VOLUME – II

SUB-SECTION – 5.2

SPECIFICATION FOR CHIMNEY LINING

A. BOROSILICATE GLASS BLOCK LINING OF FLUE CAN

1.0.0 GENERAL PROJECT INFORMATION

1.1.0 INTRODUCTION

This specification covers the technical details of the borosilicate glass flake lining for chimney with respect to its preliminary check requirements, surface preparations, coating applications & atmospheric condition requirements.

Tamil Nadu Generation and Distribution Co Ltd (TANGEDCO) is setting up the 1 x 800 MW North Chennai Thermal Power Project Stage III. One Concrete Chimney with single flue steel can of height 275 m is under construction. In order to comply with the MOEF norms for flue gas emission, a Flue gas desulphurization plant (Wet FGD) is proposed to be installed. Hence TANGEDCO is proposing to carry out Borosilicate Glass Block Lining or 2 mm thick Titanium (Grade 2 as per ASME B265) or 2 mm thick C-276 alloy of inner surface of flue can of the single flue chimney as protection from wet flue gas. The EPC contractor upon finalsaition of order shall take up the Chimney lining as a first priority and it shall be completed in 6 months.

1.2.0 INTENT OF SPECIFICATION

The intent of this technical specification is to provide a complete Chimney Lining system to protect the flue cans from wet flue gas of Flue gas desulphurization system.

The bidder shall study the specification and satisfy himself thoroughly regarding the workability and suitability of the equipment and system offered by him. He shall take full responsibility for guaranteed and satisfactory operation of the system as regards its performance and smooth and reliable working of supplied equipments

All work to be carried out as per the above guidelines shall be read in conjunction with the drawings and annexure. The bidder shall be responsible for providing all material, equipment and services, which are required to complete the project and fulfill the objective of safe and trouble free operability, maintainability and the reliability of the complete work covered under this specification.

The bidder shall fulfill all the features of their work as per the relevant codes and standards and adhere to all the local regulations, as applicable. Design, manufacture, supply, construction, erection, and commissioning will be as per the state of the art technology and satisfy all the statutory and mandatory laws and regulations to its fullest extent.

2.0.0 SCOPE OF WORK

2.1.0 The Scope of work for providing Borosilicate Glass Block Lining of the steel flue can , in the single flue chimney includes the following.

The flue shall be internally protected with a lining system consisting of borosilicate glass blocks of 51mm thick, applied with a flexible, chemically resistant adhesive membrane applied over epoxy primer and the scope of works also include modifications required if any on flue to accommodate expansion joints, providing additional support structures, lining in the inspection door area, soot hopper area. All the items, though not specifically mentioned but

needed to make the system complete and for reliable performance and safe working, shall also be included, unless otherwise specifically excluded elsewhere.

i) Complete engineering, procurement and installation of Borosilicate Glass Block Internal Lining

ii) Wet Stack design study

iii) Supervision of complete installation by the OEM's QA Inspector to perform comprehensive QA program for the requirements of this project

iv) Submission of comprehensive QA documentation after the completion of the lining process in the flue can

2.2.0 The bidder shall be responsible for the quality of the material, manufacturing, transport, storage, handling, erection and documentation.

2.3.0 The bidder shall also provide all required equipment and services which may not be specifically stated herein but are required to meet the intent of ensuring completeness, operability, maintainability and reliability of the total work covered under this specification within his quoted price.

2.4.0 The successful bidder shall be responsible for providing qualified personnel to collect the required data from Purchaser by way of hard copy, drawings, soft copy etc.

2.5.0 The bidder shall be responsible for bringing the required tools, tackles, machines, erection spares to make up for the damages during execution etc for completing the scope of the work as per this specification.

2.6.0 It may be noted that the requirements, conditions, annexures, appendices etc. stated in Technical Specification shall be read together in conjunction with the volumes Vol-I & Vol-II while interpreting the specification.

2.7.0 In the event of conflict between requirements of any two clauses of specification documents, the more stringent requirements shall apply unless otherwise confirmed by the Purchaser in writing before the award of this contract, based on a written request from the Bidder for such clarification.

2.8.0 In case Bidder is getting qualified through an Associate as per Volume-IA of this Tender Specification the work division between Bidder and the Associate shall be as per the Deed of Joint Undertaking (DJU) as stipulated in the above-referred clauses.

3.0.0 SCOPE OF SUPPLY

3.1.0 The bidder or his Associate shall design, manufacture and furnish equipment / system including but not limited to the following.

a) Borosilicate Glass Block Internal lining material on the flue can made of ''COR-TEN-B'' Steel for the entire height.

i) Borosilicate Cellular Glass Block, 51 mm thick, as required
ii) Epoxy Primer
iii) Adhesive membrane

b) Modifications to Flue can equipment's

i) Acid resistant material like Elastomeric for the Expansion bellow
ii) Acid resistant material like Hastalloy for Flue gas Sample points / sampling ports

iii) Acid resistant material or borosilicate glass block lining for Manhole / access door
iv) Suitable Condensate drain arrangement at the bottom of the flue can

c) Documentation shall, as a minimum, comprise the following.

i) All drawings for the above works and supply
ii) O&M Manual & Instruction Manual
iii) Submission of comprehensive QA documentation after the completion of the lining process in the flue can.

d) All other miscellaneous equipment and accessories required for a complete functional system which meets the intent and requirements of this specification shall also be furnished by the bidder.

4.0.0 TECHNICAL SPECIFICATIONS

4.1.0 Specification of borosilicate blocks

The lining system shall use closed cell borosilicate glass blocks with the following physical properties:

i) A coefficient of linear thermal expansion not greater than 5.5 x 10(¬6)/℃, as per ASTM E228
ii) Compressive strength of at least 1.38 Mpa / 1.1 N/Sq.mm as per ASTM C.165
iii) Flexural strength of at least 0.62 Mpa / 0.8N/Sq.mm as per ASTM C.203/C.240
iv) Thermal conductivity of 0.087 W/m℃K at a mean temperature of 38 ℃ as per ASTM C177 and ASTM C518
v) The block shall be 6 by 9 inches and 2 inches thick

4.2.0 Specification of adhesive membrane

The adhesive membrane shall be a 2-component urethane asphalt mastic having excellent elastomeric properties and be acid & heat resistant. The adhesive membrane shall be applied in between and behind the blocks in a 3 mm thick layer ensuring a proper bond and adhesion. The adhesive membrane shall have the following properties.

i) Tensile strength at 23° C of 1.0 N/mm2 as per ASTM D.412
ii) Elongation at 23° C of 147.0 % as per ASTM D.412
iii) Moisture vapor transmission of 0.0048 Perm inches as per ASTM C.96 Method E
iv) The adhesive shall show no slump after 5 hours conditioned at 60ºC with a film thickness of 3/32" as per ASTM 6511, standard test methods for solvent bearing bituminous compounds, section 12 behavior at 60ºC.

4.3.0 Specification of primer

Primer to be applied on steel substrate receiving borosilicate glass block lining system shall have the following properties including thickness, physical & chemical properties.

i) The primer shall be a high performance epoxy primer. The primer shall be applied in 1 layer with a WFT of 3 to 5 mils
ii) The primer shall be applied either by rolling or spray gun Welds and joints shall receive an additional layer of primer by brush prior to rolling or spraying
iii) The solids by volume of the high performance epoxy primer shall be no less than 50%
iv) The bonding of the primer to the steel shall be at least 1400 psi. as per ASTM D4541

4.4.0 Specification for surface preparation of steel substrate

- The steel surface shall be grit blasted to a cleanliness of SA 2 1/2 and approved by the supplier of the lining system
- The substrate shall thereafter be primed using a high performance epoxy primer within a short time window approved by the supplier

4.5.0 Wet stack properties of the lining system

The lining system (borosilicate glass block and adhesive) shall be tested for its wet stack surface properties by an independent approved institute, subject to acceptance by the Purchaser, and has during such testing been shown to allow, without any significant re-entrainment of flue gas condensate, a flue gas velocity of at least 18.3 m/s.

Bidder shall provide a project specific "Wet Stack" study, performed by an independent approved institute, subject to acceptance by the Purchaser, indicating the correct placement and design of liquid collection gutters and liquid drains to ensure minimization of liquids and condensates entering the chimney.

5.0.0 DETAILS OF CHIMNEY FLUE

5.1.0 Following are the brief details of chimney flue and other associated systems without borosilicate lining.

a)	Maximum inlet flue gas temperature	:	140 Deg. C
b)	Exit Velocity in flue	:	25 to 30 m/s
c)	Number of Wind Shields	:	1 No. made of concrete
d)	Number of Steel flue	:	1 No.
e)	Height of steel flue from Finished Floor Level (FFL)	:	275.00 m
f)	Material of Construction	:	Top 14.40 meters is made of stainless steel, remaining is made of Corten steel
g)	No. of Expansion Joints per flue	:	5 Nos. at different elevations
h)	Intermediate supports per flue	:	6 Nos. at different elevations
i)	Manhole/Access doors per flue	:	6 Nos. at different elevations.
j)	Bottom supports per flue	:	4 Nos. at El. 0. 00 (FFL)
k)	Centre line of Inlet flue gas duct	:	El. + 17.00 m from FFL
l)	Disposal of ash flue bottom ash	:	From soot hopper located below flue can
m)	Interface with SG package contractor flue gas duct	:	Outside the wind shield

5.2.0 The approximate estimated Surface area for Chimney flue and Borosilicate Lining including inlet flue gas duct, transition piece for flue duct, soot hopper etc. is furnished below. However, the surface area required for chimney lining shall be calculated by the bidder from the drawings furnished along with this tender and the lining shall be provided accordingly.

- Surface Area for one flue – 10,300 m2 { indicative minimum}

6.0.0 INSTALLATION OF BOROSILICATE BLOCK LINING SYSTEM

6.1.0 Surface Preparation & Surface Cleaning

The bidder shall carry out the following as a minimum to prepare the steel flue surface for the lining.

- Sandblasting of flue for surface preparation. Near-white metal blast finish shall be provided by the bidder for preparing the steel surfaces to receive the lining.
- All surfaces must be free from dust, dirt, and grease. Any foreign material which will interfere with adhesion must be removed.
- All weld spatter slag and old anchor welds shall be removed from the substrate, and the area ground flush with the parent metal.
- All edges and fillets and similar abrupt contours shall be rounded off smoothly.

6.2.0 Mixing of Adhesive Membrane

- The Adhesive membrane shall be mixed according to the direction for the product use in the correct mixing ratio.
- The temperature for mixing the main material and hardener shall be about 24 degC.
- Appropriate mixing method shall be used for equal mixing and should be blended for the required appropriate time.
- Sufficient time shall be allowed for curing

6.3.0 Mixing machine

Mixing machine shall be used for preparing the 2 component Adhesive Membrane on site.

- In order to ensure consistent, high quality mixing of the components of the lining system adhesive, (an) automated mixing machine(s) should be provided using a 3,200W mixer motor, with fail-safe protection against the operator error of mixing the main adhesive component without its hardener.
- The mixing machine must be CE – approved.
- The mixing machine shall have thermal motor protection to minimize failure and fire risk.
- Adequate number of mixing machines shall be employed for completion of the installation works for the two units within the scheduled time.

6.4.0 Mixing of Epoxy Primer

- Epoxy Primer shall be mixed according to the direction for the product use
- Mixing ratio shall be as recommended by OEM
- Epoxy Primer shall be blended by using Mechanical Mixer for the required minimum time.

6.5.0 Installation of Borosilicate Block

- The Adhesive membrane shall be applied as per the instructions of OEM.
- Arrange the borosilicate glass blocks such that there is no black space between the block and surface. The adhesive should fill the side joint and flow out to the edge. The block shall completely stick to adhesive applied on the surface.
- Block whose edge is broken shall not be used.
- All the equipments and tools required to install Borosilicate Glass Block lining system including Polyethylene film, Rag, Wire brush, Plastic sink, Electric drill, Jiffy Mixer Blade, Insulated saw, Float, Paint brush, hand cleaner, Cleansing glove, Hygrometer, Surface thermometer, white chalk, white spray etc as required shall be arranged by the bidder.

6.6.0 Inspection

- Inspection and testing including adhesion shall be as per approved QAP.
- The mixing, curing and adhesion characteristics of the adhesive membrane shall be evaluated by applying it onto a test area of the same material and surface preparation of the substrate. Work life and initial set time may be visually observed. Cure shall be uniform.
- The installation procedure of the lining system shall be verified by installing the system on a transparent panel. Visual inspection shall be made of back, end and side joints.

6.7.0 Heat cycling resistance

- The lining system shall, through documented testing, have been proven resistant to thermal shock, for a minimum of 1000 cycles, where each cycle results in the lining surface temperature to rise from ambient temperature to 180 ℃, and back to ambient temperature.
- The lining system shall also withstand occasional excursion of flue gas temperature of more than 200℃.

6.8.0 On site supervision and QA/QC services

- The lining system (borosilicate glass block and adhesive) supplier shall provide on-site technical support and QA/QC supervision, and shall employ QA/QC supervisors with a demonstrated experience of at least 5 years in technical support and QA/QC supervision of the subject lining system.

6.9.0 Performance, safety and fire risk

- The lining system (borosilicate glass block and adhesive) shall be tested and certified for fire risk by an approved institute subject to acceptance by the Purchaser, and through testing as per relevant ASTM standards.

7.0.0 MODIFICATIONS REQUIRED IN THE FLUE (UNDER CONSTRUCTION)

7.1.0 Sample Point

- Borosilicate block primer and high nickel steel bar will be applied to sample points to make it acid resistant.
- The nozzle (Pipe tube) shall be of suitable alloy steel to withstand design operating environment.
- Nozzle shall be fully seal-welded both inside and outside of the steel duct plate. The inside weld shall be ground smooth.
- The nozzle shall be flanged and not threaded.
- The Glass Blocks shall be Cut and shaped as required to fit. The block shall be fully bonded to the exterior surface of the nozzle with adhesive membrane.
- The bidder shall coordinate with the BOP package contractor in order to ensure that the sample point is matching with the requirements for installing the flue gas analyser probes/equipments.

7.2.0 Manhole and Access doors

- Manholes/Access doors shall be modified by application of borosilicate blocks.
- High nickel alloy stop bars of 2mm thickness for protection from acidic condensate.
- Fibre gaskets shall be used for sealing.

7.3.0 Collection gutter

- The condensate generated in flue gas while FGD is under operation, shall be collected and discharged from bottom of the flue can.
- The material of gutter including drain and base plates shall be made of suitable alloy steel to withstand design operating environment.
- All welds shall be full seal welds.
- The surfaces of the alloy materials which will be in contact with the lining system shall be blasted and primed with Epoxy Primer.
- The Glass Blocks shall be fully bonded to the alloy steel.

7.4.0 Soot Hopper

- Acid proof brick lining in soot hopper is not be required and instead borosilicate lining shall be provided resistant to acids.

7.5.0 Puddle Flange

- Puddle flange located at the bottom of soot hopper shall be lined with High nickel alloy material for protection from acidic ash.

7.6.0 Expansion Joints

- Expansion joints cannot withstand the acidic flue gas during FGD operation and hence shall be replaced by acid resistant elastomeric fabric bellows.

8.0.0 BATTERY LIMITS

Following are the battery limits. a) Chimney Flue: Entire system from inlet flue gas duct to flue top. b) Inlet flue gas duct: 1 meter from the shell outer surface. c) Soot Hopper: Entire system up to puddle flange.

9.0.0 EXCLUSIONS

Following are the exclusions from the scope of the bidder.

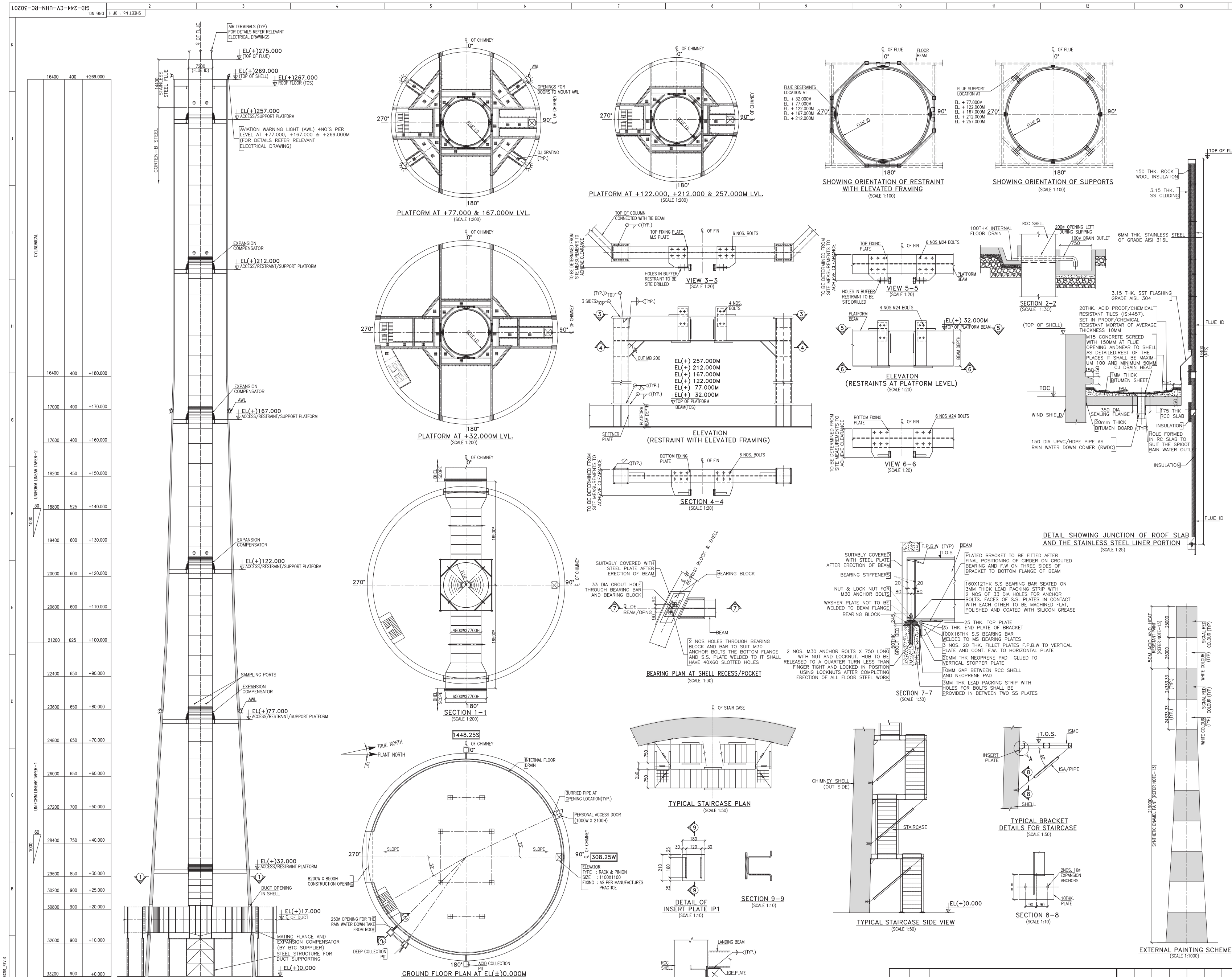
a) Disposal of condensate from soot hopper to condensate collection pit
b) Pumps and piping system for condensate disposal from condensate Collection pit to ETP.

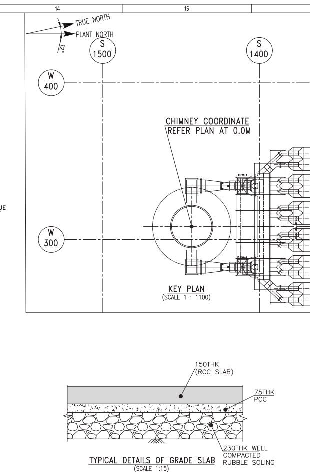
10.0.0 CHIMNEY DRAWINGS

The following drawings of the chimney are enclosed along with this tender specification.

Sl.No.	Drawing Number	Drawing description
1	GID-244-CV-UHN-RC-30201	275 M High RC Chimney- General Arrangement

FIRST ANGLE PROJECTION





LEGEND:

AWL	: AVIATION WARNING LIGHTS	M.S	: MILD STEEL
C.I	: CAST IRON	SS	: STAINLESS STEEL
℄	: CENTER LINE	TYP	: TYPICAL
FPBW	: FULL PENETRATION BUTT WELD	TOS	: TOP OF STEEL
FFL	: FINISHED FLOOR LEVEL	TOC	: TOP OF CONCRETE
FPL	: FINISHED PAVED LEVEL	▦	: GRATING
ID	: INSIDE DIAMETER	—o—o—	: HAND RAIL

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS ARE IN METERS.
2. EL. (±)0.000 CORRESPONDS TO FINISHED FLOOR LEVEL OF MAIN POWER PLANT BUILDING WHICH CORRESPONDS TO RL. 10.000M.
3. CONCRETE FOR FOUNDATION SHALL BE OF GRADE M-25 AND FOR SHELL IT SHALL BE OF GRADE M-35 CONFORMING TO IS:456
4. ALL REINFORCING STEEL SHALL BE CORROSION RESISTANT TMT BARS OF GRADE Fe500 CONFIRMING TO IS:1786 UNLESS SHOWN OTHERWISE.
5. ALL MATERIAL TESTING, STORAGE, MIXING, FORM WORK, PLACEMENT OF CONCRETE & REINFORCEMENT DETAILING AND WORKMAN SHIP SHALL CONFIRM TO IS: 456
6. INSULATION SHALL BE RESIN BONDED ROCK WOOL WITH WIRE MESH HAVING DENSITY NOT LESS THAN 64 KG/CU.M. AS PER IS: 8183.
7. THE OTHER COMPONENTS OF CHIMNEY INCLUDE A ROLL UP DOOR, ELEVATOR,PERSONAL ACCESS DOORS, LADDERS, HAND RAILING, CLEAN OUT DOORS, LINER TEST PORTS, POWER SUPPLY DISTRIBUTION BOARDS, LIGHTING PANELS, SOCKETS, OUTLETS, AVIATION ELECTRICAL LIGHTS, LIGHTNING PROTECTION, GROUNDING SYSTEM, LIGHTING AND TEMPORARY AVIATION WARNING LIGHTS ETC.
8. THE EXPANSION COMPENSATOR SHALL BE PROCURED FROM A SPECIALIST MANUFACTURER
9. ALL STRUCTURAL MEMBERS OF PLATFORMS & STAIRCASE SHALL BE PAINTED WITH 2 COATS OF ZINC CHROMATE RED OXIDE PRIMER, FOLLOWED BY 3 COATS OF SYNTHETIC ENAMEL PAINT.
10. STAINLESS STEEL LINER FABRICATED USING MATERIAL CONFORMING TO AISI 316L
11. THE ENTIRE OUTSIDE SURFACE SHALL BE PAINTED WITH ALTERNATE BANDS OF SIGNAL RED AND WHITE COLOUR. OUT OF WHICH TOP 50M SHALL BE PAINTED WITH 4 COATS OF ACID AND HEAT RESISTANT PAINT (POLYURETHANE) OVER A COAT OF PRIMER WITH TOTAL DFT OF 150 MICRONS.
12. FLUE AND DUCT PLATES IN CONTACT WITH FLUE GAS SHALL BE FABRICATED FROM CORROSION RESISTANT STEEL TYPE '' CORTEN-B " HAVING AN YIELD STRENGTH OF 250MPA.
13. ALL STRUCTURAL MEMBERS OTHER THAN PLATES FOR FLUES AND DUCT SHALL BE FABRICATED FROM MS STEEL CONFIRMING TO IS:2062 HAVING AN YIELD STRENGTH OF 250MPA.

ENGG. REF DRG/DOC.

S.NO.	DESCRIPTION	DRAWING NO.
1	PLOT PLAN	GID-244-ME-U-XF-10001.
2	LAYOUT OF ID SYSTEM ELEVATION	0-00-020-77174.
3	LAYOUT OF ID SYSTEM PLAN	0-00-020-77175.

SPACE FOR STAMP

ISSUED FOR APPROVAL

DO NOT SCALE THE DRAWING

POWER PROJECTS DIVISION-CH/HY/MU/DL

OWNER

TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION LIMITED

PROJECT

1 X 800MW - NCTPP - STAGE - III

ENNORE & PUZHUDHIVAKKAM VILLAGE, CHENNAI, TAMILNADU

OWNER'S CONSULTANT

FICHTNER CONSULTING ENGINEERS(INDIA) PRIVATE LIMITED
CHENNAI - INDIA

BOP CONTRACTOR

BGR ENERGY SYSTEMS LIMITED
CHENNAI, INDIA

	NAME	SIGN	DATE
DRN.	MMH		22/02/2017
PRP.	BECK		22/02/2017
CHD.	SAS		22/02/2017
APPD.	PS		22/02/2017

SHEET SIZE: A0

DEPT. / CODE: UNTOL. DIMS. OR. C/M/F

SCALE: AS SHOWN

BOP CONTRACTOR'S DRAWING NO.: GID-244-CV-UHN-RC-30201 — REV.: 0

TITLE: CHIMNEY
GENERAL ARRANGEMENT

OWNER'S DRAWING NO.: -

SHEET No. 1 OF 1

ZONE	REV	DESCRIPTION	DATE	DRN.	CIVIL	MECH.	ELEC.	C&I	H.O.D.
	0	FOR APPROVAL	22.02.17	MMH					

REVISIONS — APPROVED

GID-244-CV-UHN-RC-30201 — SHEET No. 1 OF 1 — DRG NO

FILE NAME : GID-244-CV-UHN-RC-30201_REV-0

TAMILNADU GENERATION AND DISTRIBUTION CORPORATION LIMITED

1X800 MW NORTH CHENNAI TPP STAGE-III

Customer's Consultant: Fichtner Consulting Engineers (India) Private Limited, Chennai

GEOTECHNICAL INVESTIGATION REPORT

BOP AREA

DOCUMENT NO: PE-DC-423-602-C001 , R01

BHARAT HEAVY ELECTRICALS LIMITED
PROJECT ENGINEERING MANAGEMENT
NOIDA-201301

GEO TECHNICAL INVESTIGATION FOR 1X800 MW NORTH CHENNAI TPP STAGE III.

CLIENT

BHARAT HEAVY ELECTRICALS LIMITED

TITLE

REPORT – BOP AREA

REPORT NO: SI/CHN/16/1317/BOP/01

AUGUST 2016

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GEO TECHNICAL INVESTIGATION FOR 1X800 MW NORTH CHENNAI TPP STAGE III.

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APPENDIX

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GEOGRAPHICAL DESCRIPTION – NORTH CHENNAI THERMAL POWER STATION

The North Chennai Thermal Power Station is a power station situated about 25 kilometres from Chennai city. It is one of the major power plants of Tamil Nadu.

The North Chennai Thermal Power Station was commissioned in 1994 in the Thiruvallur district. It was built there due to its proximity to the Ennore Port, which also supplies Ennore Thermal Power Station.

LOCATION, GEOGRAPHY AND CLIMATE:

Ennore is a suburb in Chennai, India. It is situated on a peninsula and is bounded by the Korttalaiyar River, Ennore creek and the Bay of Bengal. The creek separates Ennore from the Ennore Port and Athipattu Pudunagar.

GEOLOGY

The project site is located along the Bay coast. The sea coast is flat and sandy for about 1 km from the shore. The study area has two distinct geological environments. The eastern and southern part of the stretches consists of shallow bedrock (crystalline) while western and northern areas have Gondwana deposits below the alluvium. Almost the entire area is covered by Pleistocene / Recent alluvium, deposited by Adyar, Cooum and Kottalaiyar rivers. The thickness of these deposits ranges from a few meters in southern part to as much as 50 m in the central and northern parts, the average being 20-25 m thick. The alluvium is made up of mainly clays, sand, sandy clay and occasional boulders / gravel zones. Sandy areas are found along the river bank and coast. Igneous / metamorphic rocks are found in the southern area. The marine sediments containing clayey silt – sands and charnokite rocks are found in the eastern and northern parts. The western part is composed of alluvium and

sedimentary rocks. A thin layer of Laterites is also noticed at some places. Well rounded pebbles and small boulders have been encountered at several locations at different depths. It is seen that in general, the eastern coastal area is predominantly sandy, while the northwestern region is mostly clayey in nature. From different fields of studies it has been established that, along the coast crystalline rocks of Archean era overlain by Phenerozoic rocks. Lower Permian to Carboniferous Lower Gondwana rocks are exposed in the northeast part of the Polar basin. Mesozoic rocks are represented by Upper Gondwana Formation. Mesozoic rocks are covered with late Pleistocene to Recent sediments along the coast. The sands are composed of quartz, fragments of feldspar, magnetite and rare garnet. The alluvial soils vary in color and texture from light brown to dirty white and are composed of sand grains, clay and silt. They are more sandy along river and stream courses but silty and clayey in the flood plains. Along the coast, an arenaceous formation called Coromondal Formation of probable Holocene age has been recorded below the beach sand. This formation is essentially quartz arenite which, at places, grades in depth to clayey sand and sandy clay.

FINAL GEO TECHNICAL INVESTIGATION REPORT – BOP AREA

1.0 INTRODUCTION

- The work of Detailed Geo Technical Investigation for 1x800 MW North Chennai TPP Stage III, Chennai, Tamil Nadu, being developed by Bharat Heavy Electricals Limited, was entrusted to M/s. Geo Foundations and Structures (P) Ltd., Adyar, Chennai – 600 020, wide Detailed Letter of Intent No: BHEL PSSR SCT 1608 dated 07.05.2016.
- The soil Investigation and laboratory studies of BOP Area were carried out during **March to August 2016**. This report summarizes the results of the soil investigation carried out at BOP area, and interpretation of the results, where applicable and presents recommendation for suitable type of foundation.

2.0 OBJECTIVE OF INVESTIGATION

- The objective of the soil investigation is to determine the nature and characteristics of sub-soil below the ground level for the proposed structures. The study includes identification of suitable type of foundation for the proposed structures and assessment of safe bearing capacity at BOP area.

3.0 SCOPE OF WORK

The scope of work is as follows:

- Mobilization of four boring rigs with all necessary equipments and personnel.
- Boring of ninety five bore-holes in the project site with calyx power drilling equipments through sand, silt, clay etc. to a maximum depth up to **40.0 m**.
- The Boring was carried out at locations indicated in drawing PE-DG-423-602-C001.
- Conducting Standard Penetration Tests in the bore-holes and collecting representative soil samples including packing and transportation to laboratory.
- To conduct the following laboratory tests on soil samples as applicable to the type of soil

(a) Particle size analysis:

(i) Sieve analysis

(ii) Hydrometer analysis

(b) Index properties:

(i) Liquid limit

(ii) Plastic limit

(iii) Free swell index

(c) Dry & wet density

(d) Relative density

(e) Water content

(f) Specific gravity

(g) Shrinkage limit

(h) Swell pressure

(i) Direct shear test

(j) Tri-axial shear test

(k) One dimensional consolidation test

(l) Unconfined Compressive strength test

(i) Un consolidated undrained test

(ii) Consolidated undrained test

(iii) Consolidated drained test

(m) Chemical analysis on soil & water samples

(n) CBR Tests.

(o) Standard and Modified Proctor compaction tests

- Conducting four static plate load tests at specified locations.
- Conducting thirty eight Electrical Resistivity tests.
- Conducting three pump out field permeability tests.
- Conducting thirteen dynamic cone penetration tests.
- Conducting three pressure meter tests.
- Conducting fourteen static cone penetration tests.
- Conducting eight field CBR tests
- Conducting two cross hole shear tests

- Recording ground water table level and collection of water samples.
- Preparation and submitting detailed report with field and laboratory results and recommendations for foundations.

4.0 FIELD INVESTIGATIONS

- Nine boring rigs with all requisite equipments and accessories were mobilized at the work site in **March 2016**. A team of technical personnel with skilled labours were deployed.
- **Ninety Five bore holes** pertaining to BOP area were bored to a maximum depth up to **40 m** below the existing ground level as per **IS: 1892- 1979**. Details of the co-ordinates, Reduced Levels of the existing ground level and termination depths are given in **Table A**.
- Representative soil samples were collected at every change of strata or about 1.0 m depth intervals up to 5.0 m and thereafter at 1.5 meters depth intervals up to termination depth. The samples so collected were sealed and numbered with full particulars for identification and sent to the laboratory for conducting the required tests.
- Standard Penetration Tests were conducted in the bore- holes at intervals of 1.0 m up to 5.0 m and thereafter at 1.50 m intervals up to termination depth, as per IS: 2131-1981. In this test, the standard split spoon sampler is driven into the ground at the required depth by means of standard hammer of 63.5 kgs weight; freely falling from a height of 75 cm. Number of blows for the first 15 cm is not

taken into consideration because of possible disturbances or presence of settled suspended matters at the bottom of the bore- holes. The total number of blows for the next 30 cm depth of penetration is considered as SPT 'N' values which are shown in **Appendix I** (Page Nos. 34- 128).

- Thirty Eight Electrical Resistivity tests were conducted as per **IS 3043-1987**. Details of the co-ordinates and Reduced Levels of the existing ground level are given in **Table B**.
- Four static plate load tests were conducted as per **IS 1888**. Details of the co-ordinates and Reduced Levels of the existing ground level are given in **Table C**.
- Thirteen Dynamic cone penetration tests were conducted as per **IS 4968 Part I.** Details of the co-ordinates and Reduced Levels of the existing ground level are given in **Table D**.
- Three Pressure meter tests were conducted as per **IS 1892**. Details of the co-ordinates and Reduced Levels of the existing ground level are given in **Table E**.
- Three Pump out field permeability tests were conducted as per **IS 5529 Part I**. Details of the co-ordinates and Reduced Levels of the existing ground level are given in **Table F**.
- Nine Field CBR tests were conducted as per **IS 2720 Part XXXI.** Details of the co-ordinates and Reduced Levels of the existing ground level are given in **Table G**.
- Three Cross hole Shear tests were conducted as per **IS 13372**. Details of the co-ordinates and Reduced Levels of the existing ground level are given in **Table H**.

- Fourteen Static Cone Penetration tests were conducted as per **IS 4968 Part III.** Details of the co-ordinates and Reduced Levels of the existing ground level are given in **Table I.**

5.0 LABORATORY INVESTIGATION

The following laboratory tests (as applicable to the type of soil) were conducted on the selected soil samples collected from the bore holes:

(a) Particle size analysis:

(i) Sieve analysis
(ii) Hydrometer analysis

(b) Index properties:

(i) Liquid limit
(ii) Plastic limit
(iii) Free swell index

(c) Dry & wet density
(d) Relative density
(e) Water content
(f) Specific gravity
(g) Shrinkage limit
(h) Swell pressure
(i) Direct shear test
(j) Consolidation test
(k) Chemical analysis on selected soil & water samples

All the above laboratory tests were carried out as per relevant Indian Standards.

All the samples were identified and classified as per relevant Indian Standard, IS: 1498. The results are shown in **Appendix II** (Page Nos. 129- 223).

TABLE A- Bore Hole Location Details.

S. No	Borehole No.	Co-ordinates		Existing Ground Level (m)	Termination Depth (m)
1	1	1399 S	408 W	RL (+) 8.09	26
2	6	1483 S	313 W	RL (+) 7.94	24.5
3	7	1483 S	294 W	RL (+) 7.85	24.5
4	7A	1473 S	310 W	RL (+) 7.88	40
5	33	1371 S	177 W	RL (+) 8.59	26
6	36	1249 S	174 W	RL (+) 8.87	26
7	39	1135 S	115 W	RL (+) 8.76	29
8	40	1190 S	111 W	RL (+) 8.82	29
9	41	1249 S	94 W	RL (+) 9.04	29
10	42	1184 S	81 W	RL (+) 8.89	29
11	44	1311 S	400 W	RL (+) 8.04	27.5
12	45	1121 S	399 W	RL (+) 7.97	26
13	46	1442 S	464 W	RL (+) 8.02	30.5

Table A (Contd)

S. No	Borehole No.	Co-ordinates		Existing Ground Level (m)	Termination Depth (m)
14	47	1298 S	461 W	RL (+) 7.97	29
15	48	1254 S	477 W	RL (+) 8.05	29
16	49	1205 S	446 W	RL (+) 8.14	33.5
17	50	1224 S	512 W	RL (+)8.22	33.5
18	51	1160 S	485 W	RL (+)8.14	31.5
19	52	1130 S	449 W	RL (+)8.24	29
20	53	1051 S	457 W	RL (+)8.18	26
21	54	1082 S	588 W	RL (+)8.89	26
22	55	1629 S	408 W	RL (+)7.47	27.5
23	56	1690 S	358 W	RL (+)7.97	24.5
24	57	1627 S	346 W	RL (+)7.74	29
25	58	1535 S	305 W	RL (+)8.17	27.5
26	59	1771 S	269 W	RL (+)7.67	40
27	60	1845 S	200 W	RL (+)9.49	26
28	61	1771 S	200 W	RL (+)9.34	40
29	62	1700 S	200 W	RL (+)9.43	27.5
30	63	1629 S	200 W	RL (+)9.31	29
31	64	1506 S	161 W	RL (+)10.52	29

Table A (Contd)

S. No	Borehole No.	Co-ordinates		Existing Ground Level (m)	Termination Depth (m)
32	65	1771 S	134 W	RL (+)8.82	27.5
33	66	1668 S	134 W	RL (+)8.79	27.5
34	67	1913 S	74 W	RL (+)8.41	27.5
35	68	1549 S	45 W	RL (+)9.79	27.5
36	69	1760 S	14 W	RL (+) 7.78	27.5
37	70	1629 S	14 W	RL (+)9.34	30.5
38	71	1506 S	14 W	RL (+)9.71	29
39	72	1809 S	22 E	RL (+)8.06	30.5
40	73	1700 S	100 E	RL (+)10.29	29
41	74	1600 S	100 E	RL (+)9.52	29
42	75	1505 S	100 E	RL (+)9.32	30.5
43	76	1465 S	129 E	RL (+)9.35	30.5
44	77	1800 S	228 E	RL (+)7.65	29
45	78	1635 S	212 E	RL (+)9.56	29
46	79	1568 S	272 E	RL (+)7.78	29
47	80	1690 S	300 E	RL (+)9.97	30.5
48	81	1475 S	300 E	RL (+)9.08	29
49	82	1629 S	352 E	RL (+)11.67	29
50	83	1160 S	394 E	RL (+)9.11	40

Table A (Contd)

S. No	Borehole No.	Co-ordinates		Existing Ground Level (m)	Termination Depth (m)
51	84	1462 S	432 E	RL (+)9.14	30.5
52	85	1760 S	472 E	RL (+)9.29	30.5
53	86	1629 S	472 E	RL (+)10.15	30.5
54	87	1506 S	472 E	RL (+)9.64	40
55	88	1506 S	550 E	RL (+)9.62	30.5
56	89	575 S	455 W	RL (+)9.41	30.5
57	90	484 S	457 W	RL (+)8.82	14
58	91	910 S	380 W	RL (+)8.15	27.5
59	92	768 S	380 W	RL (+)8.51	29
60	93	651 S	362 W	RL (+)8.54	30.5
61	94	978 S	305 W	RL (+)7.69	27.5
62	95	842 S	305 W	RL (+)8.29	26
63	96	698 S	305 W	RL (+)8.44	30.5
64	97	651 S	305 W	RL (+)8.43	30.5
65	98	910 S	237 W	RL (+)8.21	29
66	99	768 S	237 W	RL (+)8.41	26
67	100	400 S	121 W	RL (+)9.64	29
68	101	809 S	55 W	RL (+)9.21	29
69	102	842 S	123 W	RL (+)9.34	29

Table A (Contd)

S. No	Borehole No.	Co-ordinates		Existing Ground Level (m)	Termination Depth (m)
70	103	1306 S	550 E	RL (+)9.35	30.5
71	104	906 S	550 E	RL (+)9.41	29
72	105	706 S	550 E	RL (+)9.34	30.5
73	106	922 N	405 E	RL (+)10.67	40
74	107	862 N	450 E	RL (+)10.52	30.5
75	108	1265 N	450 E	RL (+)11.74	29
76	109	700 N	559 E	RL (+)9.81	30.5
77	110	1415 S	55 W	RL (+)8.87	29
78	112	1242 S	408 W	RL (+)8.01	29
79	113	306 S	550 E	RL (+)9.50	27.5
80	114	106 S	550 E	RL (+)9.78	30.5
81	115	94 N	550 E	RL (+)9.29	30.5
82	116	294 N	550 E	RL (+)9.34	30.5
83	117	745 S	601 W	RL (+)7.88	27.5
84	118	1537 S	357 W	RL (+)7.98	24.5
85	119	1537 S	246 W	RL (+)8.22	24.5
86	120	1661 S	330 W	RL (+)7.96	24.5
87	121	411 S	400 W	RL (+)8.59	30.5
88	122	400 N	379 W	RL (+)9.89	29

Table A (Contd)

S. No	Borehole No.	Co-ordinates		Existing Ground Level (m)	Termination Depth (m)
89	123	350 S	107 E	RL (+)9.51	30.5
90	124	350 S	336 E	RL (+)9.75	32
91	125	200 S	418 E	RL (+)9.14	27.5
92	126	29 N	418 E	RL (+)9.01	29
93	127	258 N	418 E	RL (+)9.45	29
94	128	487 N	418 E	RL (+)9.55	27.5
95	129	716 N	418 E	RL (+)9.81	30.5

TABLE B- ERT Location Details.

