be deployed. The Medical Examination reports are maintained by the Safety Coordinator of BHEL.
- Gate pass is linked with medical check-up fitness certificate and compulsory completion of safety induction training. For under water works valid diving certificates are compulsory.

5.3 DEPLOYMENT OF PPEs

The following matrix recommends usage of minimum PPEs against the respective job. The PPEs shall conform to the relevant standards as listed in the reference under clause 3.0 and bear ISI mark. All the PPEs shall be periodically checked for its quality before issue by safety coordinator. The users shall be advised to check the PPEs themselves for any defect before putting on. The defective ones shall be repaired/ replaced. The issuing agency shall maintain register for issue and receipt of PPEs. The Helmets shall have logo or name (abbreviation of agency name permitted) affixed or printed on the front. The body harnesses shall be serial numbered.

Sl.no	Type of work	PPEs (Subject to applicability of process)
1	Concrete, asphalt mixing	Nose mask, hand glove, apron and gum boot
2	Welders/Grinders/ Gas cutters	Welding/face screen, apron, hand gloves. Helmet fitted with welding shield is preferred for welders
3	Stone/ concrete breakers	Safety goggles, hand gloves
4	Electrical Work	Rubber hand glove, Electrical Resistance shoes
5	Insulation Work	Hand gloves
6	Work at height	Double lanyard full body harness, Fall arrestor (specific cases)
7	Grit/Sand blasting	Blast suit, blast helmet, gloves
8	Painting	Plastic gloves, respirator for spray Painting)
9	Work on water for PV floaters, floating system	Life jackets, Rescue Boat with trained rescue team.
10	Work in water for anchoring and mooring system	SCUBA apparatus, Rescue Boat with trained rescue team

Rescue boat with trained and authorized boat operators with rescue team shall be available at site all the time till all persons involved reach the shore.

Besides the PPEs mentioned above, the persons shall use helmet and safety shoe. The visitors shall be issued Helmet and any other PPEs as deemed appropriate for use in the area of work.

❖ **Color Code for Helmets:**

1. Workmen: Yellow.
2. Safety staff: Green.
3. Engg, supervisor, visitor, site in charge: White.

5.4 MEDICAL FACILITIES

➢ **FIRST AID PROVIDER**

- Every injury shall be treated, recorded and reported.
- Refresher course on first aid shall be conducted as necessary.

- List of qualified first aiders and their contact numbers should be displayed at major locations by safety Coordinator.

➢ **FIRST AID BOX**

- First aid facilities shall be provided and maintained.
- The first aid box shall be kept by first aider who shall always be readily available during the working hours of the work place. His name and contact number to be displayed on the box.
- The first aid box shall be distinctly marked with a Red Cross on white background.
- Details of contents of first aid box is given in Format No.02
- Monthly inspection of First Aid Box shall be carried out by the Site In charge as per format no 02.

➢ **HEALTH CHECKUP**

The persons engaged at the site shall undergo health checkup as per the **format no 03** before induction.

a. Height workers
b. Drivers/crane operators/riggers
c. Confined space workers
d. Shot/sandblaster
e. Welding and NDE personnel.
f. Divers for under water activity

➢ **PROVISION OF EMERGENCY VEHICLE**

A vehicle shall be stationed exclusively at workplace to handle emergencies. This shall be by way of tying up with customer's medical centre /local hospitals/ sub-contractors by mutual aid agreement.

6.0 SAFETY TRAINING & AWARENESS

❖ **SAFETY INDUCTION TRAINING**

All persons entering into project site shall be given safety induction training by the Safety Coordinator of 22 MW floating solar Project. In-house induction training subjects shall include but not limited to:

- Briefing of the Project.
- Safety objectives and targets.
- Site safety rules.
- Site safety hazards
- First aid facility.
- Emergency Contact No.
- Accident reporting.
- Fire prevention and emergency response.

- Proper safety wear & gear must be issued to all the workers being registered for the induction.
- They must arrive fully dressed in safety wear & gear to attend the induction.
- Any one failing to conform to this safety wear & gear requirement shall not qualify to attend.
- Risk of Drowning

Each employee shall undergo safety induction training.

❖ **TOOL BOX TALK**

- Tool Box talk shall be conducted by Safety Coordinator to work groups prior to the start of work. The agenda shall consist of the following:
- Details of the job being intended for immediate execution.
- The relevant hazards and risks involved in executing the job and their control and mitigating measures.
- Specific site condition to be considered while executing the job like high temperature, humidity, unfavorable weather etc.
- Risk of drowning while working in water
- Recent non-compliances observed.
- Appreciation of good work done by any person.
- Record of Tool box talk shall be maintained as per format no 06

❖ **TRAINING ON HEIGHT WORK**

Training on height work shall be imparted to all workers working at height by in- house/external faculty. The training shall include following topics:

- Use of PPEs
- Use of fall arrester, life line.
- Safe climbing through monkey ladders.
- Inspection of PPEs.
- Medical fitness requirements.
- Mock drill on rescue at height.

❖ **TRAINING ON WORK IN WATER**

Training on working in water shall be imparted to all workers working in water by in- house/external faculty. The training shall include following topics:

- Use of PPEs
- Risk of drowning
- Inspection of PPEs.
- Medical fitness requirements.
- Mock drill on rescue in case of accidents.

❖ **SAFETY PROMOTION-SIGNAGE, POSTERS**

➢ **Display of safety posters and banners.**

- Site shall arrange appropriate posters, banners, slogans in local/Hindi/, English languages at workplace

➢ **Display of safety signage**

- Appropriate safety signage shall be displayed at the work area to aware workmen and passersby about the work going on and do's and don'ts to be followed.

➢ **Safety awareness program/safety training program**

- Site will arrange safety awareness program periodically on different topics including medical awareness for all personnel working at site.

- Safety Coordinator shall arrange training program based on site condition

7.0 SAFETY COMMUNICATION

❖ **MONTHLY SAFETY REPORTING**

- Safety information of Site shall be reported monthly through Monthly Site safety report (MSR) as per format 04.

- The period of reporting shall be 1st of each calendar month.

8.0 OPERATIONAL CONTROL

Permit applicant shall apply for work permit of particular work activity before starting of the work in the format 13.

8.1 EXCAVATION WORK SAFETY:

Excavation permit shall be taken before the start of the excavation work as per depth limits.

- Avoid damage / personal injury during excavation work at sites.
- Ensure proper barricading by ribbon or Hard barricading of the excavated area.
- Proper side slopes of the excavation as per the type of soil should be maintained.
- Where side slopes cannot be provided due to space constraints before excavation, sheet piling must be done to prevent the collapse of earth.
- As soon as the job is completed, immediate back filling to be done.
- No personnel be allowed within the swing area of mechanical excavator when work is in progress.
- Proper lighting to be arranged when the excavation is carried out at night.
- Excavated earth to be dumped/ stored in a designated place only.
- Surplus earth to be transported and disposed in the authorized area.

- Site safety department to identify all possible hazard areas related to excavation work and ensure control.
- Use proper PPE"s.
- Ensure adequate caution signs are displayed in the area of operation.

8.2 FLOATING WORK SAFETY

Floating work permit shall be taken before the start of any work in water.

- Ensure working with a partner or team when working around or on water. Preferably at least two people need to be in sight of each other at all times.
- Availability of communication devices to be ensured before going to work in water.
- Proper provision for first aid to be ensured.
- The availability of water rescue boat with team shall be ensured.
- Use of suitable personal buoyancy equipment, such as lifejackets shall be ensured.
- All persons who are going to work in water must trained to understand clearly any procedures in place and what action they must take to protect themselves, including in an emergency.

9.0 WORK PERMIT SYSTEM

- The following activities shall come under Work Permit System

a. Height working of 3.3 metre and above

b. Excavation more than 1.5 meter depth

c. Heavy lifting by machinery on land

d. Works of floaters involving activity in water other than shore

- "Safety Procedure for Work Permit System" shall be followed while implementing permit system.
- Permit applicant shall apply for work permit of particular work activity at particular location before starting of the work in the format 13.
- Permit signatory shall check that all the control measures necessary for the activity are in place and issue the permit to the permit holder.
- Permit holder shall implement and maintain all control measures during the period of permit
- He will close the permit after completion of the work. The closed permit shall be archived with safety personnel of site.
- Permission for Works in water shall be permitted after checks related to compliance to wearing PPEs, availability of safety boat

10.0 HOUSEKEEPING

- Proper housekeeping to be maintained at work place and the following are to be taken care of on daily basis.
- All surplus earth and debris are removed/disposed off from the working areas to identified locations.
- Unused/Surplus cables, steel items and steel scrap lying scattered at different places/elevation within the working areas are removed to identified locations.

- All wooden scrap, empty wooden cable drums and other combustible packing materials, shall be removed from workplace to identified locations. Sufficient waste bins shall be provided at different work places for easy collection of scrap/waste. Scrap chute shall be installed to remove scrap from higher location.
- Access and egress (stair case, gangways, ladders etc.) path should be free from all scrap and other hindrances.
- Workmen shall be educated through tool box talk about the importance of housekeeping and encourage not to litter.
- Fabricated steel structures, pipes & piping materials shall be stacked properly.
- No parking of trucks/trolleys, cranes and trailers etc. shall be allowed in the camp, which may obstruct the traffic movement as well as below LT/HT power lines.
- Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas.

11.0 WASTE MANAGEMENT

❖ STORAGE AND COLLECTION

- Different types of rubbish/waste should be collected and stored separately.
- Paper, oily rags, smoking material, flammable, metal pieces should be collected in separate bins with close fitting lids.
- Rubbish should not be left or allowed to accumulate on construction and other workplaces.
- Construction rubbish should not be burnt near working site.

❖ SEGGREGATION

- Earmark the scrap area for different types of waste.
- Store wastes away from building.
- Oil spill absorbed by non-combustible absorbent should be kept in separate bin.
- Clinical and first aid waste stored and incinerated separately.

❖ DISPOSAL

- Sufficient containers and scrap disposal area should be allocated.
- All scrap bin and containers should be conveniently located.
- Provide self-closing containers for flammable/spontaneously combustible material.
- Keep drainage channels free from choking.
- Maintain a schedule for collection and disposal of waste.

12.0 WARNING AND SIGNS

- Appropriate sign to be displayed at scrap storage area
- No toxic, corrosive or flammable substance to be discarded into common sewage system.
- Waste disposal shall be in accordance with best practice.

13.0 EMERGENCY PREPAREDNESS AND RESPONSE (EPR)

❖ **DEFINITION**:

An emergency occurring at site is one that may affect work at site and / or may cause serious injuries, loss of life, extensive damage to property.

❖ **OBJECTIVE:**

This EPR aims at putting into place the system for early identification of the situation, classification and setting into motion action by the concerned Action teams to mitigate the situation and normalize the area.

❖ **NATURE OF EMERGENCIES AT SITE:**

Emergencies during the course of execution of Floating SPV Project is likely from following exigencies:

1. Fire: Fire can take place at site at storage area, DG powerhouse, site offices and other areas at site.

2. Water body related accidents: Drowning, slippage, Fall in water.

3. Medical emergencies: A medical emergency refers to any situation in which a person(s) requires medical intervention. Medical emergencies include complications from medical conditions and work injuries. Having trained staff and effective emergency response procedures will reduce the impact of a medical emergency on the individual and the organization.

❖ **MODE OF OPERATION IN EMERGENCY:**

i. **Raising an Alarm:**

In the event of emergency, the security guard on duty/work supervisor will identify the nature of emergency and raise an alarm.

ii. **Assessment of The Emergency Situation**

Assessing the Emergency situation is to be done primarily by the concerned work supervisor. He assesses the situation and convey information regarding the Emergency situation to BHEL Safety Coordinator and the BHEL Site In-charge and other important persons whose Telephone numbers are given as below, as feel necessary based on assessment of situation:

EMERGENCY CONTACT NOS		
Sr. No.	Name of person Agency	Contact Nos.
1	BHEL Project In-charge	
2	BHEL Safety Coordinator	
3	BHEL site/Area in-charge / Incident Controller	
4	Bhel EPC Vendor In-charge Contact no.	
5	NTPC CISF emergency contact	
6	NTPC Fire Fighting Department Contact	
7	Kayamkulam Fire Fighting Department Contact no.	
8	NTPC Medical Centre Contact	
9	Identified Hospitals Names : with address and no. and approx. distance	
10	BHEL Emergency site vehicle Driver :	

BHEL Site Incharge in consultation with the BHEL Project Incharge will take decision on any additional resources required from outside in handling the situation. Depending on level of emergency, his job will involve co-ordination of rescue and other emergency activities on site and liaison with the respective authorities (Fire services and Hospitals) for assistance in firefighting, hospitalization etc.

iii. **Termination of the Emergency:**

When the conditions causing Emergency are brought under control and residual situation can be tackled by the site's internal resources, Site Incharge will announce termination of emergency situation and inform the project In-charge and concerned NTPC officials.

❖ **EMERGENCY MITIGATION PROCEDURE:**

1. Fire Incident:

- The emergency alarm to be raised by the concern work supervisor/security guard on duty.
- After quick assessment of situation, work supervisor shall communicate to the concern persons.
- The available personnel at site will aid the fire suppression system with the available fire extinguishing equipment
- activating water pumping sets for spraying, as available
- Provide first aid to injured persons, if any
- Suspend all operations at that area of site
-Shut off the main power supply
- Evacuation of all contractors, visitors and motor vehicles on the site to a safe distance from the site at the identified assembly point at site
- Provide access for the special equipment of the Fire Safety to sources of water
- Provide assistance to the personnel of the Fire Safety with the extinguishing of the fire;

2. Water Incident:

- Immediate information about incident to be given to BHEL site In charge and Safety Coordinator by Work Supervisor
- Information to rescue team to point in water and bringing the affected person/s to shore
- Information to BHEL emergency Vehicle for shifting of injured to nearest hospital

3. Medical emergencies:

- Immediate information about incident to be given to BHEL site in charge and Project in charge by Work Supervisor
- First Aid to be given, if possible
- Information to BHEL emergency Vehicle for shifting of injured to nearest hospital

The EPP shall be tested once in two months through Mock drills as per Format No. 14 and 15.

14.0: FIRE SAFETY PROCEDURE

1. Site-in-charge / Safety Coordinator will make periodical review of the site Fire Protection, Prevention Preparedness, Site conditions and available fire protection equipment.

2. A mutual aid agreement with local Fire station for availability of Fire tender shall be made.
3. It is very imperative good contact with Local fire station for availability of Fire tender in case of emergencies, in additional to their own fire equipment.
4. Fire Protection, Prevention and Preparedness Inspections - The Contractor /Sub-Contractor will be required to make frequent fire prevention inspections of his work site and operating facilities. Deficiencies will be corrected at once.
5. Emergency telephone number to be displayed at all important places.

15. CONTROL OF DOCUMENTS

All documents shall be controlled as per safety Procedure for Document Control and on water, in water have maintain required documents, certificates.

16.0 SAFETY INSPECTION

Inspection on safety for different activities being carried out at site shall be done to ensure compliance to safety requirements. Before start the work ensure all required PPEs on water, in water and other working locations.

❖ DAILY SAFETY CHECKS

Site Supervisors or safety Supervisors of BHEL's subcontractors are to conduct daily site safety inspection around work activities and premises to ensure that work methods and the sites are maintained to the acceptable standard.

❖ INSPECTION OF PPE

- PPEs shall be inspected by Safety Coordinator at random once in a week as per **Format no 07 for** its compliance to standard and compliance to use and any adverse observation shall be recorded in the PPE register.
- The applicable PPEs for carrying out particular activities are listed below.
- The IS standard to be complied to, for different PPEs, is given as follows:

RELEVANT IS-CODES FOR PERSONAL PROTECTION

IS: 2925 – 1984	Industrial Safety Helmets.
IS: 4770 – 1968	Rubber gloves for electrical purposes.
IS: 5557 – 1969	Industrial and Safety rubber knee boots.
IS: 5983 – 1978	Eye protectors.
IS: 9167 – 1979	Ear protectors.
IS: 3521 – 1983	Industrial Safety Belts and Harness
IROS (or MMD)	Life jackets/Vests

❖ INSPECTION OF TOOLS & PLANTS

- A master list of Tools & Plants shall be maintained by each subcontractor.
- All Tools & Plants being used at site shall be inspected by Safety Coordinator once in a month as per Format no 08 for its healthiness and maintenance.
- The Tools & Plants which require third party inspection shall be checked for its validity during inspection.
- The certificate of Tools & Plants shall be monitored as per Format no 09

❖ INSPECTION OF CRANES AND WINCHES

- Cranes and winches shall be inspected by the operator through a daily checklist for its safe condition (as provided by the equipment manufacturer) before first use of the day.
- Cranes and Winches shall be inspected by Safety Coordinator once in a month as per Format no 10 for healthiness, maintenance and validity of third party inspection and SWL shall be displayed.
- The date of third party inspection and next due date shall be painted on cranes and winches.