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
1	ERT - 1	712 S	384 W	RL (+) 8.34
2	ERT - 2	769 S	354 W	RL (+) 8.16
3	ERT - 3	852 S	340 W	RL (+) 8.13
4	ERT - 4	873 S	329 W	RL (+) 8.02
5	ERT - 5	928 S	293 W	RL (+) 7.73
6	ERT - 6	993 S	264 W	RL (+) 8.04
7	ERT -20	1473 S	305 W	RL (+) 7.87
8	ERT - 21	1125 S	428 W	RL (+) 8.07
9	ERT - 22	1159 S	493 W	RL (+) 8.02
10	ERT - 23	1200 S	525 W	RL (+) 8.18
11	ERT - 24	1309 S	475 W	RL (+) 7.88
12	ERT - 25	1298 S	407 W	RL (+) 8.05
13	ERT - 26	1385 S	409 W	RL (+) 7.93
14	ERT - 28	1535 S	455 W	RL (+) 8.12
15	ERT - 29	1552 S	326 W	RL (+)8.34

Table B (Contd)

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
16	ERT - 30	1631 S	335 W	RL (+) 7.70
17	ERT - 31	1759 S	230 W	RL (+)8.00
18	ERT - 32	1929 S	256 W	RL (+)7.93
19	ERT - 33	1651 S	200 W	RL (+) 9.39
20	ERT - 34	1637 S	170 W	RL (+) 8.69
21	ERT - 35	1904 S	66 W	RL (+) 8.34
22	ERT -36	2047 S	56 E	RL (+) 8.00
23	ERT - 37	1681 S	108 W	RL (+) 10.15
24	ERT – 38	2348 S	161 W	RL (+) 8.09
25	ERT - 39	1575 S	40 W	RL (+) 9.79
26	ERT - 40	1881 S	489 E	RL (+) 9.24
27	ERT - 41	1685 S	232 E	RL (+) 8.40
28	ERT - 42	1477 S	123 E	RL (+) 9.29
29	ERT - 43	1456 S	288 E	RL (+) 8.99
30	ERT - 44	1447 S	443 E	RL (+)9.04
31	ERT - 45	141 S	562 E	RL (+)9.23
32	ERT - 46	25 S	530 E	RL (+)9.40

Table B (Contd)

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
33	ERT - 47	892 N	465 E	RL (+) 10.09
34	ERT - 48	926 N	381 E	RL (+) 10.60
35	ERT - 49	1393 S	184 W	RL (+) 8.57
36	ERT - 50	621 S	186 W	RL (+) 8.83
37	ERT - 51	649 S	320 W	RL (+) 8.54
38	ERT - 52	361 S	349 W	RL (+) 9.03

TABLE C- PLT Location Details.

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
1	PLT - 1	900 S	305 W	RL (+) 7.78
2	PLT - 3	1271 S	118 W	RL (+) 9.41
3	PLT - 4	1651 S	257 E	RL (+) 7.99
4	PLT - 5	788 N	494 E	RL (+) 9.02

TABLE D- DCPT Location Details.

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
1	DCPT - 1	760 S	305 W	RL (+) 8.78
2	DCPT - 2	842 S	380 W	RL (+)8.27
3	DCPT - 4	1245 S	537 W	RL (+)8.30
4	DCPT - 5	1254 S	72 W	RL (+)8.73
5	DCPT - 6	1269 S	220 W	RL (+)7.59
6	DCPT - 7	1664 S	200 W	RL (+)9.25
7	DCPT - 8	1800 S	328 E	RL (+)7.53
8	DCPT - 9	1722 S	246 E	RL (+)8.69
9	DCPT - 10	1460 S	272 E	RL (+)9.03
10	DCPT - 11	1698 S	471 E	RL (+)8.47

Table D (Contd)

11	DCPT - 14	925 N	371 E	RL (+)8.21
12	DCPT - 15	1451 N	285 E	RL (+)7.98
13	DCPT - 16	1483 N	324 W	RL (+)10.61

TABLE E- PMT Location Details.

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
1	PMT - 3	1500 S	307 W	RL (+) 7.84
2	PMT - 4	1730 S	164 W	RL (+) 8.39
3	PMT - 5	1496 S	482 E	RL (+) 9.19

TABLE F- POTFPT Location Details.

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
1	POTFPT - 2	1629 S	228 W	RL (+) 8.36
2	POTFPT - 3	1570 S	471 E	RL (+) 9.22
3	POTFPT - 4	531 S	100 W	RL (+) 8.69

TABLE G- CBR Location Details.

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
1	CBR - 1	817 S	140 W	RL (+) 9.60
2	CBR - 3	1397 S	487 W	RL (+)7.89
3	CBR - 4	1722 S	80 W	RL (+)10.36
4	CBR - 5	1434 S	113 E	RL (+)9.10
5	CBR - 6	500 S	389 W	RL (+)8.56
6	CBR - 7	900 S	595 W	RL (+)10.2
7	CBR - 8	1100 S	530 W	RL (+)8.45
8	CBR - 9	1573 S	260 W	RL (+)7.88

TABLE H- CST Location Details.

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
1	CST - 4	1444 S	305 W	RL (+) 7.39
2	CST - 5	1524 S	471 E	RL (+) 8.06

TABLE I- SCPT Location Details.

S. No	Test No.	Co-ordinates		Existing Ground Level (m)
1	SCPT- 1	700 S	380 W	RL (+) 8.36
2	SCPT- 2	978 S	240 W	RL (+)8.17
3	SCPT- 3	910 S	115 W	RL (+)9.14
4	SCPT- 4	1212 S	163 W	RL (+)8.86
5	SCPT- 5	1084 S	492 W	RL (+)8.31
6	SCPT- 6	1293 S	487 W	RL (+)7.89
7	SCPT- 7	1800 S	128 E	RL (+)7.85
8	SCPT- 8	1700 S	169 E	RL (+)8.05
9	SCPT- 9	1106 S	550 E	RL (+)9.15
10	SCPT- 10	506 S	550 E	RL (+)9.28
11	SCPT- 11	24 S	536 E	RL (+)9.42
12	SCPT- 12	507 N	556 E	RL (+)9.47
13	SCPT- 13	1062 N	450 E	RL (+)10.63
14	SCPT- 14	1000 S	55 W	RL (+)9.39

Details along with calculations of thirty eight electrical resistivity tests, four static plate load tests, fourteen static cone penetration tests, thirteen dynamic cone penetration tests, two cross hole shear tests, three pressure meter tests, three pump out field permeability tests, eight field CBR test, Chemical analysis of water and soil samples, eleven laboratory CBR test results are given in **Appendix III** (Page No. 224-341), **Appendix IV** (Page No. 342- 349), **Appendix V**(Page No. 350- 398), **Appendix VI** (Page No. 399- 454), **Appendix VII** (Page No. 455- 465), **Appendix VIII** (Page No. 466-537), **Appendix IX** (Page No. 538- 541), **Appendix X** (Page No. 542- 545), **Appendix XI** (Page No. 546- 548), & **Appendix XII** (Page No. 549- 550) respectively.

6.0 GROUND WATER

Ground water level was met at a depth of **1.50 m to 4.5 m** in the bore holes during the boring from **22.03.2016** to **21.06.2016**.

6.1 Chemical composition of the ground water are presented in Appendix XI

6.2 Considering the ground water characteristics and close proximity of site to sea, it is recommended to use ordinary Portland cement with C3A from 5% to 8%.

7.0 DESIGN PROFILES

DESIGN PROFILE FOR BOP area near/ at BH 06, BH 07, BH 07A, BH 36, BH 39, BH 40, BH 41, BH 42, BH 44, BH 46, BH 47, BH 48, BH 52, BH 53, BH 54, BH 55, BH 56, BH 57, BH 59, BH 60, BH 61, BH 62, BH 63, BH 64, BH 65, BH 66, BH 67, BH 68, BH 69, BH 70, BH 71, BH 72, BH 73, BH 75, BH 77, BH 78, BH 79, BH 80, BH 81, BH 82, BH 84, BH 85, BH 87, BH 88, BH 89, BH 90, BH 91, BH 92, BH 93, BH 94, BH 95, BH 96, BH 97, BH 98, BH 99, BH 101, BH 102, BH 103, BH 104, BH 105, BH 106, BH 107, BH 108, BH 109, BH 110, BH 112, BH 113, BH 114, BH 115, BH 116, BH 117, BH 118, BH 119, BH 120, BH 121, BH 122, BH 123, BH 124, BH 125, BH 126, BH 127, BH 128, BH 129.

Depth from EGL	Type of sub Soil stratum	Average Corrected 'N' Value	Shear Parameters	
(m)			C (kg/cm^2)	Φ
0-5	Medium dense Silty Sand	14	-	30
5-14	Stiff Silty Clay/Sandy Clay	10	0.625	-
14-18.5	Medium dense Clayey Sand/ Silty Sand	24	-	34
18.5 -22	Hard Silty Clay	50	2.5	-
22 - 40	Hard Silty Clay/very dense Silty Sand*	>100	4	0

*Considering the complete BOP area and variation in soil type in different bore holes, the sub-soil is considered as fine grained soil.

DESIGN PROFILE FOR BOP area near/ at BH 01, BH 33, BH 45, BH 49, BH 50, BH 51, BH 58, BH 74, BH 76, BH 83, BH 86 & BH 100

Depth from EGL	Type of sub Soil stratum	Average Corrected 'N' Value	Shear Parameters	
(m)			C (kg/cm^2)	Φ
0-3	Medium dense Silty Sand	14	-	30
3- 6.5	Loose to medium dense Silty Sand	5	0	28.5
6.5-12.5	Soft Silty Clay	3	2	
12.5-18.5	Loose to medium dense Clayey Sand/ Silty Sand	5	-	28.5
18.5 -23	Medium dense Silty Sand	14	-	30
23 - 40	Hard Silty Clay	>100	4	0

8.0 RECOMMENDATIONS:

- The excavated earth can be used for back filling the foundations and grading purpose.
- For average resistivity values at the corresponding locations, Appendix -III can be referred.
- For Plate load test result, Appendix -IV can be referred
- The Modulus of Subgrade reaction (K) can be obtained as Ratio of allowable Bearing Pressure divided by Estimated Settlement
- For Static Cone penetration test results, Appendix -V can be referred
- For Dynamic Cone penetration test results, Appendix -VI can be referred
- For Cross hole shear tests results, Appendix -VII can be referred

- For Pressure meter tests results, Appendix -VIII can be referred
- For Field permeability tests results, Appendix -IX can be referred
- For Field CBR tests results, Appendix -X can be referred
- Considering the ground water characteristics (refer Appendix -XI) and close proximity of site to sea, it is recommended to use ordinary Portland cement with C3A from 5% to 8%.
- For Laboratory CBR results, Appendix -XII can be referred
- Wherever roads are to be constructed in fill, the CBR value in soaked condition shall be determined from the fill material in laboratory during execution. It has to be checked by Field CBR testing, during execution.
- Considering Seismic zone – 3 and sub soil characteristic, the project site is not prone to liquefaction. Sample calculation on liquefaction analysis is furnished in Appendix XIII.
- The recommended safe load carrying capacity of Bored cast-in-situ RCC piles for BOP area near/ at BH 06, BH 07, BH 07A, BH 36, BH 39, BH 40, BH 41, BH 42, BH 44, BH 46, BH 47, BH 48, BH 52, BH 53, BH 54, BH 55, BH 56, BH 57, BH 59, BH 60, BH 61, BH 62, BH 63, BH 64, BH 65, BH 66, BH 67, BH 68, BH 69, BH 70, BH 71, BH 72, BH 73, BH 75, BH 77, BH 78, BH 79, BH 80, BH 81, BH 82, BH 84, BH 85, BH 87, BH 88, BH 89, BH 90, BH 91, BH 92, BH 93, BH 94, BH 95, BH 96, BH 97, BH 98, BH 99, BH 101, BH 102, BH 103, BH 104, BH 105, BH 106, BH 107, BH 108, BH 109, BH 110, BH 112, BH 113, BH 114, BH 115, BH 116, BH 117, BH 118, BH 119, BH 120, BH 121, BH 122, BH 123, BH 124, BH 125, BH 126, BH 127, BH 128, BH 129.

Diameter of pile (mm)	Length of pile below cut off level (m)	Safe Load carrying capacity of piles (MT)		
		Vertical Compression	Uplift	Lateral*
600	17	75	15	7
	26	150	30	7
760	28	240	50	10.5

* For fixed head condition. In case of free head pile, the lateral capacity shall be reduced suitably.

Cut off level considered in case of 600 mm = 1 m below EGL

Cut off level considered in case of 760 mm = 2 m below EGL

Existing Ground Level (EGL) = RL (+) 8.000 m

- In case of Open Foundation, the allowable bearing pressure for BOP area near/ at BH 06, BH 07, BH 07A, BH 36, BH 39, BH 40, BH 41, BH 42, BH 44, BH 46, BH 47, BH 48, BH 52, BH 53, BH 54, BH 55, BH 56, BH 57, BH 59, BH 60, BH 61, BH 62, BH 63, BH 64, BH 65, BH 66, BH 67, BH 68, BH 69, BH 70, BH 71, BH 72, BH 73, BH 75, BH 77, BH 78, BH 79, BH 80, BH 81, BH 82, BH 84, BH 85, BH 87, BH 88, BH 89, BH 90, BH 91, BH 92, BH 93, BH 94, BH 95, BH 96, BH 97, BH 98, BH 99, BH 101, BH 102, BH 103, BH 104, BH 105, BH 106, BH 107, BH 108, BH 109, BH 110, BH 112, BH 113, BH 114, BH 115, BH 116, BH 117, BH 118, BH 119, BH 120, BH 121, BH 122, BH 123, BH 124, BH 125, BH 126, BH 127, BH 128, BH 129 shall be as follows.

Width of the Footing* (m)	Depth of Foundation from Ground level (m)	Allowable Bearing Pressure (T/m²)	
		Total permissible settlement of 25 mm**	Total permissible settlement of 40 mm**
Up to 2	1.0	10	11***
Up to 2	1.5	11	14
Up to 2	2.0	6.5	10

* Considering minimum width of foundation as 1 m & maximum width of foundation as 2 m. Open foundation are not recommended for foundation size/ width greater than 2 m.

** Also considering Shear failure consideration, with factor of safety.

*** Even though the bearing pressure for 40 mm settlement is 13 T/m², but on the shear failure criterion it is only 11 T/m² and this governs the allowable bearing pressure. In all the other cases, the settlement criterion governs the allowable bearing pressure.

- Open foundation are not recommended in BOP area near/ at BH 01, BH 33, BH 45, BH 49, BH 50, BH 51, BH 58, BH 74, BH 76, BH 83, BH 86 & BH 100.
- The recommended safe load carrying capacity of Bored cast-in-situ RCC piles for area near/ at BH 01, BH 33, BH 45, BH 49, BH 50 BH 51, BH 58, BH 74, BH 76, BH 83, BH 86 & BH 100 shall be as follows.

Diameter of pile (mm)	Length of pile below cut off level (m)	Safe Load carrying capacity of piles (MT)		
		Vertical Compression	Uplift	Lateral*
600	20	55	11	4.5
	30	145	30	4.5
760	32	230	50	6.5

* For fixed head condition. In case of free head pile, the lateral capacity shall be reduced suitably.

Cut off level considered in case of 600mm = 1 m below EGL

Cut off level considered in case of 760mm = 2 m below EGL

Existing Ground Level (EGL) = RL (+) 8.000 m

9.0 The results and recommendations given in this report are based on the results of the soil investigation carried out. If, in actual execution, any variation is found, the consultants may also be referred to.

For GEO FOUNDATIONS & STRUCTURES PVT. LTD.

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APPROVED BY,

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APPENDIX I

BORE LOGS

CLIENT	**: BHARAT HEAVY ELECTRICALS LIMITED**		
PROJECT	**: 1X800 MW NORTH CHENNAI STAGE 3 SUPER CRITICAL THERMAL POWER PROJECT**	CASING	: NOT USED
BORE HOLE NO.	**: 58**	SHEET NO.	: 25 OF 95
LOCATION	: AHP CONTROL ROOM	DATE	: 09.04.2016 to 10.04.2016
CO-ORDINATES	: 1535 S 305 W	METHOD	: CALYX / ROTARY DRILLING
EXISTING GROUND LEVEL	: RL(+) 8.17	GROUND WATER TABLE	: 2.75 M FROM THE G.L
DIA OF BORING	: 150 MM	TERMINATION DEPTH	: 27.50 M

DEPTH (M)	LOG	STRATA DISCRIPTION	DEPTH (M)	TYPE OF SAMLE	SAMPLER TYPE	BLOWS/15 cm			SPT N	CR %	RQD %	REMARK
						15	15	15				
1.00		**SAND**	1.00-1.45	SPT - 1	SS	7	10	15	25			
2.00		**SAND**	2.00-2.45	UDS-1	OT	-	-	-	-			
3.00		**SAND**	3.00-3.45	SPT - 2	SS	10	13	18	31			
4.00		**SAND**	4.00-4.45	UDS-2	OT	-	-	-	-			
5.00		**SAND**	5.00-5.45	SPT - 3	SS	9	15	19	34			
6.50		**SAND**	6.50-6.95	UDS-3	OT	-	-	-	-			
8.00		**SAND**	8.00-8.45	SPT - 4	SS	2	3	3	6			
9.50		**SAND**	9.50-9.95	UDS-4	OT	-	-	-	-			
11.00		**SAND**	11.00-11.45	SPT - 5	SS	3	3	4	7			
12.50		**SAND**	12.50-12.95	UDS-5	OT	-	-	-	-			
14.00		**SAND**	14.00-14.45	SPT - 6	SS	2	3	4	7			
15.50		**SAND**	15.50-15.95	UDS-6	OT	-	-	-	-			
17.00		**SAND**	17.00-17.45	SPT - 7	SS	3	5	7	12			
18.50		Silty **SAND**	18.50-18.95	SPT - 8	SS	7	8	13	21			
20.00		Silty **SAND**	20.00-20.45	SPT - 9	SS	9	13	18	31			
21.50		Silty **SAND**	21.50-21.95	SPT - 10	SS	14	19	28	47			
23.00		Silty **CLAY**	23.00-23.24	SPT - 11	SS	28	>50	-	>100			50/09 CM PENETRATION
24.50		Silty **CLAY**	24.50-24.72	SPT - 12	SS	35	>50	-	>100			50/07 CM PENETRATION
26.00		Silty **CLAY**	26.00-26.08	SPT - 13	SS	>50	-	-	>100			50/08 CM PENETRATION
27.50		Silty **CLAY**	27.50-27.54	SPT - 14	SS	>50	-	-	>100			50/04 CM PENETRATION

SPT - Standard Penetration Test
SS - Split Spoon Sampler
OT - Open Tube
EGL - Existing Ground Level
RL - Reduced Level .

CLIENT	**: BHARAT HEAVY ELECTRICALS LIMITED**		
PROJECT	**: 1X800 MW NORTH CHENNAI STAGE 3 SUPER CRITICAL THERMAL POWER PROJECT**	CASING	: NOT USED
BORE HOLE NO.	**: 70**	SHEET NO.	: 37 OF 95
LOCATION	:	DATE	: 02.07.2016 TO 03.07.2016
CO-ORDINATES	: 1629 S 14 W	METHOD	: CALYX / ROTARY DRILLING
EXISTING GROUND LEVEL	: RL(+) 9.34	GROUND WATER TABLE	: 2.00 M BELOW THE E.G.L
DIA OF BORING	: 150 MM	TERMINATION DEPTH	: 30.50 M

DEPTH (M)	LOG	STRATA DISCRIPTION	DEPTH (M)	TYPE OF SAMPLE	SAMPLER TYPE	BLOWS/15 cm			SPT N	CR %	RQD %	REMARK
						15	15	15				
1.00		Silty **CLAY**	1.00-1.45	SPT - 1	SS	3	4	5	9			
2.00		Silty **CLAY**	2.00-2.45	SPT - 2	SS	4	4	6	10			
3.00		**SAND**	3.00-3.45	SPT - 3	SS	6	8	4	12			
4.00		**SAND**	4.00-4.45	SPT - 4	SS	7	9	13	22			
5.00		**SAND**	5.00-5.45	SPT - 5	SS	7	12	14	26			
6.50		**SAND**	6.50-6.95	SPT - 6	SS	10	13	15	28			
8.00		Clayey **SAND**	8.00-8.45	SPT - 7	SS	3	3	4	7			
9.50		Clayey **SAND**	9.50-9.95	UDS-1	OT	-	-	-	-			
11.00		Clayey **SAND**	11.00-11.45	SPT - 8	SS	3	4	5	9			
12.50		Clayey **SAND**	12.50-12.95	UDS-2	OT	-	-	-	-			
14.00		Clayey **SAND**	14.00-14.45	SPT - 9	SS	4	6	3	9			
15.50		Clayey **SAND**	15.50-15.95	SPT - 10	SS	5	8	11	19			
17.00		Clayey **SAND**	17.00-17.45	SPT - 11	SS	5	9	13	22			
18.50		Sandy **CLAY**	18.50-18.95	SPT - 12	SS	6	8	11	19			
20.00		Sandy **CLAY**	20.00-20.45	SPT - 13	SS	8	12	16	28			
21.50		Silty **SAND**	21.50-21.95	SPT - 14	SS	10	14	19	33			
23.00		Sandy **SILT**	23.00-23.45	SPT - 15	SS	15	31	44	71			
24.50		Sandy **SILT**	24.50-24.95	SPT - 16	SS	18	32	48	80			
26.00		Sandy **SILT**	26.00-26.36	SPT - 17	SS	21	38	>50	>100			50/02 CM PENETRATION
27.50		Sandy **SILT**	27.50-27.83	SPT - 18	SS	23	39	>50	>100			50/05 CM PENETRATION
29.00		Sandy **SILT**	29.00-29.22	SPT - 19	SS	31	>50	-	>100			50/01 CM PENETRATION
30.50		Sandy **SILT**	30.50-30.68	SPT - 20	SS	32	>50	-	>100			50/04 CM PENETRATION

SPT - Standard Penetration Test
SS - Split Spoon Sampler
OT - Open Tube
EGL - Existing Ground Level
RL - Reduced Level .

CLIENT	**: BHARAT HEAVY ELECTRICALS LIMITED**		
PROJECT	**: 1X800 MW NORTH CHENNAI STAGE 3 SUPER CRITICAL THERMAL POWER PROJECT**	CASING	: NOT USED
BORE HOLE NO.	**: 118**	SHEET NO.	: 84 OF 95
LOCATION	: SPACE FOR FGD	DATE	: 12.04.2016 to 13.04.2016
CO-ORDINATES	: 1537 S 357 W	METHOD	: CALYX / ROTARY DRILLING
EXISTING GROUND LEVEL	:RL(+) 7.98	GROUND WATER TABLE	: 3.0 M BELOW THE E.G.L
DIA OF BORING	: 150 MM	TERMINATION DEPTH	: 24.50 M

DEPTH (M)	LOG	STRATA DISCRIPTION	DEPTH (M)	TYPE OF SAMPLE	SAMPLER TYPE	BLOWS/15 cm			SPT N	CR %	RQD %	REMARK
						15	15	15				
1.00		**SAND**	1.00-1.45	SPT - 1	SS	2	3	5	8			
2.00		**SAND**	2.00-2.45	UDS-1	OT	-	-	-	-			
3.00		**SAND**	3.00-3.45	SPT - 2	SS	3	4	5	9			
4.00		**SAND**	4.00-4.45	UDS-2	OT	-	-	-	-			
5.00		**SAND**	5.00-5.45	SPT - 3	SS	1	2	3	5			
6.50		**SAND**	6.50-6.95	UDS-3	OT	-	-	-	-			
8.00		Silty **SAND**	8.00-8.45	SPT - 4	SS	2	4	4	8			
9.50		Silty **SAND**	9.50-9.95	UDS-4	OT	-	-	-	-			
11.00		Sandy **CLAY**	11.00-11.45	SPT - 5	SS	3	5	8	13			
12.50		Sandy **CLAY**	12.50-12.95	UDS-5	SS	-	-	-	-			
14.00		Silty **SAND**	14.00-14.45	SPT - 6	SS	10	12	13	25			
15.50		Silty **SAND**	15.50-15.95	UDS-6	OT	-	-	-	-			
17.00		Silty **SAND**	17.00-17.45	SPT - 7	SS	10	14	16	30			
18.50		Silty **SAND**	18.50-18.95	SPT - 8	SS	7	15	19	34			
20.00		Silty **SAND**	20.00-20.40	SPT - 9	SS	8	19	>50	>100			50/10 CM PENETRATION
21.50		Silty **SAND**	21.50-21.93	SPT - 10	SS	40	48	>50	>100			50/13 CM PENETRATION
23.00		Silty **SAND**	23.00-23.20	SPT - 11	SS	42	>50	-	>100			50/05 CM PENETRATION
24.50		Silty **SAND**	24.50-24.57	SPT - 12	SS	>50	-	-	>100			50/07 CM PENETRATION

SPT - Standard Penetration Test
SS - Split Spoon Sampler
OT - Open Tube
EGL - Existing Ground Level
RL - Reduced Level .

CLIENT	**: BHARAT HEAVY ELECTRICALS LIMITED**		
PROJECT	**: 1X800 MW NORTH CHENNAI STAGE 3 SUPER CRITICAL THERMAL POWER PROJECT**	CASING	: NOT USED
BORE HOLE NO.	**: 119**	SHEET NO.	: 85 OF 95
LOCATION	: SPACE FOR FGD	DATE	: 11.04.2016 to 12.04.2016
CO-ORDINATES	: 1537 S 246 W	METHOD	: CALYX / ROTARY DRILLING
EXISTING GROUND LEVEL	:RL(+) 8.22	GROUND WATER TABLE	: 2.45 M BELOW THE E.G.L
DIA OF BORING	: 150 MM	TERMINATION DEPTH	: 24.50 M

DEPTH (M)	LOG	STRATA DISCRIPTION	DEPTH (M)	TYPE OF SAMPLE	SAMPLER TYPE	BLOWS/15 cm			SPT N	CR %	RQD %	REMARK
						15	15	15				
1.00		**SAND**	1.00-1.45	SPT - 1	SS	6	10	14	24			
2.00		**SAND**	2.00-2.45	UDS-1	OT	-	-	-	-			
3.00		**SAND**	3.00-3.45	SPT - 2	SS	9	13	17	30			
4.00		**SAND**	4.00-4.45	UDS-2	OT	-	-	-	-			
5.00		Silty **SAND**	5.00-5.45	SPT - 3	SS	12	16	21	37			
6.50		Silty **SAND**	6.50-6.95	UDS-3	OT	-	-	-	-			
8.00		Silty **CLAY**	8.00-8.45	SPT - 4	SS	2	3	4	7			
9.50		Silty **CLAY**	9.50-9.95	UDS-4	OT	-	-	-	-			
11.00		Sandy **CLAY**	11.00-11.45	SPT - 5	SS	2	4	4	8			
12.50		Sandy **CLAY**	12.50-12.95	UDS-5	OT	-	-	-	-			
14.00		Clayey **SAND**	14.00-14.45	SPT - 6	SS	7	10	16	26			
15.50		Clayey **SAND**	15.50-15.95	UDS-6	OT	-	-	-	-			
17.00		Silty **SAND**	17.00-17.45	SPT - 7	SS	9	14	19	33			
18.50		Silty **SAND**	18.50-18.95	SPT - 8	SS	10	16	23	39			
20.00		Clayey **SILT**	20.00-20.21	SPT - 9	SS	44	>50	-	>100			50/06 CM PENETRATION
21.50		Clayey **SILT**	21.50-21.56	SPT - 10	SS	>50	-	-	>100			50/06 CM PENETRATIOM
23.00		Silty **CLAY**	23.00-23.04	SPT - 11	SS	>50	-	-	>100			50/04 CM PENETRATION
24.50		Silty **CLAY**	24.50-24.953	SPT - 12	SS	>50	-	-	>100			50/03 CM PENETRATIOM

SPT - Standard Penetration Test
SS - Split Spoon Sampler
OT - Open Tube
EGL - Existing Ground Level
RL - Reduced Level .

APPENDIX II

LABORATORY TEST RESULTS

1X800 MW NORTH CHENNAI STAGE 3 SUPER CRITICAL THERMAL POWER PROJECT

BORE HOLE NO	DEPTH (m)	TYPE OF SAMPLE	DENSITY (KN/m³)		WATER CONTENT (%)	PARTICLE SIZE (%)				ATTERBERG'S LIMITS				SOIL			STRENGTH TEST			CONSOLIDATION TEST						SWELL TEST		COMPACTION TEST			RELATIVE DENSITY	PERMEABILITY (m/hr)	REMARKS	
			BULK	DRY		GRAVEL	SAND	SILT	CLAY	LL	PL	PI	SL	IS CLASSIFICATION	DESCRIPTION	SPECIFIC GRAVITY	TYPE	C in kN/ m²	Ø °	e	Pc	Cc	ρ	mv	Cv	S.Pr	FSI	MDD	OMC	CBR				
58	1.00	SPT			13	0	94	6						SP	**SAND**																		
	2.00	UDS												SP	**SAND**																		
	3.00	SPT												SP	**SAND**																		
	4.00	UDS												SP	**SAND**																		
	5.00	SPT			16	0	95	5						SP	**SAND**																		
	6.50	UDS												SP	**SAND**																		
	8.00	SPT												SP	**SAND**																		
	9.50	UDS												SP	**SAND**																		
	11.00	SPT												SP	**SAND**																		
	12.50	UDS												SP	**SAND**																		
	14.00	SPT												SP	**SAND**																		
	15.50	UDS												SP	**SAND**																		
	17.00	SPT												SP	**SAND**																		
	18.50	SPT			15	0	78	22						SM	Silty **SAND**																		
	20.00	SPT			16	0	75	25						SM	Silty **SAND**																		
	21.50	SPT												SM	Silty **SAND**																		
	23.00	SPT			23					42	16	26		CI	Silty **CLAY**												55						
	24.50	SPT												CI	Silty **CLAY**																		
	26.00	SPT												CI	Silty **CLAY**																		
	27.50	SPT												CI	Silty **CLAY**																		

1X800 MW NORTH CHENNAI STAGE 3 SUPER CRITICAL THERMAL POWER PROJECT

BORE HOLE NO	DEPTH (m)	TYPE OF SAMPLE	DENSITY (KN/m³)		WATER CONTENT (%)	PARTICLE SIZE (%)				ATTERBERG'S LIMITS				SOIL		SPECIFIC GRAVITY	STRENGTH TEST			CONSOLIDATION TEST						SWELL TEST		COMPACTION TEST			RELATIVE DENSITY	PERMEABILITY (m/hr)	REMARKS
			BULK	DRY		GRAVEL	SAND	SILT	CLAY	LL	PL	PI	SL	IS CLASSIFICATION	DESCRIPTION		TYPE	C	Ø	e_o	Pc	Cc	p	mv	Cv	S.Pr	FSI	MDD	OMC	CBR			
70	1.00	SPT											19.36		Silty **CLAY**																		
	2.00	SPT													Silty **CLAY**																		
	3.00	SPT				0	92	8						SP	**SAND**																		
	4.00	SPT												SP	**SAND**																		
	5.00	SPT												SP	**SAND**																		
	6.50	SPT												SP	**SAND**																		
	8.00	SPT													Clayey **SAND**																		
	9.50	UDS													Clayey **SAND**																		
	11.00	SPT													Clayey **SAND**																		
	12.50	UDS													Clayey **SAND**																		
	14.00	SPT													Clayey **SAND**																		
	15.50	SPT													Clayey **SAND**																		
	17.00	SPT													Clayey **SAND**																		
	18.50	SPT													Sandy **CLAY**																		
	20.00	SPT													Sandy **CLAY**																		
	21.50	SPT				0	89	11						SM	Silty **SAND**																		
	23.00	SPT								Non-Plastic					Sandy **SILT**																		
	24.50	SPT													Sandy **SILT**																		
	26.00	SPT													Sandy **SILT**																		
	27.50	SPT													Sandy **SILT**																		
	29.00	SPT													Sandy **SILT**																		
	30.50	SPT													Sandy **SILT**																		

1X800 MW NORTH CHENNAI STAGE 3 SUPER CRITICAL THERMAL POWER PROJECT

BORE HOLE NO	DEPTH (m)	TYPE OF SAMPLE	DENSITY (KN/m³)		WATER CONTENT (%)	PARTICLE SIZE (%)				ATTERBERG'S LIMITS				SOIL			STRENGTH TEST			CONSOLIDATION TEST						SWELL TEST		COMPACTION TEST			RELATIVE DENSITY	PERMEABILITY (m/hr)	REMARKS
			BULK	DRY		GRAVEL	SAND	SILT	CLAY	LL	PL	PI	SL	IS CLASSIFICATION	DESCRIPTION	SPECIFIC GRAVITY	TYPE	C	Ø	e	Pc	Cc	ρ	mv	Cv	S.Pr	FSI	MDD	OMC	CBR			
118	1.00	SPT				0	95	5						SP	**SAND**																		
	2.00	UDS												SP	**SAND**																		
	3.00	SPT				0	95	5						SP	**SAND**																		
	4.00	UDS												SP	**SAND**																		
	5.00	SPT				0	93	7						SP	**SAND**																		
	6.50	UDS												SP	**SAND**																		
	8.00	SPT				0	89	11						SM	Silty **SAND**																		
	9.50	UDS												SM	Silty **SAND**																		
	11.00	SPT				0	24	76		42	18	24		CI	Sandy **CLAY**																		
	12.50	UDS												CI	Sandy **CLAY**																		
	14.00	SPT				0	86	14						CI	Silty **SAND**																		
	15.50	UDS												CI	Silty **SAND**																		
	17.00	SPT				0	79	21						CI	Silty **SAND**																		
	18.50	SPT												CI	Silty **SAND**																		
	20.00	SPT												CI	Silty **SAND**																		
	21.50	SPT												CI	Silty **SAND**																		
	23.00	SPT												CI	Silty **SAND**																		
	24.50	SPT												CI	Silty **SAND**																		

1X800 MW NORTH CHENNAI STAGE 3 SUPER CRITICAL THERMAL POWER PROJECT

BORE HOLE NO	DEPTH (m)	TYPE OF SAMPLE	DENSITY (KN/m^3)		WATER CONTENT (%)	PARTICLE SIZE (%)				ATTERBERG'S LIMITS				SOIL			STRENGTH TEST			CONSOLIDATION TEST						SWELL TEST		COMPACTION TEST			RELATIVE DENSITY	PERMEABILITY (m/hr)	REMARKS
			BULK	DRY		GRAVEL	SAND	SILT	CLAY	LL	PL	PI	SL	IS CLASSIFICATION	DESCRIPTION	SPECIFIC GRAVITY	TYPE	C	Ø°	e	Pc	Cc	ρ	mv	Cv	S.Pr	FSI	MDD	OMC	CBR			
119	1.00	SPT				0	96	4						SP	**SAND**																		
	2.00	UDS												SP	**SAND**																		
	3.00	SPT				0	95	5						SP	**SAND**																		
	4.00	UDS												SP	**SAND**																		
	5.00	SPT				0	90	10						SM	Silty **SAND**																		
	6.50	UDS												SM	Silty **SAND**																		
	8.00	SPT				0	8	92		52	19	33		CH	Silty **CLAY**																		
	9.50	UDS												CH	Silty **CLAY**																		
	11.00	SPT				0	23	77		54	20	34		CH	Sandy **CLAY**																		
	12.50	UDS												CH	Sandy **CLAY**																		
	14.00	SPT				0	70	30		40	17	23		SC	Clayey **SAND**																		
	15.50	UDS												SC	Clayey **SAND**																		
	17.00	SPT				0	76	24						SM	Silty **SAND**																		
	18.50	SPT												SM	Silty **SAND**																		
	20.00	SPT												CL	Clayey **SILT**																		
	21.50	SPT												CL	Clayey **SILT**																		
	23.00	SPT								38	21	17		CI	Silty **CLAY**																		
	24.50	SPT												CI	Silty **CLAY**																		

APPENDIX III

ELECTRICAL RESISTIVITY TESTS

2.0 ELECTRICAL RESISTIVITY TEST – BOP Area

1.0 INTRODUCTION

1.1 The field studies were carried out in **April** to **July 2016**. This report summarizes Earth Resistivity values for 38 different locations pertaining to BOP Area.