❖ INSPECTION ON HEIGHT WORKING (ONLY FOR CMCS AS APPLICABLE)

- Inspection on height working shall be conducted by Safety representative of Construction agency before start of work to ensure safe working condition including provision of
    - o Safety Harness
    - o Fencing and barricading
    - o Warning signage
    - o Covering of opening
    - o Proper scaffolding with access and egress.
    - o Illumination
- Inspection on height working shall be conducted once in a week by Safety Coordinator as per format no 11
- Height working shall not be allowed during adverse weather.

❖ INSPECTION ON ELECTRICAL INSTALLATION /APPLIANCES

- Ensure proper earthing in electrical installation. Verify values per month.
- Use ELCB with 30 mille amps sensitivity at electrical booth.
- Electrical installation shall be properly covered at top where required
- Use appropriate PPEs while working
- Use portable electrical light < 24 V in confined space and potentially wet area.
- Monthly inspection shall be carried out for all ELCBs/RCCBs.

17. 0 MONTHLY SAFETY REVIEW MEETING

- Site shall hold SAFETY review meeting every month to discuss and resolve SAFETY issues of site and improve SAFETY performance. It will also discuss the incidents occurred since previous meeting its root cause and corrective action and preventive action.

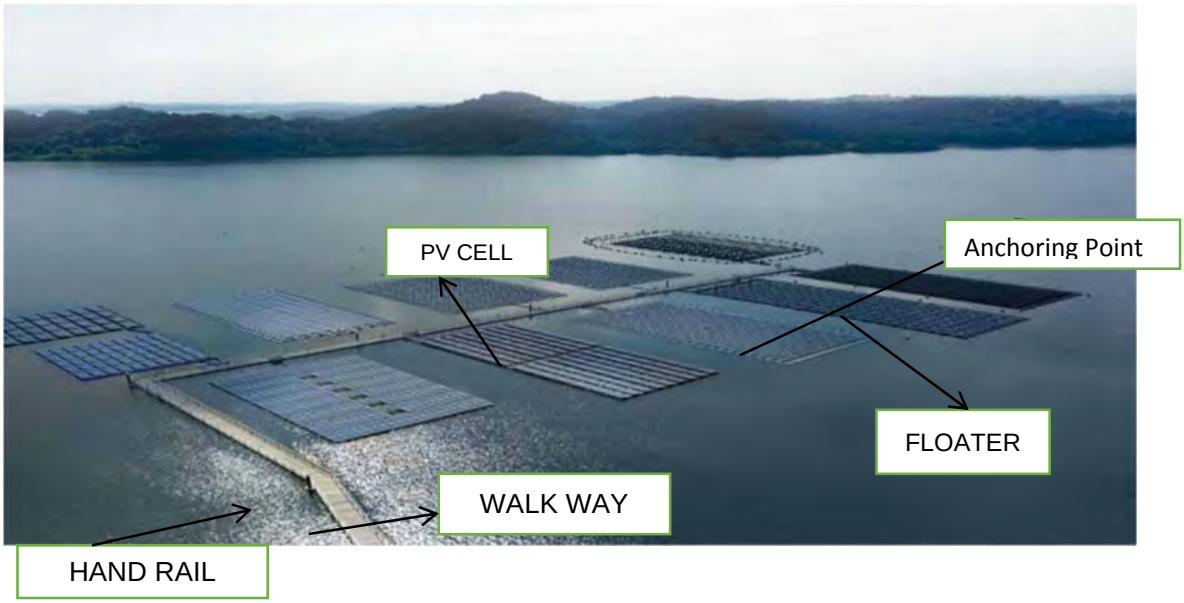
- The meeting shall be chaired by Site In charge, convened by Safety Coordinator and attended by all head of sections (HOS), Site In charge of Subcontractors and Safety representative of Subcontractors.

- MOM on the discussion will be circulated to the concerned for implementation.

18.0 TYPICAL DEPICTION OF FLOATING SOLAR PV SYSTEM (FOR GENERAL REFERENCE)

FLOATING SOLAR POWER ERECTION SAFETY

(Floating platform Under construction)



❖ **SYSTEM COMPONENTS**:

1. Solar PV modules for conversion of solar radiation to electrical energy/
2. Anchoring systems: Anchoring system refers to permanent under-water structure to secure floating platforms.
3. Pontoon: A pontoon is floatation device with enough buoyancy to float by itself as well as with a heavy load.
4. Floats: Multiple plastic hollow floats with effective buoyancy to self-weight ratio are combined over and over again, forming a giant pontoon. The floats are typically made of HDPE (high density polyethylene), known for its tensile strength, maintenance free property.
5. Mooring system: A mooring system usually refers to any permanent structure on the banks to which floats are secured.
6. Cables and connectors: Electricity is drawn from the solar array and transported to the land. Therefore, the power can be fed to the grid or stored in batteries.

19.0 RISKS AND HAZARD:

1. Identified as per Job Risk Assessment exercise and HIRA Documents attached based on planned construction activities. In case of requirement for erection or civil work of type not envisaged, JSA/HIRA for the same will be prepared and NTPC approval obtained to commence the activity.

❖ **PRECAUTIONS:**

1. As mentioned in enclosed HIRA Documents.

20.0 SITE RECORDING FORMATS: Enclosed

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HAZARD IDENTIFICATION AND RISK ASSESMENT (HIRA)	
Job Task: Tree felling and vegetation clearance	**Equipment #:** Hydra/Crane/JCB
Project/Location: 22 mw Floating Solar Project, NTPC, Kayamkulam	**Analysis done by: PV System Engg. Reviewed by: BHEL-HSE**
PPE required: Safety helmet, vest, shoes, hand gloves, goggles etc.	**Date Initiated: Revised date:**
Emergency Plan: Yes	
Tools used: Hand operated Power saws, Cutting tools	**Chemicals used:** Yes

Sequence of Job Steps	Potential Hazards	Risk/Hazard Effect	Safety Precautions	PPE
Entry to forest area (Area Survey)	1.Common Natural Hazard : A) Snake Bite, Insect bites like mosquitoe, Honey bee sting etc B) Falling branches, trees C) Fall, trip	1. Injuries 2. Fatality 3. Property damage 4. Man days lost	1. Before entry to the forest check for valid permit, and submit all documents of workers like medical fitness certificates, Group insurance, etc. 2. Briefly discuss about the job and identify line and markings of area or path of work before commencing 3. Organize for presence of a local representative/employee from forest department before start of work. 4. Exercise caution while carrying out work and before commencement of works address the workers to be always careful. 5. Work is allowed during day hours only 6. Field First aid box along with required medical kit (incl. snake anti dot, insect repellant cream) shall be available near the site 7. Awareness of types of snakes in the vicinity (poisonous/ non-poisonous) by way of display of charts	Safety knee height shoes (Gumboot) Safety Helmet, Safety goggles, Safety vest, Hand gloves, Full body protective apron ,Nose mask

Sequence of Job Steps	Potential Hazards	Risk/Hazard Effect	Safety Precautions	PPE
Cutting and shifting of heavy trees with the help of sawing machine, crane & rigging activity.	1.Pinching points. 2.Failure of lifting tools and tackles due to use of damaged / under capacity tools and tackles. 3. Failure of sawing machine. 4. Hit by load due to swinging. 5. Tree fall or collapse. 6.Electric shock 7. drowning due to sinking in swamp/ loose soil and falling in deep pits 8) Fall of logs during loading 9) Toppling of machinery due to loose soil 10) contact with Overhead live electric cable	1. Cut injuries 2. Man days lost 3. Serious injuries 4. Fatality	1.Check Submit all TPI certificates and check for proper working of cutting all machines 2.Critical Lift Permit and Lifting plan shall be prepared if use more than one crane, 75% of capacity of crane or above 50 MT material. 3. Ensure presence of an experienced and competent foreman/Signalman/Rigger. 4. Ensure that workmen keep their hands / leg away from pinching points. Proper communication & co-ordination with coworker. 5. Ensure proper supervisoin. 6. Ensure to use of certified and tested lifting tools and tackles with proper capacity. 7a. Safe working load should be displayed on all matl handling eqpt. 7. Softener or packing shall be provided in between slings and structural member. 8. While lifting ensure no one comes under suspended load. 9. Ensure use of tag lines to control the load. 10. Lifting affected area to be cordon off & caution sign to be posted to avoid unauthorized entery. 11. Only authorized operatior with valid licence to operate the crane.Authorized signal man with wearing reflective jacket shall be engaged. 12. Normal Lift Permit and Lifting plan shall be prepared if lifting Above 5 MT. 13. Daily Inspection checklist of crane/JCB/Cutting machine shall be ensured by users. 14. Stationary type Machinery shall be located in leveled platform and the same shall be ensured by the site engineer. 15.Ensure that soil bearing capacity is adequate to bear the load of machinery 16. Keep cutting tools sharp and in good condition. 17. Avoid work with oily hands. 18. Precautions for swamp/ loose soil / deep pits, etc.	Safety Knee height shoes(Gumboot), Safety Helmet, Safety goggles, Safety vest, Hand gloves, Reflective jacket, rain coat,
Housekeeping	1. Chances of fire during friction 2. Slip Trip Fall	1. Injuries 2. Fatality 3. Chances of damage natural balance.	1. Clean area properly 2. Not to dump bushes and trees in work area 3. Carry out stacking in designated area in orderly manner for further disposal.	Safety shoes (Gumboots), safety Helmet, Vest, goggles, Hand gloves.

Date	Reviewed By sub-contractor and or their authorized competent person		Is any additional precautions to be taken for the day
	Job Supervisor / Engineer	Safety Officer	

HAZARD IDENTIFICATION AND RISK ASSESMENT (HIRA)	
Job Task: Erection of materials and over all site work	**Equipment #:** Hydra/Crane, Welding M/c,
Project/Location: 22 MW Floating Solar Project, NTPC, Kayamkulam	**Analysis done by: PV System Engineering Reviewed by: BHEL- HSE**
PPE required: Safety helmet, vest, shoes, hand gloves, etc. (IS standard) **Emergency Plan:** Yes	**Date Initiated:** **Revised date:**
Tools used: Gas cutting set, Chain pulleys, Sling, D-shackle, Bow shackle.	**Chemicals used:** NO

Job activities/Work	Potential Hazards	Risk/Hazard Effect	Safety Precautions	PPE
Structural materials shifting and Lifting.	1. Pinching of leg/hands of workmen while handling 2. Structural members. 3. Swinging of load. 4. Poor weather condition. 5. Overloading of crane. 6. Unauthorized operation of crane by helper.	1. Head injuries. 2. Cut injuries 3. Man days lost 4. Property damage. 5. Chances of Fatality	1. Pre work cautioning & proper Permit must be followed before starting the work. 2. Ensure that workmen keep their body parts away from pinching points. 3. Ensure proper stacking of Structural members. 4.While fit up work structural member must be secured safely. 5. Experienced rigger and signalman should be assigned. Ensure competence Validation card. 6. Ensure use of tag lines at both ends to control the load. 7. Use crane/Hydra within the capacity and do not over load. 7a. Safe working load should be displayed on all matl handling eqpt. 8. Avoid work in poor visibility / poor weather condition / Raining and in heavy wind. 9. Affected area to be cordon off and caution sign to be posted to avoid unauthorized entry. 10. Only authorized operatior with valid licence to operate the crane.	Safety shoes, Safety Helmet, Safety goggles, Safety vest, Hand gloves.
	7.Failure of lifting tools and tackles due to use of damaged / under capacity tools and tackles.	1. Serious injuries. 2. Property damage.	1. Only single person signaling to the hydra/crane operator. 2. Ensure to use of certified and tested lifting tools and tackles with proper capacity, color code &identification number. 3. While lifting ensure no one comes under suspended load. 4. Barricading the area.	

Job activities/Work	Potential Hazards	Risk/Hazard Effect	Safety Precautions	PPE
Erections of structural materials with the help of crane& rigging activity.	1.Pinching points. 3.Failure of lifting tools and tackles due to use of damaged / under capacity tools and tackles. 4. Hit by load due to swinging.	1. Cut injuries. 2. Serious injuries. 3. Property Damage.	1. Critical Lift Permit and Lifting plan shall be prepared if use more than one crane, 75% of capacity of crane or above 50 MT material. 2. Ensure experience and competent of foreman/Signalman/Riggers. 3. Ensure that workmen keep their hands / leg away from pinching points. Proper communication & co-ordination with coworker. 4.Ensure proper supervisoin. 5. Ensure to use of certified and tested lifting tools and tackles with proper capacity. 6. Softener or packing shall be provided in between slings and structural member. 7. While lifting ensure no one comes under suspended load. 7a. Safe working load should be displayed on all matl handling eqpt. 8. Ensure use of tag lines to control the load. 9.Lifting affected area to be cordon off & caution sign to be posted to avoid unauthorized entery. 10. Only authorized operatior with valid licence to operate the crane.Authorized signal man with wearing reflective jacket shall be engaged**.** 11.Normal Lift Permit and Lifting plan shall be preparediflifingAbove 5 MT. 12.Daily Inspection checklist of crane/hydra shall be ensured by users.	Safety shoes, Safety Helmet, Safety goggles, Safety vest, Hand gloves. Full body harness.

Job activities/Work	Potential Hazards	Risk/Hazard Effect	Safety Precautions	PPE
Erection/Dismantling of Scaffolding (Only for CMCS area)	1. Dropped objects 2. Slips, trips and falls 3. Striking against 4. Collapse 5.Fall of scaffold structure	1. Falling from height. 2. Head injuries. 3. serious injuries. 4. property Damage.	1.Performing group shall conduct check of tool box relevant to the job before the work start 2. Use tools belt for containment of loose objects 3. Secure the tubes, planks and other objects when lifting/lowering 4. Barricade the work area and place sign boards 5. Do not climb with components 6. All scaffold platforms shall be fully boarded, fixed with toe boards & handrails, boards to be secured/lashed 7. Ensure area is not congested. 8. Maintain safe distance from energized power lines and heat sources 9. Ensure that only authorized/certified personnel are engaged in erecting & dismantling scaffolding 10. Examine all scaffold components prior to use 11. Scaffold should be inspected & tagged by competent person prior to use 12. Only essential personnel are allowed to access on scaffold	Safety shoes, Safety Helmet, Safety goggles, Safety vest, Hand gloves, Full body harness and fall arrester
Work at height (Only for CMCS area)	1. Fall of person. 2. Fall of materials (hand tools, Nut, bolts etc.) 3. Slippery approach. 4. Fall of person.	1. Head injuries 2. Break bones fall from height 3. Fatality. 4. Property damage.	1. Safety Net shall be provided if required. 2. Ensure proper Access and Work platform. 3. All scaffolds must be checked before use by Civil works supervisor and cleared before use.	Safety shoes, Safety Helmet, Safety googols, Safety vest, Hand gloves. Full body harness.