2.0 OBJECT OF INVESTIGATION

2.1 The object of investigation is to ascertain the variation in apparent resistivity of sub-soil below the ground level and to obtain an idea about the variation in soil profile at BOP area for the proposed site. Electrical Resistivity values are required for designing safety grounding system in the area.

3.0 FIELD INVESTIGATIONS

3.1 The method depends on the difference in the electrical resistance of different soil strata. These are several methods by which the field resistivity measurements are made. The most popular method is by Wenner's four-electrode configuration. The test is carried out as per IS 3043-1987.

3.2 Four electrodes were driven into the ground at equal spacing and designed depth .The four electrodes are connected to the terminals of the earth resistivity meter. The resistivity meter is pressed "ON" to allow the current to flow through the electrodes .On pressing the "TEST" switch available in the meter for 10 ohms and 1000 ohms, the resistance value is displayed in the meter, which is noted down.

3.3 Readings of resistance for different electrode spacing in different directions are noted as per the said procedure.

4.0 METHOD OF COMPUTING OF RESISTIVITY VALUE

Earth resistivity is calculated by according to the formula.

$= 2 \pi d R$

Where

R = resistance in Ohms (megger reading for 10 ohm)

d = is the distance between spikes if spikes are placed at equal distances (m).

5.0 RESULTS

The values of resistivity, calculated as per formula given in section 4.0 above are as enclosed. After finding out the resistivity, average resistivity value at very test locations were also calculated and given in Table No: 2.1. The polar resistivity curves were drawn as per IS: 3043-1987 under Clause: 36.6. and corresponding other graphs are also drawn show in figure nos. 2.1.1 to 2.38.3.

Table No.2.1

MARKINGS	Co - ordinates	Average Resistivity in each direction (Ω m)			
		1 m	2 m	5 m	10 m
ERT 1	712 S 384 W	12.08	2.04	2.91	4.40
ERT 2	769 S 354 W	0.36	1.85	3.85	6.60
ERT 3	852 S 340 W	0.58	1.23	2.20	6.91
ERT 4	873 S 329 W	0.44	3.02	4.16	4.71
ERT 5	928 S 293 W	13.35	2.54	1.41	2.04
ERT 6	993 S 264 W	26.73	11.50	3.77	4.71
ERT 20	1473 S 305 W	2.62	0.63	1.18	3.46
ERT 21	1125 S 428 W	13.89	6.19	10.13	9.74
ERT 22	1159 S 493 W	8.32	9.93	18.14	2.20
ERT 23	1200 S 525 W	0.20	0.97	1.96	3.30
ERT 24	1309 S 475 W	10.13	14.61	12.02	3.93
ERT 25	1298 S 407 W	11.91	13.41	17.04	4.71
ERT 26	1385 S 409 W	7.63	2.80	14.14	19.79
ERT 28	1535 S 455 W	11.04	18.66	17.51	3.61
ERT 29	1552 S 326 W	9.20	11.00	22.46	3.77
ERT 30	1631 S 345 W	13.60	5.72	9.03	5.81
ERT 31	1759 S 230 W	8.42	11.09	19.48	2.67
ERT 32	1929 S 256 W	10.43	16.21	15.94	3.93
ERT 33	1651 S 200 W	4.84	3.20	4.16	5.03
ERT 34	1637 S 170 W	5.59	9.39	17.51	2.04
ERT 35	1904 S 66 W	11.91	13.95	17.28	6.44
ERT 36	2047 S 56 E	10.04	5.31	4.16	5.03

MARKINGS	Co - ordinates	Average Resistivity in each direction (Ω m)			
		1 m	2 m	5 m	10 m
ERT 37	1681 S 108 W	5.48	6.38	9.42	2.04
ERT 38	2348 S 161 W	13.21	12.19	15.79	10.84
ERT 39	1575 S 40 W	21.94	26.14	15.31	4.24
ERT 40	1881 S 489 E	3.74	2.42	3.53	2.83
ERT 41	1685 S 232 E	7.32	10.87	9.90	6.91
ERT 42	1477 S 123 E	34.59	23.03	14.06	5.03
ERT 43	1456 S 288 E	17.25	12.72	15.08	4.56
ERT 44	1447 S 443 E	6.86	6.60	6.44	4.87
ERT 45	141 S 562 E	10.38	8.86	5.73	4.08
ERT 46	25 S 530 E	7.07	10.65	12.25	8.64
ERT 47	892 N 465 E	11.14	9.64	5.10	3.93
ERT 48	926 N 381 E	13.34	9.02	3.30	3.46
ERT 49	1393 S 184 W	20.84	16.43	15.47	5.34
ERT 50	621 S 186 W	24.77	14.86	10.29	7.07
ERT 51	649 S 320 W	7.95	7.73	6.20	4.56
ERT 52	361 S 349 W	10.24	7.48	5.89	4.24

GRAPHICAL REPRESENTATION 1- POLAR GRAPH AS PER IS 3043 - 1987

ERT - 29

Direction	Average Resistivity in each direction				
	1 m	2 m	5 m	10 m	Avg.
N	8.80	11.44	22.62	3.14	11.50
E	10.74	12.31	26.07	5.65	13.70
S	9.24	10.30	21.68	1.88	10.78
W	8.04	9.93	19.48	4.40	10.46

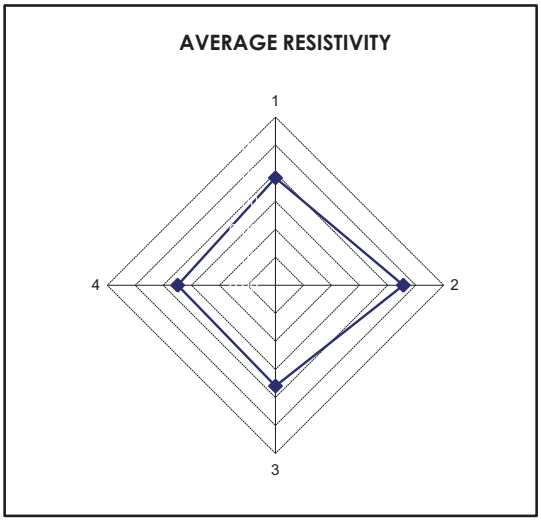


FIG NO 2.15.1

Average Resistivity at 10 m (ohm-meter) : 11.61

The term 1,2,3,4 in Polar graph indicates direction N, E, S, W respectively.

Each axis unit indicates 3 Ohm - m

ERT 29

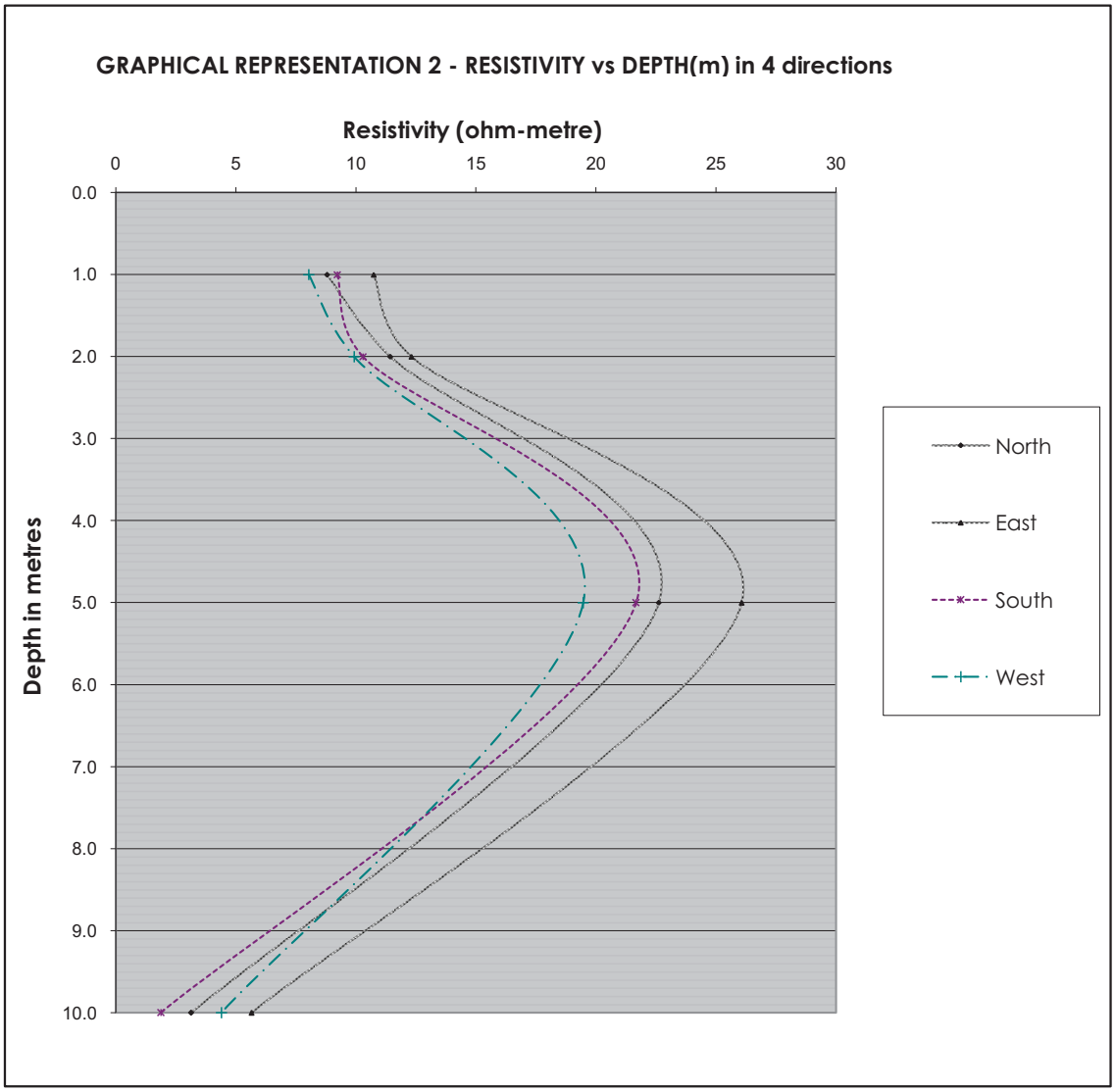


Fig No : 2.15.2

ERT 29

GRAPHICAL REPRESENTATION 3 - Average Resistivity vs Depth(m)

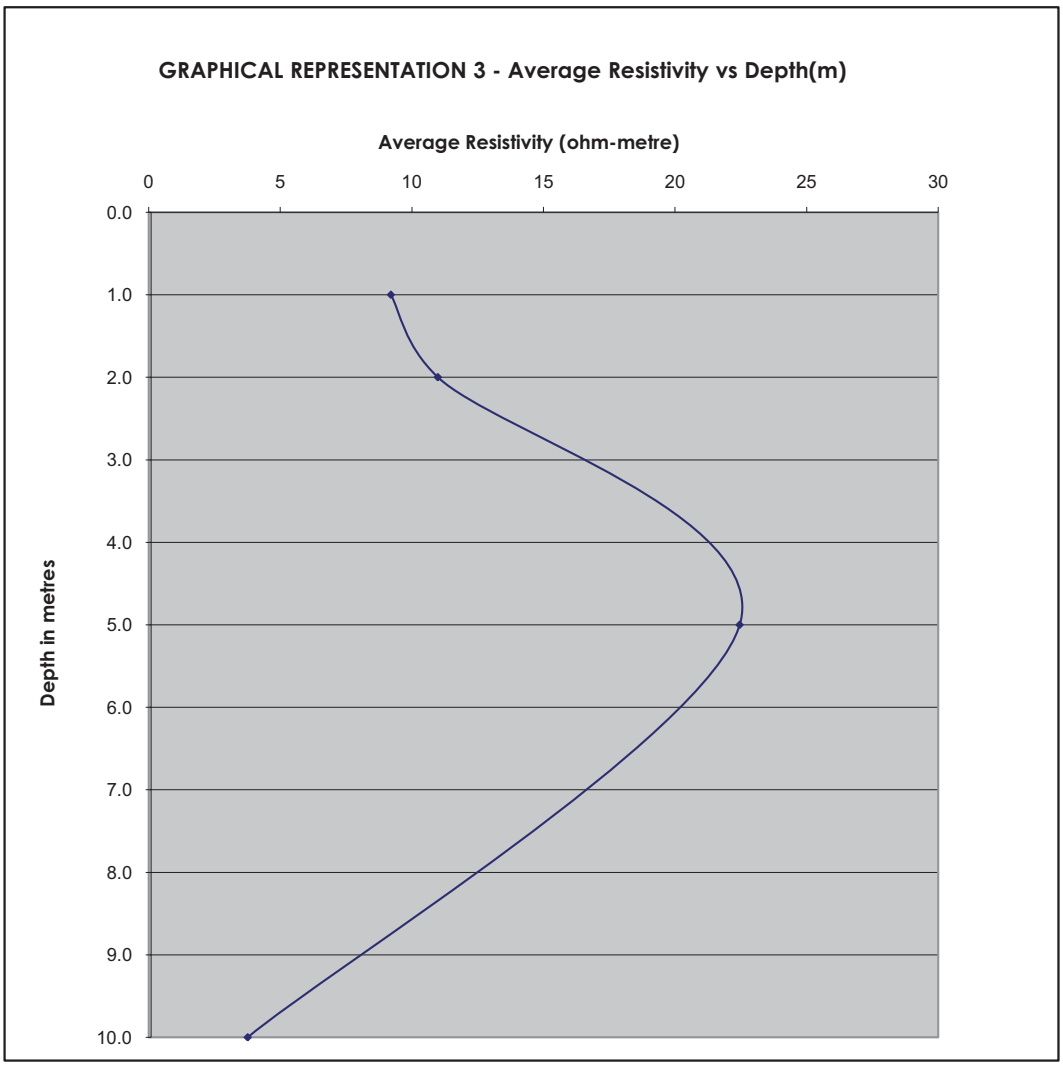


Fig No : 2.15.3

ERT 29

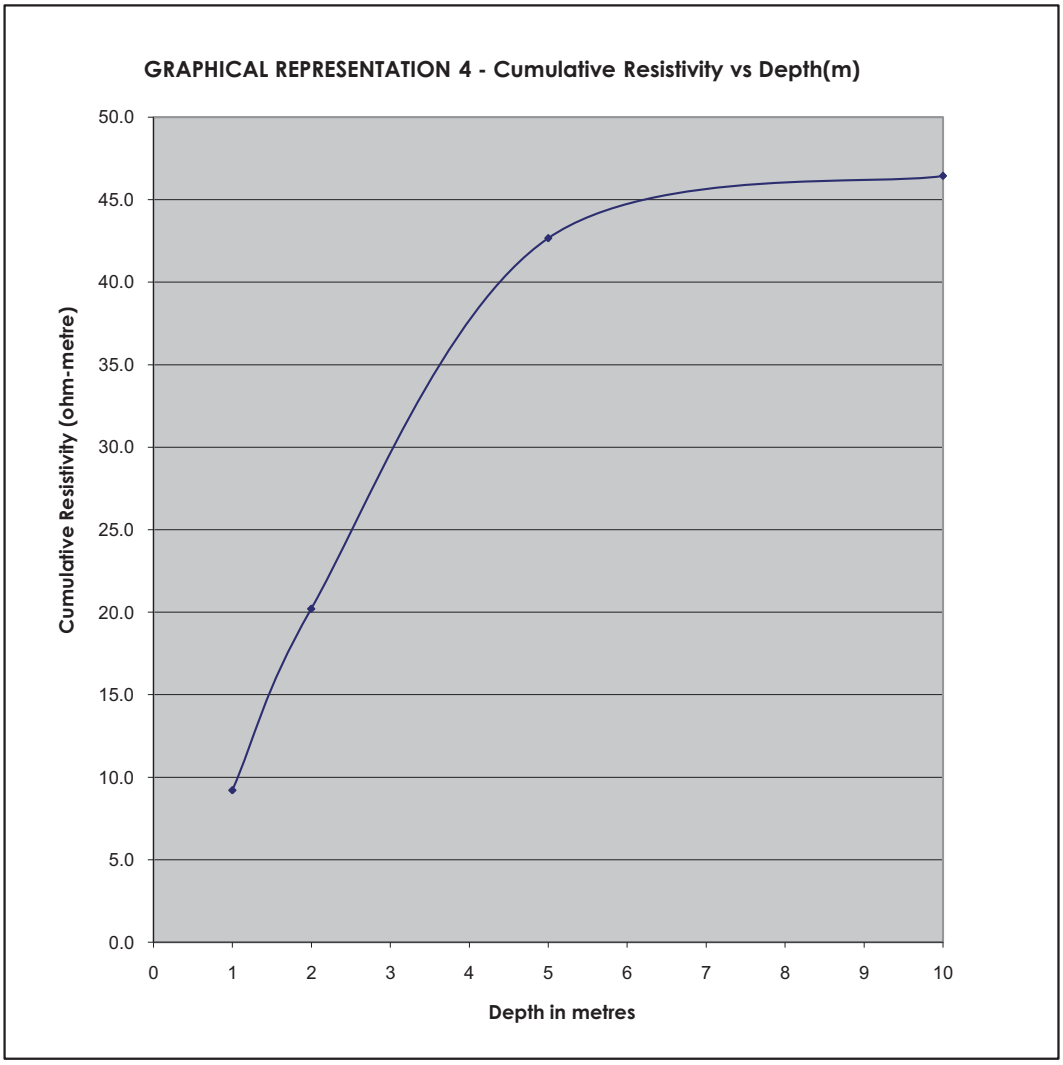


Fig No : 2.15.4

APPENDIX X

FIELD CBR TESTS

9.0 FIELD CBR TEST- BOP AREA

1.0 OBJECT OF INVESTIGATION

The objective of the investigation is to ascertain the California Bearing Ratio by conducting eight load penetration tests for the BOP area at the proposed site. The california bearing ratio test is penetration test meant for the evaluation of subgrade strength of roads and pavements.

2.0 FIELD INVESTIGATION

The California Bearing Ratio Tests were carried out as per relevant Indian Standards as per as per **IS: 2720 Part (XXXI).**

First the test locations were cleared and the equipment used to provide load reaction was located such that the centre of the beam against which the loading jack will work over the centre to the test location.

The screw jack with swivel was installed to the underside of the equipment providing reaction, at the correct position of the test. The proving ring was connected to the bottom end of the jack and the piston connected to the bottom of the proving ring.

The surcharge annular weight of 5 kg was kept in position in the surface where the test was conducted so that when the piston lowered it will pass through the hole in the annular weight.

The penetration piston was seated with the smallest possible load but in no case in excess of a total load of 4 kg or 0.002 kgf/sq.mm so that full contact was established between the piston and the surface where the test was conducted.

A layer of clean sand (3mm to 6mm) was spread over the surface in order to distribute the surcharge normally.

The penetration indicating the dial was fixed suitably for recording the penetration and initially the dial was set to zero. The load readings were recorded at penetrations of 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0 and 10.0 mm. Note

the maximum load and corresponding penetration till it occurs for a penetration less than 12.5 mm/min.

3.0 METHOD OF COMPUTING CALIFORNIA BEARING RATIO

The load vs penetration curves were plotted. The corrected load values shall be taken from the load penetration curve and the bearing ratio was calculated as follows.

C.B.R. = P_T/P_S x 100

Where,

P_t = Corrected unit(or total) test load corresponding to the chosen penetration value read from the load penetration curve.

Ps = Unit Standard load for the same depth of penetration as given in Table 10.2.1.

The following table No: 9.1 gives the standard loads adopted for different penetrations for the standard material with a C.B.R. value of 100%.

Table No : 9.1

Penetration of plunger (mm)	Standard load (kg)
2.5	1370
5.0	2055
7.5	2630
10.0	3180
12.5	3600

A sample calculation of California bearing ratio is given below.

Test Location No : 1

Depth of test : 0.50 m

Proving Ring Constant : 6.52 kg

Proving Ring dial Reading at 2.5 mm Penetration = 12 divisions

Therefore, Applied load = 12 x 6.52 = 78.19 kg

Unit standard load for 2.5 mm penetration = 1370 kg.

Therefore, Bearing Ratio at 2.5 mm penetration = (78.19/1370)* 100 = 5.71%

Proving Ring dial Reading at 5 mm Penetration = 16 divisions

Therefore, Applied load = 16 x 6.52 = 104.25 kg

Unit standard load for 5 mm penetration = 2055 kg.

Therefore, Bearing Ratio at 5 mm penetration = (104.25/2055)

= 5.07%

Recommended CBR value = 5.71%
Detailed calculation with Field data are presented in Table 9.2

Table No: 9.2

Test location no : 1 **Test Date** : 15.06.2016
Co-ordinates : 817 S 140 W **Test Depth** : 0.50 m

Penetration in mm	Proving Ring Dial Gauge Readings	Load in Kg
0.5	2.000	13.03
1.0	6.000	39.09
1.5	8.000	52.13
2.0	10.000	65.16
2.5	12.000	78.19
3.0	12.000	78.19
4.0	14.000	91.22
5.0	16.000	104.25
6.0	18.000	117.28
8.0	24.000	156.38

Bearing Ratio at 2.5mm penetration (%) : 5.71

Bearing Ratio at 5.0mm penetration (%) : 5.07

Recommended CBR Value (%) : 5.71

4.0 INTERPRETATION OF RESULTS

The C.B.R. values are usually calculated for penetration of 2.5 mm and 5 mm. Generally the C.B.R. value at 2.5 mm will be greater that at 5 mm and in such a case/the former shall be taken as C.B.R. for design purpose. Detailed Results of CBR are presented in 9.3.

Table – 9.3

S.NO	TEST NO	CO - ORDINATES		FIELD CBR %
1	FCBR-1	817 S	140 W	5.71
2	FCBR-3	1397 S	481 W	4.44
3	FCBR-4	1722 S	80 W	3.80
4	FCBR-5	1434 S	113 E	6.34
5	FCBR-6	500 S	389 W	9.04
6	FCBR-7	900 S	595 W	8.56
7	FCBR-8	1100 S	530 W	6.34
8	FCBR-9	1573 S	260 W	6.34

APPENDIX XI

CHEMICAL ANALYSIS OF WATER AND SOIL

GEO FOUNDATIONS & STRUCTURES PVT. LTD

Client : **Bharat Heavy Electricals Limited**

Table No :

Project : **Detailed Geo Technical Investigation for 1x800 MW North Chennai TPP Stage III, Chennai**

Report No. : **SI/CHN/16/**

548

Chemical Analysis of Water Sample

TESTS	BH 7	BH 49	BH 65	BH 74	BH 79	BH 80	BH 82
Colour	Pale yellow	Pale yellow	Pale Yellow	Pale Yellow	Pale yellow	Pale yellow	Pale Yellow
Odour	Muddy	Muddy	Odourless	Muddy	Muddy	Muddy	Muddy
pH at 25^{o} C	7.12	8.38	7.49	7.39	7.75	7.86	7.25
Carbonate Hardness as CaCO3 (mg/l)	254	350	556	206	250	145	155
Sulphate as SO3 (mg/l)	732	910	2676	433	122	135	120
Sulphate as SO4 (mg/l)	530	1092	3210	519	216	175	195
Chloride as CL (mg/l)	845	482	4113	695	150	250	354
Nitrogen as N (mg/l)	3	2	3	4	2	4	6
Organic Matter (mg/l)	320	44	47	39	65	120	51

GEO FOUNDATIONS & STRUCTURES PVT. LTD

Client : **Bharat Heavy Electricals Limited**

Table No :

Project : **Detailed Geo Technical Investigation for 1x800 MW North Chennai TPP Stage III, Chennai**

Report No. : **SI/CHN/16/**

Chemical Analysis of Water Sample

TESTS	BH 91	BH 96	BH 103	BH 107	BH 108
Colour	Pale yellow	Pale yellow	Pale yellow	Pale Yellow	Pale yellow
Odour	Soil	Muddy	Muddy	Solvent Smell	Muddy
pH at 25^{o} C	7.49	7.39	7.29	7.63	7.62
Carbonate Hardness as CaCO3 (mg/l)	232	158	140	154	145
Sulphate as SO3 (mg/l)	13	155	145	152	125
Sulphate as SO4 (mg/l)	16	128	118	182	128
Chloride as CL (mg/l)	71	295	525	1007	1010
Nitrogen as N (mg/l)	6	5	4	1	3
Organic Matter (mg/l)	110	100	59	41	45

Client : Bharat Heavy Electricals Limited

Table No :

Project : Detailed Geo Technical Investigation for 1x800 MW North Chennai TPP Stage III, Chennai

Report No. : SI/CHN/16/

Chemical Analysis of Soil Sample

550

TESTS	BH33	BH 64	BH 77	BH 83	BH 85	BH 86	BH 89	BH 95	BH 103	BH 110
	15.5 m	15.5 m	9.5 m	11 m	12.50 m	8 m	9.5	11 m	17 m	2 m
P^H	6.13	4.65	5.68	5.88	5.2	6.44	6.25	8.48	8.35	5.8
Carbonate CO3	0.01%	0.002%	0.003%	0.008%	0.009%	0.01%	0.04%	0.03%	0.050%	0.002%
Sulphate as SO3	0.040%	0.12%	0.08%	0.05%	0.08%	0.19%	0.26%	0.17%	0.29%	0.12%
Sulphate as SO4	0.050%	0.09%	0.05%	0.06%	0.11%	0.23%	0.25%	0.20%	0.34%	0.14%
Chloride asCl	430 ppm	150 ppm	120 ppm	200 ppm	150ppm	2800 ppm	1500 ppm	0.11%	0.13%	250 ppm
Nitrate as NO3	0.09%	0.20%	0.11%	0.09%	0.14%	0.12%	0.16%	0.04%	0.08%	0.08%
Organic Matter	2.62%	0.75%	0.80%	0.78%	0.91%	3.79%	4.10%	6.67%	6.55%	6.49%

APPENDIX XII

LABORATORY CBR TEST RESULT

11.0 LAB CALIFORNIA BEARING RATIO TEST RESULTS- BOP AREA

1.0 OBJECTIVE OF THE TEST

- The objective of the test is to evaluate the California Bearing Ratio values of soil sample collected from eleven locations in BOP area at a depth of 0.5 m from the existing ground level.

2.0 SCOPE OF WORK

The scope of work at this site comprises the following:

- Mobilization of all necessary equipments and personnel.
- Collecting soil samples from the specified locations, packing and transporting to laboratory.
- Conducting Standard and Modified Proctor tests to determine Maximum dry density and Optimum Moisture content.
- Conducting California Bearing Ratio Tests.
- Preparation and submission of the laboratory results.

3.0 FIELD INVESTIGATION

- The soil samples were collected from eleven locations at a depth of 0.5 m from the existing ground level.

4.0 LABORATORY INVESTIGATION

- California Bearing Ratio tests were conducted on the soil samples at maximum dry density, as per the relevant Indian Standard, IS 2720: Part 16 : Latest version. The results of CBR tests are presented in Table No 11.1

5.0 CONCLUSIONS

The field and laboratory tests were carried out as per the relevant Indian Standard and the results shows soaked and unsoaked CBR values as per Table 11.1 at the maximum dry density and optimum moisture content.

Table 11.1

SAMPLE	STANDARD COMPACTION		MODIFIED COMPACTION		CBR (%)	CBR (%)
	OMC (%)	MDD (g/cc)	OMC (%)	MDD (g/cc)	SOAKED	UNSOAKED
CBR 1	9.43	1.76	-	-	5.5	
CBR 3	11.2	1.83	-	-	9.3	
CBR 4	10.65	1.78	9.5	1.96	5.2	10.3
CBR 5	11.07	1.66	11.73	1.75	7.5	
CBR 6	10.94	1.79	9.82	1.84	11	
CBR 7	10.94	1.71	10.22	1.85	9.3	13.5
CBR 8	11.48	1.75	9.9	1.79	8.2	
CBR 9	11.53	1.77	8.03	1.9	10.7	17
CBR NEAR 7	-	-	10.6	1.96	8.5	
CBR NEAR 8	11.21	1.73	11.15	1.86	6.3	
CBR NEAR 9	10.87	1.79	11.1	1.82	12	

APPENDIX XIII

LIQUEFACTION ANALYSIS

1 x 800 MW NORTH CHENNAI STPP STAGE # 3

Liquefaction analysis of sub- soil

1) C_N= Correction for Overburden pressure limited to 1.70

$$C_N = \sqrt{\frac{P_a}{\sigma}}$$

P_a = 1 Atmospheric pressure = 10t/sqm

σ = Vertical effective stress at the depth of SPT

2) C_E = Correction for Level of energy delivered by SPT hammer = 1.00.

3) C_B = Correction for Borehole Diameter = 1.05 for 150mm borehole dia.

4) C_S = Correction for SPT sampler use = 1.10 for sampler without liner.

5) C_R = Correction for short length of drill rod.

Rod length(r	C_R	Rod length	C_R
<3	0.75	6-<10	0.95
3-<4	0.80	10-30	1.00
4-<6	0.85		

$(N1) = C_N C_E C_B C_S C_R$

Fine content means particles smaller than 75 micron

For Fine Content<=5,α = 0 and β = 1

For(Fine Content>5 AND <35),α = EXP((1.76-(190/FC^2)) and β = (0.99+($FC^{1.5}$/1000))

For Fine Content>35,α = 5 and β = 1.20

Corr. (N1) = α+β*(N1)

$r_d=(1-0.4113*d^{0.5}+0.04052*d+0.001753*d^{1.5})/(1-0.4177*d^{0.5}+0.05729*d-0.006205*d^{1.5}+0.00121*d^2)$

CSR = 0.65*(a_{max}/g)*(Total Overburden pressure)*r_d/(Effective Overburden pressure)

CRR=1/(34-Final$(N1)_{60}$)+Final$(N1)_{60}$/135+50/(10*Final$(N1)_{60}$+45)^2-1/200

FOS against Liquifaction = CRR/CSR

For FOS > 1.0, liquefaction is not expected

For calculation of CSR & CRR, water level is considered at ground level.

Location	Depth below EGL	Field N	Total OVP (t/sqm)	Effective OVP (t/sqm)	CN	CE	CB	CS	CR	(N1)	FC	α	β	Corr. (N1)	r_d	CSR	CRR	FOS	Remarks
BH-45	1.00	8	1.85	1.85	1.70	1.00	1.05	1.10	0.75	11.8	9	0.56	1.02	12.5	0.99	0.10	0.14	1.88	**No liquefaction**
	3.00	9	5.55	5.04	1.41	1.00	1.05	1.10	0.80	11.7	10	0.87	1.02	12.8	0.98	0.11	0.14	1.77	**No liquefaction**
	5.00	12	9.25	7.04	1.19	1.00	1.05	1.10	0.85	14.0	9	0.56	1.02	14.8	0.97	0.13	0.16	1.72	**No liquefaction**
	8.00	8	14.80	10.04	1.00	1.00	1.05	1.10	0.95	8.8	3	0.00	1.00	8.8	0.94	0.14	0.10	1.02	**No liquefaction**
	11.00	16	20.35	13.04	0.88	1.00	1.05	1.10	1.00	16.2	6	0.03	1.00	16.3	0.88	0.14	0.17	1.73	**No liquefaction**
	14.00	18	25.90	16.04	0.79	1.00	1.05	1.10	1.00	16.4	6	0.03	1.00	16.5	0.79	0.13	0.18	1.88	**No liquefaction**

APPENDIX XIV

SITE LOCATION DRAWING

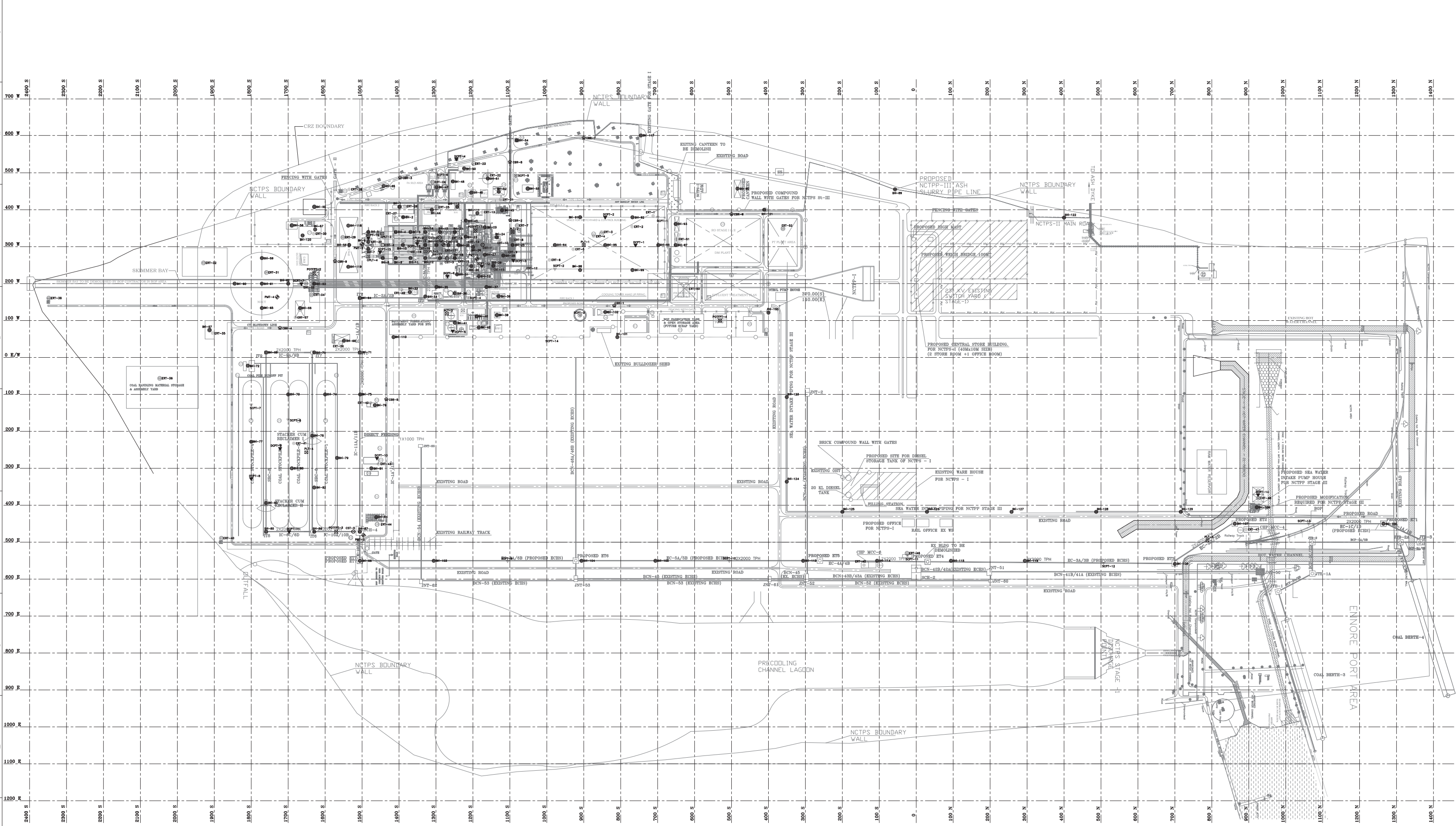
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

CUSTOMER'S DRAWING No.