Job activities/Work	Potential Hazards	Risk/Hazard Effect	Safety Precautions	PPE
Gas cutting and Welding work	1.Fire and Explosion 2. Burn injury due to fire spatters. 3.Eye injury to nearby workers 4.Welding fumes 5.Person injury due to fall of gas cylinders while transporting	1. Property damage due to cylinder blast 2. Burn injuries due to fire.	1.Ensure flash back arrester /NRV on cylinder and torch side & fire blanket. 2. The combustible material shall be removed from site before starting the job. 3. No welding cable shall pass over the combustible materials/cylinders. 4. Provide fire extinguisher. 5. Check the leakage of cylinder with soap solution. 6. Hot work permit should be taken and Fire watch person should be identified & only authorized person allow to work. 7. Fire blanket must be provided to protect falling of hot spatters at height or barricaded the area. 8. Ensure safety goggles to all workers. 9. Especially Black goggles for Welder's helper. 10. Provide suitable face protection mask for welders. 11. Use gas cylinders trolley for internal shifting of gas cylinders. 12. Fixed the valve caps while shifting/storing the gas cylinders. 13. O2 and LPG Gas cylinders shall be stored separately chained and secured. 14. Cylinders must be stored in shed to avoid direct sun light exposure. 15. Ensure safe storage of diesel fuel if any	Safety shoes, safety helmet, gloves, goggles. Face shield.
Electrical work	1.Electrical Shock 2.Electrocution 3.Fire	1. Shock due to improper insulation. 2. Property damage. 3. Fatality.	1. Electric supply should be taken through ELCB of 30mA sensitivity. 2. All power cables should be protected from damage by improper laying. 3. All m/c and panel board should be protected against rain. 4. Proper Earthing shall be provided to all electrical equipment. 5. Ensure all portable power tools are tested and inspected by concern electrical engineer. 6. D.B Should not be overloaded.	Safety shoes, safety helmet, Rubber gloves, goggles.

Job activities/Work	Potential Hazards	Risk/Hazard Effect	Safety Precautions	PPE
Removal Of Lifting Arrangement	1. Cut injury. 2. Fall of materials/objects from height.	1. cut injuries 2. serious damage. 3. property damage. 4.vertical reinforcement collapse may cause.	1. Trained and Authorized person only allow to perform the job. 2. All tools & tackles should be tightening by rope to prevent fall from height. 3. Safe lowering procedure should be ensured. 4 The area must be cordon off. 5. Life line must be provided for anchoring safety harness.	Full body harness, Safety shoes, safety helmet, gloves, goggles
Excavation Work by JCB/manually	1. Excavated depth greater than1.5 mtr. 2. Failure of breaks. 3. Dumper moving. 4. Soil collapse.	1. Serious head, hand or eye injuries. 2. Workers falling in to the depth. 3. Heavy earth mover heat by person, 4. Unknown person heat by dumper.	1. Install hard barricade around the excavated area. 2. No person allowed in during the excavation by JCB. 3. Work area clearance certificate and excavation permit must be taken before starting the work. 4. JCB inspection should be carried out before the job commencement 5. Use barrier tapes or safety net at edges in excavation area.	Safety shoes, safety helmet, goggles, hand gloves, vest.
Civil work	1. Slippery approach. 2. While work at height, fall hazard. 3. Electrical hazard for electric line/equipment's. 4. Sharp edges of construction materials.	1. Slip trip fall injuries requiring first aid. 2. Eye injuries. 3. Head injuries. 4. Property damage.	1. Preparation proper approach with proper slope, steps, hand railing. 2. Barricading the area. 3. Place safety posters in work area. 4. Inspection of all hand tools before use. 5. Working platform should be proper (board/proper ladder)	Safety shoes, safety helmet, goggles, gloves, full body harness, nose masks.
	5. Chemical component of cement.	5. Eye injuries, skin irritation		

Job activities/Work	Potential Hazards	Risk/Hazard Effect	Safety Precautions	PPE
Work on Water body (NTPC KAYAL)	1. Trip slip and fall hazard on floats 2. Chance of fall into water 3. Electrical hazard. 4. Effect of extreme weather condition such as Sun burn and heat stress.	1. Physical fall shock - chance of injury or fatality. 2. Fall from the work area in to the water resulting in suffocation or drowning. 3. Chance of fatality for over work and sun burn effect.	1. Before start the work check all documents (such as work permit, TPI certificates of all tools and tackles and test certificates of life saving boat. 2. Ensure all work men working in or very near to water to wear Life jackets 3. Ensure availability of rescue boat in water with spare life jackets and floatation air tubes 4. Make a proper approach into the water body with proper slope or steps 5. In case of emergency, rescue team consisting of expert swimmers and above rescue boat to be always prepared. 6. In case of underwater work such as diving related work, an expert for checking diving equipment prior to commencement of work and also he shall be present for observing and monitoring diving activity during dive sessions. 7. Arrangement to be in place to summon Ambulance on Call to site for emergency shifting of any injured person to the nearest hospital. 8. Ensure drinking water to avoid de-hydration 9. Ensure Wireless / mobile/ walky-talky arrangement between site to control room/office 10. Ensure non-contamination of water body during the activities	Safety shoes, safety helmet, goggles, hand gloves, Reflective life jackets. Certified and compliant Diving gear to be used by divers if required One dedicated Rescue boat with life jackets

Date	**Reviewed By sub-contractor and or their authorized competent person**		**Is any additional precautions to be taken for the day**
	Job Supervisor / Engineer	**Safety Coordinator**	

FORMATS USED IN SITE

SL. No.	Format Name	Format No.
01	Safety Check list cum compliance report	01
02	Inspection of First Aid Box	02
03	Health Check Up	03
04	Monthly Site Safety Report	04
05	Safety Induction Training	05
06	Tool Box Talk	06
07	Inspection of PPE	07
08	Inspection of T&Ps	08
09	Status of T&Ps	09
10	Inspection of Cranes and Winches	10
11	Inspection on Height Working	11
12	Inspection on Electrical installation.	12
13	Safe Work- Permit (For External Agency)	13
14	Mock Drill Format (Fire)	14
15	Mock Drill Format (Water Accident)	15

SAFETY CHECKLIST CUM COMPLIANCE REPORT

PROJECT:_____ CONTRACTOR:_ DATE:_____

OWNER :_____

INSPECTION BY:_____

Note : write 'NA' wherever the items is not applicable. Inspection to be completed once in a month.

Item	Yes	No	Remarks	Action
HOUSEKEEPING				
Waste containers provided and used				
Passageways and walkways clear				
General neatness of working area				
PERSONNEL PROTECTIVE EQUIPMENTS				
Goggles; shields				
Face protection				
Hearing protection				
masks etc.				
Safety harness/belts				
EXCAVATIONS / OPENINGS				
Openings properly covered or barricaded, cordoned				
Excavations shored				
Excavations barricaded/ cordoned				
Overnight lighting provided				
SCAFFOLDING				
Fully secured and fastened				
Guard and intermediate rails in place				
Adequate shoring				
Adequate access				
LADDER				
Extension side rails 1 m above of landing				
Properly secured				
HOISTS, CRANES AND JCB				
Condition of cables and sheaf OK				
Condition of slings, chains, hooks OK				
Inspection & maintenance log maintained				
Outriggers used				
Signals observed and understood				
Qualified operators				
MACHINERY, TOOLS & EQUIPMENT				
Proper instruction				
Safety devices				
Proper cords				
Inspection and maintenance				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				

				FORMAT 01 (Page 2 of 2)
TEMPORARY FACILITIES				
Emergency instructions posted				
Fire extinguishers provided				
Fire-aid equipment available				
General neatness				
Others				
FIRE PREVENTION				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas.				
ELECTRICAL				
Proper wiring				
ELCB's provided				
HANDLING & STORAGE OF MATERIALS				
Properly stored or stacked				
Passageways clear				
FLAMMABLE GASES AND LIQUIDS	NA			
Containers clearly identified				
Proper storage				
Fire extinguisher nearby				
WORKING AT HEIGHT				
Safety belts				
Safety helmets				
Anchoring of safety belt to the life line rope				
ENVIRONMENT				
Lubricant waste/engine oils properly dispose.				
Waste from Canteen, offices, sanitation etc. disposed properly.				
Disposal of surplus earth, stripping materials, expired batteries, oily rag sand combustible materials done properly.				
HEALTH CHECKS				
Hygienic conditions at labor camps O.K.	NA			
Availability of first-aid Facilities				
Proper sanitation at site, office				
Arrangement of medical facilities.				
Measures for dealing with illness.				
Availability of potable drinking water for workmen & staff.				

RECORD OF REVISION

Page No.	Rev No.	Brief of Revision	Date
All	00	New procedure introduced	

FORMAT – 02 (Page 1of2)

INSPECTION OF FIRST AID BOX
(Check with KFR 1969)

Name of Site :	
Name of Sub-Contractor:	
Inspected by :	
Date of Inspection:	

Number of employees on the site:-____

Sl.No.	**Item**	**No. Available**	**Remarks**
1	No. of small sterilized dressings		
2	No of medium sized sterilized dressings		
3	No of large sized sterilized dressings.		
4	No of Larg sized sterilized burn dressinge s		
5	No of (15 grams) packets sterilized cotton wool		
6	No of pieces of sterilized eye pads in separate sealed packets.		
7	No of roller bandages 10 cm wide.		
8	No of roller bandages 5 cm wide.		
9	Whether tourniquet available		
10	Whether supply of suitable splints available.		
11	No of packets of safety pins.		
12	Whether kidney tray available		
13	Whether 4%-xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops available.		
14	Whether (60ml) bottle containing a two percent alcoholic solution of iodine available		
15	Whether (two hundred ml) bottle of mercurochrome (2 per cent) solution in water available.		

FORMAT – 02 (Page 2of2)

INSPECTION OF FIRST AID BOX

Sl.No.	Item	No. Available	Remarks
16	Whether 120ml bottle containing Sal volatile having the dose and mode of administration indicated on the label, available.		
17	Whether roll of adhesive plaster (6 cmX1 meter) available		
18	No of rolls of adhesive plaster (2 cmX1 meter)		
19	Whether snake bite lancet available.		
20	Whether (30 grams) bottle of potassium permanganate crystals available.		
21	Whether a pair scissors available		
22	Whether copy of the First-Aid leaflet issued by the Director-General, Factory Advice service and labour Institutes, Government of India available.		
23	Whether bottle containing 100 tablets (each of 5 grains) of aspirin available		
24	Whether Ointment for burns available		
25	Whether bottle of a suitable surgical anti septic solution available		

Signature of SAFETY Coordinator

FORMAT – 03(Page 1 of 1)

HEALTH CHECK UP: AS PER CERTIFICATE OF MEDICAL EXAMINATION

FORM-XI
Certificate of Medical Examination

Certificate No.:
Date:

1. Name:

Identification Marks:
1……..

2. ……

2. Father's name: ……

3. Sex: ……

4. Date of Birth, if available certificate age: ……

5. Physical Fitness:
I hereby certify that I have personally examined (name)…….
son/daughter/wife of ……. residing at …….
Who is desirous of being employed in building and construction work and his/her age as nearly as can be ascertained from my examination ……. years and he/she is fit for employment in ……as an adult/adolescent.

BP: Height: Sugar:

Pulse: Weight:

Eye Vision Test:

Left:

Signature/Left hand Thumb Impression of Building worker

Signature & Seal of Medical Inspector/CMO

……
……

Note: 1. Exact details of cause of physical disability should be clearly stated.

2. Functional/productive abilities should also be stated, if disability is stated.

FORMAT -04 (1 of 4)

MONTHLY SITE SAFETY REPORT

				Report Month:			
A) Accidents/Incidents Details:-							
a	**Lost time in Accidents**	**No. of incidents**	**Man Hours Lost**	**No.of People Involved**	**No. of contractors involved**	**Client persons if any**	**No.of persons reporting to Govt.**
	For the Month						
	Cumulative						
b	**Minor Injuries**						
	For the Month						
	Cumulative						
c	**Fires**	**No. of Near-Misses**	**No. of First-Aid cases**	**No. of persons injured**	**No. of equipment's damaged**	**No. of Fire reporting Outside**	
	For the Month						
	Cumulative						
d	**Other mishaps not covered in a, b, c.**	**No. of Near-Misses**	**No. of First-Aid cases**	**No. of persons injured**	**No. of equipment's damaged**	**Total near misses and First-Aid**	
	For the Month						
	Cumulative						

Signature of Head (Site office)

Signature of Site safety Coordinator

FORMAT -04 (2 of 4)

MONTHLY SITE SAFETY REPORT

A) Status of Deployment of Safety Coordinators & electricians by Agencies:

Description	Name	Qualification & Experience
Safety Coordinators		
Electricians		

B) Lifting Tools, Tackles, Equipment and Pressure Vessels:

Item	Nos. Deployed	Identification No.	Nos. Tested by competent person	Validity of Test Certificate
Winches				
Chain Blocks				
Wire Rope Slings				
D-Shackles				
Air Compressors				
Crawler Cranes				
Mobile Cranes				
Hydra Cranes				
Others				

C) Reverse Horns in Construction Vehicles:

Item	Nos. Deployed	Nos. Having Functional reverse horns	Inspection Dates
Transit Mixers			
Hydra Cranes			
Dumpers/Trippers			
Backhoes			
Other Vehicles			

D) ELCBs:

No. Of ELCBs provided	Nos. Functional	When They were last Tested

Signature of Head (Site office)

Signature of Site safety -Coordinator

FORMAT – 04 (3 of 4)

MONTHLY SITE SAFETY REPORT

E) Electrical Earthing:

No. Of Earth resources	Whether Earthing provided to all equipment's	When they were last tested

F) Fire Extinguishers:

Name & designation of person responsible for maintenance of Extinguishers at different locations:(Individual Contractor's Safety Coordinators/Authorized executive).

FIRE EXITINGUISHERS AT ERECTION SITE & STORES:

TYPE	SIZE	QTY	HEALTHINESS	LOCATIONS
MECHANICAL FOAM				
WATER CO2				
DRY CHEMICAL POWDER (DCP)				
CARBON DIOXIDE				

G) Implementation of checklist, Work permits:

Item	During the Month	Major Deviations
Note:-Please attach photocopies of all filled Checklists & Work permits for that month.		

H) Personal Protective Equipment's Issued:

Item	Issued this Month	Nos. Issued up to the Month	Percentage of usage at site
Safety Helmet			
Safety Shoes			
Full Body Harness			
Fall Arrestor/Safety rope			
Other PPEs			

Signature of Head (Site office)

Signature of Site safety -Coordinator

MONTHLY SITE SAFETY REPORT	**FORMAT – 04 (4 of 4)**

No. of Observations received in the month	No of points complied	Cumulative no. of non-complied Points

I) Training programs on safety during the month:

1)Tool-Box talks/ Pep-talks on Safety:

Date	Tool Box Talk - No of Participants	Safety Induction - No. of Participants	Topic
Date	**Tool Box Talk No of Participants**	**Safety Induction No. of Participants**	**Topic**

k) Other Safety initiatives / Safety Activities conducted at sites:

Signature of Head (Site office)

Signature of Site safety -Coordinator

FORMAT -05 (Page 1 of 1)

SAFETY INDUCTION TRAINING

Name of Site :	
Name of Sub-Contractor :	
Date :	
Name of Training coordinator: NTPC/BHEL	

Sl No.	Name	Designation	Organisation	Signature

Signature of safety Coordinator:

FORMAT -06(Page 1 of 1)

TOOL-BOX TALK

Sub-Contractors Name :	
Date :	

Topic	**Name of person delivered Tool Box Talk**	**No. of Participants attended**	**Remarks**

Signature of safety Coordinator:

FORMAT -07(Page 1 of 1)

PERSONAL PROTECTIVE EQUIPMENTS

Name of Sub-Contractor :	
Inspected by :	
Date of Inspection:	

Item	Issued this Month	Nos. Issued up to the Month	Percentage of usage at site
Safety Helmet			
Safety Shoes			
Full Body Harness			
Fall Arrestor/Safety rope			
Life jackets			
Other PPEs			

Signature of safety coordinator:

FORMAT -08

INSPECTION OF T&Ps

Name of Sub-Contractor :	
Date of Inspection :	

Sl.No.	Description	Remarks	
1.0	Name of equipment		
2.0	Basic Information of equipment		
2.1	Specification		
2.2	Sr. No. of equipment		
2.3	Make		
2.4	Year of manufacture		
3.0	Major repairs / overhauls(Furnish details of work carried out)		Date(s) of major repair/overhaul
3.1	Repairs carried out at site		
4.0	Any performance test conducted	Yes/No	
5.0	Document Submitted	Yes/No	
6.0	Manufacturer's test / guarantee certificate	Available/ Not available	
7.0	Performance test	Done/ Not Done	
8.0	Acceptance Norms		
9.0	Committee Observations		
10.0	Date of next review (if accepted)		