DRAWING No. PE-DG-423-602-C001

COMPUTER FILE NAME:



LEGENDS

01	TURBINE GENERATOR BUILDING
02	STEAM GENERATOR
03	TRANSFORMER YARD
04	ELECTROSTATIC PRECIPITATOR
05	E.S.P. CONTROL ROOM UNIT
06	CHIMNEY
07	SERVICE BUILDING
08	765KV GIS SWITCH YARD
09	SPACE FOR FGD PLANT
10	RO DM PLANT
11	CONDENSATE STORAGE TANK
12	FUEL OIL TANK FARM
13	COMPRESSOR HOUSE
14	FUEL OIL PUMP HOUSE
15	EDG & MILL REJECT COMPRESSOR ROOM
16	AHP CONTROL ROOM
16A	AHP COMPRESSOR & BLOWERS
16B	CLARIFIER FOR ASH RECOVERY WATER
16C	RECOVERY WATER PUMPHOUSE
17	VACUM PUMP HOUSE
18	EXTERNAL COAL HANDLING CONTROL ROOM
18A	INTERNAL COAL HANDLING CONTROL ROOM
19	BULLDOZER SHED
20	ASH WATER PUMP HOUSE
21	ASH SILO
22	ASH SLURRY PUMP HOUSE
23	COOLING WATER PUMP HOUSE (CW)
24	NATURAL DRAFT COOLING TOWERS
25	CRUSHED COAL STOCK PILE
26	CRUSHER HOUSE
27	ADMIN. BUILDING
28	CANTEEN
28A	MINI CANTEEN
29	FIRE STATION
30	SECURITY & TIME OFFICE
31	MAIN PLANT GATE
32	GREEN BELT
33	SEA INTAKE PUMP HOUSE,SWITCH GEAR ROOM & ELECTRO CHLORINATION
34	WORKSHOP/ TRAINING CENTRE.
35	CLARIFIED WATER STORAGE TANK
36	PARKING AREA FOR SILO TRUK
37	C.W.P.H. FORE BAY
38	C.W. CHLORINATION BUILDING
39	WEIGH BRIDGE
40	SWITCH YARD CONTROL BUILDING
41	WAREHOUSE (PERMENT STORAGE)
42	EFFLUENT TREATMENT PLANT
43	WATCH TOWER
44	EQUIPMENT FABRICATION/ASSEMBLY YARD
45	CAR & BIKE PARKING
46	HYDROGEN GENERATION PLANT
47	AUXILIARY BOILER
48	DISPENSARY
49	GAS CYLINDER STORAGE SHED (N2)
50	GAS CYLINDER STORAGE SHED (H2 & CO2)
51	LIGHTING MAST
52	CHEMICAL DOSING CHAMBER
53	DUST SUPRESSION PUMP HOUSE
54	CHP MAINTANANCE OFFICE BUILDING
55	SEWAGE TREATMENT PLANT
56	DRINKING WATER RCC TANK (50 Cu.M)
57	CPU REG. BUILDING
RW	RAIN WATER COLLECTION PIT
S	SEWAGE COLLECTION PIT
E	EFFLUENT COLLECTION PIT

BORE HOLE (BH)

MARKING	CO-ORDINATES		DEPTH (M) (REFER NOTE-2)
BH-1	1399 S	408 W	40
BH-2	1389 S	380 W	40
BH-3	1369 S	340 W	40
BH-4	1409 S	340 W	40
BH-5	1483 S	340 W	40
BH-6	1483 S	313 W	40
BH-7	1483 S	294 W	40
BH-8	1444 S	269 W	40
BH-9	1409 S	269 W	40
BH-10	1390 S	305 W	40
BH-11	1369 S	269 W	40
BH-12	1329 S	269 W	40
BH-13	1329 S	305 W	40
BH-14	1329 S	340 W	40
BH-15	1289 S	340 W	40
BH-16	1299 S	305 W	40
BH-17	1289 S	269 W	40
BH-18	1249 S	269 W	40
BH-19	1266 S	305 W	40
BH-20	1239 S	305 W	40
BH-21	1249 S	340 W	40
BH-22	1219 S	327 W	40
BH-23	1168 S	353 W	40
BH-24	1135 S	325 W	40
BH-25	1093 S	305 W	40
BH-26	1200 S	299 W	40
BH-27	1168 S	278 W	40
BH-28	1118 S	276 W	40
BH-29	1145 S	248 W	40
BH-30	1204 S	247 W	40
BH-31	1243 S	225 W	40
BH-32	1184 S	220 W	40
BH-33	1371 S	177 W	40
BH-34	1329 S	165 W	40
BH-35	1299 S	191 W	40
BH-36	1249 S	174 W	40
BH-37	1163 S	191 W	40
BH-38	1130 S	166 W	40
BH-39	1135 S	115 W	40
BH-40	1190 S	111 W	40
BH-41	1249 S	94 W	40
BH-42	1184 S	81 W	40
BH-43	1219 S	371 W	40
BH-44	1311 S	400 W	40
BH-45	1121 S	399 W	40
BH-46	1442 S	464 W	40
BH-47	1298 S	461 W	40
BH-48	1254 S	477 W	40
BH-49	1205 S	446 W	40
BH-50	1224 S	512 W	40
BH-51	1160 S	485 W	40
BH-52	1130 S	449 W	40
BH-53	1051 S	457 W	40
BH-54	1082 S	588 W	40
BH-55	1629 S	408 W	40
BH-56	1690 S	358 W	40
BH-57	1627 S	346 W	40
BH-58	1535 S	305 W	40
BH-59	1771 S	269 W	40
BH-60	1845 S	200 W	40
BH-61	1771 S	200 W	40
BH-62	1700 S	200 W	40
BH-63	1629 S	200 W	40
BH-64	1506 S	161 W	40
BH-65	1771 S	134 W	40
BH-66	1668 S	134 W	40
BH-67	1913 S	74 W	40
BH-68	1549 S	45 W	40
BH-69	1760 S	14 W	40
BH-70	1629 S	14 W	40
BH-71	1506 S	14 W	40
BH-72	1809 S	22 E	40
BH-73	1700 S	100 E	40
BH-74	1600 S	100 E	40
BH-75	1505 S	100 E	40
BH-76	1465 S	129 E	40
BH-77	1800 S	228 E	40
BH-78	1635 S	212 E	40
BH-79	1568 S	272 E	40
BH-80	1690 S	300 E	40
BH-81	1475 S	300 E	40
BH-82	1629 S	352 E	40
BH-83	1160 S	394 E	40
BH-84	1462 S	432 E	40
BH-85	1760 S	472 E	40
BH-86	1629 S	472 E	40
BH-87	1506 S	472 E	40
BH-88	1506 S	550 E	40
BH-89	575 S	455 W	40
BH-90	484 S	457 W	40
BH-91	910 S	380 W	40
BH-92	768 S	380 W	40
BH-93	651 S	362 W	40
BH-94	978 S	305 W	40
BH-95	842 S	305 W	40
BH-96	698 S	305 W	40
BH-97	651 S	305 W	40
BH-98	910 S	237 W	40
BH-99	768 S	237 W	40
BH-100	400 S	121 W	40
BH-101	809 S	55 W	40
BH-102	842 S	123 W	40
BH-103	1306 S	550 E	40
BH-104	906 S	550 E	40
BH-105	706 S	550 E	40
BH-106	922 N	405 E	40
BH-107	862 N	450 E	40
BH-108	1265 N	450 E	40
BH-109	700 N	559 E	40
BH-110	1415 S	55 W	40
BH-111	1188 S	391 W	40
BH-112	1242 S	408 W	40
BH-113	306 S	550 E	40
BH-114	106 S	550 E	40
BH-115	94 N	550 E	40
BH-116	294 N	550 E	40
BH-117	745 S	601 W	40
BH-118	1537 S	357 W	40
BH-119	1537 S	246 W	40
BH-120	1661 S	330 W	40
BH-121	411 S	400 W	40
BH-122	400 N	379 W	40
BH-123	350 S	107 E	40
BH-124	350 S	336 E	40
BH-125	200 S	418 E	40
BH-126	29 N	418 E	40
BH-127	258 N	418 E	40
BH-128	487 N	418 E	40
BH-129	716 N	418 E	40

ELECTRICAL RESISTIVITY TEST (ERT)

MARKING	CO-ORDINATES	
ERT-1	712 S	384 W
ERT-2	769 S	354 W
ERT-3	852 S	340 W
ERT-4	873 S	329 W
ERT-5	928 S	293 W
ERT-6	993 S	264 W
ERT-7	1080 S	357 W
ERT-8	1093 S	318 W
ERT-9	1110 S	285 W
ERT-10	1128 S	319 W
ERT-11	1150 S	239 W
ERT-12	1060 S	242 W
ERT-13	1175 S	393 W
ERT-14	1190 S	304 W
ERT-15	1214 S	251 W
ERT-16	1254 S	332 W
ERT-17	1281 S	291 W
ERT-18	1317 S	305 W
ERT-19	1374 S	286 W
ERT-20	1473 S	305 W
ERT-21	1125 S	428 W
ERT-22	1159 S	493 W
ERT-23	1200 S	525 W
ERT-24	1309 S	475 W
ERT-25	1298 S	407 W
ERT-26	1385 S	409 W
ERT-27	1412 S	381 W
ERT-28	1535 S	455 W
ERT-29	1552 S	326 W
ERT-30	1631 S	335 W
ERT-31	1759 S	230 W
ERT-32	1929 S	256 W
ERT-33	1651 S	200 W
ERT-34	1637 S	170 W
ERT-35	1904 S	66 W
ERT-36	2047 S	56 E
ERT-37	1681 S	108 W
ERT-38	2348 S	161 W
ERT-39	1575 S	40 W
ERT-40	1881 S	489 E
ERT-41	1685 S	232 E
ERT-42	1477 S	123 E
ERT-43	1456 S	288 E
ERT-44	1447 S	443 E
ERT-45	141 S	562 E
ERT-46	25 S	530 E
ERT-47	892 N	465 E
ERT-48	926 N	381 E
ERT-49	1393 S	184 W
ERT-50	621 S	186 W
ERT-51	649 S	320 W
ERT-52	361 S	349 W

N O T E S:-

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. BORE HOLE SHALL BE DRILLED UPTO THE DEPTH INDICATED AGAINST EACH BORE HOLE OR SPT 'N' VALUE GREATER THAN 100 IS OBTAINED FOR FOUR CONSECUTIVE INTERVALS WHICHEVER IS EARLIER.
3. BACKFILLING OF BORE HOLES AND PITS SHALL BE AS PER SPECIFICATION AND AS DIRECTED BY THE ENGINEER-IN-CHARGE.
4. STARTING DEPTH OF STANDARD PENETRATION TEST (SPT) SHALL BE 1M BELOW GROUND LEVEL AND THE TEST SHALL BE CONDUCTED AT EVERY 1M INTERVAL ALTERNATE TO COLLECTION OF UNDISTURBED SAMPLE (UDS) UPTO 5M DEPTH BELOW GROUND LEVEL AND AT EVERY 1.5M INTERVAL ALTERNATE TO COLLECTION OF UDS BEYOND 5M DEPTH, AT CHANGE OF STRATA & AT DEPTHS WHEREVER UDS COULD NOT BE COLLECTED.
5. STARTING DEPTH OF COLLECTION OF UDS SHALL BE 2M BELOW GROUND LEVEL AND UDS SHALL BE COLLECTED AT 1M INTERVAL ALTERNATE TO CONDUCTING SPT UPTO 10M DEPTH BELOW GROUND LEVEL & AT EVERY 1.5M INTERVAL ALTERNATE TO CONDUCTING SPT BEYOND 5M DEPTH.
6. CROSS HOLE SHEAR WAVE TEST SHALL BE CARRIED OUT AT 3M, 5M, 7M, 9M, 11M, 13M, 15M, 17M, 20M, 23M, 26M, 30M, 35M, & 40M DEPTH BELOW GROUND LEVEL.
7. FIELD VANE SHEAR TEST SHALL BE CARRIED OUT IN BH-6, BH-9, BH-14, BH-23, BH-30, BH-61, BH-73, BH-79, BH-85 BH-88, BH-95 & BH-103 AT DEPTH WHERE VERY SOFT CLAY SOFT CLAY LAYER IS ENCOUNTERED IN CONSULTATION WITH ENGINEER IN-CHARGE.
8. PUMP IN TYPE FIELD PERMEABILITY TEST SHALL BE CARRIED OUT IN BH-8, BH-15, BH-25, BH-54, BH-81, BH-83 & BH-99 AT 1.5M & 4.5M DEPTH BELOW GROUND LEVEL.
9. ELECTRICAL RESISTIVITY TEST SHALL BE CARRIED OUT AS PER WENNER'S METHOD.
10. PRESSURE METER TEST SHALL BE CARRIED OUT AT 2M, 4M, 6M, 8M, 10M, 12M, 15M, 18M, 21M, 23M, 25M, 30M, 35M & 40M DEPTH BELOW GROUND LEVEL.
11. GROUND WATER SAMPLE SHALL BE COLLECTED FROM BH-7, BH-13, BH-20, BH-25, BH-25, BH-36, BH-49, BH-65 BH-73, BH-74, BH-80, BH-82, BH-91, BH-96, BH-103, BH-107 & BH-108.
12. PERCOLATION TEST SHALL BE CARRIED OUT AT 3.0M DEPTH BLEOW GROUND LEVEL IN PLT-1, PLT-3, PLT-4 & CPLT-4.
13. GEOTECHNICAL INVESTIGATION SHALL BE CARRIED OUT AS PER SPECIFICATION.
14. DO NOT SCALE THIS DRAWING.

REF DRG :

PE-DG-K75-100-M001, REV-00 "PLOT PLAN".

GEOTECHNICAL INVESTIGATION LEGEND:

1. BOREHOLE (BH) . . . . ●
2. PLATE LOAD TEST (PLT) . . . . ⊠
3. DYNAMIC CONE PENETRATION TEST (DCPT) . . . . ▼
4. STATIC CONE PENETRATION TEST (SCPT) . . . . ▽
5. PUMP OUT TYPE FIELD PERMEABILITY TEST (POTFPT) . . . . .
6. PRESSURE METER TEST (PMT). . . . .
7. CROSSHOLE SHEAR TEST (CST). . . . . ⊙
8. CYCLIC PLATE LOAD TEST (CPLT) . . . . ▣
9. FIELD CBR TEST (CBR). . . . .
10. ELECTRICAL RESISTIVITY TEST (ERT) . . . . ◎

DYNAMIC CONE PENETRATION TEST (DCPT)

MARKING	CO-ORDINATES	
DCPT-1	760 S	305 W
DCPT-2	842 S	380 W
DCPT-3	1091 S	263 W
DCPT-4	1245 S	537 W
DCPT-5	1254 S	72 W
DCPT-6	1269 S	220 W
DCPT-7	1664 S	200 W
DCPT-8	1800 S	328 E
DCPT-9	1722 S	246 E
DCPT-10	1460 S	272 E
DCPT-11	1698 S	471 E
DCPT-12	1176 S	247 W
DCPT-13	1350 S	309 W
DCPT-14	925 N	371 E
DCPT-15	1451 N	285 E
DCPT-16	1483 N	324 W

STATIC CONE PENETRATION TEST (SCPT)

MARKING	CO-ORDINATES	
SCPT-1	700 S	380 W
SCPT-2	978 S	240 W
SCPT-3	910 S	115 W
SCPT-4	1212 S	163 W
SCPT-5	1084 S	492 W
SCPT-6	1293 S	487 W
SCPT-7	1800 S	128 E
SCPT-8	1700 S	169 E
SCPT-9	1106 S	550 E
SCPT-10	506 S	550 E
SCPT-11	24 S	536 E
SCPT-12	507 N	556 E
SCPT-13	1062 N	450 E
SCPT-14	1000 S	55 W

PUMP OUT TYPE FIELD PERMEABILITY TEST (POTFPT)

MARKING	CO-ORDINATES		DEPTH (M)
POTFPT-1	1193 S	344 W	10
POTFPT-2	1629 S	228 W	10
POTFPT-3	1570 S	471 E	10
POTFPT-4	531 S	100 W	10

CYCLIC PLATE LOAD TEST (CPLT)

MARKING	CO-ORDINATES		DEPTH (M)
CPLT-1	1329 S	287 W	4
CPLT-2	1329 S	323 W	4
CPLT-3	1446 S	335 W	4
CPLT-4	1483 S	272 W	4

PLATE LOAD TEST (PLT)

MARKING	CO-ORDINATES		DEPTH (M)
PLT-1	900 S	305 W	3
PLT-2	1093 S	340 W	3
PLT-3	1271 S	118 W	3
PLT-4	1651 S	257 E	3
PLT-5	788 N	494 E	3

FIELD CBR TEST

MARKING	CO-ORDINATES		DEPTH (M)
CBR-1	817 S	140 W	0.5
CBR-2	1099 S	371 W	0.5
CBR-3	1397 S	487 W	0.5
CBR-4	1722 S	80 W	0.5
CBR-5	1434 S	113 E	0.5
CBR-6	500 S	389 W	0.5
CBR-7	900 S	595 W	0.5
CBR-8	1100 S	530 W	0.5
CBR-9	1573 S	260 W	0.5

CROSSHOLE SHEAR TEST (CST)

MARKING	CO-ORDINATES	
CST-1	1174 S	305 W
CST-2	1290 S	325 W
CST-3	1270 S	268 W
CST-4	1444 S	305 W
CST-5	1524 S	471 E

PRESSURE METER TEST (PMT)

MARKING	CO-ORDINATES	
PMT-1	1189 S	269 W
PMT-2	1280 S	305 W
PMT-3	1500 S	307 W
PMT-4	1730 S	164 W
PMT-5	1496 S	482 E

REV	DATE	ALTD	CHD	APPD	DESCRIPTION
03	19.04.16	PK -sd-	-sd-	TKM -sd-	REVISION MARKED AS △3 THUS TO INCORPORATE THE CUSTOMER COMMENTS.
02	02.04.16	PK -sd-	KK -sd-	TKM -sd-	REVISION MARKED AS △2 THUS TO INCORPORATE THE CUSTOMER COMMENTS.
01	18.03.16	PK -sd-	TMSR -sd-	CPK -sd-	i. REVISION MARKED AS △1 THUS DUE TO INCORPORATE THE CUSTOMER COMMENTS AND ii. ERT TEST LOCATIONS HAS BEEN INCORPORATED.

CUSTOMER: TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION LIMITED

CUSTOMER'S CONSULTANT

JOB No. 423

STATUS CONTRACT

DISTRIBUTION

TO

No.OFF

1 X 800 MW NORTH CHENNAI TPP (STAGE-III, UNIT # 1)

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE C

	NAME	SIGN	DATE
DRN	S.ND	-sd-	08.03.2016
DESN	V.V.	-sd-	08.03.2016
CHD	TMSR	-sd-	08.03.2016
APPD	CPK	-sd-	08.03.2016

TITLE: GEOTECHNICAL INVESTIGATION LAYOUT

MPL	C	MSE	I	MAX	E	DEPT.	SCALE

SIGN

DATE

DRAWING No. PE-DG-423-602-C001

SHEET 1 OF 1 REV 03

SIZE-A0

Annexure

C1

DATE:31/05/2019

REVISED RATES OF T&P HIRE CHARGES FOR CRANES & TRAILERS ETC. FOR
SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	USEFUL LIFE (IN YRS)	Revised rates (Rs./Hour) valid from 01/06/2019 to 31/5/2021 (WITHIN USEFUL LIFE)	Revised rates (Rs./Hour) valid from 01/06/2019 to 31/5/2021 (BEYOND USEFUL LIFE)
I.	CRANES:-			
1	Portal Gantry Crane 500T	15	20100.00	19980.00
2	100MT Crawler Crane ZOOMLION CRANE-QUY-100	10	11370.00	11320.00
3	Heavy Lift Crawler Crane 600MT Class DEMAG Model CC2800	15	56290.00	55940.00
4	PORTAL CRANE, 360T	15	14070.00	13980.00
5	600MT Class Crawler Crane- Manitowoc Model 18000-UPGRADED	15	55460.00	55110.00
6	600MT Class Crawler Crane- Liebherr Model LR1600-2 (Upgraded version)	15	68610.00	68180.00
7	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH RINGER)	15	33510.00	33300.00
8	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH-OUT RINGER)	15	20940.00	20810.00
9	MANITOWOC M-250T TRUCK CRANE	15	30160.00	29970.00
10	270 MT Class Crawler Crane- Manitowoc Model 2250	15	31660.00	31470.00
11	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1	15	26390.00	26220.00
11.A	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1 (UPGRADED)	15	36110.00	36110.00
12	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2	15	15130.00	15030.00
12.A	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2 (UPGRADED)	15	18850.00	18850.00
13	LINKBELT LS- 248H CRAWLER CRANE (180T)	15	16750.00	16650.00
14	MANITOWAC MODEL 888 CRAWLER CRANE (200 MT)	15	21780.00	21640.00
15	CRAWLER CRANE SUMITOMO, 150T	15	10890.00	10820.00
16	All Terrain Crane, 150MT- Liebherr Model LTM1150	15	13400.00	13320.00
17	CRAWLER CRANE, 120 T Fushun Model QUY120	10	10830.00	10780.00
18.A	CRAWLER CRANE 135MT Kobelco Model CK1350- 1F	15	10720.00	10650.00
18.B	CRAWLER CRANE 135MT Kobelco Model CK1350	15	8880.00	8820.00
19	CRAWLER CRANE 120MT - Tata-Sumitomo Model SCX1200-2	15	10050.00	9990.00
20	CRAWLER CRANE 100 T (KH 500)	15	10050.00	9990.00
21	Hydraulic Crawler Crane 80MT, Fushun Model QUY 80B	10	5410.00	5390.00
22	ROUGH TERRAIN CRANE 75T (RT880)	12	6140.00	6110.00
23	CRAWLER CRANE, 75T -Tata Model 955ALC/TFC280	12	5370.00	5340.00
24	Mobile Crane, 55MT (TIL)	12	4410.00	4390.00
25	CRAWLER CRANE, 25T -Tata Model TFC75	10	3030.00	3010.00
26	MOBILE CRANE, 20MT (TIL)	10	2270.00	2260.00
27	MOBILE CRANE, 20MT (ESCORTS)	10	2270.00	2260.00
28	MOBILE CRANE ESCORTS- 14MT	10	710.00	710.00
29	HYDAULIC PICK & CARRY CRANE, 8/9/10/11/12 MT	10	390.00	380.00
30	ELECTRIC GANTRY CRANE 3T	5	430.00	430.00
31	ELECTRIC GANTRY CRANE 5T	5	540.00	540.00
32	ELECTRIC GANTRY CRANE 30T	5	3640.00	3620.00
33	FORK LIFT 5T	5	650.00	650.00
34	FORK LIFT 3T	5	540.00	540.00

Annexure C2 DATE 31/05/2019

REVISED RATES OF T&P HIRE CHARGES FOR CRANES & TRAILERS ETC. FOR OUTSIDE AGENCIES

SL NO.	ITEM DESCRIPTION	USEFUL LIFE (IN YRS)	Revised rates (Rs./Hour) valid from 01/06/2019 to 31/5/2021 (WITHIN USEFUL LIFE)	Revised rates (Rs./Hour) valid from 01/06/2019 to 31/5/2021 (BEYOND USEFUL LIFE)
I.	CRANES:-			
1	Portal Gantry Crane 500T	15	22340.00	22200.00
2	100MT Crawler Crane ZOOMLION CRANE-QUY-100	10	12630.00	12570.00
3	Heavy Lift Crawler Crane 600MT Class DEMAG Model CC2800	15	62550.00	62160.00
4	PORTAL CRANE, 360T	15	15630.00	15540.00
5	600MT Class Crawler Crane- Manitowoc Model 18000-UPGRADED	15	61620.00	61240.00
6	600MT Class Crawler Crane- Liebherr Model LR1600-2 (Upgraded version)	15	76230.00	75760.00
7	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH RINGER)	15	37230.00	37000.00
8	CRAWLER CRANE FMC/LINKBELT 718, 250T (WITH-OUT RINGER)	15	23270.00	23120.00
9	MANITOWOC M-250T TRUCK CRANE	15	33510.00	33300.00
10	270 MT Class Crawler Crane- Manitowoc Model 2250	15	35180.00	34960.00
11	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1	15	29320.00	29130.00
11.A	300MT Crane Crawler Crane LIEBHERR Model LR-1350/1 (UPGRADED)	15	40120.00	40120.00
12	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2	15	16810.00	16700.00
12.A	250MT Class Mid range Crawler Crane- Kobelco Model CKE2500-2 (UPGRADED)	15	20950.00	20950.00
13	LINKBELT LS- 248H CRAWLER CRANE (180T)	15	18610.00	18500.00
14	MANITOWAC MODEL 888 CRAWLER CRANE (200 MT)	15	24200.00	24050.00
15	CRAWLER CRANE SUMITOMO, 150T	15	12100.00	12020.00
16	All Terrain Crane, 150MT- Liebherr Model LTM1150	15	14890.00	14800.00
17	CRAWLER CRANE, 120 T Fushun Model QUY120	10	12030.00	11970.00
18.A	CRAWLER CRANE 135MT Kobelco Model CK1350- 1F	15	11910.00	11840.00
18.B	CRAWLER CRANE 135MT Kobelco Model CK1350	15	9860.00	9800.00
19	CRAWLER CRANE 120MT - Tata-Sumitomo Model SCX1200-2	15	11170.00	11100.00
20	CRAWLER CRANE 100 T (KH 500)	15	11170.00	11100.00
21	Hydraulic Crawler Crane 80MT, Fushun Model QUY 80B	10	6010.00	5980.00
22	ROUGH TERRAIN CRANE 75T (RT880)	12	6830.00	6790.00
23	CRAWLER CRANE, 75T -Tata Model 955ALC/TFC280	12	5970.00	5940.00
24	Mobile Crane, 55MT (TIL)	12	4900.00	4880.00
25	CRAWLER CRANE, 25T -Tata Model TFC75	10	3370.00	3350.00
26	MOBILE CRANE, 20MT (TIL)	10	2520.00	2510.00
27	MOBILE CRANE, 20MT (ESCORTS)	10	2520.00	2510.00
28	MOBILE CRANE ESCORTS- 14MT	10	790.00	790.00
29	HYDAULIC PICK & CARRY CRANE, 8/9/10/11/12 MT	10	430.00	430.00
30	ELECTRIC GANTRY CRANE 3T	5	480.00	480.00
31	ELECTRIC GANTRY CRANE 5T	5	600.00	600.00
32	ELECTRIC GANTRY CRANE 30T	5	4040.00	4030.00
33	FORK LIFT 5T	5	720.00	720.00
34	FORK LIFT 3T	5	600.00	600.00

ANNEXURE-T I
DT: 31/05/2019

RATES OF T&P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILERS ETC. FOR SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/06/2019 to 31/5/2021
I.	LIFTING EQUIPMENTS	
1	Strand Jack System for Boiler Drum Lifting	20930
2	MULTI SHEAVE PULLEY BLOCK 40/50T/60T	310
3	MULTI SHEAVE PULLEY BLOCK 100T	630
4	MULTI SHEAVE PULLEY BLOCK 150T	1260
5	ELCTRIC WINCH 5T	1270
6	ELCTRIC WINCH 10T	2360
7	ELECTRIC WINCH 15 T	2150
8	PASSENGER CUM GOODS HOIST 1T	2270
9	FURNACE MAINTENANCE PLATFORM	5040
10	Gang Operated Hydraulic Jack (Set of 4 Jacks - 175 MT each)	2100
II	WELDING & HEAT TREATMENT EQUIPMENT	
1	125KW, 3KHZ, AIR-COOLED INDUCTION HEATING EQUIPMENT	16380
2	75KW, 10 KHZ, COMPACT INDUCTION HEATING EQUIPMENT	8190
3	WELDING GENERATOR 320/300 A	300
4	WELDING RECTIFIER 400A/300A	300
5	WELDING RECTIFIER 600A	400
6	DIESEL WELDING GENERATOR 400A/300A	400
7	TRANSFORMER,600A	300
8	TRANSFORMER 300/400A	200
III	SERVICE PLANTS & ALLIED EQUIPT.	0
1	500KVA DIESEL GENERATOR	3800
2	TRANSFORMER OIL FILTERATION EQUIPMENT 6000LPH CAPACITY WITHOUT STORAGE TANK	6370
3	-DO- , WITH STORAGE TANK	7280
4	OIL FILTERATION M/C, 250/500 LPH (OTHER THAN SILICON OIL)	910
5	OIL FILTERATION M/C, 250GPH/1000LPH (OTHER THAN SILICON	1360
6	OIL FILTERATION M/C, 500GPH/2500LPH (OTHER THAN SILICON	1820
7	OIL FILTERATION M/C, 1000GPH/5000LPH (OTHER THAN SILICON	3640
8	Portable Lube Oil Purification Unit (Centrifuge M/c) Capacity: 750	1270
9	Low Vacuum de-hydration unit	630
10	DIESEL GENERATING SET,250 KVA	1770
11	DIESEL GENERATING SET,25 KVA	500
12	VACUUM PUMP(ABSOLUTE V.C.)	540
13	ACID CIRCULATING PUMP WITH MOTOR 120M HEAD, 150T/HR	1090
14	ACID TRANSFER PUMP 20/50 T/HR	540
15	DEWATERING PUMP (Kirloskar make,11KW/15HP)	80
16	HP Air compressor (32 Kg/Sq. Cm, 150 CFM)	4240

RATES OF T&P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILERS ETC. FOR SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/06/2019 to 31/5/2021
17	AIR COMPRESSORS 250/300/330/360/350 CFM	2730
18	AIR COMPRESSORS 140/150/190/210 CFM	910
19	ACID CIRCULATING PUMP WITH MOTOR & STARTER, 200T/HR, 150M, 220 HP	1820
20	Industrial Blower 2000CFM	1270
21	Air Leak Test Blower (Flow: 40000 m^3/Hr)	1160
22	Air Blower (Flow: 20000 m^3/Hr)	940
IV	METAL FORMING /CUTTING EQUIPMENT	
1	TUBE EXPANDING M/C PNEUMATIC 60-100 MM	630
2	ELECTRO HYDRAULIC PIPE BENDING M/C 4"	1630
3	BOLTING MACHINE (ALCOA/AVLOCK/ HUCK)	1800
4	-do- Gun with nose Assembly only	540
V	TESTING/INSPECTION EQUIPMENT	
1	DATA LOGGER for PG TESTING	36980
2	MOTORISED HYDRAULIC TEST PUMP 250kg/cmsq	800
3	MOTORISED HYDRAULIC TEST PUMP 400-450kg/cmsq	1090
4	MOTORISED HYDRAULIC TEST PUMP 600 KG/CMSQ	1270
5	HYDRAULIC TEST PUMP 800 KG/CMSQ	1330
6	HYDRAULIC TEST PUMP 1000 KG/CMSQ	2230
7	BOLT STRETCHING DEVICE	910
8	BOROSCOPE/FIBROSCOPE FLEXIBLE TYPE (FLEXUX) IMPORTED	3640
9	ULTRASONIC FLAW DETECTOR	2730
10	MPI TEST KIT	360
11	GAS LEAK DETECTOR	270
12	VIBRATION/SOUND LEVEL METER IRD-306	360
13	VIBRATION/SOUND LEVEL METER IRD-308	360
14	VIBRATION ANALYSER/DYNAMIC BALANCING M/C IRD 350	1450
15	VIBRATION ANALYSER/DYNAMIC BALANCING M/C IRD 360	2540
16	SHOCK PULSE METER	630
17	HV.DC TEST KIT UPTO 50 KV	540
18	HV.DC TEST KIT ABOVE 50 KV	1000
19	HV.AC TEST KIT UPTO 50KV	810
20	HV.AC TEST KIT ABOVE 50KV	2910
21	MOTORISED MEGGER 2.5KV	400
22	MOTORISED MEGGAR 5KV	450
23	OSCILLOSCOPE-DUAL BEAM INDIGENOUS	450
24	OSCILLOSCOPE-DUAL BEAM IMPORTED	1090
25	WAVEFORM ANALYSER	910
26	OSCILLOGRAPH/UV RECORDER 24 CHANNEL	1630
27	OSCILLOGRAPH/UV RECORDER 12 CHANNEL	1090
28	OSCILLOGRAPH/UV RECORDER 6 CHANNEL	910
29	DIGITAL LOW RESISTANCE METER	630
30	DC POTENTIOMETER	180
31	PRECISION DEAD WEIGHT TESTER	1000
32	OPTICAL ALIGNMENT KIT	1360
33	BOROSCOPE/FIBROSCOPE(NON FLEXIBLE)	1200
34	VERNIER THEODOLITE,PRECISION	1200
35	VERNIER THEODOLITE,ORDINARY	200
36	ENGINEERS PRECISION LEVEL/DUMPY LEVEL	120
37	ISKAMATIC 'A'	3200
38	CALIBRATOR '03'	1000
39	48 POLE EXTENDER CARD	200

RATES OF T&P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILERS ETC. FOR SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/06/2019 to 31/5/2021
40	MULTIJET NPM	400
41	OSCILLOMETER	10190
42	VOC EQUIPMENT	1400
43	BINARY SIGNAL GENERATOR	290
44	ELECTRIC COUNTER	690
45	FREQUENCY GENERATOR	1000
46	DBF 3 VIBRATION RECORDER/ANALYSER	3270
47	L&T GOULD OSCILLOGRAPH 2-CHANNEL	490
48	L&T GOULD OSCILLOGRAPH 6-CHANNEL	1180
49	VIBROPORT 41/FFT ANALYSER	5460
50	ELCID kit	10010
51	UNIVERSAL CALIBRATION SYSTEM	2730
52	NATURAL FREQUENCY TESTER	2910
53	DIGITAL HARDNESS TESTER	360
54	ADRE 208 VIBRATION ANALYSER	7280
55	PCB DIAGONISTIC REPAIR KIT	2000
56	SECONDARY INJECTION RELAY TEST KIT	5270
57	MICRO OHM METER	1450
58	DIGITAL MICRO OHM METER MEASURING RANGE: 200 μΩ TO 20KΩ	3230
59	PMI Machine OLYMPUS make	3350
60	Mobile Lighting Mast - 9 metres (4X400 W)	860
61	10KVA RESISTANCE BRAZING MACHINE	140
62	RECURRENT SURGE OSCILLOGRAPH (RSO) TEST KIT WITH PORTABLE HANDHELD OSCILLOSCOPE.	460
63	HYDROGEN GAS LEAK DETECTOR	50
64	STATOR WEDGE ANALYZER KIT WITH COMPLETE ACCESSORIES	4980
65	WEDGE DEFLECTION KIT	80
66	TILE PRESSING MACHINE FOR GAS TURBINE	270
67	INDUCTION BRAZING MACHINE	4870
68	MAGNETIC COHESIVE FORCE (MCF) EQUIPMENT	3640
69	ULTRASONIC FLOW METER	180
70	PORTABLE VIBRATION ANALYSER (MODEL 811T)	40
71	CENTRIFUGAL PUMP SET FOR ACID CLEANING (WITH MOTOR AND PANEL) : PRESSURE -14KG/SQ CM. : FLOW 60 M3/HR	470
72	CENTRIFUGAL PUMP SET FOR ACID CLEANING (WITH MOTOR AND PANEL) : PRESSURE -30KG/SQ CM. : FLOW 15 M3/HR	430
73	HI SPEED MEMORY RECORDER, MAKE -YOKOGAWA, MODEL DL850E-Q-HE/B5/HD1	1810
74	TROLLEY MOUNTED HYDRAULIC JACK (100 MT)	1260
75	5KV Insulation Tester	450
76	4 Channel Digital Oscilloscope /Fast Recorder	1710
77	4 Channel Oscillographic Recorder	580
78	Sound Level Meter	230
79	Thermal Imaging Camera	770
80	Videoscope (Video Boroscope)	1510
81	DO (Dissolve Oxygen) Meter (0 to 1500 ppb)	1310
82	Conductivity Meter	80
83	Core Flux Test Kit	7280
84	Primary Current Injection Kit (2000A)	870
85	3 Phase Secondary Injection Kit (Relay Test)	3760
86	FRF Filtration Kit	1330
87	FFT Analyser	2290

RATES OF T&P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILERS ETC. FOR SUB-CONTRACTORS WORKING FOR BHEL FOR DOING BHEL JOBS

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/06/2019 to 31/5/2021
88	Flue Gas Analyser	1030
89	Oil Test Kit (Mineral Oil)-Transformer	1010
90	Winding Resistance kit (R L C Load)	880
91	SFRA test Kit	1190
92	Tan Delta test Kit	4060
93	PF Meter	330
94	Ultrasonic Flow Meter	830
95	Oil Particle Counter	360

ANNEXURE-T II

DT: 31/05/2019

RATES OF T & P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILLERS ETC. FOR OUTSIDE AGENCIES

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/06/2019 to 31/5/2021
I.	LIFTING EQUIPMENTS	
1	Strand Jack System for Boiler Drum Lifting	23250
2	MULTI SHEAVE PULLEY BLOCK 40/50T/60T	350
3	MULTI SHEAVE PULLEY BLOCK 100T	700
4	MULTI SHEAVE PULLEY BLOCK 150T	1400
5	ELCTRIC WINCH 5T	1410
6	ELCTRIC WINCH 10T	2620
7	ELECTRIC WINCH 15 T	2390
8	PASSENGER CUM GOODS HOIST 1T	2520
9	FURNACE MAINTENANCE PLATFORM	5600
10	Gang Operated Hydraulic Jack (Set of 4 Jacks - 175 MT each)	2330
II	WELDING & HEAT TREATMENT EQUIPMENT	
1	125KW, 3KHZ, AIR-COOLED INDUCTION HEATING EQUIPMENT	18190
2	75KW, 10 KHZ, COMPACT INDUCTION HEATING EQUIPMENT	9090
3	WELDING GENERATOR 320/300 A	330
4	WELDING RECTIFIER 400A/300A	330
5	WELDING RECTIFIER 600A	440
6	DIESEL WELDING GENERATOR 400A/300A	440
7	TRANSFORMER,600A	330
8	TRANSFORMER 300/400A	220
III	SERVICE PLANTS & ALLIED EQUIPT.	
1	500KVA DIESEL GENERATOR	4220
2	TRANSFORMER OIL FILTERATION EQUIPMENT 6000LPH	7070
3	-DO- , WITH STORAGE TANK	8080
4	OIL FILTERATION M/C, 250/500 LPH (OTHER THAN SILICON OIL)	1010
5	OIL FILTERATION M/C, 250GPH/1000LPH (OTHER THAN SILICON	1510
6	OIL FILTERATION M/C, 500GPH/2500LPH (OTHER THAN SILICON	2020
7	OIL FILTERATION M/C, 1000GPH/5000LPH (OTHER THAN SILICON	4040
8	Portable Lube Oil Purification Unit (Centrifuge M/c) Capacity: 750	1410
9	Low Vacuum de-hydration unit	700
10	DIESEL GENERATING SET,250 KVA	1970
11	DIESEL GENERATING SET,25 KVA	560
12	VACUUM PUMP(ABSOLUTE V.C.)	600
13	ACID CIRCULATING PUMP WITH MOTOR 120M HEAD, 150T/HR	1210
14	ACID TRANSFER PUMP 20/50 T/HR	600
15	DEWATERING PUMP (Kirloskar make,11KW/15HP)	90
16	HP Air compressor (32 Kg/Sq. Cm, 150 CFM)	4710

ANNEXURE-T II
DT: 31/05/2019

RATES OF T & P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILLERS ETC. FOR OUTSIDE AGENCIES

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/06/2019 to 31/5/2021
17	AIR COMPRESSORS 250/300/330/360/350 CFM	3030
18	AIR COMPRESSORS 140/150/190/210 CFM	1010
19	ACID CIRCULATING PUMP WITH MOTOR & STARTER, 200T/HR, 150M, 220 HP	2020
20	Industrial Blower 2000CFM	1410
21	Air Leak Test Blower (Flow: 40000 m^3/Hr)	1290
22	Air Blower (Flow: 20000 m^3/Hr)	1040
IV	METAL FORMING /CUTTING EQUIPMENT	
1	TUBE EXPANDING M/C PNEUMATIC 60-100 MM	700
2	ELECTRO HYDRAULIC PIPE BENDING M/C 4"	1810
3	BOLTING MACHINE (ALCOA/AVLOCK/ HUCK)	2000
4	-do- Gun with nose Assembly only	600
V	TESTING/INSPECTION EQUIPMENT	
1	DATA LOGGER for PG TESTING	41090
2	MOTORISED HYDRAULIC TEST PUMP 250kg/cmsq	880
3	MOTORISED HYDRAULIC TEST PUMP 400-450kg/cmsq	1210
4	MOTORISED HYDRAULIC TEST PUMP 600 KG/CMSQ	1410
5	HYDRAULIC TEST PUMP 800 KG/CMSQ	1480
6	HYDRAULIC TEST PUMP 1000 KG/CMSQ	2480
7	BOLT STRETCHING DEVICE	1010
8	BOROSCOPE/FIBROSCOPE FLEXIBLE TYPE (FLEXUX) IMPORTED	4040
9	ULTRASONIC FLAW DETECTOR	3030
10	MPI TEST KIT	400
11	GAS LEAK DETECTOR	300
12	VIBRATION/SOUND LEVEL METER IRD-306	400
13	VIBRATION/SOUND LEVEL METER IRD-308	400
14	VIBRATION ANALYSER/DYNAMIC BALANCING M/C IRD 350	1610
15	VIBRATION ANALYSER/DYNAMIC BALANCING M/C IRD 360	2830
16	SHOCK PULSE METER	700
17	HV.DC TEST KIT UPTO 50 KV	600
18	HV.DC TEST KIT ABOVE 50 KV	1110
19	HV.AC TEST KIT UPTO 50KV	900
20	HV.AC TEST KIT ABOVE 50KV	3230
21	MOTORISED MEGGER 2.5KV	440
22	MOTORISED MEGGAR 5KV	500
23	OSCILLOSCOPE-DUAL BEAM INDIGENOUS	500
24	OSCILLOSCOPE-DUAL BEAM IMPORTED	1210