Signature-Site Safety Coordinator	**Signature-Subcontractor/ Subcontractor's Safety Coordinator**

FORMAT - 09(Page 1 of 1)

STATUS OF T&Ps

Name of Site :	
Name of Sub-Contractor :	
Date of Inspection :	

Item	Nos. Deployed	Identification No.	Nos. Tested by competent person	Validity of Test Certificate
Winches				
Chain Blocks				
Wire Rope Slings				
Man Cages				
D-Shackles				
Air Compressors				
Crawler Cranes				
Mobile Cranes				
Hydra Cranes				
Others				

Signature of safety Coordinator: **Signature-Subcontractor/ Subcontractor's Safety Coordinator**

Signature of BHEL Site Supervisor

INSPECTION OF CRANES AND WINCHES

Name of Sub-Contractor :	
Inspected by :	
Date of Inspection:	

Crane Reg. No(Make/Model) _____

Name of Driver/Operator _____

Sl.no.	Description	Observation	Measures
1	Valid Driving license		
2	Hook & Hook Latch		
3	Over Hoist limit switch		
4	Boom limit switch		
5	Boom Angle Indicator		
6	Boom limit cutoff switch		
7	Condition of Boom		
8	Condition of ropes		
9	Number of load lines		
10	Size and condition of the slings		
11	Stability of the cranes		
12	Soil Condition		
13	Swing Break And Lock		
14	Proper Break And Lock		
15	Hoist Break And Lock		
16	Boom Break And Lock		
17	Main Clutch		
18	Leakage in Hydraulic Cylinders		
19	Out riggers filly extendable		
20	Tire pressure		
21	Condition of Battery And Lamps		
22	Guards of moving and rotating parts		

23	Load chart provided		
24	Number and position of pedant ropes		
25	Reverse Horn		
26	Load Test Details		
27	Operator's fitness		
28	Pollution under control certificate		
29	Fire extinguisher of appropriate type.		
30	Training of the operator		

WINCH

Sl. No.	Description	YES	NO	NA
1	Has the copy of Third Party Inspection certificate been provided in winch machine shed?			
2	Is winch machine operator experienced enough to operate the winch machine?			
3	Is the winch machine operated by someone other than the winch machine operator?			
4	Is there guard provided in all moving parts like wheel and motor's shaft?			
5	Will it protect against unforeseen operational contingencies?			
6	Are brakes, clutch and locking arrangement working properly?			
7	Has it been ensured that the guard does not constitute a hazard by itself?			
8	Are the cranks and the connecting rods protected by guardrails?			
9	Is there provision for fully covered shed with wooden plank roof?			
10	Is wire rope free from any kind of damage or wear and tear?			
11	Is split pin provided for the protection of clutch and brake locking arrangement?			
12	Is pulley inspected by competent person and certified before use?			
13	Is pulley free from any wear and tear visually?			
	FORMAT -10(Page 1 of 3)			

14	Is winch rope barricaded with clipsheet for the protection of rope and person?			
15	Is the wire rope lubricated by cardium oil?			
16	Is there any friction in wire rope which may damage the wire rope rather than the rolling parts?			
17	Is there any oil leakage in the hydraulic system of the winch machine?			
18	Has it been ensured that the guard will not cause discomfort or inconvenience to operator?			
	Total Number of NO:			
	Total Number of NA:			
	% Compliance :			

Signature of safety Coordinator: **Signature-Subcontractor/ Subcontractor's Safety Coordinator**

Signature of BHEL Site Supervisor

FORMAT -11(Page 1 0f 2)

INSPECTION OF HEIGHT WORKING

Name of Sub-Contractor :	
Inspected by :	
Date of Inspection:	

Sl. No.	Descriptions	Observation (Yes/No)
1	All the workers have been explained safe work method?	
2	An established communication system has been established and explained to the workers.	
3	Adequate illumination has been ensured.	
4	Work area inspected prior to the start of the work.	
5	Area below the work place barricaded, particularly below hot work.	
6	Workers provided with bags /box to carry bolts, nuts and hand tools	
7	Arrangement for fastening hand tools made.	
8	All work platforms ensured to be of adequate strength and ergonomically suitable.	
9	Fabricated makeshift arrangements are checked for quality and type of material welding, anchoring etc.	
10.	Work at more than one elevation at the same segment is restricted.	
	ACCESS/EGRESS	
1	Walkways provided with handrail?	
2	All checkered plates, gratings properly welded/ bolted?	
3	Are ladders inspected and they are in good condition?	
4	Are ladders spliced?	
5	Are ladders properly secured to prevent slipping, sliding or falling?	
6	Do side rails extend 36” above top landing?	
7	Are built up ladders constructed of sound materials?	
8	Are rugs and cleats not over 12” on center?	
9	Metal ladders not used around electrical hazards.	
10	Proper maintenance and storage.	
11	Ladders placed at right slope.	
12	Ladders / staircases welded/ bolted properly.	

		FORMAT - 11(Page 1 0f 2)
13	Any obstruction in the stairs.	
14	Are landing provided with handrails, knee rails, toe boards etc.?	
15	Whether ramp is provided with proper slope.	
16	Proper hand rails / guards provided in ramps.	
	Housekeeping	
1	Walkways, aisles & all overhead workplaces cleared of loose material.	
2	Flammable materials, if any, are cleared.	
3	All the de shuttering materials are removed after de shuttering is done.	
4	Platforms and walkways free from oil/grease or other slippery material.	
5	Collected scrap are brought down or lowered down and not dropped from height.	
	PPE And Safety Devices	
1	Use of safety helmet, safety belts ensured for all workers	
2	Anchoring points provided at all places of work.	
3	Common lifeline provided wherever linear movement at height is required.	
4	Safety nets are use wherever required.	
5	Proper fall arrest system is deployed at critical workplaces.	

Signature of safety Coordinator **Signature-Subcontractor/ Subcontractor's Safety Coordinator**

Signature of BHEL Site Supervisor

FORMAT -12

INSPECTION OF ELECTRICAL INSTALLATION

Name of Sub-Contractor :	
Inspected by :	
Date of Inspection :	

Sr. No.	Contents	Yes/No	Remarks
A	**Cable**		
1.	Whether the condition of cable is checked?		
2.	Are cables received from other sites checked for insulation resistance before putting them into use?		
3.	Are all main cables taken either underground / overhead?		
4.	Are welding cables routed properly above the ground?		
5.	Are welding and electrical cables overlapping?		
6.	Is any improper joining of cables/wires prevailing at site?		
B	**DBs/SDBs**		
1.	Is earth conductor continued upto DB / SDB?		
2.	Whether DBs and extension boards are protected from rain / water?		
3.	Is there any overloading of DBs / SDBs?		
4.	Are correct / proper fuses & CBs provided at main boards and sub-boards?		
5.	Is energized wiring in junction boxes, CB panels & similar places covered all times?		
C	**ELCB**		
1.	Whether the connections are routed through ELCB?		
2.	Is ELCB sensitivity maintained at 30 mA?		
3.	Are the ELCB numbered and tested periodically & test results recorded in a logbook countersigned by a competent person?		
D	**Grounding**		

1.	Is natural earthing ensured at the source of power (main DB at Generator or Transformer)?		
2.	Whether the continuity and tightness of the earth conductor are checked?		
3.	Mention the gauge of the earth conductor used at the site.		
4.	Mention the value of Earth Resistance.		
E	**Electrically operated Machines or Accessories**.		
1.	Whether the plug top is provided everywhere.		
2.	Are all metal parts of electrical equipment and light fittings / accessories grounded?		
3.	Is there any shed or cover for welding machines?		
4.	Are halogen lamps fixed at proper places?		
5.	Are portable power tools maintained as per norms?		
6.	Any other information:		

Signature of safety Coordinator : **Signature-Subcontractor/ Subcontractor's Safety Coordinator**

Signature of BHEL Site Supervisor

Safe Work- -Permit (For External Agency)

Type of permit	Tick whichever is applicable
Height working of 3.3 metre and above at FSPV Site (Applicable for erection of communication towers/Electrical Towers, if any)	
Excavation more than 1.5 meter depth	
Heavy lifting by machinery (only on land)	
Works on Floating Platforms in Water	

Permit initiation

Permit no: _____ Date: _____

The following persons are here by engaged to undertake the above work (tick whichever is applicable) in the areas indicated below. The contractor and the workers will strictly adhere to the safety instructions contained in the annexure, as applicable.