ANNEXURE-T II
DT: 31/05/2019

RATES OF T & P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILLERS ETC. FOR OUTSIDE AGENCIES

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/06/2019 to 31/5/2021
25	WAVEFORM ANALYSER	1010
26	OSCILLOGRAPH/UV RECORDER 24 CHANNEL	1810
27	OSCILLOGRAPH/UV RECORDER 12 CHANNEL	1210
28	OSCILLOGRAPH/UV RECORDER 6 CHANNEL	1010
29	DIGITAL LOW RESISTANCE METER	700
30	DC POTENTIOMETER	200
31	PRECISION DEAD WEIGHT TESTER	1110
32	OPTICAL ALIGNMENT KIT	1510
33	BOROSCOPE/FIBROSCOPE(NON FLEXIBLE)	1330
34	VERNIER THEODOLITE,PRECISION	1330
35	VERNIER THEODOLITE,ORDINARY	220
36	ENGINEERS PRECISION LEVEL/DUMPY LEVEL	130
37	ISKAMATIC 'A'	3550
38	CALIBRATOR '03'	1110
39	48 POLE EXTENDER CARD	220
40	MULTIJET NPM	440
41	OSCILLOMETER	11320
42	VOC EQUIPMENT	1550
43	BINARY SIGNAL GENERATOR	320
44	ELECTRIC COUNTER	760
45	FREQUENCY GENERATOR	1110
46	DBF 3 VIBRATION RECORDER/ANALYSER	3630
47	L&T GOULD OSCILLOGRAPH 2-CHANNEL	540
48	L&T GOULD OSCILLOGRAPH 6-CHANNEL	1310
49	VIBROPORT 41/FFT ANALYSER	6060
50	ELCID kit	11120
51	UNIVERSAL CALIBRATION SYSTEM	3030
52	NATURAL FREQUENCY TESTER	3230
53	DIGITAL HARDNESS TESTER	400
54	ADRE 208 VIBRATION ANALYSER	8080
55	PCB DIAGONISTIC REPAIR KIT	2220
56	SECONDARY INJECTION RELAY TEST KIT	5860
57	MICRO OHM METER	1610
58	DIGITAL MICRO OHM METER	3590
59	PMI Machine OLYMPUS make	3730
60	Mobile Lighting Mast -	960
61	10KVA RESISTANCE BRAZING MACHINE	160
62	RECURRENT SURGE OSCILLOGRAPH (RSO) TEST KIT WITH	510

ANNEXURE-T II

DT: 31/05/2019

RATES OF T & P HIRE CHARGES FOR ITEMS OTHER THAN CRANES & TRAILLERS ETC. FOR OUTSIDE AGENCIES

SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/06/2019 to 31/5/2021
63	HYDROGEN GAS LEAK DETECTOR	60
64	STATOR WEDGE ANALYZER KIT WITH COMPLETE	5530
65	WEDGE DEFLECTION KIT	90
66	TILE PRESSING MACHINE FOR GAS TURBINE	300
67	INDUCTION BRAZING MACHINE	5410
68	MAGNETIC COHESIVE FORCE (MCF) EQUIPMENT	4040
69	ULTRASONIC FLOW METER	200
70	PORTABLE VIBRATION ANALYSER (MODEL 811T)	50
71	CENTRIFUGAL PUMP SET FOR ACID CLEANING (WITH MOTOR	520
72	CENTRIFUGAL PUMP SET FOR ACID CLEANING (WITH MOTOR	480
73	HI SPEED MEMORY RECORDER, MAKE -YOKOGAWA, MODEL	2010
74	TROLLEY MOUNTED HYDRAULIC JACK (100 MT)	1400
75	5KV Insulation Tester	500
76	4 Channel Digital Oscilloscope /Fast Recorder	1900
77	4 Channel Oscillographic Recorder	650
78	Sound Level Meter	260
79	Thermal Imaging Camera	860
80	Videoscope (Video Boroscope)	1680
81	DO (Dissolve Oxygen) Meter (0 to 1500 ppb)	1460
82	Conductivity Meter	90
83	Core Flux Test Kit	8090
84	Primary Current Injection Kit (2000A)	960
85	3 Phase Secondary Injection Kit (Relay Test)	4180
86	FRF Filtration Kit	1480
87	FFT Analyser	2550
88	Flue Gas Analyser	1140
89	Oil Test Kit (Mineral Oil)-Transformer	1120
90	Winding Resistance kit (R L C Load)	970
91	SFRA test Kit	1320
92	Tan Delta test Kit	4510
93	PF Meter	360
94	Ultrasonic Flow Meter	920
95	Oil Particle Counter	400

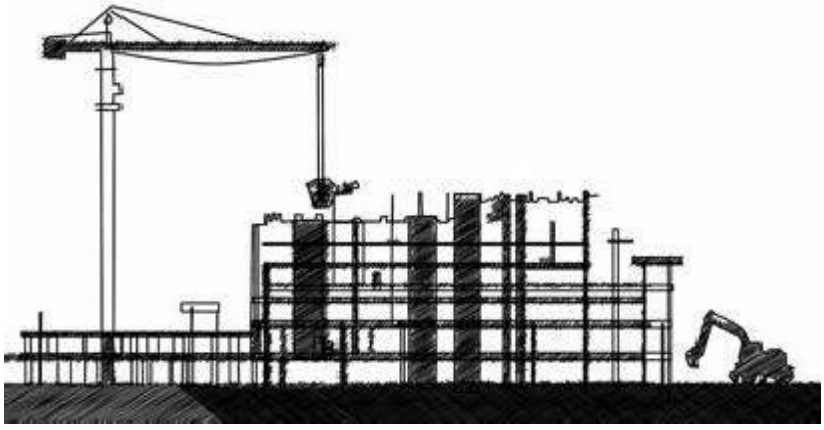
HEALTH, SAFETY and ENVIRONMENT PLAN

for

SITE OPERATIONS

by

SUB-CONTRACTORS



POWER SECTOR

HSE PLAN FOR SITE OPRATIONS BY BHEL'S SUBCONTRACTORS

AT A GLANCE

BEFORE START

SIGNING OF MOU
Agree to comply to HSE requirement- Statutory and BHEL's

PLAN

HSE ORGANISATION	
Manpower • 1 (one) safety officer for every 500 workers or part thereof • 1(one) safety-steward/ supervisor for every 100 workers **Qualification** As per Cl. 7.1	**HSE Roles and responsibilities** • Site In-charge- As per clause 7.2.1 • Safety officer- As per clause 7.2.2

HSE Planning
for Man, Machinery/Equipment/Tools & Tackles

PROVIDE

HSE INFRASTUCTURE	
• PPEs • Drinking Water • Washing Facilities • Latrines and Urinals • Provision of shelter for rest • Medical facilities	• Canteen facilities • Labour Colony • Emergency Vehicle • Pest Control • Scrapyard • Illumination

TRAIN

HSE TRAINING , AWARENESS & PROMOTION	
Training • Induction training • Height work and other critical areas • Tool Box talk & Pep Talk	**Awareness & Promotion** • Signage • Poster • Banner • Competition • Awards

COMMUNICATE

HSE COMMUNICATION	
Incident Reporting • Accident- Fatal & Major • Property damage • Near Miss	**Event Reporting** • Celebrations • Training • Medical camp

EXECUTE SAFELY

OPERATIONAL CONTROL PROCEDURES

PERMIT TO WORK

Height work (above 2 metres), Hot Work, Heavy Lifting, Confined Space, Radiography, excavation (More than 4 metres)

SAFETY DURING WORK EXECUTION	
• Welding • Rigging • Cylinder- storage & Movement • Demolition work • T&Ps • Chemical Handling • Electrical works	• Fire • Scaffolding • Height work • Working Platform • Excavation • Ladder • Lifting • Hoisting appliance
HOUSE KEEPING	
WASTE MANGEMENT	
TRAFFIC MANAGEMENT	
ENVIRONMENTAL CONTROL	
EMERGENCY PREPAREDNESS AND RESPONSE PLAN	

CHECKS

HSE AUDITS & INSPECTION	
• Daily Checks • Inspection of PPEs • Inspection of T& Ps • Inspection of Cranes & Winches	• Inspection of Height work • Inspection of Welding and Gas cutting • Inspection of elevators etc.

HSE PERFORMANCE EVALUATION PARAMETERS

NON CONFORMANCE

PENALTY for NON CONFORMANCE

Refer Clause 16

Incremental penalty

For repeated violation by the same person, the penalty would be double of the previous penalty

For repeated fatal incident in the same Unit incremental penalty to be imposed. The subcontractor will pay 2 times the penalty compared to previously paid in case there are repeated cases of fatal incidents under the same subcontractor for the same package in the same unit.

REVISION HISTORY SHEET

Date	Revision No.	Details of Changes	Reason	Prepared	Reviewed	Approved
12.08.2014	00	First Issue	First Issue	S. B. Jayant, Dy Manager-FQA & Safety	A. K. Sinha, GM-FQA & Safety	Anuj Bhatnagar, ED-FQA & Safety
20.01.2020	01	Formats added: **HSEP:14-F30 – Monthly HSE Planning & Review** (Page 11, Clause 8.0 - updated) HSEP:14-F13E-Excavation Inspection Format (part of F30)) HSEP:14-F32B – Job Safety Analysis Format (part of F30) **HSEP:14-F31A – Daily HSE Reporting** (Page 18, Clause 10.3 – added) **HSEP:14-F33 – HSE Performance Evaluation** (Page 31, Clause 13 – revised)	IOM No. **PSHQHSE/MONREP/02** Dated 08-Jan-2020	Rohit Kumar	Santosh Nair, GM (MSX & HSE)	

1.0 PURPOSE

1.1 The purpose of this HSE 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 installation and servicing of industrial projects and power plants.

1.2 This document shall be followed by BHEL's subcontractors at all installation and servicing sites. In case customer specific documents are to be implemented, this document will be followed in conjunction with customer specific documents.

1.3 Although every effort has been made to make the procedures and guidelines in line with statutory requirements, in case of any discrepancy relevant statutory guidelines must be followed.

1.4 In case the customer has any specific requirement, the same is to be fulfilled.

2.0 SCOPE

The document is applicable for BHEL's Subcontractors at all installation / servicing activities of BHEL Power Sector as per the relevant contractual obligations.

3.0 OBJECTIVES AND TARGETS

The HSE Plan reflects that BHEL places high priority upon the Occupational Health, Safety and Environment at workplaces.

- Ensure the Health and Safety of all persons at work site is not adversely affected by the work.
- Ensure protection of environment of the work site.
- Comply at all times with the relevant statutory and contractual HSE 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 on the safety aspect of their work.
- Effectively control, co-ordinate and monitor the activities of all personnel on the Project sites including subcontractors in respects of HSE.
- Establish effective communication on HSE 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 person.
- Ensure timely provision of resources to facilitate effective implementation of HSE requirements.
- Ensure continual improvements in HSE 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.

HSE TARGETS

EXPLOSION	**ZERO**
FATALITY	**ZERO**
LOST TIME INJURY	**ZERO**
FIRE	**ZERO**
VEHICLE INCIDENTS	**ZERO**
ENVIRONMENTAL INCIDENTS	**ZERO**

4.0 BHEL POWER SECTOR HEALTH, SAFETY & ENVIRONMENT POLICY

Health, Safety & Environment Policy of BHEL

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.

` **sd/-**

CMD, BHEL

5.0 MEMORANDUM OF UNDERSTANDING:

After award of work, subcontractors are required to enter into a memorandum of understanding as given below:

Memorandum of Understanding

BHEL, Power Sector_____Region is committed to Health, Safety and Environment Policy (HSE Policy).

M/s_____do hereby also commit to comply with the same HSE Policy w h i l e executing the Contract Number _____

M/s_____shall ensure that safe work practices as per the HSE plan. Spirit and content therein shall be reached to all workers and supervisors for compliance.

In addition to this, M/S_____shall comply to all applicable statutory and regulatory requirements which are in force in the place of project and any special requirement specified in the contract document of the principal customer.

M/s_____shall co-operate in HSE audits/inspections conducted by BHEL /customer/ third party and ensure to close any non-conformity observed/reported within prescribed time limit.

Signed by authorized representative of M/s ----------

Name :

Place & Date:

6.0 TERMS AND DEFINITIONS

6.1 DEFINITIONS

6.1.1 INCIDENT

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

6.1.2 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".

6.1.3 MAN-HOURS WORKED

The total number of man hours worked by all employees including subcontractors working in the premises. It includes managerial, supervisory, professional, technical, clerical and other workers including contract labours. 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 workdays 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.

6.1.4 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.

6.1.5 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.

6.1.6 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.

6.1.7 TYPE OF INCIDENTS & THEIR REPORTING:

The three categories of Incident are as follows:

Non-Reportable Cases:
An incident, 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 disable 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 incident caused injury to the person, but he still continues his duty.

6.1.8 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:

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

6.1.9 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:

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

6.1.10 INCIDENCE RATE

Incidence Rate is the Number of LTI per one thousand manpower deployed. Mathematically, the formula reads as:

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

7.0 HSE ORGANISATION

Number of safety officers:
The subcontractor must deploy one safety officer for every 500 workers or part thereof in each package. In addition, there must be one safety-steward/safety-supervisor for every 100 workers.

Deployment: The subcontractor should deploy sufficient safety officers and safety-steward/Safety-supervisor, as per requirement given above, since initial stage and add more in proportion to the added strength in work force. Any delay in deployment will attract a penalty of Rs.30,000/- per man month for the delayed period.

7.1 QUALIFICATION FOR HSE PERSONNEL

Sl.no	Designation	Qualification	Experience
1	Safety officer (Construction Agency)	Degree or Diploma in Engineering with full time diploma in Industrial Safety with construction safety as one of the subjects	Minimum two years for degree holder and five years for diploma holder in the field of Construction of power plant/ major industries

2	Safety-Steward/ Safety-Supervisor	Degree or diploma in any discipline with full time diploma in Industrial Safety with construction safety as one of the subjects	Minimum two years

7.2 RESPONSIBILITIES

7.2.1 SITE IN -CHARGE OF SUBCONTRACTOR

- Shall sign Memorandum of Understanding (MoU) for compliance to BHEL's HSE Plan for Site Operations as per clause 5.0
- Shall engage qualified safety officer(s) and steward (s) as per clause 7.0
- Shall adhere to the rules and regulations mentioned in this code, 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 safety helmets, belts, full body harness, shoes, face shield, hand gloves etc. before starting the job. Shall ensure that no working men/women carry excessive weight more than stipulated in Factory Rule Regulation R57.
- Shall ensure that all T&Ps engaged are tested for fitness and have valid certificates from competent person.
- Shall ensure that provisions stipulated in contract Labour Regulation Act 1970, Chapter V C.9, canteen, rest rooms/washing facilities to contracted employees at site.
- Shall adhere to the instructions laid down in Operation Control Procedures (OCPs) available with the site management.
- Shall ensure that person working above 2.0 meter should use Safety Harness tied to a life line/stable structure.
- Shall ensure that materials are not thrown from height. Cautions to be exercised to prevent fall of material from height.
- Shall report all incidents (Fatal/Major/Minor/Near Miss) to the Site engineer /HSE officer of BHEL.
- Shall ensure that Horseplay is strictly forbidden.
- Shall ensure that adequate illumination is arranged during night work.
- 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 HSE audit, mockdrill, medical camps, induction training and training on HSE at site.
- Shall ensure full co-operation during HQ/External /Customer HSE audits.

- Shall ensure submission of look-ahead plan for procurement of HSE equipment's and PPEs as per work schedule.
- Shall ensure good housekeeping.
- Shall ensure adequate valid fire extinguishers are provided at the work site.
- Shall ensure availability of sufficient number of toilets /restrooms and adequate drinking water at work site and labour colony.
- Shall ensure adequate emergency preparedness.
- Shall be member of site HSE committee and attend all meetings of the committee
- Power source for hand lamps shall be maximum of 24 v.
- Temporary fencing should be done for open edges if Hand – railings and Toe-guards are not available.

7.2.2 HEALTH, SAFETY AND ENVIRONMENT OFFICER OF SUBCONTRACTOR

- Carry out safety inspection of Work Area, Work Method, Men, Machine & Material, P&M and other tools and tackles.
- Facilitate inclusion of safety elements into Work Method Statement.
- Highlight the requirements of safety through Tool-box / other meetings.
- Help concerned HOS to prepare Job Specific instructions for critical jobs.
- Conduct investigation of all incident/dangerous occurrences & recommend appropriate safety measures.
- Advice & co-ordinate for implementation of HSE permit systems, OCPs & MPs.
- Convene HSE meeting & minute the proceeding for circulation & follow-up action.
- Plan procurement of PPE & Safety devices and inspect their healthiness.
- Report to PS Region/HQ on all matters pertaining to status of safety and promotional program at site level.
- 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.
- Apprise PS– Region on safety related problems.
- Notify site personnel non-conformance to safety norms observed during site visits / site inspections.
- Recommend to Site In charge, 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.
- Shall work as interface between various agencies such customer, package-in-charges, subcontractors on HSE matters

8.0 PLANNING BY SUBCONTRACTOR

Monthly planning and review of HSE activities shall be carried out by subcontractor as per format No. HSEP:14-F30 jointly along with BHEL.

8.1 MOBILISATION OF MACHINERY/EQUIPMENT/TOOLS BY SUBCONTRACTOR

- 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 embraced for this purpose shall include but not limited to the following:

  - Mobile cranes.
  - Side Booms.
  - Forklifts.
  - Grinding machine.
  - Drilling machine.
  - Air compressors.
  - Welding machine.
  - Generator sets.
  - Dump Trucks.
  - Excavators.
  - Dozers
  - Grit Blasting Equipment.
  - Hand tools.

- Subcontractor shall notify the engineer, of his intention to bring on to site any equipment or any container, with liquid or gaseous fuel or other substance which may create a hazard. The Engineer shall have the right to prescribe the condition under which such equipment or container may be handled and used during the performance of the works and the subcontractor shall strictly adhere to such instructions. The Engineer shall have the right to inspect any construction tool and to forbid its use, if in his opinion it is unsafe. No claim due to such prohibition will be entertained.

8.2 MOBILISATION OF MANPOWER BY SUBCONTRACTOR

- The subcontractor shall arrange induction and regular health check of their employees as per schedule VII of BOCW rules by a registered medical practitioner.
- The subcontractor shall take special care of the employees affected with occupational diseases under rule 230 and schedule II of BOCW Rules. The employees not meeting the fitness requirement should not be engaged for such job.
- Ensure that the regulatory requirements of excessive weight limit (to carry/lift/ move weights beyond prescribed limits) for male and female workers are complied with.
- Appropriate accommodation to be arranged for all workmen in hygienic condition.

8.3 PROVISION OF PPEs

- Personnel Protective Equipment (PPEs), in adequate numbers, will be made available at site & their regular use by all concerned will be ensured
- The following matrix recommends usage of minimum PPEs against the respective job.

Sl. No	Type of work	PPEs
1	Concrete and asphalt mixing	Nose mask, hand glove, apron and gum boot
2	Welders/Grinders/ Gas cutters	Welding/face screen, apron, hand gloves, nose mask and ear muffs if noise level exceeds 90dB. Helmet fitted with welding shield is preferred for welders
3	Stone/ concrete breakers	Ear muffs, safety goggles, hand gloves
4	Electrical Work	Rubber hand glove, Electrical Resistance shoes
5	Insulation Work	Respiratory mask, Hand gloves, safety goggles
6	Work at height	Double lanyard full body harness, Fall arrestor (specific cases)
7	Grit/Sand blasting	Blast suit, blast helmet, respirator, leather gloves
8	Painting	Plastic gloves, Respirators (particularly for spray painting)
9	Radiography	As per BARC guidelines

- The PPEs shall conform to the relevant standards as below and bear ISI mark.

Relevant is-codes for personal protection

IS: 2925 – 1984	Industrial Safety Helmets.
IS: 4770 – 1968	Rubber gloves for electrical purposes.
IS: 6994 – 1973 (Part-I)	Industrial Safety Gloves (Leather &Cotton Gloves).
IS: 1989 – 1986 (Part-I-II)	Leather safety boots and shoes.
IS: 5557 – 1969	Industrial and Safety rubber knee boots.
IS: 6519 – 1971	Code of practice for selections care and repair of Safety footwear.
IS: 11226 – 1985	Leather Safety footwear having direct molding sole.
IS: 5983 – 1978	Eye protectors.
IS: 9167 – 1979	Ear protectors.
IS: 1179-1967	Eye & Face protection during welding
IS: 3521 – 1983	Industrial Safety Belts and Harness
IS:8519 -1977	Guide for selection of industrial Safety equipment for body protection
IS:9473-2002,14166-1994,14746-1999	Respiratory Protective Devices

The list is not exhaustive. The safety officer may demand additional PPEs based on specific requirement.

- Where workers are employed in sewers and manholes, which are in use, the subcontractor shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into manhole, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent incident to the public
- Besides the PPEs mentioned above, the persons shall use helmet and safety shoe. The visitors shall use Helmet and any other PPEs as deemed appropriate for the area of work.

Colour scheme for Helmets:

1. Workmen: Yellow
2. Safety staff: Green or white with green band
3. Electrician: Red
4. Others including visitors: White

- All the PPEs shall be checked for its quality before issue and the same shall be periodically checked. 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.

8.4 ARRANGEMENT OF INFRASTRUCTURE

8.4.1 DRINKING WATER

- Drinking water shall be provided and maintained at suitable places at different elevations.
- Container should be labeled as " Drinking Water"
- Cleaning of the storage tank shall be ensured atleast once in 3 months indicating date of cleaning and next due date.
- Potability of water should be tested as per IS10500 at least once in a year.

8.4.2 WASHING FACILITIES

- In every workplace, adequate and suitable facilities for washing shall be provided and maintained.
- Separate and adequate cleaning facilities shall be provided for the use of male and female workers. Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition and dully illuminated for night use.
- Overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the painters and other workers to wash during the cessation of work.

8.4.3 LATRINES AND URINALS

- Latrines and urinals shall be provided in every work place.
- Urinals shall also be provided at different elevations.
- They shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times, by appointing designated person.
- Separate facilities shall be provided for the use of male and female worker if any.

8.4.4 PROVISION OF SHELTER DURING REST

Proper Shed & Shelter shall be provided for rest during break

8.4.5 MEDICAL FACILITIES

8.4.5.1 MEDICAL CENTRE (As per Schedule V, X and XI of BOCW central Rules, 1998)

- A medical centre shall be ensured/identified at site with basic facilities for handling medical emergencies. The medical center can be jointly developed on proportionate sharing basis with permission from BHEL
- A qualified medical professional, not less than MBBS, shall be deployed at the medical centre
- The medical centre shall be equipped with one ambulance, with trained driver and oxygen cylinder.
- Medical waste shall be disposed as per prevailing legislation (Bio-Medical Waste –Management and Handling Rules, 1998)

8.4.5.2 FIRST AIDER

- Ensure availability of Qualified First-aider throughout the working hours.
- 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 conspicuous places.

8.4.5.3 FIRST AID BOX (as per schedule III of BOCW)

- The subcontractor shall provide necessary first aid facilities as per schedule III of BOCW. At every work place 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 no to be displayed on the box.
- The first aid boxes should be placed at various elevations so as to make them available within the reach and at the quickest possible time.
- The first aid box shall be distinctly marked with a Green Cross on white background.
- Details of contents of first aid box is given in Annexure No. 01
- Monthly inspection of First Aid Box shall be carried out by the owner as per format no. HSEP:14-F01
- The subcontractor should conduct periodical first –aid classes to keep his supervisor and Engineers properly trained for attending to any emergency.

8.4.5.4 HEALTH CHECK UP (As per schedule VII and Form XI)

The persons engaged at the site shall undergo health checkup as per the format no. HSEP:14-F02 before induction. The persons engaged in the following works shall undergo health checkup at least once in a year:

a. Height workers
b. Drivers/crane operators/riggers

c. Confined space workers
d. Shot/sand blaster
e. Welding and NDE personnel

8.4.6 PROVISION OF CANTEEN FACILITY

- Canteen facilities shall be provided for the workmen of the project inside the project site.
- Proper cleaning and hygienic condition shall be maintained.
- Proper care should be taken to prevent biological contamination.
- Adequate drinking water should be available at canteen.
- Fire extinguisher shall be provided inside canteen.
- Regular health check-up and medication to the canteen workers shall be ensured.

8.4.7 PROVISION OF ACCOMODATION/LABOUR COLONY

- The subcontractor shall arrange for the accommodation of workmen at nearby localities or by making a labour colony.
- Regular housekeeping of the labour colony shall be ensured.
- Proper sanitation and hygienic conditions to be maintained.
- Drinking water and electricity to be provided at the labour colony.
- Bathing/ washing bay
- Room ventilation and electrification.

8.4.8 PROVISION OF EMERGENCY VEHICLE

- Dedicated emergency vehicle shall be made available at workplace by each subcontractor to handle any emergency

8.4.9 PEST CONTROL

Regular pest control should be carried out at all offices, mainly laboratories, canteen, labour colony and stores.

8.4.10 SCRAPYARD

- In consultation with customer, scrapyard shall be developed to store metal scrap, wooden scrap, waste, hazardous waste.
- Scrap/Waste shall be segregated as Bio-degradable and non-bio-degradable and stored separately.

8.4.11 ILLUMINATION

- The subcontractor shall arrange at his cost adequate lighting facilities e.g. flood lighting, hand lamps, area lighting etc. at various levels for safe and proper working operations at dark places and during night hours at the work spot as well as at the pre-assembly area.

- Adequate and suitable light shall be provided at all work places & their approaches including passage ways as per IS: 3646 (Part-II). Some recommended values are given below:

S. No.	Location	Illumination (Lux)
A.	**Construction Area**	
1.	Outdoor areas like store yards, entrance and exit roads	20
2.	Platforms	50
3.	Entrances, corridors and stairs	100
4.	General illumination of work area	150
5.	Rough work like fabrication, assembly of major items	150
6.	Medium work like assembly of small machined parts rough measurements etc.	300
7.	Fine work like precision assembly, precision measurements etc.	700
8.	Sheet metal works	200
9.	Electrical and instrument labs	450
B.	**Office**	
1.	Outdoor area like entrance and exit roads	20
2.	Entrance halls	150
3.	Corridors and lift cars	70
4.	Lift landing	150
5.	Stairs	100
6.	Office rooms, conference rooms, library reading tables	300
7.	Drawing table	450
8.	Manual telephone exchange	200

- Lamp (hand held) shall not be powered by mains supply but either by 24V or dry cells.
- Lamps shall be protected by suitable guards where necessary to prevent danger, in case of breakage of lamp.
- Emergency lighting provision for night work shall be made to minimise danger in case of main supply failure.

If the subcontractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions issued by the authorized BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the subcontractor

9.0 HSE TRAINING& AWARENESS

9.1 HSE INDUCTION TRAINING

All persons entering into project site shall be given HSE induction training by the HSE officer of BHEL /subcontractor before being assigned to work.

In-house induction training subjects shall include but not limited to:

- Briefing of the Project details.
- Safety objectives and targets.
- Site HSE rules.
- Site HSE hazards and aspects.
- First aid facility.
- Emergency Contact No.
- Incident reporting.
- Fire prevention and emergency response.
- Rules to be followed in the labour colony (if applicable)

- Proper safety wear & gear must be issued to all the workers being registered for the induction (i.e., Shoes/Helmets/Goggles/Leg guard/Apron etc.)
- 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.
- On completing attending subcontractor's in-house HSE induction, each employee shall sign an induction training form (format no. HSEP:14-F03) to declare that he had understood the content and shall abide to follow and comply with safe work practices. They may only then be qualified to be issued with a personal I.D. card, for access to the work site.

9.2 HSE TOOLBOX TALK

- HSE tool Box talk shall be conducted by frontline foreman/supervisor of subcontractor to specific work groups prior to the start of work. The agenda shall consist of the followings:
  - 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.
  - Recent non-compliances observed.
  - Appreciation of good work done by any person.
  - Any doubt clearing session at the end.
- Record of Tool box talk shall be maintained as per format no. HSEP:14-F04
- Tool box talk to be conducted at least once a week for the specific work.

9.3 TRAINING ON HEIGHT WORK

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

- Use of PPEs
- Use of fall arrester, retractable fall arrester, life line, safety nets etc.
- Safe climbing through monkey ladders.
- Inspection of PPEs.
- Medical fitness requirements.
- Mock drill on rescue at height.
- Dos & Don'ts during height work.

9.4 HSE TRAINING DURING PROJECT EXECUTION

- Other HSE training shall be arranged by BHEL/ subcontractor as per the need of the project execution and recommendation of HSE committee of site.
- The topics of the HSE training shall be as follows but not limited to:
  - Hazards identification and risk analysis (HIRA)
  - Work Permit System
  - Incident investigation and reporting
  - Fire fighting
  - First aid
  - Fire-warden training
  - EMS and OHSMS
  - T & Ps fitness and operation

- Electrical safety
- Welding, NDE & Radiological safety
- Storage, preservation & material handling.

- A matrix shall be maintained to keep an up-to-date record of attendance of training sessions carried out.

9.5 HSE PROMOTION-SIGNAGE, POSTERS, COMPETITION, AWARDS ETC

9.5.1 Display of HSE posters and banners

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

9.5.2 Display of HSE signage

- Appropriate HSE 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

9.5.3 Competition on HSE and award

- Site will arrange different competition (slogan, poster, essay etc.) on HSE time to time (Safety day, BHEL day, World Environment Day etc.) and winners will be suitably awarded.

9.5.4 HSE awareness programme

- Subcontractor shall arrange HSE awareness programme periodically on different topics including medical awareness for all personnel working at site

10.0 HSE COMMUNICATION

10.1 INCIDENT REPORTING

- The subcontractor shall submit report of all incidents, fires and property damage etc to the Engineer immediately after such occurrence, but in any case not later than 24 hours of the occurrence. Such reports shall be furnished in the manner prescribed by BHEL. (Refer HSE procedure for incident investigation, analysis and reporting for details)
- In addition, periodic reports on safety shall also be submitted by the subcontractor to BHEL from time to time as prescribed by the Engineer. Compiled monthly reports of all kinds of incidents, fire and property damage to be submitted to BHEL safety officer as per prescribed formats.
- HSE incidents of site shall be reported to BHEL site Management as per Procedure for Incident Investigation and Reporting in format no. HSEP:14-F15. Corrective action shall be immediately implemented at the work place and compliance shall be verified by BHEL HSE officer and until then, work shall be put on hold by Construction Manager.

10.2 HSE EVENT REPORTING

- Important HSE events like HSE training, Medical camp etc. organized at site shall be reported to BHEL site management in detail with photographs for publication in different in-house magazines
- Celebration of important days like National Safety Day, World Environment Day etc. shall also be reported as mentioned above.

10.3 DAILY HSE ACTIVITY REPORTING

Daily HSE activities shall be reported by subcontractor to BHEL as per Format No. HSEP:14-F31A

11.0 OPERATIONAL CONTROL

All applicable OCPs (Operational control procedures) will be followed by subcontractor as per BHEL instructions. This will be done as part of normal scope of work. List of such OCPs is given below. In case any other OCP is found to be applicable during the execution of work at site, then subcontractor will follow this as well, within quoted rate. These OCPs (applicable ones) will be made available to subcontractor during work execution at site. However for reference purpose, these are kept with Safety Officer of BHEL at the Power Sector Regional HQ, or available in downloadable format in the website, which may be refereed by subcontractor, if they so desire.

LIST OF OCPs

Safe handling of chemicals	Safety in use of cranes	Hydraulic test
Electrical safety	Storage and handling of gas cylinders	Spray insulation
Energy conservation	Manual arc welding	Trial run of rotary equipment
Safe welding and gas cutting operation	Safe use of helmets	Stress relieving
Fire safety	Good house keeping	Material preservation
Safety in use of hand tools	Working at height	Cable laying/tray work
First aid	Safe excavation	Transformer charging
Food safety at canteen	Safe filling of hydrogen in cylinder	Electrical maintenance
Illumination	Vehicle maintenance	Safe handling of battery system
Handling and erection of heavy metals	Safe radiography	Computer operation
Safe acid cleaning	Waste disposal	Storage in open yard
Safe alkali boil out	Working at night	For sanitary maintenance
Safe oil flushing	Blasting	Batching
Steam blowing	DG set	Piling rig operation
Safe working in confined area	Handling & storage of mineral wool	Gas distribution test
Safe operation of passenger lift, material hoists & cages	Drilling, reaming and grinding(machining)	Cleaning of hotwell / deaerator
Electro-resistance heating	Compressor operation	O&M of control of AC plant & system
Air compressor	Passivation	Safe Loading of Unit
Safe EDTA Cleaning	Safe Chemical cleaning of Pre boiler system	Safe Boiler Light up
Safe Rolling and Synchronization		

11.1 HSE ACTIVITIES

HSE activities shall be conducted at site based on the HSEMSM developed by Power Sector and issued to site by Regions.
While planning for any activity the following documents shall be referred for infrastructural requirements to establish control measures:

1) HSE Procedure for Register of OHS Hazards and Risks
2) HSE Procedure for Register of Environmental Aspects and Impacts
3) HSE Procedure for Register of Regulations

4) Operational Control Procedures
5) HSE Procedure for Emergency Preparedness and Response Plan
6) Contract documents

11.2 WORK PERMIT SYSTEM

- The following activities shall come under Work Permit System
  a. Height working above 2 metres
  b. Hot working at height
  c. Confined space
  d. Radiography
  e. Excavation more than 4 meter depth
  f. Heavy lifting above 50 ton
  Refer Annexure 05 for Work permit formats.
- "HSE Procedure for Work Permit System" shall be followed while implementing permit system. Where customer is having separate Work Permit System the same shall be followed.
- Permit applicant shall apply for work permit of particular work activity at particular location before starting of the work with Job Hazard Analysis.
- 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 in HSE Department of site.

11.3 SAFETY DURING WORK EXECUTION

Respective OCPS are to be followed and adherence to the same would be contractually binding

11.3.1 WELDING SAFETY

All safety precautions shall be taken for welding and cutting operations as per IS-818. All safety precautions shall be taken for foundation and other excavation marks as per IS-3764.

11.3.2 RIGGING

Rigging equipment shall not be loaded in excess of its recommended safe working load. Rigging equipment, when not in use, shall be removed from the original work area so as not to present a hazard to employees.

11.3.3 CYLINDERS STORAGE AND MOVEMENT

All gas cylinders shall be stored in upright position. Suitable trolley shall be used. There shall be flash-back arrestors conforming to IS-11006 at both cylinder and burner ends. Damaged tube and regulators must be immediately replaced. No of cylinders shall not exceed the specified quantity as per OCP
Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dragged, struck or permitted to strike each other violently.

When cylinders are transported by powered vehicle they shall be secured in a vertical position.

11.3.4 DEMOLITION WORK

Before any demolition work is commenced and also during the process of the work the following shall be ensured:

- All roads and open areas adjacent to the work site shall either be closed or suitably protected.
- No electric cable or apparatus which is liable to be a source of danger nor a cable or an apparatus used by the operator shall remain electrically charged.
- All practical steps shall be taken to prevent danger to persons employed from the risks of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render them unsafe.

11.3.5 T&Ps

All T&Ps/ MMEs should be of reputed brand/appropriate quality & must have valid test/calibration certificates bearing endorsement from competent authority of BHEL..Subcontractor to also submit monthly reports of T&Ps deployed and validity test certificates to BHEL safety Officer as per the format/procedure of BHEL.

11.3.6 CHEMICAL HANDLING

Displaying safe handling procedures for all chemicals such as lube oil, acid, alkali, sealing compounds etc , at work place.Where it is necessary to provide and/or store petroleum products or petroleum mixture & explosives, the subcontractor shall be responsible for carrying out such provision / storage in accordance with the rules & regulations laid down in the relevant petroleum act, explosive act and petroleum and carbide of calcium manual, published by the chief inspector of explosives of India. All such storage shall have prior approval if necessary from the chief inspector of explosives or any other statutory authority. The subcontractor shall be responsible for obtaining the same.

11.3.7 ELECTRICAL SAFETY

- Providing adequate no. of 24 V sources and ensure that no hand lamps are operating at voltage level above 24 Volts.
- Fulfilling safety requirements at all power tapping points.
- High/ Low pressure welders to be identified with separate colour clothings. No welders will be deployed without passing appropriate tests and holding valid welding certificates. Approved welding procedure should be displayed at work place.
- The subcontractor shall not use any hand lamp energized by Electric power with supply voltage of more than 24 volts in confined spaces like inside water boxes, turbine casings, condensers etc.
- All portable electric tools used by the subcontractor shall have safe plugging system to source of power and be appropriately earthed. Only electricians licensed by appropriate statutory authority shall be employed by the subcontractor to carry out all types of electrical works. Details of earth resource ad their test date to be given to BHEL safety officer as per the prescribed formats of BHEL
- The subcontractor shall use only properly insulated and armored cables which conform to the requirement of Indian Electricity Act and Rules for all wiring, electrical applications at site.

- BHEL reserves the right to replace any unsafe electrical installations, wiring, cabling etc. at the cost of the subcontractor.
- All electrical appliances used in the work shall be in good working condition and shall be properly earthed.
- No maintenance work shall be carried out on live equipment.
- The subcontractor shall maintain adequate number of qualified electricians to maintain his temporary electrical installations.
- Area wise Electrical safety inspection is to be carried out on monthly basis as per "Electrical Safety Inspection checklist' and the report is to be submitted to BHEL safety officer
- Adequate precautions shall be taken to prevent danger for electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public
- The subcontractor shall carefully follow the safety requirement of BHEL/ the purchaser with the regard to voltages used in critical areas.

11.3.8 FIRE SAFETY

- Providing appropriate fire fighting equipment at designated work place and nominate a fire officer/warden adequately trained for his job.
- Subcontractor shall provide enough fire protecting equipment of the types and numbers at his office, stores, temporary structure in labor colony etc. Such fire protection equipment shall be easy and kept open at all times.
- The fire extinguishers shall be properly refilled and kept ready which should be certified at periodic intervals. The date of changing should be marked on the Cylinders.
- All other fire safety measures as laid down in the "codes for fire safety at construction site" issued by safety coordinator of BHEL shall be followed.
- Non-compliance of the above requirement under fire protection shall in no way relieve the subcontractor of any of his responsibility and liabilities to fire incident occurring either to his materials or equipment or those of others.
- Emergency contacts nos must be displayed at prominent locations
- Tarpaulin being inflammable should not be used (instead, only non-infusible covering materials shall be used) as protective cover while preheating, welding, stress relieving etc. at site.

11.3.9 SCAFFOLDING

- Suitable scaffolds shall be provided for workman for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration of work which can be done safely from ladders.
- When a ladder is used, it shall be of rigid construction made of steel. The steps shall have a minimum width of 45 cm and a maximum rise of 30 cm. Suitable handholds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper then ¼ horizontal and 1 vertical.
- Scaffolding or staging more than 3.6 m above the ground floor, swung or suspended from an overhead support or erected with stationery support shall have a guard rail properly bolted, braced or otherwise secured, at least 90 cm above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from saver, from swaying, from the building or structure.

11.3.10 **WORK AT HEIGHT**:

- Guardrails and toe-board/barricades and sound platform conforming to IS:4912-1978 should be provided.

- Wherever necessary, life-line (pp or metallic) and fall arrestor along with Polyamide rope or Retractable lifeline should be provided.
- Safety Net as per IS:11057:1984 should be used extensively for prevention/ arrest of men and materials falling from height. The safety nets shall be fire resistant, duly tested and shall be of ISI marked and the nets shall be located as per site requirements to arrest or to reduce the consequences of a possible fall of persons working at different heights.
- Reaching beyond barricaded area without lifeline support, moving with support of bracings, walking on beams without support, jumping from one level to another, throwing objects and taking shortcut must be discouraged.
- Use of Rebar steel for making Jhoola and monkey-ladder (Rods welded to vertical or inclined structural members), temporary platform etc. must be avoided.
- Monkey Ladder should be properly made and fitted with cages.
- Jhoola should be made with angles and flats and tested like any lifting tools before use.
- Lanyard must be anchored always and in case of double lanyard, each should be anchored separately.
- In case of pipe-rack, persons should not walk on pipes and walk on platforms only.
- In case of roof work, walking ladder/ platform should be provided along with lifeline and/ or fall arrestor.
- Empty drums must not be used.
- For chimney or structure painting, both hanging platform and men should be anchored separately to a firm structure along with separate fall arrestor. Rope ladder should be discouraged.

11.3.11 WORKING PLATFORM

Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform gangways provided is more than 3.6 m above ground level or floor level, they shall be closely boarded and shall have adequate width which shall not be less than 750 mm and be suitably fenced as described above. Every opening in the floor or a building or in a working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm.

11.3.12 EXCAVATION

Wherever there are open excavation in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping into the excavations.

11.3.13 LADDER SAFETY

Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in the length while the width between side rails in rung ladder shall in no case be less than app. 29.2 cm for ladder upto and including 3 m in length. For longer ladders this width shall be increased at least ¼'' for each additional foot of length.

A sketch of the ladders and scaffolds proposed to be used shall be prepared and approval of the Engineer obtained prior to Construction.

11.3.14 LIFTING SAFETY

- It will be the responsibility of the subcontractor to ensure safe lifting of the equipment, taking due precaution to avoid any incident and damage to other equipment and personnel.

- All requisite tests and inspection of handling equipment, tools & tackle shall be periodically done by the subcontractor by engaging only the Competent Persons as per law.
- Defective equipment or uncertified shall be removed from service.
- Any equipment shall not be loaded in excess of its recommended safe working load.

11.3.15 HOISTING APPLIANCE

- Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safe guards.
- Hoisting appliance should be provided with such means as will reduce to the minimum the risk of any part of a suspended load becoming incidentally displaced.
- When workers employed on electrical installations which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary should be provided.
- The worker should not wear any rings, watches and carry keys or other materials which are good conductor of electricity.

11.4 ENVIRONMENTAL CONTROL

Environment protection has always been given prime importance by BHEL. Environmental damage is a major concern of the principal subcontractor and every effort shall be made, to have effective control measures in place to avoid pollution of Air, Water and Land and associated life. Chlorofluorocarbons such as carbon tetrachloride and trichloroethylene shall not be used. Waste disposal shall be done in accordance with the guidelines laid down in the project specification.

Any chemical including solvents and paints, required for construction shall be stored in designated bonded areas around the site as per Material Safety Data Sheet (MSDS).

In the event of any spillage, the principle is to recover as much material as possible before it enters drainage system and to take all possible action to prevent spilled materials from running off the site. The subcontractor shall use appropriate MSDS for clean-up technique

All subcontractors shall be responsible for the cleanliness of their own areas.

The subcontractors shall ensure that noise levels generated by plant or machinery are as low as reasonably practicable. Where the subcontractor anticipates the generation of excessive noise levels from his operations the subcontractor shall inform to Construction Manager of BHEL accordingly so that reasonable &practicable precautions can be taken to protect other persons who may be affected.
It is imperative on the part of the subcontractor to join and effectively contribute in joint measures such as tree plantation, environment protection, contributing towards social upliftment, conversion of packing woods to school furniture, keeping good relation with local populace etc.
The subcontractor shall carry out periodic air and water quality check and illumination level checking in his area of work place and take suitable control measure.

11.5 HOUSEKEEPING

- Keeping the work area clean/ free from debris, removed scaffoldings, scraps, insulation/sheeting wastage /cut pieces, temporary structures, packing woods etc. will be in the scope of the subcontractor. Such cleanings has to be done by

subcontractor within quoted rate, on daily basis by an identified group. If such activity is not carried out by subcontractor / BHEL is not satisfied, then BHEL may get it done by other agency and actual cost along with BHEL overheads will be deducted from contractor's bill. Such decisions of BHEL shall be binding on the subcontractor

- 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 high 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.
- Labour camp area shall be kept clear and materials like pipes, steel, sand, concrete, chips and bricks, etc. shall not be allowed in the camp to obstruct free movement of men and machineries.
- 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 line.
- Utmost care shall be taken to ensure over all cleanliness and proper upkeep of the working areas

11.6 WASTE MANAGEMENT

Take suitable measures for waste management and environment related laws/legislation as a part of normal construction activities. Compliance with the legal requirements on storage/ disposal of paint drums (including the empty ones), Lubricant containers, Chemical Containers, and transportation and storage of hazardous chemicals will be strictly maintained.

11.6.1 BINS AT WORK PLACE

- Sufficient rubbish bins shall be provided close to workplaces.
- Bins should be painted yellow and numbered.
- Sufficient nos. of drip trays shall be provided to collect oil and grease.
- Sufficient qty. of broomsticks with handle shall be provided.
- Adequate strength of employees should be deployed to ensure daily monitoring and service for waste management.

11.6.2 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 work places.
- Do not burn construction rubbish near working site.

11.6.3 SEGREGATION

- 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.

11.6.4 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.
- Make schedule for collection and disposal of waste.

11.6.5 WARNING AND SIGNS

- Appropriate sign to be displayed at scrap storage area
- No toxic, corrosive or flammable substance to be discarded into public sewage system.
- Waste disposal shall be in accordance with best practice.
- Comply with all the requirements of Pollution Control Board (PCB) for storage and disposal of hazardous waste.

11.7 TRAFFIC MANAGEMENT SYSTEM

11.7.1 SAFE WORKPLACE TRANSPORT SYSTEM

- Traffic routes in a work place shall be suitable for the persons or vehicles using them. This shall be sufficient in number and of sufficient size. This shall reflect the suitability of traffic routes for vehicles and pedestrians.
- Where vehicles and pedestrians use the same traffic routes there shall be sufficient space between them. Where necessary all traffic routes must be suitably indicated. Pedestrians or vehicles must be able to use traffic routes without endangering those at work. There must be sufficient separation of traffic routes from doors, gates and pedestrian traffic routes.
- For internal traffic, lines marked on roads / access routes and between buildings shall clearly indicate where vehicles are to pass.
- Temporary obstacles shall be brought to the attention of drivers by warning signs or hazard cones.
- Speed limits shall be clearly displayed. Speed ramps preceded by a warning signs or marker are necessary.
- The traffic route should be wide enough to allow vehicles to pass and re-pass oncoming or parked traffic and it may be advisable to introduce on-way system or parking restrictions.
- Safest route shall be provided between places where vehicles have to call or deliver.
- Avoid vulnerable areas/items such as fuel or chemicals tanks or pipes, open or unprotected edges and structures likely to collapse

- Safe areas shall be provided for loading and unloading.
- Avoid sharp or blind bends. If this is not possible hazards should be indicated e.g. blind corner.
- Ensure road crossings are minimum and clearly signed.
- Entrance and gateways shall be wide enough to accommodate a second vehicle without causing obstruction.
- Set sensible speed limits which are clearly sign posted.
- Where necessary ramps should be used to retard speed. This shall be preceded by a warning sign or mark on the road.
- Forklift trucks shall not pass over road hump unless of a type capable of doing so.
- Overhead electric cable, pipes containing flammable hazardous chemical shall be shielded by using goal posts height gauge posts or barriers.
- Road traffic signs shall be provided on prominent locations for prevention of incidents and hazards and for quick guidance and warning to employees and public. Safety signs shall be displayed as per the project working requirement and guideline of the state in which project is done. Vehicles hired or used shall not be parked within the 15m radius of any working area. Any vehicle, that is required to be at the immediate/near the vicinity, shall be approved by the person in-charge of the site.

11.7.2 TRAFFIC ROUTE FOR PEDESTRIANS

- Where traffic routes are used by both pedestrians and vehicles road shall be wide enough to allow vehicles and pedestrians safely.
- Separate routes shall be provided for pedestrians to keep them away from vehicles. Provide suitable barriers/guard at entrances/exit and the corners or buildings.
- Where pedestrian and vehicle routes cross, appropriate crossing shall be provided.
- Where crowd is likely to use roadway e.g. at the end of shift, stop vehicles from using them at such times.
- Provide high visibility clothing for people permitted in delivery area.

11.7.3 WORK VEHICLE

Work vehicle shall be as safe stable efficient and roadworthy as private vehicles on public roads. Site management shall ensure that drivers are suitably trained. All vehicle e.g. heavy motor vehicle forklift trucks dump trucks mobile cranes shall ensure that the work equipment conforms to the following:

- o A high level of stability.
- o A safe means of access/egress.
- o Suitable and effective service and parking brakes.
- o Windscreens with wipers and external mirrors giving optimum all round visibility.
- o Provision of horn, vehicle lights, reflectors, reversing lights, reversing alarms.
- o Provision of seat belts.
- o Guards on dangerous parts.
- o Driver protection - to prevent injury from overturning and from falling objects/materials.
- o Driver protection from adverse weather.
- o No vehicle shall be parked below HT/LT power lines.
- o Valid Pollution Under Control certification for all vehicles

11.7.4 DAILY CHECK BY DRIVER

- There should also be daily safety checks containing below mentioned points by the driver before the vehicle is used.
  - Brakes.
  - Tires.
  - Steering.
  - Mirrors.
  - Windscreen waters.
  - Wipers.
  - Warning signals.
  - Specific safety system i.e. control interlocks
- Management should ensure that drivers carry out these checks.

11.7.5 TRANSPORTATION OF PERSONNEL AND MATERIALS BY VEHICLES

- All drivers shall hold a valid driving License for the class of vehicle to be driven and be registered as an authorized BHEL driver with the Administration Department.
- Securing of the load shall be by established and approved methods, i.e. chains with patented tightening equipment for steel/heavy loads. Sharp corners on loads shall be avoided when employing ropes for securing.
- All overhangs shall be made clearly visible and restricted to acceptable limits
- Load shall be checked before moving off and after traveling a suitable distance.
- On no account is construction site to be blocked by parked vehicles Drivers of vehicles shall only stop or park in the areas designate by the stringing foreman.
- Warning signs shall be displayed during transportation of material.
  All vehicles used by BHEL shall be in worthy condition and in conformance to the Land Transport requirement.

11.7.6 MAINTENANCE

All Vehicles used for transportation of man and material shall undergo scheduled inspections on frequent intervals to secure safe operation. Such inspections shall be conducted in particular for steering, brakes, lights, horn, doors etc. Site management shall ensure that work equipment is maintained in an efficient, working order and in good repair. Inspections and services carried out at regular intervals of time and or mileage. No maintenance shall be carried below HT/LT power lines.

11.8 EMERGENCY PREPAREDNESS AND RESPONSE

- Emergency preparedness and response capability of site shall be developed as per Emergency Preparedness and Response plan issued by Regional HQ
- Availability of adequate number of first aiders and fire warden shall be ensured with BHEL and its subcontractors
- All the subcontractor's supervisory personnel and sufficient number of workers shall be trained for fire protection systems. Enough number of such trained personnel must be available during the tenure of contract. Subcontractor should nominate his supervisor to coordinate and implement the safety measures.
- Assembly point shall be earmarked and access to the same from different location shall be shown
- Fire exit shall be identified and pathway shall be clear for emergency escape.

- Appropriate type and number of fire extinguisher shall be deployed as per Fire extinguisher deployment plan and validity shall be ensured periodically through inspection
- Adequate number of first aid boxes shall be strategically placed at different work places to cater emergency need. Holder of the first aid box shall be identified on the box itself who will have the responsibility to maintain the same.
- First aid center shall be developed at site with trained medical personnel and ambulance
- Emergency contact numbers (format given in EPRP) of the site shall be displayed at prominent locations.
- Tie up with fire brigade shall be done in case customer is not having fire station.
- Tie up with hospital shall be done in case customer is not having hospital.
- Disaster Management group shall be formed at site
- Mock drill shall be arranged at regular intervals. Monthly report of the above to be given to BHEL safety Officer as per prescribed BHEL formats
- Mock drill shall be conducted on different emergencies periodically to find out gaps in emergency preparedness and taking necessary corrective action

12.0 HSE INSPECTION

Inspection on HSE for different activities being carried out at site shall be done to ensure compliance to HSEMS requirements. The subcontractor shall maintain and ensure necessary safety measures as required for inspection and tests HV test, Pneumatic test, Hydraulic test, Spring test, Bend test etc. as applicable, to enable inspection agency for performing Inspection. If any test equipment is found not complying with proper safety requirements then the Inspection Agency may withhold inspection, till such time the desired safety requirements are met.

12.1 DAILY HSE CHECKS

Both the Site Supervisors and safety officer of Subcontractor are to conduct daily site Safety inspection around work activities and premises to ensure that work methods and the sites are maintained to an acceptable standard. The following are to form the common subjects of a daily safety inspection:

- Personal Safety wears & gear compliance.
- Complying with site safety rules and permit-to-work (PTW).
- Positions and postures of workers.
- Use of tools and equipment etc. by the workers.

The inspection should be carried out just when work starts in beginning of the day, during peak activities period of the day and just before the day's work ends.

12.2 INSPECTION OF PPE

- PPEs shall be inspected by HSE officer at random once in a week as per format no. HSEP:14-F06 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.

12.3 INSPECTION OF T&Ps

- A master list of T&Ps shall be maintained by each subcontractor.
- All T&Ps being used at site shall be inspected by HSE officer once in a month as per format no. HSEP:14-F07 for its healthiness and maintenance.
- The T&Ps which require third party inspection shall be checked for its validity during inspection. The third party test certificate should be accompanied with a copy of the concerned competent person's valid qualification record.
- The validity of T&P shall be monitored as per "Status of T&Ps" format no. HSEP:14-F08

12.4 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 HSE officer once in a month as per format no. HSEP:14-F09 for healthiness, maintenance and validity of third party inspection.
- The date of third party inspection and next due date shall be painted on cranes and winches.
- The operators/drivers shall be authorized by sub-contractor based on their competency and experience and shall carry the I-card.
- The operator should be above 18 years of age and should be in possession of driving license of HMV man & goods), vision test certificate and should have minimum qualification so that he can read the instructions and check list.

12.5 INSPECTION ON HEIGHT WORKING

- Inspection on height working shall be conducted daily by supervisors before start of work to ensure safe working condition including provision of
    - Fall arrestor
    - Lifelines
    - Safety nets
    - Fencing and barricading
    - Warning signage
    - Covering of opening
    - Proper scaffolding with access and egress.
    - Illumination
- Inspection on height working shall be conducted once in a week by HSE officer as per format no. HSEP:14-F10.
- Medical fitness of height worker shall be ensured.
- Height working shall not be allowed during adverse weather.

12.6 INSPECTION ON WELDING AND GAS CUTTING OPERATION

- Supervisor shall ensure that no flammable items are available in near vicinity during welding and gas cutting activity.
- Gas cylinders shall be kept upright.
- Use of Flash back arrestor shall be ensured at both ends.

- Inspection during welding and gas cutting operations shall be carried out by HSE officer once a month as per format no. HSEP:14-F11.
- Use of fire blanket to be ensured to avoid falling of splatters during welding or gas cutting operation at height.
- Availability of fire extinguisher at vicinity shall be ensured.

12.7 INSPECTION ON ELECTRICAL INSTALLATION / APPLIANCES

- Ensure proper earthing in electrical installation
- Use ELCB 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 as per format no. HSEP:14-F12.

12.8 INSPECTION OF ELEVATOR

- Elevators shall be inspected by concerned supervisors once in a week as per format no. HSEP:14-F13.
- All elevators shall be inspected by competent person and validity shall be ensured.
- The date of third party inspection and next due date shall be painted on elevator.

12.9 INSPECTION OF EXCAVATION

Excavation activities shall be inspected as per Format HSEP:14-F13A

13.0 HSE PERFORMANCE

- Contractor shall be assessed on monthly basis for HSE Compliance by BHEL Safety In-charge at site.
  The HSE compliance shall be based on Online HSE Evaluation System of BHEL as per Format No. HSEP:14-F33.
- BHEL shall reserve the right to use this assessment for evaluating bidder's capacity for future tenders
- Suitable HSE reward system shall be developed at site level to promote HSE compliance amongst workmen by the subcontractor.
  To decide HSE reward, performance towards HSE shall be evaluated for workmen and it shall be awarded regularly in public gathering.
- If safety record of the subcontractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognize the safety performance of the subcontractor may be considered by BHEL after completion of the job.

14.0 HSE PENALTIES

- As per contractual provision HSE penalties shall be imposed on subcontractors for non- compliance on HSE requirement as per format no. HSEP:14-F14. The list in the format is only indicative. For any other violation, not listed in the format, the minimum penalty amount is to be decided as per BOCW act.
- If principal customer/statutory and regulatory bodies impose some penalty on HSE due to the non-compliance of the subcontractor the same shall be passed on to them.
- The penalty amount shall be recovered by Site Finance department from subcontractors from the RA/Final bill.

15.0 OTHER REQUIREMENTS

- In case of any delay in completion of a job due to mishaps attributable to lapses by the subcontractor, BHEL shall have the right to recover cost of such delay from the payments due to the subcontractor, after notifying the subcontractor suitably.
- If the subcontractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given reasonable opportunity to do so and/or if the subcontractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instruction regarding safety issued by BHEL, BHEL shall have the right to take corrective steps at the risk and cost of the subcontractor after giving a notice of not less than 7 days indicating the steps that would be taken by BHEL.
- If the subcontractor succeeds in carrying out its job in time without any fatal or disabling injury incident and without any damage to property BHEL may, at its sole discretion, favorably consider to reward the subcontractor suitably for the performance.
- In case of any damage to property due to lapses by the subcontractor, BHEL shall have the right to recover the cost of such damages from the subcontractor after holding an appropriate enquiry.
- The subcontractor shall take all measures at the sites of the work to protect all persons from incidents and shall be bound to bear the expenses of defense of every suit, action or other proceeding of law that may be brought by any persons for injury sustained or death owing to neglect of the above precautions and to pay any such persons such compensation or which may with the consent of the subcontractor be paid to compromise any claim by any such person, should such claim proceeding be filed against BHEL, the subcontractor hereby agrees to indemnify BHEL against the same.
- The subcontractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, overalls shall be supplied by the subcontractor to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
- The subcontractor shall notify BHEL of his intention to bring to site any equipment or material which may create hazard.
- BHEL shall have the right to prescribe the conditions under which such equipment or materials may be handled and the subcontractor shall adhere to such instructions.

- BHEL may prohibit the use of any construction machinery, which according to the organization is unsafe. No claim for compensation due to such prohibition will be entertained by BHEL.

16. NON COMPLIANCE

NONCONFORMITY OF SAFETY RULES AND SAFETY APPLIANCES WILL BE VIEWED SERIOUSLY AND BHEL HAS RIGHT TO IMPOSE FINES ON THE SUBCONTRACTOR AS UNDER FOR EVERY INSTANCE OF VIOLATION NOTICED:

SN	Violation of Safety Norms	Fine (in Rs)
01	Not Wearing Safety Helmet	200/- *
02.	Not wearing Safety Belt or not anchoring life line	500/-*
03	Not wearing safety shoe	200/-*
04	Not keeping gas cylinders vertically	200/-
05	Not using flash back arrestors	100/-
06	Not wearing gloves	50/- *
07.	Grinding Without Goggles	50/- *
08.	Not using 24 V Supply For Internal Work	500/-
09.	Electrical Plugs Not used for hand Machine	100/-
10.	Not Slinging properly	200/-
11.	Using Damaged Sling	200/-
12.	Lifting Cylinders Without Cage	500/-
13.	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-
14.	Not Removing Small Scrap From Platforms	500/-
15.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	500/-
16.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-
17.	Improper Earthing Of Electrical T&P	500/-
18	No or improper barricading	500/-
19.	Activity carried out without Safety work permit (Height work, Lifting activity, Hot work-each person/case)	1000/-
20.	Incident Resulting in Partial Loss in Earning Capacity	25,000/- per victim
21.	Fatal Incident Resulting in total loss in Earning Capacity	1,00,000/- per victim for first instance #

- Legend:-

  *: per head. For repeated violation by the same person, the penalty would be double of the previous penalty. Date of "Repeated violation" will be counted from subsequent days.

  #: or as deducted by customer, whichever is higher. For repeated fatal incident in the same Unit incremental penalty to be imposed. The subcontractor will pay 2 times the penalty compared to previously paid in case there are repeated cases of fatal incidents under the same subcontractor for the same package in the same unit.

Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the subcontractor. The amount collected above will be utilized for giving award to the employees who could avoid incident by following safety rules. Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.

17.0 HSE AUDIT/INSPECTION

- Regular HSE Audit/inspection shall be carried out by Subcontractor as per Site HSE audit calendar.
- HSE checklist **(Annexure 02)** shall be used for carrying out audit/inspection and report shall be submitted to BHEL site management
- All non-conformities and observations on HSE identified during internal or external HSE audit shall be disposed off by site in a time bound manner and reported back the implementation status
- Corrective action and Preventive action on HSE issues raised by certification body issued by Regional HQs shall be implemented by site and reported to Site management.

18.0 MONTHLY HSE REVIEW MEETING

- Site shall hold HSE review meeting every month to discuss and resolve HSE issues of site and improve HSE performance. It will also discuss the incidents occurred since previous meeting,its root cause and Corrective action and Preventive action. The agenda is given below:
  - Implementation of earlier MOM
  - HSE performance
  - HSE inspection
  - HSE audit and CAPA
  - HSE training
  - Health check-up camp
  - HSE planning for the erection and commissioning and installation activities in the coming month
  - HSE reward and promotional activities
- The meeting shall be chaired by Construction Manager, convened by HSE coordinator and attended by all HOS, Site Incharge of Subcontractors and HSE officer of Subcontractors.
- MOM on the discussion will be circulated to the concerned for implementation.

19.0 FORMATS USED (Details available in Annexure-04)

SL. No.	Format Name	Format No.	Rev No.
01	Inspection of First Aid Box	HSEP:14-F01	00
02	Health Check Up	HSEP:14-F02	00
03	HSE Induction Training	HSEP:14-F03	00
04	Tool Box Talk	HSEP:14-F04	00
05	Monthly Site HSE Report	As specified by BHEL	00
06	Inspection of PPE	HSEP:14-F06	00

07	Inspection of T&Ps	HSEP:14-F07	00
08	Status of T&Ps	HSEP:14-F08	00
09	Inspection of Cranes and Winches	HSEP:14-F09	00
10	Inspection on Height Working	HSEP:14-F10	00
11	Inspection on Welding & Gas Cutting	HSEP:14-F11	00
12	Inspection on Electrical Installation	HSEP:14-F12	00
13	Inspection on Elevator	HSEP:14-F13	00
14	HSE Penalty	HSEP:14-F14	00
15	Accident /incident / property damage /fire incident report	HSEP:14-F15	00

20.0 ANNEXURES

ANNEXURE 01

As per Contract Labour (Regulation & Abolition Act), Central Rules, 1971,

(1) The first-aid box shall be distinctively marked with a Red Cross on a white background and shall contain the following items, namely:

(a) For establishments in which the number of contract labour employed does not exceed fifty, each first aid box shall contain the following equipment:

(i)	6 small sterilized dressings
(ii)	3 medium size sterilized dressings
(iii)	3 large size sterilized dressings
(iv)	6 pieces of sterilized eye pads in separate sealed packets.
(v)	6 roller bandages 10 cm wide.
(vi)	6 roller bandages 5 cm wide.
(vii)	One tourniquet
(viii)	A supply of suitable splints
(ix)	Three packets of safety pins.
(x)	Kidney tray.
(xi)	3 large sterilized burn dressings.
(xii)	1 (30ml) bottle containing a two percent alcoholic solution of iodine
(xiii)	1 (30 ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label
(xiv)	1 snake bite lancet
(xv)	1 (30gms) bottle of potassium permanganate crystals.
(xvi)	1 pair scissors
(xvii)	1 copy of the First-Aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
(xviii)	A bottle containing 100 tablets (each of 5 grains) of aspirin
(xix)	Ointment for burns
(xx)	A bottle of suitable surgical anti-septic solution

(b) For establishment in which the number of contract labour exceeds fifty each first-aid box shall contain the following equipment:

(i)	12 small sterilized dressings
(ii)	6 medium size sterilized dressings
(iii)	6 large size sterilized dressings.
(iv)	6 large size sterilized burn dressings
(v)	6 (15 grams) packets sterilized cotton wool
(vi)	12 pieces of sterilized eye pads in separate sealed packets.

(vii)	12 roller bandages 10 cm wide.
(viii)	12 roller bandages 5 cm wide.
(ix)	One tourniquet.
(x)	A supply of suitable splints.
(xi)	Three packets of safety pins.
(xii)	Kidney tray.
(xiii)	Sufficient number of eye washes bottles filled with distilled water or suitable liquid clearly indicated by a distinctive sign which shall be visible at all times.
(xiv)	4 per cent Xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops.
(xv)	1 (60ml) bottle containing a two percent alcoholic solution of iodine
(xvi)	One (two hundred ml) bottle of mercurochrome (2 per cent) solution in water.
(xvii)	1 (120ml) bottle containing Sal volatile having the dose and mode of administration indicated on the label.
(xviii)	1 roll of adhesive plaster (6 cmX1 meter)
(xix)	2 rolls of adhesive plaster (2 cmX1 meter)
(xx)	A snake bite lancet.
(xxi)	1 (30 grams) bottle of potassium permanganate crystals.
(xxii)	1 pair scissors
(xxiii)	1 copy of the First-Aid leaflet issued by the Director-General, Factory Advice service and labour Institutes, Government of India.
(xxiv)	a bottle containing 100 tablets (each of 5 grains) of aspirin
(xxv)	Ointment for burns
(xxvi)	A bottle of a suitable surgical anti septic solution.

(2) Adequate arrangement shall be made for immediate recoupment of the equipment when necessary.

ANNEXURE 02

HSE AUDIT/INSPECTION CHECKLIST CUM COMPLIANCE REPORT

PROJECT:_____ SUBCONTRACTOR:_____

DATE : _____ OWNER :_____

INSPECTION BY:_____

Note : write 'NA' wherever the items is not applicable

Item	Yes	No	Remarks	Action
HOUSEKEEPING				
Waste containers provided and used				
Passageways and walkways clear				
General neatness of working area				
Other				
PERSONNELPROTECTIVEEQUIPTMENTS				
Goggles; shields				
Face protection				
Hearing protection				
Respiratory masks etc.				
Safety belts				
Other				
EXCAVATIONS / OPENINGS				
Openings properly covered or barricaded				
Excavations shored				
Excavations barricaded				
Overnight lighting provided				
Other				
WELDING, CUTTING				
Gas cylinders chained upright				
Cable and hoses not obstructing				
Fire extinguisher (s) accessible				
Others				
SCAFFOLDING				
Fully decked platforms				
Guard and intermediate rails in place				
Toe boards in place				
Adequate shoring				
Adequate access				
Others				
LADDER				
Extension side rails 1 m above				
Top of landing				
Properly secured				

Angle + 70^0 from horizontal				
Other				
HOISTS, CRANES AND DERRICKS				
Condition of cables and sheaf OK				
Condition of slings, chains, hooks OK				
Inspection & maintenance log maintained				
Outriggers used				
Signals observed and understood				
Qualified operators				
Others				
MACHINERY, TOOLS & EQUIPMENT				
Proper instruction				
Safety devices				
Proper cords				
Inspection and maintenance				
Other				
VEHICLE AND TRAFFIC				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Other				
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.				
Hydrants				
Clearance				
Others				
ELECTRICAL				
Proper wiring				
ELCB's provided				
Ground fault circuit interrupters				
Protection against damage				
Prevention of tripping hazards				
Other				
HANDLING & STORAGE OF MATERIALS				
Properly stored or stacked				
Passageways clear				
Other				
FLAMMABLE GASES AND LIQUIDS				
Containers clearly identified				
Proper storage				
Fire extinguisher nearby				

Other				
WORKING AT HEIGHT				
Safety nets				
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 rags and combustible materials done properly.				
HEALTH CHECKS				
Hygienic conditions at labor camps O.K.				
Availability of first-aid facilities				
Proper sanitation at site, office & labor camps.				
Arrangement of medical facilities.				
Measures for dealing with illness.				
Availability of potable drinking water for workmen & staff.				
Provision of crèches for children.				

ANNEXURE 03

REFERENCES

- Contract documents
- Relevant legislations
- HSEMSM
- Relevant Indian standards as listed below (illustrative only):

SL NO	CODE NAME	TITLE
(1)	IS : 818-1888 (Reaffirmed 2003)	Code of Practice for safety and health requirements in Electric and Gas Welding and Cutting operations.
(2)	IS: 1179-1967 (Reaffirmed 2003)	Specification for Equipment for Eye & Face protection during welding.
(3)	IS : 1989 (Part 2):1986 (Reaffirmed 1997)	Specification for Leather Safety Boots & Shoes
(4)	IS:2925 – 1984 (Reaffirmed 2010)	Specification for Industrial Safety Helmets
(5)	IS:3521 : 1999 (Reaffirmed 2002)	Industrial Safety Belts & Harnesses-Specification
(6)	IS:3646(Part II) – 1966 (Reaffirmed 2003)	Code of Practice for Interior Illumination
(7)	IS:3696 (Part I) – 1987 (Reaffirmed 2002)	Safety Code for Scaffolds and Ladders
(8)	IS: 3696(Part 2) : 1991 (Reaffirmed 2002)	Scaffolds and Ladders-Code of Safety
(9)	IS:3786 – 1983 (Reaffirmed 2002)	Method for Computation of Frequency and Severity Rates for Industrial Injuries and Classification of Industrial Incidents
(10)	IS:4770 : 1991 (Reaffirmed 2006)	Rubber Gloves – Electricals purposes-Specification
(11)	IS:4912 : 1978 (Reaffirmed 2002)	Safety Requirements for Floor and Wall Openings, Railings and Toe Boards
(12)	IS: 5983 – 1980 (Reaffirmed 2002)	Specification for Eye-Protectors
(13)	IS:6519 – 1971 (Reaffirmed 1997)	Code of Practice for Selection, Care and Repair of Safety Footwear
(14)	IS:9167:1979	Specification for Ear-Protectors
(15)	IS:6994(Part I)-1973 (Re affirmed 1996)	Specification for Industrial Safety Gloves Leather and Cotton Gloves
(16)	IS:8519 – 1977 (Reaffirmed 1983)	Guide for Selection of Industrial Safety Equipment for Body Protection.
(17)	IS 11006 : 2011	Flash Back(Flame Arrestor) Specification

(18)	IS:8520 – 1977 (Reaffirmed 2002)	Guide for Selection of Industrial Safety Equipment for Eye, Face and Ear Protection.
(19)	IS:9473:2002	Respiratory Protective Devices-Filtering Half Masks to protect against Particles-Specification.
(20)	IS:9944:1992 (Reaffirmed 2003)	Natural and Man-made Fiber Rope Slings-Recommendations on Safe working loads.
(21)	IS:11057 – 1884 (Reaffirmed 2001)	Specification for Industrial Safety Nets
(22)	IS:12254:1993 (Reaffirmed 2002)	Polyvinyl Chloride (PVC) Industrial Boots-Specification
(23)	IS:13367(Part 1):1992 (Reaffirmed 20030	Safe Use of Cranes-Code of Practice
(24)	IS:14166:1994 (Reaffirmed 2002)	Respiratory Protective Devices-Full Face Masks Specification
(25)	IS:14746 : 1999 (Reaffirmed 2003)	Respiratory Protective Devices-Half Masks and Quarter Masks - Specification
(26)	IS : 15397 :2003 (Reaffirmed 2008)	Portable Extinguisher Mechanical Foam Type(Stored Pressure)-Specification
(27)	IS: 19011:2002	Guidelines for Quality and/or Environmental Management Systems Auditing

ANNEXURE 04 : SAFETY FORMATS
&
ANNEXURE 05 : WORK PERMIT FORMATS

	POWER SECTOR	FORMAT NO: HSEP:14-F01 REV NO.: 00 PAGE NO. 01 OF 02
	INSPECTION OF FIRST AID BOX	

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 large sized sterilized burn dressings		
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 sufficient number of eye wash bottles, filled with distilled water or suitable liquid, clearly indicated by a distinctive sign which shall be visible at all times, available.		
14	Whether 4%-xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops available.		
15	Whether (60ml) bottle containing a two percent alcoholic solution of iodine available		
16	Whether (two hundred ml) bottle of mercurochrome (2 per cent) solution in water available.		

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

Signature of Subcontractor's Site I/C:

	POWER SECTOR	FORMAT NO: HSEP:14-F02 REV NO.: 00 PAGE NO. 1 OF 02
	HEALTH CHECK UP	

Name of Site :	
Name of Sub-Contractor :	
Name of Employee :	

NAME:

History Of Past Illness	H/O Epilepsy
	H/O Drug Allergy
	H/O Diabetics/ Hypertension
	H/O Unconsciousness
Personal History	

EXAMINATION		**OBSERVATION**	
General Physical Examination			
Height	:		
Weight	:		
BMI	:		
Built And nourishment	:		
Pallor	:		
Temperature	:		
Chest Expansion	:	Inspiration	Expansion
Lymph Node Enlargement	:		
Ear, Nose, Throat	:		
Ear	:		
Nose	:		
Throat	:		

EXAMINATION		OBSERVATION	
Cardiovascular System Examination :			
Inspection	:		
Palpation	:	Pulse	BP
Auscultation (Heart Sounds)	:		
Respiratory System	:		
Inspection	:	Respiratory Rate	
Palpation:	:		
Percussion	:		
Auscultation (Breath Sounds)	:		
Examination of Abdomen	:		
Inspection	:		
Palpation	:		
Auscultation (Bowel Sounds)	:		
Any Other	:		
Clinical Impression			

Signature of the examining doctor

	POWER SECTOR **HSE INDUCTION TRAINING**	FORMAT NO: HSEP:14-F03 REV NO.: 00 PAGE NO. 01 OF 01

Name of Site :	
Name of Sub-Contractor :	
Date :	
Name of Training Co-ordinator	

Sl No.	**Name**	**Designation**	**Organisation**	**Signature**

Signature of Training co-ordinator :

	POWER SECTOR	FORMAT NO: HSEP:14-F04 REV NO.: 00 PAGE NO. 01 OF 01
	TOOL-BOX TALK	

Name of Site :	
Sub-Contractors Name :	
Date :	

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

Signature of Site I/C of Subcontractor :

	POWER SECTOR **PERSONAL PROTECTIVE EQUIPMENTS**	FORMAT NO: HSEP:14-F06 REV NO.: 00 PAGE NO. 01 OF 01

Name of Site :	
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 Nets			
Other PPEs.			

Signature of Site I/C of Subcontractor :

	POWER SECTOR **INSPECTION OF T&Ps**	FORMAT NO: HSEP:14-F07 REV NO.: 00 PAGE NO. 01 OF 01

Name of Site :	
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			
3.2			
3.3	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 Officer (BHEL)	**Signature-Subcontractor/ Subcontractor's Safety Officer**

	POWER SECTOR **STATUS OF T&Ps**	FORMAT NO: HSEP:14-F08 REV NO.: 00 PAGE NO. 01 OF 01

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 Site I/C of subcontractor:

	POWER SECTOR **INSPECTION OF CRANES AND WINCHES**	FORMAT NO: HSEP:14-F09 REV NO.: 00 PAGE NO. 01 OF 03

Name of Site :	
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	Tyre pressure		
21	Condition of Battery And Lamps		

Sl.no.	Description	Observation	Measures
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	Remarks
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?				

Sl. No.	Description	YES	NO	NA	Remarks
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?				
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 Site I/C of subcontractor :

	POWER SECTOR	FORMAT NO: HSEP:14-F10 REV NO.: 00 PAGE NO. 01 OF 02
	INSPECTION OF HEIGHT WORKING	

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

Sl. No.	**Descriptions**	**Observation (Yes/No)**	**Remarks**
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, mid-rail and toe guard?		
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?		

Sl. No.	Descriptions	Observation (Yes/No)	Remarks
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.		
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.		
6	Crawler boards/Safety system or works on fragile roof are used.		

Signature of Site I/C of subcontractor :

	POWER SECTOR **INSPECTION OF WELDING AND GAS CUTTING**	FORMAT NO: HSEP:14-F11 REV NO.: 00 PAGE NO. 1 OF 02

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

Welding				
Sl.no.	Description	Yes	No	Remarks
1	Is electric connection given through 30 mA ELCB/RCCB to welding m/c?			
2	Is electric cable fitted properly in junction box on m/c?			
3	Is electrical cable free from joints?			
4	Are the joints attached firmly & insulated with tape?			
5	Is double earthing given to body of m/c?			
6	Is the physical condition of the m/c good?			
7	Is ON/OFF switch connected to the m/c is working and in good condition?			
8	Are indication lamps on m/c working?			
9	Is the electrode holder in good condition?			
10	Are the cables of the welding m/c lugged & tight properly?			
11	Are return lead connected properly (Rod, Angle, Channels shall not be used)			
	Total No of NO			
	Total No of YES			

	POWER SECTOR **INSPECTION OF WELDING AND GAS CUTTING**	FORMAT NO: HSEP:14-F11 REV NO.: 00 PAGE NO. 2 OF 02

Gas Cutting				
Sl. no	Description	Yes	No	Remarks
1	Are Cylinders kept on trolleys?			
2	Physical condition of Gas cylinders Good?			
3	Is there Oil/Grease on valve of the cylinder?			
4	Are pressure regulators in good condition?			
5	Condition of hose pipe OK?			
6	Are hose pipe clamped with hose clip?			
7	Is flash back arrestor & NRV fitted on torch both for O2 and LPG cylinder?			
8	Is nozzle of the torch cleaned?			
	Total Number of NO			
	Total No of YES			
	% Compliance			

Signature of Site I/C of subcontractor :

	POWER SECTOR **INSPECTION OF ELECTRICAL INSTALLATION**	FORMAT NO: HSEP:14-F12 REV NO.: 00 PAGE NO. 01 OF 02

Name of Site	
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 up to 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?		

Sr. No.	Contents	Yes/No	Remarks
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 Site I/C of subcontractor :

	POWER SECTOR **INSPECTION OF ELEVATOR**	FORMAT NO: HSEP:14-F13 REV NO.: 00 PAGE NO. 01 OF 01

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

Sr. 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		
3.2		
3.3	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-Subcontractor/ Subcontractor's Safety Officer	**Signature-Site Safety Officer (BHEL)**

	POWER SECTOR	FORMAT NO: **HSEP:14-F13E** REV NO.: 00 PAGE NO. 01 OF 01
	Inspection of Excavation	

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

Sl.no.	Description	Yes	No	Remarks
1	Precautions taken for Underground Electrical Cable			
2	Precautions taken for Under / Above ground sewer/ Drinking Water Line			
3	Precautions taken for Underground Telecommunication Line			
4	Precautions taken for Underground Product/Utility Line			
5	Precautions taken for Underground Fire Water Line			
6	Shoring / Shuttering / Sheet piling done to prevent collapse of excavation walls. Strength of Excavation wall ensured at all times			
7	Slope Cutting / Angle Maintained			
8	Hard Barricading & Edge Protection provided			
9	Separate Safe Access for Man and Vehicle			
10	Lighting arrangement			
11	Banksman Provided			
12	Required basic PPEs provided			
13	Excavated soil / Construction Material / equipment kept away from the edge.			
14	First aid in attendance.			
15	Other:			
	Total No of YES			

Signature-Subcontractor/ Subcontractor's Safety Officer **Signature-Site Safety Officer (BHEL)**

Sub: MEMO for Penalty for non-compliances in Safety

Following lapse (tick marked) was observed and penalty is imposed as stated at the bottom of this memo. It is requested that such occurrences be please avoided in future.

Safety Area

SN	Violation of Safety Norms	Fine (in Rs)
01	Not Wearing Safety Helmet	200/- *
02.	Not wearing Safety Belt or not anchoring life line	500/-*
03	Not wearing safety shoe	200/-*
04	Not keeping gas cylinders vertically	200/-
05	Not using flash back arrestors	100/-
06	Not wearing gloves	50/- *
07.	Grinding Without Goggles	50/- *
08.	Not using 24 V Supply For Internal Work	500/-
09.	Electrical Plugs Not used for hand Machine	100/-
10.	Not Slinging properly	200/-
11.	Using Damaged Sling	200/-
12.	Lifting Cylinders Without Cage	500/-
13.	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-
14.	Not Removing Small Scrap From Platforms	500/-
15.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	500/-
16.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-
17.	Improper Earthing Of Electrical T&P	500/-
18	No or improper barricading	500/-
19.	Activity carried out without Safety work permit (Height work, Lifting activity, Hot work-each person/case)	1000/-
20.	Incident Resulting in Partial Loss in Earning Capacity	25,000/- per victim
21.	Fatal Incident Resulting in total loss in Earning Capacity	1,00,000/- per victim for first instance #

Legend: -

*: per head. For repeated violation by the same person, the penalty would be double of the previous penalty. Date of "Repeated violation" will be counted from subsequent days.

#: or as deducted by customer, whichever is higher. For repeated fatal incident in the same Unit incremental penalty to be imposed. The subcontractor will pay 2 times the penalty compared to previously paid in case there are repeated cases of fatal incidents under the same subcontractor for the same package in the same unit.

Details (if any) related to non- compliance (Name of persons, Nature of deficiency, etc.)

_____

Penalty imposed:

1, Rate as per above chart_____

2. No. of Persons/ machine/ event/ labour _____

3. Total Penalty= 1. X 2. =_____

Signature:

Witnessed by: (Sub- Contractor representative) (BHEL Personnel)

Name_____ Name_____

Distribution: 1 Copy: to Sub- contractor,
1 Copy to Site Construction Manager (BHEL)

बी एच ई एल BHEL	**POWER SECTOR- HQ** **Incident Report** (To be submitted within 24 hours of time of incident)	FORMAT NO: HSEP:14-F15 REV NO.: 00 PAGE NO. 01 OF 01

Type of incident: Fatal/Major/ Minor/Fire/Property Damage/Near-miss

1	NAME OF SITE		3	ACTIVITY AREA	
2	SCOPE OF WORK		4	NAME OF CONTRACTOR	
			5	NAME & DESIGNATION OF BHEL ACTIVITY I/C	
6	DATE & TIME OF ACCIDENT		7	DATE RESUMED	
8	NO. OF WORK-DAYS LOST BY VICTIM (If duty not resumed, give estimated figure)				
9	NO. OF MANHOURS LOST BY OTHERS				
10	PERSONAL DETAILS OF INJURED AND / OR DETAILS OF MATERIALS / EQUIPMENT / PROPERTY DAMAGED				

NAME				NAME OF MATERIAL / EQUIPMENT / PROPERTY	
PERIOD OF EMPLOYMENT					
AGE	YRS	SEX	MALE/ FEMALE	ESTIMATED COST	ACTUAL COST
MARITAL STATUS	SINGLE / MARRIED				
OCCUPATION				NATURE OF DAMAGE	
PART OF BODY INJURED					
NATURE OF INJURY					
AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) MOST RESPONSIBLE FOR CAUSING ACCIDENT / INJURY / DAMAGE					
12	PERSON (NAME & DESIGNATION) WITH MOST CONTROL OVER AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) CAUSING ACCIDENT INJURY / DAMAGE				
13	DESCRIBE CLEARLY HOW THE ACCIDENT OCCURRED (USE ADDITIONAL SHEET, IF REQUIRED				
ANALYSIS					
14	WHAT ACTS AND / OR CONDITIONS CONTRIBUTED MOST DIRECTLY TO THIS ACCIDENT				
15	WHAT ARE THE BASIC REASON FOR THE EXISTENCE OF THESE ACTS AND / OR CONDITION ?				
16	WHAT CORRECTIVE ACTIONS HAVE BEEN TAKEN TO PREVENT ACCIDENT RECURRENCE ?				
	DATE :			SIGNATURE OF SITE HSE COORDINATOR	
17	COMMENTS OF HEAD / SOX				
	DATE:			SIGNATURE OF HEAD/SOX	

	POWER SECTOR	FORMAT NO: **HSEP:14-F30** REV NO.: 00 PAGE NO. 01 OF 3
	Format for Monthly HSE Planning & Review	

Note: This is a template and can be modified in consultation with BHEL			
Name of the Site		**Name of the Subcontractor**	
Scope of Work		**Date**	
PART- A: PLAN OF HSE ACTIVITIES FOR THE MONTH OF……			**PART-B: REVIEW ON ……**
SN.	**Description of HSE Activity & Formats**	**Plan & Targets for the month**	**Review**
1	Availability of First Aid Box at Required Places and Inspection thereof as per Format: F01	Areas 1. … …	
2	Health check-up as per Format: F02	Health check-up for Nos 1. New inductees 2. Drivers & Operators 3. Workers in following high risk areas: a. …	
3	Induction training of newly joined workers as per Format: F03	Minimum No. of workers:	
4	Toolbox talks (TBT) conducted before start of work as per Format: F04	Locations of TBTs & No. of workers **1.** …	
5	PPE usage and issue as per Format: F06		
6	Inspection of T&Ps as per Format: F07	List of T&Ps to be inspected 1.	
7	Identification & Inspection Status of T&Ps as per Format: F08		
8	Inspection of Cranes & Winches as per Format: F09	List of Cranes & Winches & Nos. 1. …	
9	Inspection of Height Working as per Format: F10	Areas: 1. …	
10	Inspection of Welding & Gas Cutting operations as per Format: F11	Areas: 1. …	
11	Inspection of Electrical Installations as per Format: F12	Locations: 1. …	
12	Inspection of Elevators (as applicable) as per Format: F13	Locations: 1. …	
13	Inspection of Excavation as per Format: F13E	**Locations:** **1. …**	

SN.	Description of HSE Activity & Formats	Plan & Targets for the month	Review
14	Job Safety Analysis as per Format F32B	**Activities:** **1. …**	
15	Regular Job Specific Training (Re-training) for workers involved in hazardous activities	Topics/ Hazards & No. of workers **1.** …	
16	Mass housekeeping (HK) drive in work areas	Areas **1.** …	
17	Vertigo Test of Height workers	Minimum No. of workers:	
18	Deployment of qualified HSE Officers as per contract	Location(s) & Nos. **1.** …	
19	Deployment of qualified HSE Stewards as per contract	Location(s) & Nos. **1.** …	
20	Deployment of Safety tools & Equipment (Safety Nets, Lifelines, Fall arrestors, Man-cages, flashback arrestors, scaffolding etc.)	Tool/ Equipment & Location **1.** …	
21	Safety Walks by site in charge of agency (4 -Weekly once)	Dates:	
22	Safety walks by departmental head (8-Weekly twice)	Dates:	
23	Availability/ deployment of Safety posters/ placards/ signage at strategic locations	Locations: Nos. **1.** …	
24	Provision of clean drinking water sources for workers	Locations: Nos. **1.** …	
25	Provision of toilets for workers (separate for male & female workers)	Locations: Nos. **1.** …	
26	Rest sheds for workers during lunchtime, rain, dust storm etc.	Locations: Nos. **1.** …	
27	Availability of following in Labor colony	**1. Clean drinking water** **2. Toilets** **3. Cleanliness & Hygiene** **4. Grass cutting,** **5. Fogging** **6. Electrical Inspection …**	

SN.	Description of HSE Activity & Formats	Plan & Targets for the month	Review
28	Availability of dust/ waste bins at various locations	Locations: **1.** …	
29	Availability of Ambulance (individual/ joint) in each shift	Ambulance No.	
30	Availability of emergency vehicle in each shift	Emergency vehicle	
31	Deployment/ Availability of tested Fire Extinguishers	Locations & Nos. **1.** …	
32	Tree plantation	Locations & Nos. **1.** …	
33	Waste disposal & Scrap Bins	Locations **1.** …	
34	Illumination checks	Locations **1.** …	
35	Safety award function: 1. Display of good practices Award presentation	Minimum 1 per month	
36	**Submission of Daily Reports as per Format No.F31A**	**Daily Reports (Night & Day Shifts)**	

PLAN		**REVIEW**	
Agency Name: Sign: Date:	**BHEL** Name: Sign: Date:	**Agency** Name: Sign: Date:	**BHEL** Name: Sign: Date:

	POWER SECTOR	FORMAT NO: **HSEP:14-F31** A REV NO.: 00 PAGE NO. 01 OF 1
	Format for Daily HSE Reporting	

Note: Following format to be submitted (preferably) in excel/ soft copy by subcontractor daily at the end of each shift. Any photographs/ records to be attached

Site									**Subcontractor**																		
Year							**Month**													**Day**							
SHIFT	Submitted By	Work Area(s)	Staff	Man-Power	Safety Officers	Safety Stewards	Tool Box (Topics and No. of Participants)	Induction Training (No. of Participants)	Vertigo Test (Numbers Tested)	On-the-Job Training (Topic & participants)	Work Permits	Job Safety Analyses conducted	Height Work Inspection	Other Hazardous Activities Inspection	T&P Inspection (Names & Nos. Inspected)	Safety Walk (Designation, Areas)	HSE Meeting	Safety Reward (Details)	Housekeeping/ Dust Suppression/ Tree Plantation Activities (Locations/Details)	Lost time Accident	Restricted Work Case	Medical Treatment Case	First Aid Case	Near miss	Property Damage/ Fire	Non-Compliances Submitted by BHEL	Complied by Agency	Any other Remarks/ Inputs
Day																											
Night															NA		NA	NA	NA								

	POWER SECTOR **Job Safety Analysis Format**	FORMAT NO: **HSEP:14-F32B** REV NO.: 00 PAGE NO. 01 OF 1

Name of the Site	
Name of the Subcontractor	
Activity, Area	

HAZARDS	**PRECAUTIONS**

(Name)	**Submitted By (Agency HSE)**		**Reviewed By (BHEL Execution)**		**Approved By (BHEL HSE)**	
(Sign)						
(Date)						

SL	Parameter for Measurement	M/ O	Wt	Supporting Documents
1a	Induction training for new workers conducted through audio-visual medium & documented ?	M	1	Induction Training Records
1b	Tool box talk conducted regularly as per plan, and documented?	M	1	Toolbox Talk Records
1c	Contractor in charge and safety in charge attended safety meetings?	M	2	Minutes of Meeting
1d	Whether observations in safety meetings are complied before next meeting?	M	2	-do-
1e	Preparation and submission of Monthly HSE report within stipulated time	M	1	Report submission date
1f	Preparation and submission of Incident/near-miss report and RCA Report (as applicable) within stipulated time	M	1	Incident/ Near Miss Records
1g	Carrying out Inspections and submission of Inspection reports within stipulated time	M	1	Inspection Records
1h	Regular Job Specific Training ensured for High Risk Workers (through audio-visual medium) as per plan	M	1	Training & Attendance Records
2a	Whether the contractor is registered under BOCW	M	2	BOCW Registration Certificate
2b	Availability of Qualified safety officer (1 for every 500 labour)	M	2	Safety Officer qualification & experience records
2c	Availability of Qualified safety supervisor (1 for every 100 labour)	M	2	Safety Officer qualification & experience records
2d	All the workers are provided and using safety helmets and safety shoes/gum boots	M	2	PPE Issue Records, Inspection/ non-conformity records
2e	Housekeeping done on regular basis and scrap removal at site	M	1	Housekeeping records, Inspection/ non-conformity records
2f	Usage of Goggles/Face shields and Hand gloves for gas cutter and grinders		1	PPE Issue Records, Inspection/ non-conformity records
2g	Wall openings & floor openings are guarded?		1	Inspection/ non-conformity records
2h	Adequate illumination provided in all working area?		1	Inspection/ non-conformity records
2i	Safety posters, sign boards and emergency contact numbers in all prominent location are displayed?		1	Inspection/ non-conformity records
2j	Availability of automatic reverse horns, Main horn, hook latches for Vehicles, mobile cranes, Hydras		1	Inspection/ non-conformity records
2k	Ban of carrying mobile phones to work place is implemented for workers		1	Inspection/ non-conformity records
2l	Availability of Tags & Inspection Certificates for Cranes of all capacities		1	Master T&P List with internal & external test details
2l.2	Availability of Tags & Inspection Certificates for Winches of all capacities		1	Master T&P List with internal & external test details
2l.3	Availability of Tags & Inspection Certificates, color coding for Chain pulley blocks		1	Master T&P List with internal & external test details
2l.4	Availability of Tags & Inspection Certificates for Vehicles - Trailers, Dozers, Dumpers, Excavators. Mixers etc.		1	Master T&P List with internal & external test details
2l.5	Availability of Tags & Inspection Certificates for Welding machines, grinders, Drilling machines, etc.		1	Master T&P List with internal & external test details
2l.6	Availability of Tags & Inspection Certificates, colour coding for Wire rope slings etc.		1	Master T&P List with internal & external test details
2l.7	Availability of Tags & Inspection Certificates for Batching plants		1	Master T&P List with internal & external test details

SL	Parameter for Measurement	M/ O	Wt	Supporting Documents
2m.1	Use of Lifting Permit as per requirement		1	Permit Records
2m.2	Use of Height Permit as per requirement		1	Permit Records
2m.3	Use of Hot Work Permit as per requirement		1	Permit Records
2m.4	Use of Excavation permit as per requirement		1	Permit Records
2m.5	Use of Confined space work permit as per requirement		1	Permit Records
2m.6	Use of Grating removal and safety net removal permit as per requirement		1	Permit Records
2m.7	Use of Lockout-Tag out permit as per requirement		1	Permit Records
2m.8	Use of Radiography permit as per requirement		1	Permit Records
2m.9	Use of Night/ Holiday Work Permit as per requirement		1	Permit Records
2m.10	Use of Any other Applicable Permit as per requirement		1	Permit Records
3a	Material safety data sheet(MSDS) available for all chemicals and displayed in usage and storage area?		1	Inspection/ non-conformity records
3b	Spillages of oil/concrete and other chemical is controlled and cleaned by proper method in case of spill?		1	Inspection/ non-conformity records
3c	Availability of adequate number of urinals in workplace and in elevations and maintained	M	1	
3d	Availability of rest rooms for workers at site	M	1	
3e	Availability of Drinking water facility at work spot		1	
3f	Hygienic Labour colony is provided for workers.		1	
4a	Is heavy/complex critical lifting permit obtained for heavy, complex materials before handling/erection activity?		1	Work Permit records
4b	Whether area below lifting activities barricaded		1	Inspection/ non-conformity records
4c	Availability of experienced rigging foreman		1	Experience details of rigging foreman
4d	Is agency is following proper storage and handling procedure as per manufacturer standard for all hazardous material?		1	Procedure for storage & handling
4e	Are oxygen and acetylene cylinders are transported to work place from storage area in trolleys		1	
5a	Whether all deep excavation has been protected by barrier		1	Inspection/ non-conformity records
5b	Sloping/benching & shoring provided for excavation as per requirement?		1	-do-
5c	Proper access and egress provided for excavations?		1	-do-
5d	Blasting is done in controlled manner?		2	-do-
6a	Whether Electrical booth is equipped with Co_2 fire extinguishers and fire buckets filled with sand?		2	Inspection/ non-conformity records
6b	Availability of Illumination lamp in electric booth?		1	-do-
6c	whether Caution Boards have been displayed?		1	-do-
6d	Usage of Metal Plug top for all hand power tools ?		1	-do-
6e	Usage of Insulated welding cables.		1	-do-
6f	Electrical Booth/Distribution Board to be covered by proper Canopy.		1	-do-
6g	Availability of functional & individual 30ma ELCB / RCCB and MCB for protection and conducting periodical check-up?		1	-do-
6h	Double earthing for panel boards and all machinery & proper earth pit with regular inspection available?		1	-do-
6i	Whether Electrician is qualified and experienced		1	Qualification & Experience records of electrician
6j	Availability and usage of Rubber hand gloves by electrician?		1	Inspection/ non-conformity records

SL	Parameter for Measurement	M/ O	Wt	Supporting Documents
7a	Whether Scaffolding pipes made with steel or aluminum, are being used and checked periodically by experienced/ certified scaffolder?		2	Inspection/ non-conformity records
7b	8mm Stainless Steel wire rope with plastic cladding is provided for life line (Vertical / Horizontal) during height work?		2	-do-
7c	Availability of emergency lighting in case of power failure		1	-do-
7d	Whether all the openings are covered with Safety Nets made of fire proof Nylon?		1	-do-
7e	Whether MS pipe rails around staircases & platforms in usage are provided with top, middle rails and toe guard ?		1	-do-
7f	Whether Ladder with vertical life line /Fall arrestor is available to climb?		1	-do-
7g	Whether all workers deployed for working at height have been issued height pass after undergoing vertigo test?		1	Height Pass records
7h	Whether all workers deployed for height work / climbing ladder are provided and using Double lanyard safety belt?		1	PPE Issue records, inspection/ non-conformity reports
7i	Is all hand tools/Small material used by height workers is tied firmly to prevent fall?		1	-do-
8a	Flash back arrestors for all gas cutting sets is available on Torch side and cylinder side		1	Inspection/ non-conformity records
8b	Oxygen/Acetylene/LPG cylinders not in use have caps in place and stored separately?		1	-do-
8c	Availability of Face screen, Hand gloves, and Apron, for welders		1	-do-
8d	Protection from falling hot molten metal during metal cutting / welding at height by providing GI sheet below the cutting area especially in fire prone areas		1	-do-
9a	Pre-employment medical check-up done for all workers and submitted?		1	Medical check records
9b	Availability of first aid center, with MBBS doctor(Own or Sharing basis)	**M**	2	Attendance records
9c	Availability of Ambulance facility 24 hours (Own or sharing basis)	**M**	2	-do-
9d	Is First aid trained personnel's are available and their names are displayed at site?	**M**	1	-do-
9e	Availability of Emergency vehicle at site		1	
9f	Periodical medical check-up is conducted for all the workers and submitted?		1	Medical check records
9g	Availability of sufficient number of first aid box as per standard list and maintaining record		1	Inspection records
10a	Availability of Fire extinguishers, buckets at all vulnerable points		2	Fire extinguisher records
10b	Periodic fire mock drill conducted?		1	Fire, Mock drill records
10c	Are all flammable materials are stored separately?		1	
10d	Periodic grass cutting is done in material storage area?		1	
10e	Availability of 24V DC lighting in confined space work area		1	
10f	Availability of exhaust fan in confined space work area		1	

Note:

- **M: Mandatory; O: Optional**. Points other than mandatory can be excluded with appropriate justification (scope etc.) by BHEL
- Additionally: 30 Marks for each Fatal Accident and 10 mark for each major accident shall be deducted.

SAFETY WORK CLEARANCE	Permit no.
Project:	Emergency Contact Nos:
Subcontractor:	

BURNING/WELDING /HOT WORK PERMIT

Area :_____ Date:_____ Time:_____

Name of Site Engineer (Permit Requesting Authority):_____ Sign:_____

Name of Work Performing Contractor: _____

Name of Package In charge:_____ Sign:_____ Date:_____

Description of Work: _____

_____

Work Execution Date:_____ Time Valid from:_____ to _____

The above signing person(s) will be responsible to ensure that the above described work will be done under all the safety precautions mentioned on the permit to work.

The following precautions are to be taken:

No.	Item	Yes	Not required
1.	Proper Access/Exit available		
2.	Proper ventilation and /or lighting provided.		
3.	Proper and safe scaffolding, platform, ladder provided.		
4.	Welding machine located in a clean and dry area.		
5.	Welding machine grounded at the equipment and proper leakage current protection device (ELCB) provided for welding machine.		
6.	Emergency STOP buttons are in working condition. Welder /Helper knows how to operate it.		
7.	Welding machine input/output cables, welding holder and weld return clamp (Holder) are insulated and in good condition.		
8.	Welder & Fitter trained to connect ground/work return clamps (Holder) to work place prior to energization of welding machine.		
9.	Gas cylinders are stacked vertically and not below the welding / cutting area. Regulator key is available with cylinder.		
10.	Pressure gauges/Flash back arrestor provided and in working condition.		
11.	Personal Protective equipment Minimum applicable: safety helmet, safety goggles, welding helmet, safety shoes, leather gloves, long sleeve and nose mask -provided		
12.	In case of pits, water removed from the pit and wood/rubber insulation provided.		
13.	Safety signboards are in place.		
14.	Adequate and Suitable nos. of fire fighting extinguisher provided.		
15.	Nearby combustible material removed. Housekeeping done.		
16.	Other		

Name of Contractor Safety Officer:_____ Sign:_____ Date:_____ Time: _____

Reviewed and approved by BHEL Site Engineer (Permit Issuing Authority):

Name:_____ Sign:_____ Date:_____ Time:_____

Name of BHEL Safety Representative:_____ Sign: _____

I understand the precaution to be taken as described above and as per project requirement and hereby confirm that work will be executed under my supervision by following all precaution and Safety Rules.

Name of Work Performing Authority:_____ Sign:_____ Date:_____ Time:_____

Permit Cancellation:

I hereby declare that the work is complete, all workers under my control have been withdrawn and the site restored to safe tidy condition.

Name of Work performing Authority:_____ Sign:_____ Date:_____ Time:_____

Name of Site Engr. (Permit Requesting Authority):_____ Sign:_____ Date:_____ Time:_____

Name of BHEL Site Engr. (Permit Issuing Authority):_____ Sign:_____ Date:_____ Time: _____

(This permit is valid only for the date it is issued)

Original at BHEL site **Second Copy – BHEL SAFETY** **Third Copy : Contractor**

SAFETY WORK CLEARANCE	Permit no.
Project:	**Emergency Contact Nos:**
Subcontractor:	

LIFTING ACTIVITY PERMIT

Area :_____ Date:_____ Time:_____

Name of Site Engineer (Permit Requesting Authority):_____ Sign: Name of Work

Performing Contractor: _____

Name of Package In charge:_____ Sign:_____ Date:_____

Description of Work: _____

_____

Work Execution Date:_____ Time Valid from:_____ to _____

The above signing person(s) will be responsible to ensure that the above described work will be done under all the safety precautions mentioned on the permit to work.

The following precautions are to be taken:

No.	Item	Yes	Not required
1.	Crane used for lifting activity tested, certified and approved for rated lifting		
2.	All lifting tackles, gears/appliances are tested and certified for lifting works.		
3.	Crane operator is trained and competent for lifting operation.		
4.	Lifting sling/ belt is protected against sharp edge of the jobs to be lifted.		
5.	Access and exit marked and without obstruction.		
6.	Lifting arrangement adequate.		
7.	Unwanted rubbish material removed from work platform.		
8.	Minimum 2 guidelines have been provided for balancing and guiding jobs to be lifted.		
9.	Periphery area of crane booms as well as lifting job is barricaded and unauthorized/no-entry sign board posted.		
10.	Rigger and signal man is trained and competent for lifting work.		
11.	No lifting activity to be carried out during lightening, heavy wind/rain.		
12.	If scaffolding to be used during lift, scaffolding with valid tag available for use.		
13.	Double lanyards safety harness/belt checked an in working condition.		
14.	Safety shoes (non-slip), helmet with chin strap available with employees.		
15.	Others.		

Name of Contractor Safety Officer:_____ Sign:_____ Date:_____ Time: _____

Reviewed and approved by BHEL Site Engineer (Permit Issuing Authority):

Name:_____ Sign:_____ Date:_____ Time:_____

Name of BHEL Safety Representative:_____ Sign: _____

I understand the precaution to be taken as described above and as per project requirement and hereby confirm that work will be executed under my supervision by following all precaution and Safety Rules.

Name of Work Performing Authority:_____ Sign:_____ Date:_____ Time:_____

Permit Cancellation:

I hereby declare that the work is complete, all workers under my control have been withdrawn and the site restored to safe tidy condition.

Name of Work performing Authority:_____ Sign:_____ Date:_____ Time:_____

Name of Site Engr. (Permit Requesting Authority):_____ Sign:_____ Date:_____ Time:_____

Name of BHEL Site Engr. (Permit Issuing Authority):_____ Sign:_____ Date:_____ Time: _____

(This permit is valid only for the date it is issued)

Original at BHEL site **Second Copy – BHEL SAFETY** **Third Copy : Contractor**

SAFETY WORK CLEARANCE	Permit no.
Project:	**Emergency Contact Nos:**
Subcontractor:	

WORKING AT HEIGHT PERMIT

Area :_____ Date:_____ Time:_____

Name of Site Engineer (Permit Requesting Authority):_____ Sign: Name of Work

Performing Contractor: _____

Name of Package In charge:_____ Sign:_____ Date:_____

Description of Work: _____

_____

Work Execution Date:_____ Time Valid from:_____ to _____

The above signing person(s) will be responsible to ensure that the above described work will be done under all the safety precautions mentioned on the permit to work.

The following precautions are to be taken:

No.	Item	Yes	Not required
1.	All workers on job are medically fit for working at height (Person should not have vertigo)		
2.	Scaffolding with valid tag available for use		
3.	Safety harness with life line support/ fall arrester are checked and in working condition		
4.	Safety shoes (non-slip), Helmet with chin strip available with employees		
5.	Safety nets are provided as per design and provided 25 ft. below working area & extending 8 ft beyond.		
6.	Horizontal life lines are provided to cater to design specification of 2300kg per person.		
7.	Ladders have been inspected and provided as per BHEL standard/contract.		
8.	All lifting / tightening tools, hand tools/equipment checked and in good condition		
9.	Access and exit marked and without obstruction.		
10.	Lighting arrangement adequate.		
11.	Unwanted and rubbish material removed from working platform.		
12.	Electrical cable, welding Hose/Compressed air hose properly secured and lay down without obstruction.		
13.	Signboards provided on working platforms		
14.	Hazards in the vicinity are identified and communicated to the worker.		
15.	Other		

Name of Contractor Safety Officer:_____ Sign:_____ Date:_____ Time: _____

Reviewed and approved by BHEL Site Engineer (Permit Issuing Authority):

Name:_____ Sign:_____ Date:_____ Time:_____

Name of BHEL Safety Representative:_____ Sign: _____

I understand the precaution to be taken as described above and as per project requirement and hereby confirm that work will be executed under my supervision by following all precaution and Safety Rules.

Name of Work Performing Authority:_____ Sign:_____ Date:_____ Time:_____

Permit Cancellation:

I hereby declare that the work is complete, all workers under my control have been withdrawn and the site restored to safe tidy condition.

Name of Work performing Authority:_____ Sign:_____ Date:_____ Time:_____

Name of Site Engr. (Permit Requesting Authority):_____ Sign:_____ Date:_____ Time:_____

Name of BHEL Site Engr. (Permit Issuing Authority):_____ Sign:_____ Date:_____ Time: _____

(This permit is valid only for the date it is issued)

Original at BHEL site **Second Copy – BHEL SAFETY** **Third Copy : Contractor**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BHEL

PSSR	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page **1** of **6**

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART- A: PLAN/ REVIEW OF WORK FOR THE MONTH OF ……..…….. Date of Plan/ Review……

SN.	Description of Work	Unit of Measur-ement	Unit Rate	Planned (QTY Planned for the month as per Part –C of last month)		Cumulative Shortfall attributable to contractor upto last month (Refer Note 1)		Achieved		Shortfall attributable to BHEL w.r.t Plan (as per Col. 3 of Part-D)		Cumulative Shortfall attributable to Contractor upto & including this month		REMARKS (Reasons for Shortfall attributable to Contractor. Supporting documents to be kept as record.)
(a)	(b)	(c)	(d)	A		B		C		D		E=A+B-C-D		
				Phy.	Financial	Phy	Financial	Phy.	Financial	Phy.	Financial	Phy.	Financial	
	Value of Other Items not mentioned above but planned to be executed in this month													
Total					ΣA		ΣB		ΣC		ΣD		ΣE	

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART- A: Contd…….

Note 1: **In addition to the work planned as per Col. 'A', Contractor shall also make full efforts to minimize the 'Cumulative shortfall attributable to contractor upto the month' as mentioned in Col. 'B' by enhancing its resources, so as to achieve the completion of activities as per agreed schedule. In case contractor is not able to execute the entire shortfall, then BHEL 'Engineer in-charge', shall decide the priority of work to be executed and it shall be binding on the contractor.**

Note 2: Percentage Shortfall attributable to contractor w.r.t. **"**Plan - Shortfall attributable to BHEL**"** for the month = [(ΣE-ΣB)/(ΣA-ΣD)]x100
In case, (ΣE-ΣB) is negative, then it shall be treated as zero percent."

Note 3: Form 14 should include all items being planned in the current month, and all items against which shortfall was attributable to contractor till previous month. However, for practical reason, if it is not possible to mention some of the items in Form-14 being planned to be executed in this month, then also value of such items shall necessarily be included in calculation of Total Value.

Note 4: In case reason for shortfall attributable to contractor is w.r.t. T&P and Manpower, it should be in conformity with Part B1 and B2.

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

PSSR	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page **3** of **6**

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – B-1: PLAN/REVIEW OF DEPLOYMENT OF MAJOR T&Ps FOR THE MONTH OF ……..…….. Date of Plan/ Review……

CONTRACTOR'S SCOPE: -

SN.	PLAN				DEPLOYMENT STATUS			
	Major T&P to be deployed as per work planned for the month	QTY	Deployment Period (in days)	Weightage assigned to planned T&P (in fraction such that ΣC =1)	Actual Deployed Quantity	Actual Deployment Period (in days)	Weighted T&P Deployed	REMARKS (Works affected due to non-deployment of T&Ps)
		A	B	C	D	E	F=(C x D x E) / (A x B)	

Note: In case, E>B, it shall be considered as E=B. Similarly, in case D>A, it shall be considered as D=A.
Percentage of T&P Deployed = ΣF x 100

BHEL SCOPE: -

SN.	PLAN			DEPLOYMENT STATUS		
	Major T&P to be deployed as per work planned for the month	QTY	Deployment Period (in days)	Actual Deployed Quantity	Actual Deployment Period (in days)	REMARKS (Works affected due to non-deployment of T&Ps)

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – B-2: PLAN/ REVIEW OF DEPLOYMENT OF MANPOWER FOR THE MONTH OF ……..…….. Date of Plan/ Review……

CONTRACTOR'S SCOPE: -

SN.	Area of Work	Category of Labour	No. of Labour required as per category	Deployment Period (in days)	No. of Labour actually deployed	Actual Deployment Period (in days)	REMARKS (Works affected due to non-availability of labour)
			A	B	C	D	

Percentage of Manpower Deployed=100 x Σ(CxD)/Σ(AxB)

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

PSSR	MONTHLY PLAN & REVIEW WITH CONTRACTOR	Page **5** of **6**

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – C: PLAN(PHYSICAL) FOR THE NEXT MONTH i.e. ……..…….. Date of Plan ……

SN.	Description of work	Original Planned Quantity	Planned Quantity (excluding shortfalls attributable to contractor till date)	Unit of Measu-rement	T&Ps Required				Manpower Required		REMARKS (Reasons for difference in Original Planned Quantity w.r.t. Planned quantity to be given)
					Contractor Scope		BHEL Scope		Category of Labour	No. of Labour required as per Category	
					Major T&P to be deployed as per work planned for the month	Quantity	Major T&P to be deployed as per work planned for the month	Quantity			

Note 1: Planned quantity should be based on available/ expected fronts/ inputs in the next month

Note 2: “Original Planned Quantity” shall be as per latest jointly agreed programme between BHEL and Contractor before commencement of work or at the time of latest Time Extension, as the case may be.

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

Name of Project		Contract No.	
Name of Work		Name of Contractor	

PART – D: REASONS FOR SHORTFALL ATTRIBUTABLE TO BHEL IN RESPECT OF PLAN FOR THE MONTH……

SN.	Description of Work (from Part-A)	Quantities Affected		Reasons for Shortfall attributable to BHEL	Agency responsible for reasons for Shortfall	Remarks (Supporting Documents in respect of agency responsible)
		(Physical Quantity)	Unit of Measu-rement			
1	2	3	4	5	6	7

Note1: Reasons for shortfall shall include non-availability of fronts/ drawings/ materials/ T&P (BHEL Scope)/ clearances etc. and other hindrances for which contractor is not responsible.

Note2: Agency responsible may be BHEL Site/ MUs/ Design Centre/ BHEL Customer/ other Contractors etc.

BHEL
(Sign with name, designation and date)

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
#1.01	Cumulative number of days in the month, the nominated Quality Officer or his authorised nominee was not available	QUALITY	1.5		Quality Officer or his authorised nominee should be available for all the days of working at site	Daily Log Book entry/Incident Registers/letter references
#1.02	Number of instances of non- compliance wrt FQP, Standard Drawings, Specifications, E&C Manuals etc.	QUALITY	1.5		No deviation from FQP, Standard Drawings, Specifications, E&C Manuals etc. is allowed without BHEL Engineer's approval.	Daily Log Book entry/Incident Registers/letter references
#1.03	Percentage submission of test certificates for batches of welding electrodes, cement, sand, aggregate, consumable, Paints etc. as applicable for this month OR In case of MM & MH package, monthly checks for Storage/Preservation of material.	QUALITY	1		Submission of 100% Test certificates for materials as per FQP is mandatory. MM & MH package: Storage/Preservation as per manual/procedure.	Daily Log Book entry/Incident Registers/letter references
#1.04	Number of incidences of improper storage & preservation (not in accordance to the guidelines of BHEL MUs or approved FQP) of materials, consumables (viz. gases, welding electrodes & fluxes, fuel etc.) & bought-out items (paints, fasteners etc.) under the custody of the contractor	QUALITY	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#1.05	Rework/ Rejection instances in a month necessitated due to deviation from Standard Drawings /Specifications /Manuals /E&C procedures /FQPs or due to Poor Workmanship by contractor	QUALITY	2		Reworks/ Rejection should be as minimum as possible. Total number of reworks/ rejections due to reasons attributable to contractor.	Daily Log Book entry/Incident Registers/letter references
#1.06	Delay in preparation & submission of signed protocols / log sheets / site register / NDT test reports as per approved FQP/ Qualified Welder List along with photocopies of Welder ID cards / Welder Performance Evaluation records etc. in the month OR in case of MM / MH package reconciliation statement / verification report.	QUALITY	1		Within 2 days of measurements taken or within first 3 working days of next month, as advised by BHEL Engineer	Daily Log Book entry/Incident Registers/letter references
#1.07	Number of instances for Major equipment/product failure due to negligence/improper work/poor workmanship by contractor	QUALITY	1		No such event should happen	Daily Log Book entry/Incident Registers/letter references
#1.08	Total number of complaints received in the month on the quality of finish / aesthetics	QUALITY	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
#2.01	Cumulative number of days of delay in submission of Plan FOR THE MONTH supported by deployment plan of Major T&Ps and Manpower (as per Form F-14) and relevant construction/layout drawings - like A4 plan / elevation views of plan status for structures / pressure parts/Civil Works, Piping isometrics for piping, Layout / PID / System reference sketch, Unloading / storage plans etc.as applicable.	PERFORMANCE	5		Number of days delayed from second working day of the month	Daily Log Book entry/Incident Registers/letter references
#2.02	Percentage of timely submission of Daily Reports for Progress of work, Resources, Consumables etc.	PERFORMANCE	1.5		Percentage of timely submission of daily reports/ Scheduled date is successive next day for each day	Daily Log Book entry/Incident Registers/letter references
#2.03	Number of days delayed for submission of FQP log sheets / protocols / Monthly Progress Reports for the work executed during the month under measurement	PERFORMANCE	1.5		Number of days delayed/Scheduled date is first 2 working days of next month	Daily Log Book entry/Incident Registers/letter references
#2.04	Percentage Shortfall attributable to contractor w.r.t. “Plan - Shortfall attributable to BHEL” for the month as per Form-14	PERFORMANCE	35		As per Part-A of Form-14	Progress review formats
#2.05	Number of days delayed in submission of Running bills with complete supporting documents (including updated reconciliation statement of BHEL issued material) for the month	PERFORMANCE	2		Number of days delayed / Scheduled date is 7th day of next month	Daily Log Book entry/Incident Registers/letter references
#2.06	Number of times the Top Management of contractor did not respond to critical issues of site, for the month	PERFORMANCE	1		Total number of instances	Daily Log Book entry/Incident Registers/letter references
#2.07	Cumulative number of days in the month the works were stopped / refused on interpretation of contract clauses/scope due to tendency of taking undue advantage by interpreting contract clauses in their favour	PERFORMANCE	2		Cumulative number of days lost	Daily Log Book entry/Incident Registers/letter references
#2.08	Number of times rework was refused by contractor	PERFORMANCE	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
#2.09	Cumulative number of days in the month recording / logging was not done in daily log / history register / hindrance register / soft form in a PC maintained at BHEL Site Office	PERFORMANCE	1		Cumulative number of days recording or logging was not done / all days of the month	Daily Log Book entry/Incident Registers/letter references
#3.01	Percentage of Manpower Deployed w.r.t. Plan for the month as per Form-14.	RESOURCES	7		As per Part-B2 of Form-14	Daily Log Book entry/Incident Registers/letter references
#3.02	Percentage of T&P Deployed w.r.t. Plan for the month as per Form-14.	RESOURCES	7		As per Part-B1 of Form-14	Daily Log Book entry/Incident Registers/letter references
#3.03	Cumulative number of major instances in the month hampering / affecting progress of work due to breakdown or non-availability of major T&P and MME for the work, under the scope of Contractor	RESOURCES	3		Cumulative number of instances	Daily Log Book entry/Incident Registers/letter references
#3.04	Cumulative number of major instances in the month hampering / affecting progress of work due to non-availability of Consumables/ use of improper consumables under the scope of contractor	RESOURCES	3		Cumulative number of instances	Daily Log Book entry/Incident Registers/letter references
#4.01	Number of non-compliances during the month for Statutory requirements like validity of Labour Licence, Insurance Policy, Labour Insurance, PF, BOCW Compliance etc. and any other applicable laws/ Regulation, Electrical Licence, T&P fitness certificate, Contractors' All Risk Policy etc. as applicable	SITE INFRASTRUCTURE & SERVICE	1		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#4.02	Cumulative number of days in a month poor illumination is reported at storage area, erection area, pre-assembly area and other designated areas by BHEL site.	SITE INFRASTRUCTURE & SERVICE	0.5		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references
#4.03	Cumulative number of days of non-availability of well-maintained toilets facilities for workers (separate for men and women) and non-availability of potable drinking water stations for workers in specified areas.	SITE INFRASTRUCTURE & SERVICE	1		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
#4.04	Total number of instances in the month, Housekeeping NOT attended to in spite of instructions by BHEL -i.e. removal / disposal of surplus earth / debris / scrap / unused / surplus cable drums / other electrical items / surplus steel items / packing materials, thrown out scrap like weld butts, cotton waste etc. from the working area to identified locations	SITE INFRASTRUCTURE & SERVICE	2		Total number of non-compliances/random checks	Daily Log Book entry/Incident Registers/letter references
#4.05	Total number of instances in a month, Site Office with reasonably good facilities including enough nos. of computers and printers etc. for use by office and supporting staff was not made available/maintained.	SITE INFRASTRUCTURE & SERVICE	0.5		No discrepancy during regular or surprise visits	Photograph and report of the Engineer
#5.01	Number of days delayed in making labour payments for the last month	SITE FINANCE	2		Number of days delayed / Scheduled date is 7th day of next month	Daily Log Book entry/Incident Registers/letter references
#5.02	Number of complaints from labour/ sub supplier/ sub-contractor for non-receipt of payments from contractor	SITE FINANCE	1.5		Total number of complaints or reporting	Daily Log Book entry/Incident Registers/letter references
#5.03	Number of times the site operations were hampered for want of funds at the disposal of site-in-charge.	SITE FINANCE	1.5		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#6.0	Performance against HSE Parameters (as per Annexure-AA)	HSE	10		Score as per Safety Performance Evaluation System, scaled down to 10	Safety Performance Evaluation System
		Total	**100**			

Less Deduction in Score Due to Fatal Accidents attributable to the Contractor @ 20 points/ accident	
Less Deduction in Score Due to Major Accidents (Permanent Disability or bodily injury by which person injured is prevented to resume to work within 48 hours or more after accident,, Major Damage to Equipment etc.) attributable to the contractor @ 15 points/ accident	
Less Deduction in Score Due to Minor Accidents attributable to the contractor @ 2 points/ accident	
Less Deduction in Score Due to not Maintaining of Labour Colony (if applicable) as per BHEL HSE policy @3 points in a month on verification any day	
Final Score	

Project		**Vendor**			**Package/Unit**	
Sl. No.	**Parameter for Measurement**	**Classification**	**Max Score**	**Score Obtained**	**Measurement Key/Scheduled date**	**Supporting Documents**
	Performance Score Summary for the Month	**Total Score**	**Score Obtained**			
	QUALITY	10				
	PERFORMANCE	50				
	RESOURCES	20				
	SITE INFRASTRUCTURE & SERVICE	5				
	SITE FINANCE	5				
	HSE	10				
	OTHERS (deductions if any)	0	-			
	TOTAL	**100**				

Note:

1) It is only indicative and shall be as per the online format issued by BHEL time to time.
2) No request will be entertained after specified date of current month w.r.t. changes requested in the scores of immediate previous month.

Annexure-AA to Form F-15

Monthly Safety Performance Evaluation of Contractor

SL	Parameter for Measurement	M/O	Wt	Supporting Documents
1a	Induction training for new workers conducted through audio-visual medium & documented ?	**M**	1	Induction Training Records
1b	Tool box talk conducted regularly as per plan, and documented?	**M**	1	Toolbox Talk Records
1c	Contractor in charge and safety in charge attended safety meetings?	**M**	2	Minutes of Meeting
1d	Whether observations in safety meetings are complied before next meeting?	**M**	2	-do-
1e	Preparation and submission of Monthly HSE report within stipulated time	**M**	1	Report submission date
1f	Preparation and submission of Incident/near-miss report and RCA Report (as applicable) within stipulated time	**M**	1	Incident/ Near Miss Records
1g	Carrying out Inspections and submission of Inspection reports within stipulated time	**M**	1	Inspection Records
1h	Regular Job Specific Training ensured for High Risk Workers (through audio-visual medium) as per plan	**M**	1	Training & Attendance Records
2a	Whether the contractor is registered under BOCW	**M**	2	BOCW Registration Certificate
2b	Availability of Qualified safety officer (1 for every 500 labour)	**M**	2	Safety Officer qualification & experience records
2c	Availability of Qualified safety supervisor (1 for every 100 labour)	**M**	2	Safety Officer qualification & experience records
2d	All the workers are provided and using safety helmets and safety shoes/gum boots	**M**	2	PPE Issue Records, Inspection/ non-conformity records
2e	Housekeeping done on regular basis and scrap removal at site	**M**	1	Housekeeping records, Inspection/ non-conformity records
2f	Usage of Goggles/Face shields and Hand gloves for gas cutter and grinders		1	PPE Issue Records, Inspection/ non-conformity records
2g	Wall openings & floor openings are guarded?		1	Inspection/ non-conformity records
2h	Adequate illumination provided in all working area?		1	Inspection/ non-conformity records
2i	Safety posters, sign boards and emergency contact numbers in all prominent location are displayed?		1	Inspection/ non-conformity records
2j	Availability of automatic reverse horns, Main horn, hook latches for Vehicles, mobile cranes, Hydras		1	Inspection/ non-conformity records
2k	Ban of carrying mobile phones to work place is implemented for workers		1	Inspection/ non-conformity records
2l	Availability of Tags & Inspection Certificates for Cranes of all capacities		1	Master T&P List with internal & external test details
2l.2	Availability of Tags & Inspection Certificates for Winches of all capacities		1	Master T&P List with internal & external test details
2l.3	Availability of Tags & Inspection Certificates, colour coding for Chain pulley blocks		1	Master T&P List with internal & external test details
2l.4	Availability of Tags & Inspection Certificates for Vehicles - Trailers, Dozers, Dumpers, Excavators, Mixers etc.		1	Master T&P List with internal & external test details
2l.5	Availability of Tags & Inspection Certificates for Welding machines, grinders, Drilling machines, etc.		1	Master T&P List with internal & external test details

2l.6	Availability of Tags & Inspection Certificates, colour coding for Wire rope slings etc.		1	Master T&P List with internal & external test details
2l.7	Availability of Tags & Inspection Certificates for Batching plants		1	Master T&P List with internal & external test details
2m.1	Use of Lifting Permit as per requirement		1	Permit Records
2m.2	Use of Height Permit as per requirement		1	Permit Records
2m.3	Use of Hot Work Permit as per requirement		1	Permit Records
2m.4	Use of Excavation permit as per requirement		1	Permit Records
2m.5	Use of Confined space work permit as per requirement		1	Permit Records
2m.6	Use of Grating removal and safety net removal permit as per requirement		1	Permit Records
2m.7	Use of Lockout-Tag out permit as per requirement		1	Permit Records
2m.8	Use of Radiography permit as per requirement		1	Permit Records
2m.9	Use of Night/ Holiday Work Permit as per requirement		1	Permit Records
2m.10	Use of Any other Applicable Permit as per requirement		1	Permit Records
3a	Material safety data sheet(MSDS) available for all chemicals and displayed in usage and storage area?		1	Inspection/ non-conformity records
3b	Spillages of oil/concrete and other chemical is controlled and cleaned by proper method in case of spill?		1	Inspection/ non-conformity records
3c	Availability of adequate number of urinals in workplace and in elevations and maintained	**M**	1	
3d	Availability of rest rooms for workers at site	**M**	1	
3e	Availability of Drinking water facility at work spot		1	
3f	Hygienic Labour colony is provided for workers.		1	
4a	Is heavy/complex critical lifting permit obtained for heavy, complex materials before handling/erection activity?		1	Work Permit records
4b	Whether area below lifting activities barricaded		1	Inspection/ non-conformity records
4c	Availability of experienced rigging foreman		1	Experience details of rigging foreman
4d	Is agency is following proper storage and handling procedure as per manufacturer standard for all hazardous material?		1	Procedure for storage & handling
4e	Are oxygen and acetylene cylinders are transported to work place from storage area in trolleys		1	
5a	Whether all deep excavation has been protected by barrier		1	Inspection/ non-conformity records
5b	Sloping/benching & shoring provided for excavation as per requirement?		1	-do-
5c	Proper access and egress provided for excavations?		1	-do-
5d	Blasting is done in controlled manner?		2	-do-
6a	Whether Electrical booth is equipped with Co_2 fire extinguishers and fire buckets filled with sand?		2	Inspection/ non-conformity records
6b	Availability of Illumination lamp in electric booth?		1	-do-
6c	whether Caution Boards have been displayed?		1	-do-
6d	Usage of Metal Plug top for all hand power tools ?		1	-do-
6e	Usage of Insulated welding cables.		1	-do-
6f	Electrical Booth/Distribution Board to be covered by proper Canopy.		1	-do-
6g	Availability of functional & individual 30ma ELCB / RCCB and MCB for protection and conducting periodical check-up?		1	-do-
6h	Double earthing for panel boards and all machinery & proper earth pit with regular inspection available?		1	-do-
6i	Whether Electrician is qualified and experienced		1	Qualification & Experience records of electrician
6j	Availability and usage of Rubber hand gloves by electrician?		1	Inspection/ non-conformity records

7a	Whether Scaffolding pipes made with steel or aluminium, are being used and checked periodically by experienced/ certified scaffolder?		2	Inspection/ non-conformity records
7b	8mm Stainless Steel wire rope with plastic cladding is provided for life line (Vertical / Horizontal) during height work?		2	-do-
7c	Availability of emergency lighting in case of power failure		1	-do-
7d	Whether all the openings are covered with Safety Nets made of fire proof Nylon?		1	-do-
7e	Whether MS pipe rails around staircases & platforms in usage are provided with top, middle rails and toe guard ?		1	-do-
7f	Whether Ladder with vertical life line /Fall arrestor is available to climb?		1	-do-
7g	Whether all workers deployed for working at height have been issued height pass after undergoing vertigo test?		1	Height Pass records
7h	Whether all workers deployed for height work / climbing ladder are provided and using Double lanyard safety belt?		1	PPE Issue records, inspection/ non-conformity reports
7i	Is all hand tools/Small material used by height workers is tied firmly to prevent fall?		1	-do-
8a	Flash back arrestors for all gas cutting sets is available on Torch side and cylinder side		1	Inspection/ non-conformity records
8b	Oxygen/Acetylene/LPG cylinders not in use have caps in place and stored separately?		1	-do-
8c	Availability of Face screen, Hand gloves, and Apron, for welders		1	-do-
8d	Protection from falling hot molten metal during metal cutting / welding at height by providing GI sheet below the cutting area especially in fire prone areas		1	-do-
9a	Pre-employment medical check-up done for all workers and submitted?		1	Medical check records
9b	Availability of first aid centre, with MBBS doctor(Own or Sharing basis)	**M**	2	Attendance records
9c	Availability of Ambulance facility 24 hours (Own or sharing basis)	**M**	2	-do-
9d	Is First aid trained personnel's are available and their names are displayed at site?	**M**	1	-do-
9e	Availability of Emergency vehicle at site		1	
9f	Periodical medical check-up is conducted for all the workers and submitted?		1	Medical check records
9g	Availability of sufficient number of first aid box as per standard list and maintaining record		1	Inspection records
10a	Availability of Fire extinguishers, buckets at all vulnerable points		2	Fire extinguisher records
10b	Periodic fire mock drill conducted?		1	Fire, Mock drill records
10c	Are all flammable materials are stored separately?		1	
10d	Periodic grass cutting is done in material storage area?		1	
10e	Availability of 24V DC lighting in confined space work area		1	
10f	Availability of exhaust fan in confined space work area		1	

Note:

- M: Mandatory; O: Optional. Points other than mandatory can be excluded with appropriate justification (scope etc.) by BHEL. Score obtained in selected parameters divided by maximum possible score of selected parameters shall be multiplied by 10 for use in as per point Sl. no. # 6.0 as detailed at page 4 of Form F-15.
- There shall be deduction of marks from overall score for Fatal/ Major/ Minor Accidents and for not maintaining labour colony, as detailed at page 4 of Form F-15.

Form WAM 23

PROFORMA OF BANK GUARANTEE (in lieu of EARNEST MONEY if permissible under Works Policy)

(On non-Judicial paper of appropriate value)
(Para 4.7.6 of Works Accounts Manual)

Bank Guarantee No……
Date……

To
(Employer's Name and Address)
……..

Dear Sirs,

In accordance with the terms and conditions of Invitation for Bids/Notice Inviting Tender No……[1] (Tender Conditions), M/s. ……[2] having its registered office at ……[3] (hereinafter referred to as the 'Tenderer'), is submitting its bid for the work of……[4] invited by Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at *BHEL House, Siri Fort, Asiad, New Delhi – 110049* through its unit at *Bharat Heavy Electricals Limited, Power Sector Southern Region, Tek Towers, No.11, Old Mahabalipuram Road, Okkiyam Thoraipakkam, Chennai – 600097.*

The Tender Conditions provide that the Tenderer shall pay a sum of Rs ……[5] as Earnest Money Deposit in the form therein mentioned. The form of payment of Earnest Money Deposit includes Bank Guarantee executed by a Scheduled Bank.

In lieu of the stipulations contained in the aforesaid Tender Conditions that an irrevocable and unconditional Bank Guarantee against Earnest Money Deposit for an amount of .....[6] is required to be submitted by the Tenderer as a condition precedent for participation in the said Tender and the Tenderer having approached us for giving the said Guarantee,

we, the .....(Name & address of the Bank) ..... having our Head Office at ……..(hereinafter referred to as the Bank) being the Guarantor under this Guarantee, hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer without any demur, merely on your first demand any sum or sums of Rs.....[6] (in words Rupees.....) without any reservation, protest, and recourse and without the beneficiary needing to prove or demonstrate reasons for its such demand.

Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____.[6]

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Tenderer in any suit or proceeding pending before any Court or Tribunal, Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this Guarantee shall be a valid discharge of our liability for payment hereunder and the Tenderer shall have no claim against us for making such payment.

We …….. Bank further agree that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Tender or to extend the time of submission of from time to time or to postpone

for any time or from time to time any of the powers exercisable by the Employer against the said Tenderer and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said Tenderer or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said Tenderer or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Tenderer and notwithstanding any security or other guarantee that the Employer may have in relation to the Tenderer's liabilities.

This Guarantee shall be irrevocable and shall remain in force upto and including…….[7] and shall be extended from time to time for such period as may be desired by the Employer.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Tenderer but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms hereof. However, unless a demand or claim under this Guarantee is made on us in writing on or before the ……[8] we shall be discharged from all liabilities under this Guarantee.

We, …… Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.
Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed……[6]
b) This Guarantee shall be valid up to ……[7]
c) Unless the Bank is served a written claim or demand on or before _____[8] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

For and on behalf of
(Name of the Bank)

(Signature of Authorised signatory)

Date…….
Place of Issue…….

[1] Details of the Invitation to Bid/Notice Inviting Tender (Tender Ref. No. Eg. - BHEL PSSR SCT XXXX)
[2] Name of Tenderer
[3] REGISTERED Office Address of the Tenderer
[4] Details of the Work i.e Tender Description
[5] EMD Amount as mentioned in Notice Inviting Tender
[6] BG Amount in words and Figures (BG Amount shall be Minimum of EMD amount less Rs. 2 Lakhs)
[7] Validity Date
[8] Date of Expiry of Claim Period (Claim Period shall be minimum of 3 Months after the validity date of Bank Guarantee)

Note:
1. The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier /Bank issuing the guarantee.

2. In Case of Bank Guarantees submitted by Foreign Vendors-
   a. From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India) can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
   b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor Country's Bank)
      b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by any of the Consortium Banks only will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.
      b.2 In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at sl.no. b.1 will required to be followed.
      b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time).

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)
(On non-Judicial paper of appropriate value)
(Para 4.7.6 of Works Accounts Manual)

Bank Guarantee No……
Date……

To
(Employer's Name and Address)
……..

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at *BHEL House, Siri Fort, Asiad, New Delhi – 110049* through its unit at *Bharat Heavy Electricals Limited, Power Sector Southern Region, Tek Towers, No.11, Old Mahabalipuram Road, Okkiyam Thoraipakkam, Chennai - 600097* having agreed to exempt _____[1] (Name of the Vendor / Contractor / Supplier) with its registered office at_____[2] (hereinafter called the said "Contractor" which term includes supplier), from demand under the terms and conditions of the Contract arising vide Letter of Intent (LOI) reference No._____ dated _____[3] valued at Rs. _____[4] (Rupees _____ only)[4] (hereinafter called the said Contract), of Security Deposit for the due fulfilment by the said Contractor of the terms and conditions contained in the said Contract, on production of a Bank Guarantee for Rs. _____[5] (Rupees _____ only),

We, the .....(Name & address of the Bank) ..... having our Head Office at ……..(hereinafter referred to as the Bank), at the request of _____ [Contractor(s)], being the Guarantor under this Guarantee, do hereby irrevocably and unconditionally undertake to forthwith and immediately pay to the Employer, an amount not exceeding Rs._____ without any demur, immediately on demand from the Employer and without any reservation, protest, and recourse and without the Employer needing to prove or demonstrate reasons for its such demand

Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____[5].

We undertake to pay to the Employer any money so demanded notwithstanding any dispute or disputes raised by the Contractor(s) in any suit or proceeding pending before any Court or Tribunal or Arbitrator or any other authority, our liability under this present being absolute and unequivocal.

The payment so made by us under this guarantee shall be a valid discharge of our liability for payment hereunder and the Contractor(s) shall have no claim against us for making such payment.

We, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied & the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) or acceptance of the final bill or discharge of this guarantee by the Employer, whichever is earlier. This guarantee shall initially remain in force upto and including _____[6] and shall be extended from time to time for such period as may

be desired by the Employer. Unless a demand or claim under this guarantee is made on us in writing on or before the _____[7], we shall be discharged from all the liability under this guarantee thereafter.

We, _____(indicate the name of the Bank) further agree with the Employer that the Employer shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said Contract or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Employer against the said contractor(s) and to forbear or enforce any of the terms and conditions relating to the said Contract and we shall not be relieved from our liability by any reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act or omission on the part of the Employer or any indulgence by the Employer to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving us.

The Bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

This Guarantee shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the Contractor but shall in all respects and for all purposes be binding and operative until payment of all money payable to the Employer in terms thereof. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

We, ……. BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.
Notwithstanding anything to the contrary contained hereinabove:

a) The liability of the Bank under this Guarantee shall not exceed……[5]

b) This Guarantee shall be valid up to ……[6]

c) Unless the Bank is served a written claim or demand on or before _____[7] all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

We, _____ Bank, have power to issue this Guarantee under law and the undersigned as a duly authorized person has full powers to sign this Guarantee on behalf of the Bank.

Date _____ Day of _____

for_____ (indicate the name of the Bank)

(Signature of Authorised signatory)

[1] NAME OF VENDOR /CONTRACTOR / SUPPLIER
[2] REGISTERED OFFICE ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.
[3] LETTER OF INTENT(LOI) REFERENCE NO. WITH DATE
[4] CONTRACT VALUE (AS MENTIONED IN LOI)
[5] BG AMOUNT IN FIGURES AND WORDS
[6] VALIDITY DATE
[7] DATE OF EXPIRY OF CLAIM PERIOD (CLAIM PERIOD SHALL BE MINIMUM OF 3 MONTHS AFTER VALIDITY DATE)

Note:

1. The BG should be on Non-Judicial Stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the State(s) where the BG is submitted or is to be acted upon or the rate prevailing in the State where the BG was executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Vendor/Contractor/Supplier /Bank issuing the guarantee.
2. In Case of Bank Guarantees submitted by Foreign Vendors-
   a. From Nationalized/Public Sector / Private Sector/ Foreign Banks (BG issued by Branches in India) can be accepted subject to the condition that the Bank Guarantee should be enforceable in the town/city or at nearest branch where the Unit is located i.e. Demand can be presented at the Branch located in the town/city or at nearest branch where the Unit is located.
   b. From Foreign Banks (wherein Foreign Vendors intend to provide BG from local branch of the Vendor Country's Bank)
      b.1 In such cases, in the Tender Enquiry/ Contract itself, it may be clearly specified that Bank Guarantee issued by any of the Consortium Banks only will be accepted by BHEL. As such, Foreign Vendor needs to make necessary arrangements for issuance of Counter- Guarantee by Foreign Bank in favour of the Indian Bank's (BHEL's Consortium Bank) branch in India. It is advisable that all charges for issuance of Bank Guarantee/ counter- Guarantee should be borne by the Foreign Vendor. The tender stipulation should clearly specify these requirements.

      b.2 In case, Foreign Vendors intend to provide BG from Overseas Branch of our Consortium Bank (e.g. if a BG is to be issued by SBI Frankfurt), the same is acceptable. However, the procedure at sl.no. b.1 will required to be followed.
      b.3 The BG issued may preferably be subject to Uniform Rules for Demand Guarantees (URDG) 758 (as amended from time to time).

Procedure-2.3

PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS

1. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided herein:

2. The party desirous of resorting to Conciliation shall send an invitation/notice in writing to the other party to conciliate specifying all points of Disputes with details of the amount claimed. The party concerned shall not raise any new issue thereafter. Parties shall also not claim any interest on claims/counter-claims from the date of notice invoking Conciliation till the conclusion of the Conciliation proceedings. If BHEL is to initiate Conciliation, then, the invitation to Conciliate shall be extended to the concerned Stakeholder in **Format 7** hereto. Where the stakeholder is to initiate the Conciliation, the notice for initiation of Conciliation shall be sent in **Format-8** hereto.

3. The party receiving the invitation/notice for Conciliation shall within 30 days of receipt of the notice of Conciliation intimate its consent for Conciliation along with its counter-claims, if any.

4. The Conciliation in a matter involving claim or counter-claim (whichever is higher) up to Rs 5 crores shall be carried out by sole Conciliator nominated by BHEL while in a matter involving claim or counter-claim (whichever is higher) of more than Rs 5 crores Conciliation shall be carried out by 3 Conciliators nominated by BHEL. The appointment of Conciliator(s) shall be completed and communicated by the concerned Department/Group of BHEL Unit/Division/Region/Business Group to the other party and the Conciliator(s) within 30 days from the date of acceptance of the invitation to conciliate by the concerned party in the **Format-9**. The details of the Claim, and counter-claim, if any, shall be intimated to the Conciliator(s) simultaneously in **Format-5**.

5. The Parties shall be represented by only their duly authorized in-house executives/officers and neither Party shall be represented by a Lawyer.

6. The first meeting of the IEC shall be convened by the IEC by sending appropriate communication/notice to both the parties as soon as possible but not later than 30 days from the date of his/their appointment. The hearings in the Conciliation proceeding shall ordinarily be concluded within two (2) months and, in exceptional cases where parties have expressed willingness to settle the matter or there exists possibility of settlement in the matter, the proceedings may be extended by the IEC by a maximum of further 2 months with the consent of the Parties subject to cogent reasons being recorded in writing.

7. The IEC shall thereafter formulate recommendations for settlement of the Disputes supported by reasons at the earliest but in any case within 15 days from the date of conclusion of the last hearing. The recommendations so formulated along with the reasons shall be furnished by the IEC to both the Parties at the earliest but in any case within 1 month from the date of conclusion of the last hearing.

8. Response/modifications/suggestions of the Parties on the recommendations of the IEC are to be submitted to the IEC within time limit stipulated by the IEC but not more than 15 days from the date of receipt of the recommendations from the IEC.

9. In the event, upon consideration, further review of the recommendations is considered necessary, whether by BHEL or by the other Party, then, the matter can be remitted back to the IEC with request to reconsider the same in light of the issues projected by either/both the Parties and to submit its recommendations thereon within the following 15 days from the date of remitting of the case by either of the Parties.

10. Upon the recommendations by the Parties, with or without modifications, as considered necessary, the IEC shall be called upon to draw up the Draft Settlement Agreement in terms of the recommendations.

11. When a consensus can be arrived at between the parties only in regard to any one or some of the issues referred for Conciliation the draft Settlement Agreement shall be accordingly formulated in regard to the said Issue(s), and the said Settlement Agreement, if signed, by the parties, shall be valid only for the said issues. As regards the balance issues not settled, the parties may seek to resolve them further as per terms and conditions provided in the contract.

12. In case no settlement can be reached between the parties, the IEC shall by a written declaration, pronounce that the Conciliation between the parties has failed and is accordingly terminated.

13. Unless the Conciliation proceedings are terminated in terms of para 22 (b), (c) & (d) herein below, the IEC shall forward his/its recommendations as to possible terms of settlement within one (1) month from the date of last hearing. The date of first hearing of Conciliation shall be the starting date for calculating the period of 2 months.

14. In case of 3 members IEC, 2 members of IEC present will constitute a valid quorum for IEC and meeting can take place to proceed in the matter after

seeking consent from the member who is not available. If necessary, videoconferencing may be arranged for facilitating participation of the members. However, the IEC recommendations will be signed by all members. Where there is more than one (1) Conciliator, as a general rule they shall act jointly. In the event of differences between the Members of IEC, the decision/recommendations of the majority of the Members of IEC shall prevail and be construed as the recommendation of the IEC.

15. The Draft Settlement Agreement prepared by the IEC in terms of the consensus arrived at during the Conciliation proceedings between the Parties shall be given by the IEC to both the parties for putting up for approval of their respective Competent Authority.

16. Before submitting the draft settlement agreement to BHEL's Competent Authority viz. the Board Level Committee on Alternative Dispute Resolution (BLCADR) for approval, concurrence of the other party's Competent Authority to the draft settlement agreement shall be obtained by the other party and informed to BHEL within 15 days of receipt of the final draft settlement agreement by it. Upon approval by the Competent Authority, the Settlement Agreement would thereafter be signed by the authorized representatives of both the Parties and authenticated by the members of the IEC.

17. In case the Draft Settlement Agreement is rejected by the Competent Authority of BHEL or the other Party, the Conciliation proceedings would stand terminated.

18. A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.

19. The Settlement Agreement shall thereafter have the same legal status and effect as an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal passed under section 30 of the Arbitration and Conciliation Act, 1996.

20. Acceptance of the Draft Settlement Agreement/recommendations of the Conciliator and/or signing of the Settlement Agreement by BHEL shall however, be subject to withdrawal/closure of any arbitral and/or judicial proceedings initiated by the concerned Party in regard to such settled issues.

21. Unless otherwise provided for in the agreement, contract or the Memorandum of Understanding, as the case may be, in the event of likelihood of prolonged

absence of the Conciliator or any member of IEC, for any reason/incapacity, the Competent Authority/Head of Unit/Division/Region/Business Group of BHEL may substitute the Conciliator or such member at any stage of the proceedings. Upon appointment of the substitute Conciliator(s), such reconstituted IEC may, with the consent of the Parties, proceed with further Conciliation into the matter either de-novo or from the stage already reached by the previous IEC before the substitution.

22. The proceedings of Conciliation under this Scheme may be terminated as follows:

a. On the date of signing of the Settlement agreement by the Parties; or,

b. By a written declaration of the IEC, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of the declaration; or,

c. By a written declaration of the Parties addressed to the IEC to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,

d. By a written declaration of a Party to the other Party and the IEC, if appointed, to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,

e. On rejection of the Draft Settlement Agreement by the Competent Authority of BHEL or the other Party.

23. The Conciliator(s) shall be entitled to following fees and facilities:

Sl No	**Particulars**	**Amount**
1	Sitting fees	Each Member shall be paid a Lump Sum fee of Rs 75,000/- for the whole case payable in terms of paragraph No. 27 herein below.
2	Towards drafting of settlement agreement	In cases involving claim and/or counter-claim of up to Rs 5crores. Rs 50,000/- (Sole Conciliator) In cases involving claim and/or counter-claim of exceeding Rs 5 crores but less than Rs 10 crores. Rs 75,000 (per Conciliator)

Sl No	Particulars	Amount
		In cases involving claim and/or counter-claim of more than Rs 10 crores. Rs 1,00,000/- (per Conciliator) Note: The aforesaid fees for the drafting of the Settlement Agreement shall be paid on the, Signing of the Settlement Agreement after approval of the Competent Authority or Rejection of the proposed Settlement Agreement by the Competent Authority of BHEL.
3	Secretarial expenses	Rs 10,000/- (one time) for the whole case for Conciliation by a Sole Member IEC. Where Conciliation is by multi member Conciliators –Rs 30,000/- (one time)- to be paid to the IEC
4	Travel and transportation and stay at outstation Retired Senior Officials of other Public Sector Undertakings (pay scale wise equivalent to or more than E-8 level of BHEL)	As per entitlement of the equivalent officer (pay scale wise) in BHEL.
	Others	As per the extant entitlement of whole time Functional Directors in BHEL. Ordinarily, the IEC Member(s) would be entitled to travel by air Economy Class.
5	Venue for meeting	Unless otherwise agreed in the agreement, contract or the Memorandum of Understanding, as the case may be, the venue/seat of proceedings shall be the location of the concerned Unit / Division / Region /

Sl No	Particulars	Amount
		Business Group of BHEL. Without prejudice to the seat/venue of the Conciliation being at the location of concerned BHEL Unit / Division / Region / Business Group, the IEC after consulting the Parties may decide to hold the proceedings at any other place/venue to facilitate the proceedings. Unless, Parties agree to conduct Conciliation at BHEL premises, the venue is to be arranged by either Party alternately.

24. The parties will bear their own costs including cost of presenting their cases/evidence/witness(es)/expert(s) on their behalf. The parties agree to rely upon documentary evidence in support of their claims and not to bring any oral evidence in IEC proceedings.

25. If any witness(es) or expert(s) is/are, with the consent of the parties, called upon to appear at the instance of the IEC in connection with the matter, then, the costs towards such witness(es)/expert(s) shall be determined by the IEC with the consent of the Parties and the cost so determined shall be borne equally by the Parties.

26. The other expenditures/costs in connection with the Conciliation proceedings as well as the IEC's fees and expenses shall be shared by the Parties equally.

27. Out of the lump sum fees of Rs 75,000/- for Sitting Fees, 50% shall be payable after the first meeting of the IEC and the remaining 50% of the Sitting Fees shall be payable only after termination of the conciliation proceedings in terms of para 22 hereinabove.

28. The travelling, transportation and stay at outstation shall be arranged by concerned Unit as per entitlements as per Serial No. 4 of the Table at para 23 above, and in case such arrangements are not made by the BHEL Unit, the same shall be reimbursed to the IEC on actuals limited to their entitlement as per Serial No. 4 of the Table at Para 23 above against supporting documents. The IEC Member(s) shall submit necessary invoice for claiming the fees/reimbursements.

29. The Parties shall keep confidential all matters relating to the conciliation proceedings. Confidentiality shall extend also to the settlement agreement,

except where its disclosure is necessary for purposes of its implementation and enforcement or as required by or under a law or as per directions of a Court/Governmental authority/ regulatory body, as the case may be.

30. The Parties shall not rely upon or introduce as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the Disputes that is the subject of the Conciliation proceedings:

a. Views expressed or suggestions made by the other party in respect of a possible settlement of the Disputes;

b. admissions made by the other party in the course of the Conciliator proceedings;

c. proposals made by the Conciliator;

d. The fact that the other Party had indicated his willingness to accept a proposal for settlement made by the Conciliator.

31. The Parties shall not present the Conciliator(s) as witness in any Alternative Dispute Resolution or Judicial proceedings in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.

32. None of the Conciliators shall act as an arbitrator or as a representative or counsel of a Party in any arbitral or judicial proceeding in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.

33. The Parties shall not initiate, during the Conciliation proceedings, any arbitral or judicial proceedings in respect of a Disputes that is the subject matter of the Conciliation proceedings except that a Party may initiate arbitral or judicial proceedings where, in his opinion, such proceedings are necessary for preserving his rights including for preventing expiry of period of limitation. Unless terminated as per the provisions of this Scheme, the Conciliation proceedings shall continue notwithstanding the commencement of the arbitral or judicial proceedings and the arbitral or judicial proceedings shall be primarily for the purpose of preserving rights including preventing expiry of period of limitation.

34. The official language of Conciliation proceedings under this Scheme shall be English unless the Parties agree to some other language.

FORMAT-5

STATEMENT OF CLAIMS/COUNTER CLAIMS TO BE SUBMITTED TO THE IEC BY BOTH THE PARTIES

1. Chronology of the Disputes

2. Brief of the Contract/MoU/Agreement/LOI/LOA

3. Brief history of the Disputes:

4. Issues:

5. Details of Clam(s)/Counter Claim(s):

Sl. No.	**Description of claim(s)/Counter Claim**	**Amount (in INR)Or currency applicable in the contract**	**Relevant contract clause**

6. Basis/Ground of claim(s)/counter claim(s) (along with relevant clause of contract)

Note– *The Statement of Claims/ Counter Claims may ideally be restricted to maximum limit of 20 pages. Relevant documents may be compiled and submitted along with the statement of Claims/ Counter Claims. The statement of Claims/ Counter Claims is to be submitted to all IEC members and to the other party by post as well as by email.*

FORMAT-7

FORMAT FOR NOTICE INVOKING CONCILIATION CLAUSE BY BHEL FOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,

M/s. (Stakeholder's name)

Subject: **NOTICE FOR INVOCATION OF THE CONCILIATION CLAUSE OF THE CONTRACT BY BHEL**

Ref: Contract No/MoU/Agreement/LOI/LOA& date _____.

Dear Sir/Madam,

As you are aware, with reference to above referred Contract/MoU/Agreement/LOI/LOA, certain disputes have arisen, which, in-spite of several rounds of mutual discussions and various correspondences have remained unresolved. The brief particulars of our claims which arise out of the above- referred Contract/MoU/Agreement/LOI/LOA are reproduced hereunder:

Sl. No.	Claim description	Amount involved

As you are aware, there is a provision in the captioned Contract/MoU/Agreement/LOI/ LOA for referring disputes to conciliation.

In terms of Clause ---------of Procedure i.e., Annexure ------ to the Contract/MoU /Agreement / LOI / LOA, we hereby seek your consent to refer the matter to Conciliation by Independent Experts Committee to be appointed by BHEL. You are invited to provide your consent in writing to proceed with conciliation into the above mentioned disputes within a period of 30 days from the date of this letter along with details of counter-claims, if any, which you might have with regard to the subject Contract/ MoU/ Agreement/ LOI/ LOA.

Please note that upon receipt of your consent in writing within 30 days of the date of receipt of this letter by you, BHEL shall appoint suitable person(s) from the BHEL Panel of Conciliators.

This letter is being issued without prejudice to our rights and contentions available under the contract and law.

Thanking you
Yours faithfully

Representative of BHEL

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

FORMAT-8

FORMAT FOR NOTICE INVOKING CONCILIATION CLAUSE BY A STAKEHOLDER FOR REFERRING THE DISPUTES TO CONCILIATION THROUGH IEC

To,
BHEL (Head of the Unit/Division/Region/Business Group)

Subject: **NOTICE FOR INVOCATION OF THE CONCILIATION CLAUSE OF THE CONTRACT BY A STAKEHOLDER**

Ref: Contract No/MoU/Agreement/LOI/LOA& date _____.

Dear Sir/Madam,

As you are aware, with reference to above referred Contract/MoU/Agreement/LOI/LOA, certain disputes have arisen, which, in-spite of several rounds of mutual discussions and various correspondences have remained unresolved. The brief particulars of our claims which have arisen out of the above-referred Contract/MoU/Agreement/LOI/LOA are enumerated hereunder:

Sl. No.	Claim description	Amount involved

As you are aware, there is a provision in the captioned Contract/MoU/Agreement/LOI/ LOA for referring inter-se disputes of the Parties to conciliation.

We wish to refer the above-said disputes to Conciliation as per the said Clause of the captioned Contract/MoU/Agreement/LOI/ LOA. In terms of Clause ---------of Procedure i.e., Annexure ------ to the Contract/MoU /Agreement / LOI / LOA, we hereby invite BHEL to provide its consent in writing to proceed with conciliation into the above mentioned disputes within a period of 30 days from the date of this letter along with details of counter-claims, if any, which it might have with regard to the subject Contract/ MoU/ Agreement/ LOI/ LOA and to appoint suitable person(s) as Conciliator(s) from the BHEL Panel of Conciliators.

This letter is being issued without prejudice to our rights and contentions available under the contract and law.

Thanking you
Yours faithfully

Representative of the Stakeholder

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.

FORMAT-9

FORMAT FOR INTIMATION TO THE STAKEHOLDER ABOUT APPOINTMENT OF CONCILIATOR/IEC

To,

M/s. (Stakeholder's name)

Subject: **INTIMATION BY BHEL TO THE STAKEHOLDER AND CONCILIATOR(S) ABOUT APPOINTMENT OF CONCILIATOR/IEC**

Ref: Contract No/MoU/Agreement/LOI/LOA& date _____.

Sir,

This is with reference to letter dated ---------- regarding reference of the disputes arising in connection with the subject Contract No /MoU/Agreement/LOI/LOA to conciliation and appointment of Conciliator(s).

In pursuance of the said letter, the said disputes are assigned to conciliation and the following persons are nominated as Conciliator(s) for conciliating and assisting the Parties to amicably resolve the disputes in terms of the Arbitration & Conciliation Act, 1996 and the Procedure ---- to the subject Contract ...../MoU/Agreement/LOI/LOA, if possible.

Name and contact details of Conciliator(s)

a) .....

b) .....

c) .....

You are requested to submit the Statement of Claims or Counter-Claims (strike off whichever is inapplicable) before the Conciliator(s) in Format 5 (enclosed herewith) as per the time limit as prescribed by the Conciliator(s).

Yours faithfully,

Representative of BHEL

CC: To Conciliator(s)… for Kind Information please.
Encl: As above

Note: The Format may be suitably modified, as required, based on facts and circumstances of the case.