Name of the work :-

Brief description of work:

Area/Location of work:

Period of work From _____ to _____

Time of work From _____ to _____

Name and Address of the contractor :

Work Order No. & Date

Details of Persons Engaged

Sl. No.	Name	Age	ESI No.	Id No.
1				
2				
3				
4				
5				

*The persons engaged are possessing certificate against Vertigo in their medical clearance certificate.

_____ _____

Signature of Contractor with contact no. Signature of BHEL Sup/Executive

Permit Clearance:

1.0 Clearance from – In-charge/ Services (BHEL)

_____
(Signature)

2.0 Clearance from Safety

_____
(Signature)

3.0 The above work is permitted subject to above clearance.

_____
(Signature of Site Incharge)/Authorised executive)

4.0 Permit Withdrawal / closure

4.1 The work has been completed, Men and Materials withdrawn. Intimation is given to Services Department and Concerned Supervisor / Area-Incharge

_____
(Signature of Executing Dept. Sup./Executive)

5.0 Withdrawal of Permit/Closure recordings

_____
(Signature of Safety Coordinator)

Note: Wherever Clearance Is Not Required, Write ‘Not Applicable’ (NA)

Annexure- Checklist for Work permit

Work Permit Checklist

A. Height working of 3.3 metre and above at FSPV Site (Applicable for erection of communication towers/Electrical Towers, if any)

Sl. No.	Criteria	Yes	No	NA	Remark
1	Have scaffolding/lacers/working platform been checked and provided.				
2	Is roof ladder /crawling board provided?				
3	Have safety belts and helmets inspected and provided.				
4	Is adequate illumination provided?				
5	Are safety nets erected at site to arrest falls when climbing up/down or moving at heights?				
6	Is barricading provided to avert fall of material down below.				
7	Is the work area clear and safe from overhead electrical lines/other protecting structures?				
8	Surrounding area checked.				
9	Have all combustibles within 35 ft. are removed and protected.				
10	Fire Fighting system readiness.				
11	Precautionary tags/ boards provided.				
12	Nearby working area, pipes checked for leakage and effectively protected against falling sparks.				
13	Condition of Hoses and Cylinders.				
14	Is he having phobia (Vertigo)				
15	All Employees involved have been informed of precautions.				
16	Work shall be closed before sunset.				
17	Ensure that continuous supervision				
18	Ensure that persons working at height should anchor harness to rigid support.				

B. Excavation more than 1.5 meter depth

Sl. No.	Criteria	Yes	No	NA	Remark
1	Cable route detection done at the place of excavation				
2	Free from water, hydrant, sprinkler pipes; telephone & sewer lines.				
3	Excavation work does not affect surrounding structures.				
4	Piling, shoring, bracing, walers and runners provided and of adequate strength to prevent cave in				
5	Excavated materials are placed >2 feet from edges of trench.				
6	Open sides of trench are barricaded to prevent fall .				

7	Warning signs are posted.				
	Annexures to Format-13 (Page 2 of 3)				
8	No person is working in trench during excavation.				
9	Suitable access to and egress from trench of 1.2 m and above is arranged.				
10	Banksman arranged				

C. Heavy lifting by machinery (only on land)

Sl. No.	Criteria	Observations	Measures
Readiness of Lifting Equipment:			
1	Over-Hoist Limit Switch		
2	Boom-Limit Switch		
3	Boom Angle indicator		
4	Boom-Limit cut-off switch		
5	Safe Load Indicator available		
6	Condition of boom		
7	Condition of Ropes		
8	Size and condition of the sling		
9	Stability of crane		
10	Soil Condition		
11	Swing Brake & Lock		
12	Propel Brake & Lock		
13	Hoist Brake & Lock		
14	Boom Brake & Lock		
15	Main clutch		
16	Leakage in hydraulic cylinders		
17	Out riggers fully extendible		
18	Tyre pressure		
19	Condition of Battery and Lamps		
20	Guards of moving and rotating parts		
21	Load chart provided		
22	Automatic Reverse horn/Swing Alarm (With nominal sound frequency)		
23	Load test details		
24	Fire Extinguisher in operators cabin		
Readiness of Lifting Slings:			
1	Tag number/ Identification number(with SWL marked)		
2	Validity		
3	Capacity & length of the Sling		
4	Check for any visual damaged outer sheath		
5	Check for any damages at the cuts/ threading		
6	Check for any damages at the eye portion of the sling		
7	Check the overall condition of the sling.		
8	Check for any twisted/ knotted condition		
9	Check the overall surface contour of the sling.		
10	Any Other Observations		

Readiness of Manpower/Area of work:					
	Annexures to Format-13 (Page 3 of 3)				
1	Operator Fitness and Licence				
2	Dedicated helper availability				
3	Work area to be cordoned off & caution sign to be posted to avoid unauthorized entry.				
4	PPEs availability for Manpower				
D.	**Works on Floating Platforms in Water**				
Sl. No.	**Criteria**	**Yes**	**No**	**NA**	**Remark**
1	Availability of life Jackets to all manpower going on water				
2	Availability of rescue boat in water with spare life jackets and floatation air tubes				
3	Safe access to floating platform from ground				
4	Availability of rescue team of expert swimmer, helper				
5	Arrangement of Emergency vehicle for quick shifting of any injured person to the nearest hospital.				
6	Availability of drinking water to avoid de-hydration				
7	Availability of communication sources such as Wireless / mobile/ walky-talky arrangement between site to control room/office				
8	For underwater work such as diving related work, Fitness of diving equipment				
9	Diver fitness and skill				
10	Training imparted to manpower for working on floating platform				

Signature of safety Coordinator : Signature-Subcontractor/ Subcontractor's Safety Coordinator

Signature of BHEL Site Supervisor

Format-14

MOCK DRILL FORMAT (FIRE)

VENUE/SITE: Date:

Time:

'FIRE MOCK-DRILL ON EMERGENCY SITE'

OBSERVATION SHEET

SL. NO.	PARTICULARS	DESIRED TIME (min.)	RECORDED TIME (min.)
A	INFORMATION TO IMPORTANT AGENCIES		
	Inform Emergency Main control room (NTPC-Security)	Immediate	
	Inform incident controller (BHEL Site In-Charge)		
	Inform Fire Pump House (by NTPC-Security)		
	Inform NTPC Safety (by BHEL Safety Coordinator)		
	Inform First Aid (by BHEL Safety)		
B	ARRIVAL OF THE SERVICE PERSONAL / ACTION		
	Incident controller reaching the site	5	
	Assembly of work teams at identified Assembly point at site	5	
	Safety personnel reaching the site/coordinating	5	
	NTPC-Security personnel reaching the site	5	
	Fire Guard/Engine reaching the site	5	
	Medical team reaching the site	5	
C	CLOSURE OF OPERATIONS		
	Rescue operation over (rescuing persons)	5	
	Fire-fighting operation over	5	

General Remarks:

Observation Name:

Designation:

Sign:

Format-15

MOCK DRILL FORMAT (WATER ACCIDENT)

VENUE/SITE: Date:
Time:

'WATER ACCIDENT MOCK-DRILL ON EMERGENCY SITE'

OBSERVATION SHEET

SL. NO.	PARTICULARS	DESIRED TIME (min.)	RECORDED TIME (min.)
A	INFORMATION TO IMPORTANT AGENCIES		
	Inform Emergency Main control room (NTPC-Security)	Immediate	
	Inform incident controller (BHEL Site In-Charge)		
	Inform Rescue Team (by work supervisor)		
	Inform BHEL Safety Coordinator (by work supervisor)		
	Inform NTPC Safety (by BHEL Safety Coordinator)		
	Inform First Aid (by NTPC-Security)		
B	ARRIVAL OF THE SERVICE PERSONAL / ACTION		
	Incident controller reaching the site	5	
	Safety personnel reaching the site/coordinating	5	
	NTPC-Security personnel reaching the site	5	
	Rescue team reaching the site	5	
	Medical team reaching the site	5	
C	CLOSURE OF OPERATIONS		
	Rescue operation over (rescuing persons)	5	

General Remarks:

Observation Name:

Designation:

Sign: