VOLUME – IA
Part I & II
TECHNICAL CONDITIONS OF CONTRACT (TCC)

NAME OF WORK:

Renovation, Modernization & Uprating of Kodayar HEP from 1x60MW to 1x70MW: Unit No: 1 - Dismantling of existing unit, Erection, Testing & Commissioning of new unit of electro-mechanical equipment including material handling Works as per SOW.

BHARAT HEAVY ELECTRICALS LIMITED

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Project Information

Sl. No.	Title	Description
1.	**Name of the Owner:**	**TAMILNADU GENERATION & DISTRIBUTION CORPORATION LTD**. (TANGEDCO)
2.	**Address**	Kodayar Power House – Stage 1, Tirunelveli Generation circle, District: Kanyakumari (Tamil Nadu)
3.	**New Installation**	1 x 70 MW
4.	**Nearest Railway station**	Kanyakumari **railway station** is the closest **Railway Station** (72 KM)
5.	**Nearest Road**	(0 KM)
6.	**Nearest City**	Kanyakumari (75 km)
7.	**Nearest Airport**	Trivandrum Airport is the closest Airport (75 km)
8.	**Highest Temperature**	31.5 deg C
9.	**Lowest Temperature**	8 deg C
10.	**Elevation**	506.36m (Turbine Centre line)

Note: - The bidder is advised to visit and examine the site of WORKS and its surroundings and obtain for himself on his own responsibility all information that may be necessary for preparing the bid and entering into the CONTRACT. All costs for and associated with site visits shall be borne by the bidder.

VOLUME – I A (PART – I): Chapter- II
Scope of Work

1.2.1 BROAD SCOPE OF WORKS:

The scope of work under the contract shall include Dismantling of Old TG set including auxiliaries; renovate and reuse the fixed/embedded components and reuse the foundations, unloading at store, loading, transportation, storing & preservation at site, loading & unloading of dismantled material from site to dumping yard, complete erection of all the components testing, commissioning and handing over operating plant to TANGEDCO (customer) unit 1 along with mechanical, electrical, control & instrumentation works as required including demonstration of performance guarantees for successful R & M with new TG of the unit and hand over to the TANGEDCO as an operating plant and the project shall include material & equipment and facilities within the defined battery limits.

The scope of work under this contract shall comprise of dismantling of the complete machine and safe storage of all the dismantled components and transportation of certain identified assemblies/ components from Kodayar HEP to identified dumping ground by TANGEDCO. All parts should be properly match marked before dismantling. The machine shall be handed over to sub-contractor after de-watering of machine by the TANGEDCO.

I. Total plant materials/ equipment's involved for material handling work under this tender will be approx. - 2000 MT. This quantity shall include new supply as well as old dismantled material.

II. The total new material to be supplied from the BHEL manufacturing units for the project is approximately 1075 MT for Erection, Testing and Commissioning. The contractor has to handle whatever actual materials are dispatched for the project irrespective of any variations and payments shall be released for the actual gross tonnage handled.

III. The Contractor shall make all arrangements to deliver the equipment at site by trucks/ trailers. Contractor also do the proper storage of equipment, maintain the stores and all related documents and records, transport the new/renewed equipment to site for erection purpose. All security arrangements also shall be made by the Contractor. Security arrangements means all necessary arrangement for security of equipment, tools and tackles etc. of the contractor at site shall be responsibility of contractor.

IV. Dismantling of all the items through the agreed dismantling procedure or mutually decided procedure between TANGEDCO & BHEL without affecting day to day operation of Power house. All the items so dismantled are to be tagged properly recorded with customer TANGEDCO & Shifted to earmarked dumping yard after Handing Over to TANGEDCO.

V. The Contractor shall be responsible for proper and neat storage and also undertake conservation of all consignments including damaged boxes. During storage of equipment, the Contractor shall take into account deterioration and carry out the re-conservation of the complete equipment/parts/supplies as may be necessary as per the storage instructions of the Manufacturer of equipment/components. The Contractor shall also supply the consumables required for such re-conservation work and repair/replace parts required thereof for the proper functioning of the equipment after erection and commissioning.

VI. The Contractor shall take the equipment from stores and transport the same to erection site. In case of dismantling & repair, the Contractor shall take the equipment/components from site to their repair shop (preferably most of the repair work shall be done at site only) and transport back the same to site after repair.

VII. The Contractor shall unpack and do visual checking against physical damages to the equipment/cases, clean equipment before start of erection as well as before taking delivery in case of equipment/components required for repair. Damages/shortage, if any, shall be reported to the BHEL.

VIII. The Contractor shall provide all necessary erection equipment and tools & tackles including material handling equipment, mobile cranes, fork lift machine, trailers, cranes, machine tools & repair kit, compressors and other equipment and instruments and consumables, all commissioning equipment and instruments, welding equipment, winches, alignment tools, precision levels, theodolite etc. which may be required for carrying out the erection and commissioning work efficiently. All instruments shall be properly calibrated before use. However, TANGEDCO /BHEL's prior permission shall be required for removal of these erection and repair equipment/ materials from the site. The Contractor shall ensure that proper documentation is followed at entry gate of TANGEDCO's premises for such items which shall be carried back by Contractor after completion of work. **The Contractor shall provide within 15 days from the date of effective date of Contract, his scheme for mobilization with Bar Chart indicating clearly the resources, manpower and machinery proposed to be deployed to ensure timely completion of work and quality of workmanship.**

IX. The Contractor shall provide all temporary ladders, scaffolding materials, platforms, supports and other necessary facilities required for dismantling, material handling, erection, testing and visual inspection of supplies at the point of installation and shall also provide necessary packing plates, wedges, shims, levelling screws etc. required for erection of equipment and structures.

X. The Contractor shall provide erection consumables like oxygen and acetylene gas, welding rods, solder lugs, oil, grease, kerosene, cotton waste, etc. required for erection, installation and repair of equipment and steel structures.

XI. The Contractor shall maintain in a neat manner the area placed at the Contractor's disposal.

XII. The Contractor shall provide sufficient fencing, notice boards and lights to protect and warn others as may be considered necessary by the TANGEDCO /BHEL. All materials used for providing these facilities shall be properties of the Contractor. A safety notice board containing warnings written in English, Hindi & Tamil Languages shall be placed by the Contractor.

XIII. The plant and equipment will be erected as per the instructions of the TANGEDCO/BHEL and under the supervision of the supervisory personnel, to be deputed by the Contractor at site. The Contractor will also undertake rectification work on account of manufacturing defects, if any, required for proper erection and assembly which can be done at site only according to site condition.

XIV. The Contractor will align, level, couple and securely fix all equipment, steel structures, appurtenances and accessories in accordance with drawings and/or instructions.

XV. All precision survey instruments including leveling instruments will be arranged by the Contractor. The Contractor will carry out oil flushing and lubricants, grease, chemicals and as required till successful commissioning. Laying and termination of cables, bus bars, bus ducts and earthing will be done by the Contractor.

XVI. Installation and connection of all piping's and fittings from the headers termination points to the equipment and inter-connection of all service lines within the design limit after the main headers/termination points will be Contractor's responsibility.

XVII. The Contractor will check electrical connections to individual items. The Contractor will be responsible for checking the correctness of erection of mechanical equipment, auxiliary systems, electrical equipment, other equipment, etc. as per the specification and relevant drawings.

XVIII. The Contractor will arrange all facilities at site to undertake Ultrasonic testing and stress relieving of butt welded pipe joints, as required.

XIX. The Contractor will be responsible for the management of erection work with proper and adequate supervision for ensuring progress of erection work and quality of workmanship. The Contractor will deploy required number of supervisory, skilled, unskilled and auxiliary labor as required, for the erection work and comply with such reasonable instructions of the TANGEDCO /BHEL in the interest of satisfactory progress and completion of the work according to the schedule.

XX. Contractor is required to draw mutually agreed monthly erection programs in consultation with BHEL well in advance. Contractor shall ensure achievement

of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL.

XXI. Progress review meetings will be held at site during which actual progress during the week vis-a-vis scheduled program shall be discussed for actions to be taken for achieving targets. Contractor shall also present the program for subsequent week. The contractor shall constantly update / revise his work program to meet the overall requirement. All quality problems shall also be discussed during above review meetings. Necessary preventive and corrective action shall be discussed and decided upon in such review meetings and shall be implemented by the contractor in time bound manner so as to eliminate the cause of non-conformities.

XXII. The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials report, consumables (gases / electrodes) report, cranes availability report and other reports as per Performa considered necessary by the Engineer. The periodicity of the reports will be decided by BHEL Engineer at site.

XXIII. The Contractor will be responsible for total commissioning of the Plant including mechanical run, commissioning and demonstration of Performance Guarantee Tests. The Contractor will organize the work in a manner that other work at site is not impeded and the workmen therein not endangered. Contractor will arrange temporary access at site, if required, for the erection work. Field efficiency test of (Turbine & Generator) shall be done in Unit no.1

XXIV. The Contractor will intimate the TANGEDCO/BHEL/concerned Plant authorities in writing well in advance about the requirement of shut down of any of the existing facilities for inter-connection/ incorporation of additional facilities. The shutdown period will be mutually discussed and finalized. The work to be undertaken during the shutdown period will be planned meticulously by the Contractor to reduce the shutdown period to the minimum.

XXV. The Contractor will return to the TANGEDCO all crates, packing cases and packing materials and all returnable supplies belonging to the TANGEDCO at a place designated by the TANGEDCO at the erection site in the conditions these exist during and after erection work is completed.

XXVI. The tests/checks to be conducted during erection by the Contractor will be as per the BHEL/manufacturer's instructions. The Contractor will attend to the rectification of erection defects, if any, expeditiously. The Contractor will arrange all testing instruments for such testing at site.

XXVII. The Contractor will carry out final painting of the plant & equipment and pipelines, etc. erected as per the instructions of the TANGEDCO /BHEL.

XXVIII. Grouting of the equipment on the foundations with Shrink komp/ Ferro grout will be the responsibility of the Contractor.

XXIX. The Contractor will indicate to the TANGEDCO /BHEL well in advance the requirement of services such as electric power, water, EOT crane, etc. required during Dismantling/construction/erection period. The Contractor will arrange for the staying facilities of his working personnel. All safety, health and pollution control measures, as required to be adopted as per the Statutory Regulations and the Safety Codes for projects issued along with the tender documents otherwise required or implied by statutory regulations or practices, will be strictly followed by the Contractor during the execution of the Contract. The Contractor will set up a suitable safety organization of his own at site in this regard.

XXX. A complete schedule of sequential erection of all the equipment, method of erection, safety aspects etc., is to be prepared by the contractor, well ahead of the start of the erection and it should be submitted for approval by BHEL. Erection of all the equipment shall be subject to inspection and clearance by BHEL / Customer at every stage. A log book shall be maintained for recording all the erection activities, procedures, checks and inspection details. This will bear the countersignature of BHEL /Customer's inspector at every stage. It is the responsibility of the contractor to maintain necessary records for the stage inspection, critical checks, etc. to meet the protocol for review.

XXXI. The Contractor will comply with all Statutory Rules & Regulations with respect to the employment of labour at site including payment of minimum wages as per Govt. rules, deduction of employee's contribution to Provident Funds, depositing the same along with Contractor's contribution to the Provident Fund Commissioner, Employees State Insurance and other statutory deductions/ obligations.

XXXII. At the end of the work the Contractor will remove all such temporary structures put up by him and hand over the site to the TANGEDCO /BHEL in neat and tidy manner.

1.2.2 DETAILED SCOPE OF WORK, EXISTING FACILITIES & BATTERY LIMIT

The scope of work for unit no. 1 is as below (SCOPE OF WORK):

(a) Dismantling of existing TG sets including associated auxiliaries, like cooling water system, dewatering & drainage system, Firefighting system, air conditioning system, ventilation system, drinking water system, compressed air system etc. and place these at a suitable storage space / yard (storage space will be provided by TANGEDCO within 3 KM of plant.

(b) Dismantling of distributor and liner and renovate and reuse the foundation plates and anchorages etc.

(c) Total plant materials/equipment's involved for material handling work under this tender will be approx. - 2000 MT. This quantity shall include new supply as well as old dismantled material.

(d) Erection, testing, commissioning, start up and performance testing and handing over of Unit no 1 of 70 MW Hydro turbine-generator set (TG set). The TG sets includes Pelton turbine, Synchronous Generator along with associated Auxiliaries; Electricals including 11 kv Bus Duct, excitation equipment, Unit Auxiliary transformer and associated equipment; Control & Instrumentation and associated civil work. Contractor will ensure that the TG set will be completed with all materials and equipment whether specifically mentioned herein or not but required for satisfactory operation of the Units.

1.2.3 DETAILED SCOPE OF MATERIAL HANDLING WORKS:

a) The plant material shall be unloaded at power house with E.O.T cranes and shall be unloaded/loaded at BHEL stores /work site by contractor Mobile cranes/ Hydra. The E.O.T cranes shall be provided by TANGEDCO /customer on free of cost for material handling/erection work. Arrangement of operator shall be responsibility of the contractor, if not provided by TANGEDCO. In case EOT cranes are not available or under breakdown at Power house, contractor shall arrange his own Hydra/cranes /alternative arrangement which is acceptable to BHEL site engineer for material handling work loading / unloading of the plant materials /equipment and shall carry out the material handling work at project site.

b) Keeping records and status of all materials as per BHEL practices. Verification of all the materials received at site. Prepare shortages/damage reports if any and assisting in insurance claim lodging.

c) Transportation of materials from project store to the powerhouse service bay or the pre assembly area or any other work area of installation & vice-versa as per site requirement and the instructions of site engineer.

d) Construction of temporary sheds/shelters for some of the special equipment's/ items as per the instruction of the site engineer.

e) Providing sufficient illumination, firefighting equipment, warning signs in and around the place of work. Providing all necessary support/assistance for efficiency testing. Handing over of all the spares to customer at their stores. Handling and Transportation of scrap (packing wood and steel) from power house to TANGEDCO scrap yard/stores/Dumping yard as per the instructions of BHEL engineer.

f) Unloading and stacking of items in the service bay / work area with the help of EOT cranes/unloading arrangement as per the instruction of BHEL engineer. Proper Housekeeping and safe working.

g) Dismantling of the existing equipment's and Erection, Testing, Commissioning, trial operation and Handing over of all new equipment's covered in this tender (See table below).

The broad facilities/equipment to be dismantled (common as well as unit specific) are given in Table below:

Sl. No.	Name of the Equipment/Facility
1	Butterfly Valve including complete control system etc.
2	Main Inlet Valve including complete control system etc.
3	**TURBINE AND ASSOCIATED AUXILIARIES** - Runner with Buckets, distributor, nozzles including spears, deflectors and its lever and linkages, Turbine Shaft, Turbine Guide Bearing, Complete governor along with piping
4	Brake system
5	Lube oil System including pipe, valves, pump, motor, strainer, cooler etc.
6	**GENERATOR & ASSOCIATED EQUIPMENT AND ELECTRICS -** Stator, Rotor, Generator shaft, Thrust Bearing, Generator guide bearing, Generator air coolers
7	Excitation System including Pilot Exciter, Main Exciter, Slip rings, Excitation panels, Amplidyne etc.
8	Generator Transformer and associated facilities
9	Station Service transformer and other associated facilities
11	Unit Auxiliary Transformer
12	11kV/0.110 kV Potential Transformers, 11kV Current Transformers, Lightning Arrestors and Generator Neutral Grounding Transformer
13	TG Control Desk and Metering & Protection Panels
14	ACDB and DCDB
15	HT Cables, LT Power Cables, Control Cables and Instrumentation cables
	COMMON FACILITIES
17	Cooling water system including pipe lines, filters, valves etc (Except embedded pipe if any)
18	Fire protection system (Except embedded piping if any)
19	110 V DC system Battery arid Battery chargers

NOTE: - ***01 No of 14T Hydra to be provided close to storage sheds of BHEL/ TANGEDCO.*** Also operation and maintenance during entire contract period is the responsibility of contractor. It is the property of the contractor and shall be dismantled and taken back after completion of work.

h) Shifting and re-stacking of materials if required to facilitate the erection works.

i) Re-conciliation of materials with BHEL and TANGEDCO. Documentation and records (Films/ Movies/ Photographs) from embedment to evacuation.

j) All the dismantled components that are not envisaged to be used back in the unit are required to be stored/preserved properly till the completion of work. All nuts bolts studs & dowels shall be cleaned, applied grease and kept in polythene packs with proper tagging/ bin cards. Responsibility for arrangement of wooden boxes as required shall be of the contractor at his own cost.

k) All consumables like old dhoties, markeen cloth, kerosene oil, petrol, diesel, jute, grease and other preservatives shall be arranged by the contractor at his own cost.

l) All measurements like levels & clearances shall be recorded at each stage of dismantling of machines as per directions of BHEL Engineer. For design/ manufacturing purpose, if BHEL requires the measurement of Structure/existing components extra, contractor has to perform on the instruction of BHEL. Necessary measuring instruments for this are to be made available by the contractor.

m) All consumables required for grinding, welding, gas cutter etc. required shall be arranged by the sub- contractor at his own cost for completion of dismantling and erection work. All material required for platform shall be arranged by the sub-contractor at his own cost. Welding generators, grinders, cutters etc. shall be arranged by the sub-contractor at his own cost.

n) Erection devices, special T&P etc. as available with TANGEDCO shall be supplied free of cost. However special spanners, slings, required for the job but not available with TANGEDCO in usable conditions shall be arranged by the contractor at his own cost. In case of any damage during dismantling to devices, T&P etc. provided by TANGEDCO free of cost to the sub-contractor, sub-contractor will have to bear the replacement/ repair cost.

o) Chain pulley blocks, jacks, pull lift machines, D-shackles and general T&P shall be arranged by the sub- contractor at his own cost with due test certificates.

p) There is a rotor erection pit in power house. The ways and means of cutting and dismantling the rotor within transportable limit of power house shall be responsibility of the Contractor. Necessary procedure for the same shall be submitted by the Contractor to BHEL for information/acceptance.

q) All dismantled equipment shall be stored on the wooden planks and preserved properly. All safety rules in respect of handling of equipment of material is also to be observed. If any other part required to be dismantled for complete & successful dismantling of Machine, the same shall be done by the contractor

within the scope of this work.

r) Any component if damaged during dismantling due to negligence of contractor shall be replaced by the contractor at the time of assembly at his own cost. Such components should be of best quality manufactured as per the BHEL drawing.

1.2.4 DETAILED SCOPE OF DISMANTALING WORK (TURBINE, GENERATOR & OTHER MECHANICAL EQUIPMENT)

The following existing facilities will be dismantled:

- Unit 1 Turbine Generator set including the associated equipment up to Generator transformer adjacent to power house towards tail race side and auxiliary transformer located at upstream of power house.

- All facilities associated with the above including cables, cable structures, maintenance platforms etc. Transport/shift and place all the dismantled equipment to the storage space ear marked for the purpose.

- Lifting devices and special tools required for dismantling shall be provided by BHEL/TANGEDCO as per availability. Healthiness is to be assessed by the Contractor. Necessary device if available will be provided 'As is where Basis'. Dismantling of stator shall be done in erection pit/ Service bay only. Generator/Transformer/cable etc., will be dismantled and properly recorded with TANGEDCO and to be stored/placed in space provided by BHEL/TANGEDCO normally within 1KM of power house.

- There is one rotor erection pit in power house. The ways and means of dismantling rotor within transportable limit of power house shall be responsibility of the Contractor. Necessary procedure for the same shall be submitted by the Contractor to BHEL for information/acceptance.

- Before dismantling of unit is carried out, Dummy cone (BHEL supplied item) to be welded with penstock in power house.

- Power/ control/ Instrumentation common cable in dismantled unit to be isolated, tagged and tapped.

- Further details of major components to be dismantled are given below for information:

1.2.4.1	**BUTTERFLY VALVE:**	
	Dia	1700 mm
	Max. Working Pressure	224ft of Water Column
1.2.4.2	**MAIN INLET VALVE:**	

	Dia	1000 mm
	Max. Working Pressure	90 kg
1.2.4.3	**TURBINE**	
	Make	Hydro Vevey, Switzerland
	Type	Pelton wheel, Vertical shaft
	Net head	3109 ft
	Discharge	275 cusec
	Output of turbine	87130 HP
	Rated speed	500 rpm
	No of jet	2
	Included angle	81°
	Dia of jet	7.6" (193 mm)
	Nozzle centre level	+1158 ft
	No. of buckets	22
	Dia of runner	97" (3100 mm)
	Weight of runner	9.6 ton
	Material of runner	13:4 (Cromium:Nickle)
	Dia of shaft	579.5 mm
	Water consumption	16.5 cft / unit energy
	Centerline of runner	1158
1.2.4.4	**GOVERNOR**	
	Make	Vevey, Switzerland
	Type	Accelero — Tachymetric
	Rating	1700 ft Lbs
	Oil pressure	415 lbs / sq inch (30 kg/cm2)
1.2.4.5	**GENERATOR**	
	Type	Synchronous
	Make	Alsthorn, France
	Normal Apparent Rating	66667 KVA
	Power factor	0.9
	Volts (Nominal / maximum)	11000/12000 Volts
	Nominal Stator current	3500 Amps
	No. of Rotor Poles	12
	No. of Generator Air Cooler	**6**

	Insulation Class	B
	Speed	500 RPM
1.2.4.6	**EXCITATION SYSTEM WITH AVR**	
	Excitation voltage	
	Excitation current (under nominal load and voltage condition)	
1.2.4.7	**POWER TRANSFORMER**	
	Make	ANSALDO SAN GIORGIO COMPANGNIA GENERALE GENOVA
	Year of Installation	1970
	Capacity	3 X 22500KVA
	DETAILS OF ONE SINGLE PHASE GENERATOR TRANSFORMER OF 22500KVA CAPACITY	
	VOLTAGE	
	HV	110kV
	LV	11kV
	CURRENT	
	HV	354.5 Amp
	LV	3542/V3 Amp
	Frequency	50 Hz
	Type of Cooling	OFW
	Weight of Core & Winding	16.785 Tons
	Weight of Oil	6.32 Tons
	Total Weight	29.62 Tons
	Volume of Oil	1560 gallon
	Oil Cooler	
	Oil Flow	1560 imp gallons / minute
	Water Flow	430tre / minute
1.2.4.8	**UNIT AUXILIARY TRANSFORMER (UAT)**	
	Make	Current Electricals, Madras
	Capacity	300 kVA, 3 Phase, 50 Hz
	Voltage ratio	11000V / 415V

	Vector Group	Dyll
	Cooling	4.8
	Current : HV/ LV	15.175 A/ 417.4 A
1.2.4.9	**STATION SERVICE TRANSFORMER**	
	Make	Radio & electricals Limited, Madras
	Capacity	250 kVA, 3 Phase, 50 Hz
	Voltage ratio	11000V / 416V
	Vector Group	Dy11
	Cooling	ONAN
	Current : HV/ LV	13.1 A/ 347 A
1.2.4.10	**V GENERATOR CABLES:**	
	Material / Core	Aluminium / Single Core
	Cross Section	625 Sq mm
	No. of Cables / phase	10
1.2.4.11	**110kV SWITCHYARD :**	
	POTENTIAL TRANSFORMERS FOR LINE	
	Make	BALTEAU, Belgium
	Ratio	110kV/V3/110V/V3
	VA	250
	Phase	1
	CURRENT TRANSFORMER	
	Make	ASEA
	Ratio Available	125/150/250/300/500/600
	Ratio Adopted	500/1
	Burden /Class	30VA/BM
	Burden/Class	60 VA/S
	SF6 Circuit Breaker	
	Make	AREVA
	Rated Voltage	145 KV
	Frequency	50 Hz
	Normal Current	2000 A
	Total Mass	1534 kg
	Year of Manufacture	2009

1.2.4.12	Brake system	1 no.
1.2.4.13	Lube oil System including pipe, valves, pump, motor, strainer, cooler etc	1 Lot
1.2.4.14	11kV/0.110 kV Potential Transformers, 11kV Current Transformers, Lightning Arrestors and Generator Neutral Grounding Transformer	1 Lot
1.2.4.15	TG Control Desk and Metering & Protection Panels	1 Lot
1.2.4.16	ACDB and DCDB	1 Lot
1.2.4.17	Fire protection system	1 Lot
1.2.4.18	110 V DC system Battery arid Battery chargers	1 Lot

1.2.5 EXISTING FACILITIES TO BE REFURBISHED AND UTILISED:

Fixed/embedded components of Unit 1 e.g. pit liner, and foundation plates and anchorages are to be refurbished and reused. The required renovation details are enumerated in the Table.

Sl.No	Name of the equipment	Details of Renovation
1.	**Turbine Housing/ Discharge Chamber**	Housing/Discharge Chamber shall be modified for accommodating the new symmetrical manifold. Internal surfaces of housing shall be weld filled by grinding and providing protection coating.
2.	Penstock	A. The penstock need to be Cleaned and painted with water resistant paint as per the specification detailed below; Anchor blocks are to be repaired; Guide pads are to be refurbished and properly lubricated; All Expansion joints to be replaced with new one. Maintenance platforms are to be painted with weather proof paint if any strengthening is required same shall be carried out by contractor. i) Internal surface of the penstock shall be cleaned by using brush, water jet and shot blasting. After cleaning the internal surface shall be painted with water resistant paint. For selection of the paint necessary water analysis shall be carried out by contractor. Contractor shall submit a detailed procedure for cleaning and painting for approval from Purchaser.

		ii) Outer surface of the penstock shall be cleaned by using brush and water jet. After cleaning the outer surface shall be painted with weather proof paint. Contractor shall submit a detailed procedure for cleaning and painting for approval from Purchaser. iii) All Expansion joints shall be designed to take care of the expansions between the two consecutive anchor blocks. The material of the convolute of the expansion joints shall be of stainless steel.
3.	Foundation plates and anchorages	Renovate and reuse the existing foundation plates and anchorages
4.	Drainage and Dewatering System	Following works to be carried out for drainage and dewatering system a) Exposed pipe is to be replaced by new one. Pipe and fittings shall be designed in accordance with IS 1239 or equivalent standards. b) Replacement or rerouting of embedded piping c) Strengthening of pipe supports if any to be done.
5.	Compressed air system	a. The existing compressors shall be refurbished with replacement of all pipe, valves, instruments etc. The details of the existing compressors are as detailed below: **Compressor -1:** Make K.G. Khosla and Co. Type B.D.12 Capacity 340 lit/min Opening Pressure 30 Kg/cm2 **Compressor -2:** Make K.G. Khosla and Co. Type B.D.7.2 Capacity 505 Ipm Opening Pressure 30 Kg/cm2 Air receiver tank: Capacity 400 liter Maximum pressure 35 Kg/cm2 Working pressure of air brake: 7 Kg/cm2 Working pressure for general purpose: 4 Kg/cm2 b. Two additional compressors (1W+1S) of adequate capacity along with air receiver, pipe, valve, necessary

		instruments etc. shall be provided for operation of governor OPU. c. Each compressor shall comprise of intercoolers, after coolers, intake air filter cum silencer, discharge valve with NRV, relief valve, and all necessary instruments, Air receiver tank etc. d. There should be interconnection in between the existing and new compressors through pressure reducing valves so that air can be availed for braking purpose in case of failure of both the existing compressors. These compressors shall be installed at coupling chamber floor. A tentative space is proposed in the equipment layout drawing.
6.	Complete Unit area	Cleaning of the area including minor repairs. All surface drains to be discharged in tail pool/discharge chamber whichever is applicable. All existing pipe valves are to be replaced with new except embedded if any.

1.2.6 DETAILED SCOPE OF NEW PLANT & EQUIPMENT FOR ERECTION, TESTING & COMMISSIONING:

The broad scope of new equipment/facility is as follows.

Sl. No.	Name of Equipment /Facility to be replaced or refurbished	Unit	Qty
A	**MECHANICAL EQUIPMENT**		
1.	Runner	1 Set	To be replaced with new equipment
2.	Nozzle, Spear/ Needle, Deflector	1 Set	To be replaced with new equipment
3.	Turbine Guide Bearing	1 Set	To be replaced with new equipment
4.	Distributor/ Manifold	1 Set	To be replaced with new equipment
5.	Turbine Shaft	1 Set	To be replaced with new equipment
6.	Servomotor for nozzle and deflector of turbine	1 Set	To be replaced with new equipment
7.	Brake jet manifold	1 Set	To be replaced with New Pneumatic brakes and hydraulic jack system etc. for uprated machine
8.	Governor	1 Set	To be Replaced with new digital PID type with

			provision of RGMO including the Pressure oil system
9.	Governor oil pumping Unit (i.e. Oil Pressure Unit -OPU)	1 Set	To be replaced with new equipment
10.	Pressure receiver	1 Set	To be replaced with new equipment
11.	Governor oil	1 Set	To be replaced with new equipment
12.	Butterfly Valve	1 Set	To be replaced with new equipment
13.	Penstock	1 Set	To be Refurbished
14.	Main inlet valve as a complete system such as servo-motor etc. including connected pipelines	1 Set	To be replaced with new equipment
15.	Turbine Housing / Discharge chamber	1 Set	To be Refurbished
16.	Cooling Water System	1 Set	To be replaced with new system
17.	Fire Protection system • Fire Hydrant System • Microprocessor Based Fire Detection and Alarm System • HVWS and MVWS Water Spray system • Portable Fire Extinguisher	1 Set	New system to be provided
18.	Vibration Monitoring System • Portable vibration FFT Analyser	1 Set	New system to be provided
19.	Generator	1 Set	To be replaced with new equipment
20.	Generator Fire Fighting System	1 Set	To be replaced with new equipment
21.	Excitation System	1 Set	To be replaced with new equipment
22.	Automatic Voltage Regulator	1 Set	To be replaced with new equipment
23.	Generator LA-VT-CT System and NGT System	1 Set	To be replaced with new equipment
24.	Generator Transformer	1 Set	To be replaced with new equipment
25.	Unit Auxiliary transformer	1 Set	To be replaced with new equipment
26.	Station Auxiliary inspectors	1 Set	To be replaced with new equipment
27.	11kV Distribution Board	1 Set	To be replaced with new equipment

28.	Generator Protection, Generator Transformer Protection, Aux. transformer Protection	1 Set	To be replaced with new equipment
29.	LT AC Distribution Board	1 Set	To be replaced with new equipment
30.	DC Distribution Board	1 Set	To be replaced with new equipment
31.	Uninterruptible Power System (UPS)	1 Set	New system to be provided
32.	All HT, LT , Power, Control and Instrumentation Cables	1 Set	To replace all existing cables by new cables
33.	(i) Illumination system (ii) Power Distribution Board / ACDB	1 Set	Refurbishment of Illumination system with replacement of light & LDBs fittings MLDB
34.	Earthing System	1 Set	(i) Refurbishment with new equipment earthing, (ii) new electronic earth pit — 2 nos. (separate earth pit for control & PLC Instruments)
35.	Local push button station junction	1 Set	To be replaced with new equipment
36.	Local Control Station	1 Set	To be replaced with new equipment
40.	DCS /PLC based control system for each unit	1 Set	To be replaced with new equipment
41.	Complete local & remote instrumentation	1 Set	To be replaced with new equipment

B	**Electrical Equipment: Detailed in this chapter in SECTION IIA**
C	**Control & Instrumentation: Detailed in this chapter in SECTION IIB**
D	**MISCELLANEOUS**

1.2.7 BATTERY LIMITS:

On the power house upstream side, the battery limit will be up to BFV inlet in power house. On the downstream side, the battery limit will be up to Turbine discharge chamber.

FACILITIES ALREADY INSTALLED FOR THE PROPOSED UNIT

Penstock, Power House, LP compressed air system EOT Crane (1 Nos of capacity 135/20 Ton) and Tailrace are constructed/installed and to be utilized for the proposed Unit.

BRIEF OF EQUIPMENT

1. TURBINE SYSTEM

a. Runner

The runner shall be forged stainless steel (13% Cr.-4% Ni) with integral buckets The runner shall be manufactured by full forging method from a forged disc by carving out buckets on its periphery by CNC machining. The Pelton Runner Manufacturing Technique of full Forged runner being offered by BHEL is by-far the best method and totally eliminates chances of defects/ cracks being present as in the case of manufacturing by Casting process or Forged-fabricated technique. This increases the reliability of Pelton runner many folds. Further there are a number of other advantages of a fully forged runner in comparison to other prevalent methods. The material (including the surface sub-structure) is completely homogenous across the entire bucket, has better toughness and other mechanical properties, is more resistant to surface erosion and has much improved fatigue characteristics. The runner shall be designed and constructed to withstand safely to stresses developed due to unit operating at runaway speed under conditions of rated head. The finished runner shall be statically balanced at works before dispatch. Bolted flanged connections shall be provided for attaching the runner to the turbine shaft. The runner shall be interchangeable.

b. Turbine shaft

Turbine shaft shall be of forged steel and machined all over. Shaft shall have integral flanges at both ends, one for bolting to the runner and other to the generator shaft. An integrally forged collar forming the guide bearing journal shall be provided. The journal shall be polished to a fine finish. The turbine shaft shall be connected to the generator shaft by fitted bolts. The coupling bolts and nuts for connecting turbine and generator shaft shall also be supplied. The shaft shall be bored for full length to ascertain soundness and machined true. The shaft is provided with a collar to support the runner and shaft assembly on the turbine guide bearing housing when uncoupled from the generator end. The shaft shall be of ample size to operate at any speed up to runaway speed without vibration and distortion.

c. Guide Bearing

Shall be of submerged, self-oil lubricating, pivoted pad type, with external / internal cooler. The bearing shall be situated above the shaft gland as close to the turbine runner as possible. The bearing shall permit sufficient vertical movement of the runner and shaft to allow for adjustment of the generator thrust bearing.

d. Bearing pads
Shall be individually adjustable, bolted to the support ring, lined with white metal and easily dismantle able. Pads shall be provided with thermometer pockets.

e. Bearing support ring
Shall be of electrically welded steel in halves with heavy joint and support flanges, rigidly bolted and dowelled to the top cover/housing. Bolts shall be provided for adjustment of clearances between pads and shaft

f. Oil sump
Shall be of welded steel construction and having reservoirs for incoming and outgoing bearing oil. An oil seal baffle on upper side of bearing around the shaft shall be provided to prevent the leakage. The whole bearing shall be arranged for continuous oil circulation while the turbine is in operation.

g. Cooling arrangement
An internal/ external water cooled heat exchanger shall be provided for effective cooling. The heat exchanger shall be suitably located. The cooling water shall be tapped from the cooling water supply system.

h. Sets of Nozzle and Deflector Assembly

Each set Comprising of Main Injector Shall be of plate steel with suitable flanged connections for bolting on to the respective inlet wye branch of distributor. Inserted star guides of steel for smooth and stream lined flow, guide bearing and bushes of bronze for the spear stem shall also be supplied. Nozzle Tip/Body and Nozzle Tip Liner Nozzle tip shall be of forged stainless steel bolted on to the nozzle inlet, accurately shaped and polished for compact and streamlined jet and fitted with accurately shaped and polished nozzle tip liner of stainless steel. Nozzle tip liner shall be replaceable type. Integrally cast bosses for mounting the deflector shaft guide bearing shall be provided. Suitable baffle / hood arrangement shall be provided for taking the complete thrust of the deflected jet, thereby protecting the nozzle assembly.

i.Deflector Operating Gear Each consisting of following:- **Deflector Servomotor**: The servomotor actuating the deflector shall comprise of a steel body complete with end cover and assembly flange, a steel housing mounted to the body with seals for connecting rod. The servomotor shall be of single/double acting type. It shall be normally open and close by oil pressure. In case of failure of oil pressure, the deflector shall be closed by spring. A piston with integral connecting rod also carries the feedback rod. It shall be suitably mounted on its own foundations. The servomotor

cylinder shall be accurately bored and shall be provided with flanges for connecting oil piping and stuffing boxes to prevent leakage of oil along the piston rod. A suitable scale with pointer to indicate the deflector opening shall be provided. **Deflector Operating Gear** Shall be consisting of servomotor connecting rod, lever, inter connecting links etc.

2. MAIN INLET VALVE (Spherical Valve):

Main Inlet Valve:

The main inlet valve shall be of spherical type, tested at works, designed to open under balanced condition and to close against full flow by oil operated servomotor. It shall be opened by oil operated servomotor and closed by dead weights.
Each comprising of the following:

Body
Shall be of cast /fabricated steel in two parts flanged together, reinforced with ribs and complete with brackets and feet. The body shall be accurately bored out for the door and trunnions and complete with self-lubricated bearings and seals for the trunnions. Provision for mounting movable seal rings of service and maintenance seal shall be made. The body shall have flanges on either side to connect upstream pipe on upstream side and dismantling joint on downstream side. The valve body shall incorporate bracket feet supports suitable for hydraulic forces. All necessary foundation plates and anchor bolts shall be provided

Valve door/Rotor
Shall be of cast steel or fabricated steel construction. The cast/ forged trunnions shall be bolted/ welded to it. Provision for installation of stainless steel seating rings of service and maintenance seal shall be made on the door. Those portions of the trunnions that pass through stuffing boxes and operated in packing or bearing areas shall be protected by removable stainless steel sleeves.

Service Seal
Comprising of a stainless steel ring sliding in machined face provided on the valve body and seating against the stainless steel seating ring fixed on the door. The service seal shall be automatically operated by oil pressure. This seal shall be located on downstream side of MIV.
Provision shall also be made for manually operating the seal with a hand pump. The seal shall be provided with a position indicator. Removable valve seats of working seals for maintenance and operation shall be interchangeable.

Maintenance seal
Comprising of a stainless steel ring sliding in machined face provided on upstream side of the valve body and seating against the stainless steel seating ring on the valve door. The maintenance seal shall be operated by oil pressure. This seal shall be located on upstream of MIV. mechanical locking device and position indicator shall also be provided.

Lever
Shall be of fabricated steel keyed to the trunnion and with self-lubricated bush for the servomotor piston rod. Manual locking device shall be provided to lock the valve in close positions. Dead weights shall be suitably attached to it.

Servomotor
Comprising of fabricated steel cylinder with covers, piston, piston rod and complete with sealing gland, pipe connection, timing diaphragm etc. The servomotor shall be oil operated and designed to open the valve under balanced conditions and to close from fully open position under the conditions of maximum flow at all heads with minimum oil pressure. A suitable throttling device to adjust the time of closing and opening shall be provided

Outlet pipe with Dismantling joint
Shall be of electrically welded steel situated on the downstream of the valve. This would facilitate dismantling of the valve for maintenance. The valve support shall not be designed to transmit axial hydraulic force to the foundations. Therefore, purchaser / employer should provide necessary anchor block on upstream of valve.

Inlet pipe (Upstream pipe)
Of electrically welded steel with a flange for connecting to the valve on the downstream side and the other side shall be edge prepared for welding to penstock at 0 necessary connections, tapping's and fittings for pressure gauge, penstock drain, bypass valve etc. shall be provided in this pipe. Sufficient excess length shall be provided as a trim allowance.

Bypass valve and piping

Shall be oil pressure operated for balancing the pressure across the MIV. It shall be designed to get vibrations and noise free operation. Metal sealing shall be provided to have proof seal when valve is closed.

Air release valve / Decompression valve

shall be automatic operating type of valve to supply or release the air during draining off and filling the distributor.

3. PENSTOCK BUTTERFLY VALVE

The Penstock valve shall be of a lattice door butterfly valve, tested at works, designed to open under balanced conditions and to close against full flow in emergency. It shall be opened and closed by oil operated servomotor and shall be capable of closing by dead weight in case of emergency. Each comprising of the following :

Body
shall be cast steel construction/ fabricated from steel plates, in one piece/ halves accurately bored out for the door and trunnions and complete with self-lubricated bushes, bearings and seals for the trunnions and stainless steel seating ring for the seal. Suitable support feet shall be provided for transmitting the load of the valve.

Valve door
shall be cast steel construction or fabricated from steel plates. The trunnions shall be dowelled /bolted to the door. The trunnions shall be provided with stainless steel overlay/ stainless steel sleeve on the surface facing bushes and seals.

Main (Service) seal
consisting of adequately reinforced rubber sealing ring held in position by removable steel ring fixed by rustless screws and seating against stainless steel ring. The seal can be adjusted bytightening the screws from downstream with full water pressure on upstream side.

Lever
shall be of fabricated steel keyed to the trunnion and with self-lubricated bush for the servomotor piston rod. Manual locking device shall be provided to lock the valve in closed positions. Dead weights shall be suitably attached to it for closing the valve.

Servomotor
comprising of fabricated steel cylinder with covers, cast iron piston, forged steel piston rod and complete with sealing gland, pipe connection, timing diaphragm etc. The servomotor shall be oil operated and designed to open the valve under balanced conditions and to close from fully open position under the conditions of maximum flow at all heads with minimum oil pressure. A suitable throttling device to adjust the time of closing and opening shall be provided.

Outlet pipe with Dismantling joint
Shall be of steel and of telescopic type situated on the downstream of the value. It shall be edge prepared for welding to the penstock on its

downstream side. This would facilitates dismantling of the valve for maintenance. The valve supports shall not be designed to transmitted axial hydraulic force to foundation. Therefore, necessary anchor block on upstream of valve should be provided by purchaser / employer.

Inlet pipe (Upstream pipe)
of electrically welded steel plate with a flange for connecting to the B.F. valve on the downstream side and the other side shall be edge prepared for welding to the penstock at site. Necessary connection, tapping and fittings for pressure gauge, penstock drain and bypass connection shall be provided on this pipe. Sufficient excess length shall be provided as a trim allowance.

Air valve cum anti-vacuum valve
shall be automatic operating type of valve to supply or release the air during draining off and filling the downstream penstock.

There is no EOT provision for handling/dismantling the existing BFV and assembly and erection of new BFV. The contractor has to arrange mobile crane to carry out the dismantling of old BFV and assembly/erection of new BFV.

4. COOLING WATER SYSTEM

ONE SET OF COOLING WATER SYSTEM — (Open loop System) (for complete power house): The set shall consist of the following : Two Nos. of Horizontal centrifugal type pump motor set for power house with accessories(One main + One standby). One No. of Automatic backwash Duplex coarse filter for discharge side of centrifugal pump with accessories. Two Nos. Fine Filters for unit wise CW supply with accessories (1 main + 1 standby). One Set of non-return valves, gate valves, isolating valves, pressure reducing valves (if required) necessary for operation. One Set of seamless ERW carbon steel pipes necessary for operation.

5. LP COMPRESSED AIR SYSTEM

Compressed air system shall be provided for the complete power house, for intermittent supply of air to cater the needs of generator brakes and operation and maintenance of the plant. The system shall comprise of the following:-
Two number A.C. motor driven air compressors, one main and the other standby, for supplying air. The capacity of compressors shall be sufficient to meet the system. It shall be air cooled single stage oil free screw type. Necessary air cooled after cooler shall also be provided. The compressor

motors shall be rated for 415V, 3 phase 50 Hz. The air from individual compressor shall first pass through after cooler and then through air dryers and oil removers. The air dryer dries the humid air and oil remover removes undesired traces of oil. The air shall be accumulated in L.P. air receiver fitted with pressure gauge, safety valve and drain trap. For automatic starting/stopping of motor and very low pressure alarm, pressure switches shall be provided. Piping's, fittings, pipe support, adequate number of isolating valves, non-return valves etc. shall be provided.

6. GENERATOR SYSTEM and AUXILLARIES

GENERAL

The GENERATOR will be vertical shaft type having salient poles with closed air circuit ventilation and suitable for coupling to a matching TURBINE. The GENERATOR will have a combined thrust and guide bearing above the rotor and one guide bearing below the rotor. The GENERATOR will have the rating and characteristics as detailed in the technical schedule/particulars. The components will be designed to withstand seismic forces, as specified. The general description of main parts of GENERATOR is as follows:

a. STATOR

a.1 STATOR FRAME

The stator frame will be a fabricated structure. The joints between the segments of the frame will be coupled by a number of short bolts. The frame will be bolted to its sole plates which in turn will be grouted to concrete. The stator frame **will** be designed to carry the weight of top bracket, stationary parts above it.

a.2 STATOR CORE

The stator core will be built up of insulated stampings of low loss non—ageing cold rolled alloy steel. The core will be clamped between segmental steel end-plates. Jacking bolts will be provided at the outer edge of end plates to enable pressure distribution. Ventilation ducts will be provided at intervals along the stator core. The core will be securely clamped by a large number of studs outside the core, extending over its full length.

a.3 STATOR WINDING

The stator winding will have a Class 'F' BHEL epoxy resin based insulation system. The winding will be of bar type, wound in open slots and will be provided with BHEL'S PROVEN "resiflex" insulation system (Class F). Each bar will consist of a number of insulated copper conductors to minimize eddy current losses.

a.4 WOUND STATOR

Stator will be partially wound at works and shall be dispatched to site in number of segments to suit the transport limitations. The winding at the joints of the stator segments will be carried out at site.

7. ANTI CONDENSATION HEATERS

Low temperature heaters to prevent condensation on the windings during periods of shutdown will be mounted suitably inside the barrel. They will be of box type construction. They will form a balanced 3-phase load.

8. ROTOR

The rotor will be designed to safely withstand all mechanical stresses developed at the maximum runaway speed. The static and dynamic balancing of the rotor will be carried out as part of pre-commissioning tests at site to minimize the vibrations.

8.1 SHAFT AND THRUST BEARING COLLAR

The top shaft and thrust collar are forged individually from high quality alloy steel. The top shaft has been accurately machined. A forged thrust hearing collar will be shrink fitted on the top shaft. Bottom Shaft is provided with bottom guide bearing collar. Solid coupling flange is provided at lower end of the shaft, for connection to the turbine shaft. The coupling flange will be in accordance with IEEE: 810.

8.2 SPIDER & ROTOR RIM

The rotor spider will be a fabricated structure. This will be fitted to the shaft with the help of key & bolts. The rotor rim will be assembled around rotor spider. Slots in the outer periphery of the rim will receive similar shaped projections on the poles

8.3 POLES WITH FIELD WINDINGS

The poles will be of laminated construction consisting of sheet steel punching, clamped between heavy steel end plates by means of steel studs. The pole core will have dove tail to engage with corresponding slots in rotor disc. The damper winding bars will be of circular cross section and embedded in pole face. The end of damper bars of the pole will be short circuited together by copper punching. Damper winding shall be not connected type.

The field coils will be manufactured from rectangular cooper strips. Field coils & pole body insulation will be class 'F'. All connections between

adjacent field coils and between field coils to slip ring will be of firmly secured to the rotor.

8.4 SLIPRING & BRUSH GEAR

The slip rings will be of mild steel and mounted on the top of tubular shaft. The brush gear will be mounted on insulated studs and will allow convenient access for maintenance and inspection of brush gear. Slip ring & Brush Gear will be insulated with class 'F' insulation system.

9. BEARINGS

9.1 THRUST BEARING

The thrust bearing will be of the spring mattress type in which the stationary parts consist of a set of white metal (babbitted) segmental pads. Thrust pads will be prevented from rotation by clamps which would also prevent the pads from rising with the thrust block during the rotor jacking operation. The thrust bearing pads will be completely immersed in an oil bath and would be cooled by means of oil cooler units. The bearing will be designed for the axial load which is summation of the weights of all rotating parts of GENERATOR, TURBINE and maximum axial hydraulic thrust.

9.2 GUIDE BEARING

The guide bearings will be of the pivoted pad type consisting of a row of white metal (babbitted) pads arranged in a support ring to bear on a surface. A pivot bar will be bolted to the back of each guide pad to enable the lightly to take up a suitable position and facilitate formation of the oil film when running. The clearance between the individual pads and the journal will be set by adjusting the shims between the back of the pad and the pivot bar. Oil vapour seal will be fitted to prevent the escape of oil vapour into the GENERATOR air circuit.

9.3 BEARING INSULATION

The bearing above the rotor will be adequately insulated to prevent circulating shaft current from passing through the bearing surface. The insulation will be arranged to break the possible paths of such currents.

10. OIL COOLERS

10.1 PLUG IN TOP OIL COOLER

The oil of the upper bearing housing & lower bearing housing will be cooled by one or more number of plug-in-type oil coolers. Each cooler will consist of a bank of '0' shaped cupro-nickel tubes wound with copper

wire fins carried in mild steel frame with inlet end terminating in a rolled tube plate and the other `U' end shaped in a tube fixed to frame.

11. VENTILATION

The machine will have a closed circuit ventilation system. Suitable number of air cooler unit will be fixed to the outer periphery of the stator frame and the cooled air will be discharged into the annular space surrounding the stator.

11.1 AIR COOLERS

A number of air coolers will be fixed to the stator frame for dissipating the losses in the machine. Each air cooler unit will consist of a rectangular nest of tubes between two water chambers, arranged for the air to flow over cooling water tubes. The tubes will be of cupro-nickel alloy. Proper cooling water piping will be made up to the cooler, complete with valves, flow relay etc., as required.

12. TOP BRACKET

The top bracket is a steel fabricated construction which accommodates the thrust bearing and upper guide bearing. The bracket is designed to carry the static load plus the weight of turbine and generator rotating parts and the maximum hydraulic thrust experienced when running.

13. BOTTOM BRACKET

The bottom bracket will also be of a fabricated construction which accommodates Lower Guide Bearing. The bracket will be designed in such a way that it will be possible to lift it through stator bore. Brakes and jack units will be mounted on the bracket for braking and jacking.

14. BRAKING AND JACKING SYSTEM

The GENERATOR brakes will consist of a number of replaceable shoes mounted on a vertical piston moving in a cylinder and will operate against a polished circular-steel brake track. To apply the brakes, air will be fed into the cylinder from compressed air system. Brakes will be automatically applied when the will reduce to a preset value, and will remain applied continuously so that the unit stops completely. The brakes will be automatically reset after complete stopping of the GENERATOR. Limit switches will be provided for each brake to prevent the machine from starting if any brake is in the raised position. The brakes will be mounted on the bottom bracket. The brakes will also serve as a convenient means for jacking the rotor for maintenance purpose.

14.1 BRAKE/JACK CONTROL PANEL

Each unit will be provided with a brake/jack control panel serving as a common approach point for braking or jacking of the rotor. Braking of the rotor will be automatically achieved through braking solenoid valve, which will be located in the brake panel. Also this solenoid valve will be provided with manual over ride which can be used whenever required. Jacking of the rotor will be attempted when rotor is stand-still. Separate inlet and outlet ports will be available in this panel for connecting the pressure and drain line of the hydraulic power pack. An instruction plate will be provided on the front of the panel describing the sequence of operation to be followed for braking and jacking.

14.2 HYDRAULIC POWER PACK

Portable motor operated high pressure oil pump will be provided for jacking of the rotor during maintenance. Flexible hoses with swivel nuts for connection between power pack and brake jack control panel will also be provided.

15. OVER SPEED DEVICE

A mechanical over speed device will be mounted on the Top of the unit and will consist of a spring operated latched switch mounted on a bracket. The switch will be tripped by a spring loaded plunger carried on the tubular shaft. The device can be reset by hand and will have a suitable range of adjustment. The over speed device will be set to trip at a speed above the full load throw-off speed of the unit.

16. BRAKE DUST COLLECTION EQUIPMENT

The brake dust collection equipment will consists of an extraction unit, hoppers around brake assemblies for entrapping the dust and flexible hoses for connecting hoppers to extraction unit.

17. CARBON DUST COLLECTION SYSTEM

Necessary arrangement will be provided to prevent mixing of carbon dust with the closed air ventilation system of generator. The carbon dust will be collected in the tray mounted under slip ring assembly on the brush gear casing and fan & filter assembly are also provided for removing of carbon dust.

18. FIRE EXTINGUISHING EQUIPMENT

Automatic fire extinguishing equipment will be of the carbon-dioxide type and separate for each generator of power house. In the event of a fire, smoke detectors will first operate to give early warning signal to the

operator. For deep seated fires of hazardous nature, release of CO2 gas will be initiated by heat detectors located inside the machine in the hot air zone or by the operation of the differential relay. Protection will be effected by filling the generator air circuit with CO2 at a concentration sufficient to dilute the oxygen content to a point where combustion cannot continue. The extinguishing system will be designed in accordance with NFPA:12. One CO2 banks, each consisting of an adequate number of CO2 cylinders will be provided for flooding the unit.

19. SPECIAL INSTRUMENTS & DEVICES

19.1 CHARTLESS MULTIPOINT TEMPERATURE RECORDER

This will be multi-point chartless recorder. Required number of RTDs will be connected to the recorder and it will record each RTD at a predetermined time interval. Set points are provided to give alarm/trip at predetermined temperature settings.

19.2 ON LINE VIBRATION MONITORING SYSTEM

A continuous on line vibration monitoring system shall be provided. It shall comprise of 2 nos non-contact type proximity probes each for upper guide bearing, lower guide bearing and turbine guide bearing. (x-y direction). 3 no. contact type probe for upper, lower & turbine bracket vibration. 1 no. contact type proximity probe at thrust bearing to measure axial vibrations. 1 no synchronization probe. Set of input/output modules, power supply, relay modules etc shall be Provided.

19.3 SHAFT CURRENT MONITOR

This will consist of shaft current transformer and relay unit. The shaft current transformer will be of ring shaped sheet steel core, encircling the shaft, which will form the primary winding and carry on evenly spaced torroidal secondary winding. The transformer will have an additional winding on the core enabling testing of the protection by induction. The core and winding will be fitted in a circular 'U' shaped steel ring. The relay unit will have relay testing switch, alarm and trip indication. When current flows in the shaft, flux will be generated in the core which will induce voltage in the secondary winding. This voltage will give rise to a current in the shaft current relay for operation and trip.

19.4 MOISTURE DETECTOR

The instrument will be solid state type with a probe immersed in the bearing oil. The presence of moisture content is sensed through a capacitive sensor and a signal will be sent to the indicating unit or a relay

through an amplifier. The relay can be set to give an alarm in the event of moisture in bearing oil exceeding preset value.

20. LIGHTING SYSTEM:

The lighting system will be provided for lighting the space between the stator frame and the housing. Also the lighting arrangement will be provided for top brush gear casing and bottom bracket pit.

21. EXCITATION SYSTEM

The proposed scope covers ONE (1) set of microprocessor based Static Excitation System.

MAIN EQUIPMENT OF STATIC EXCITATION EQUIPMENT 1 set
Each set of Static Excitation Equipment consists of the following **major** items:

A. REGULATION PANEL

Consisting of:
A.1 Microprocessor based hardware, Interface, Power supply & Associated software for the following operating channels.

Two (2) Auto Channels:

Each Auto Channel shall have the following features/sub-systems
- Automatic voltage regulator with reference value setting
- Limitation of volt / frequency (auto over-fluxing control)
- Adjustable voltage droop compensation (compounding)
- Field current limiter (over excitation limiter)
- Load angle limiter (under excitation limiter)
- Stator current limiter
- Follow-up circuit
- Slip stabilizer unit
- PT fuse failure detection
- Thyristor firing pulse generation & amplification circuit

Each of above auto channels are having in-built manual channels

A.2 Logic & Control function, Hardware, interfaces, power supply and associated software for Interlocks for control, protection, indications and remote signalling.

A.3 Local HMI PC for control and metering 1 set
Other features/sub-systems :
- Excitation Transformer over current protection

• Excitation Transformer over temperature protection
• Misc. items comprising aux. power supply transformers, MCBs, fuses and relays

B.**RECTIFIER BRIDGE PANEL 2 Nos**.

One bridge is required to provide required excitation including ceiling current. Total 2 Nos. of bridges for N+N configuration. Each panel will be consisting of:

• Three phase fully controlled thyristor bridge with semi-conductor Fuses, RC Snubber circuit and Gate circuit with pulse transformer
• Parallel sharing reactors
• Thyristor bridge cooling fans, redundant mode
•Air flow monitoring unit
• Misc. items comprising HRC fuses, MCBs, meters & bus bars

C. FIELD SUPPRESSION PANEL 1 No.

Consisting of:

• Field-flashing contactor
• AC field flashing circuit with three phase diode bridge and transformer
• DC field flashing circuit with blocking diodes and suitable voltage Dropping resistor for standby DC field flashing
• Rotor over-voltage protector
• Field circuit breaker
• Field discharge resistor
• Field ammeter, voltmeter, shunt
• Misc. items e.g. HRC fuses, MCBs, relays bus bars

D. TRANSFORMER CUBICLE 1 No
Consisting of:
• Excitation transformer, dry type (to be supplied separately by BHEL Jhansi)
• CTs for over current protection of excitation transformer & excitation system
• HV/LV Bus bars and other hardware etc

22. CONTROL & MONITORING SYSTEM (SCADA)

The Control and Monitoring System (SCADA) shall include the following items:

A. CONTROL BOARDS
Following Control Boards are included in the scope of supply. The boards are to be located in the main control room or at other suitable place in

the power house for control and monitoring of the generating units and their auxiliaries, common station auxiliaries.

Unit Control Board (UCB)

Unit control boards (UCB) consisting of (1) Electronic panels containing Processor Module (redundant) & input/output modules of Valmet DNA DCS for data acquisition and sequence control (2) Electrical transducers (3) Power supply modules (4) Auxiliary Relays for interfacing to process (5) Energy Meter for control and monitoring of Generating units (6) Auto synchronizer

To perform local control & monitoring of the unit and unit auxiliaries, each UCB shall be provided a PC based HMI (Local HMI).

LCB for Common Auxiliary Systems and Aux. Power Controls

A Control Board consisting of (1) Electronic panels containing Processor Module (redundant) & input/output modules of Valmet DNA DCS for data acquisition and sequence control and monitoring (2) Power supply modules (3) PC based HMI (Local HMI) for control & monitoring of common Auxiliary Systems

RTU with controller at BFV

An RTU/ Control Board consisting of (1) Electronic panels containing Processor Module (redundant) & input/output modules of Valmet DNA DCS for data acquisition and sequence control and monitoring (2) Power supply modules (3) Control & monitoring of BFV RTU will from main control room

CENTRAL CONTROL ROOM (CCR) EQUIPMENT

CCR will comprise of the following:

Consisting of:
One (1) no. of Operator WorkStation each with 1 no. 29" TFT monitor, keyboard, mouse and software applicable for Valmet DNA
• One (1) no. of Engineering Work Station (EWS —STATION PC) with 1 no. 29" TFT monitor, CPU, keyboard, mouse and software applicable for Valmet DNA
v One (1) no. of Historian Station PC with 1 no. 29" TFT monitor, CPU, keyboard, mouse and software
applicable for Valmet DNA
+ One (1) no. of Laptop computer for SCADA Tool
+ One (1) no. 65" LED type Display

+ One (I) set of router/gateway for Data Transmission to Load Dispatch Centre through employer's communication media on IEC 60870-5-104 protocol
One (1) set of router/gateway for OPC Interface for Purchaser's MIS 1 set of Desk for OWS and Metering PC (3.5 meter)
+ 1 set of Desk for EWS (1.7 meter)
+ Table for printers
+ 2 Nos. Tables for SAS Operator Stations
+ 1 No. Table with Drawers
+ 5 nos. chairs
+ One (1) no. A4 size Color Laser Jet Printer, One (1) no. A3 size Color Laser Jet Printer and One (1) no. DMP

23. 415V LTAC BOARDS

(A) LT Distribution Board- 1 No.

1 No. LT Distribution board comprising 3 sections fed by incoming feeders from Unit Auxiliary Transformer, Station Auxiliary Transformer & DG Set shall be provided to cater unit & common load requirement of power house. Each section shall be separated by bus coupler ACB.

24. STARTERS FOR TURBINE & GENERATOR AUXILIARIES: 1 SET

Local wall mounted / Floor mounted, DOL / star delta, fixed type starter panels, complete with MCCB, contactors, indicating lamps, push buttons etc will be provided for the Turbine & Generator auxiliaries.

25. 220V DC SYSTEM

The 220V DC system will comprise of the following:

a. BATTERY: - 2 Sets
Tubular Type Lead-Acid Stationary Batteries in Transparent (SAN) container complete with terminal connections, hardware, with rating as under will be provided as per Cl no. 02.02.04.10 of VOL-III, Technical Specification of the tender.

AH rating : 400 AH
Type : Tubular Type Lead-Acid Stationary Batteries
Voltage : 220 V

b. BATTERY CHARGER) 3 Nos. (2 Working + 1 Standby)
Float cum boost charger for boost, float & trickle charging the battery will be provided. The battery charger will be free standing metal enclosed type. The panel will be provided complete with interior illumination,

space heaters, terminal blocks, earthing studs etc. The battery charger will be suitable for operation on three phase power supply of 415 V AC, and capable of supplying DC voltage of 220 V DC and 50 A current.

c. DC DISTRIBUTION BOARD: 1 No.

DC distribution board catering the loads of control circuits related to power house shall be provided Board will be compartmentalized design. The DC distribution board will be fabricated out of sheet steel, and will be free floor standing type. Outgoing feeders will be manually operated fixed type MCCBs. The cubicle will be supplied complete with interior illumination lamp, space heater, terminal block, wiring and other accessories required for proper operation / functioning of cubicle and

26. CABLING SYSTEM

1. POWER, CONTROL & INSTRUMENTATION CABLES: 1 LOT

2. 11kV (UE) HT TERMINATION KITS : 1SET

A set of suitable termination kits shall be provided for termination of 11kV cables mentioned above.

3. CABLE ACCESSORIES: - 1 SET

A Set of cable accessories shall be provided as per requirement for laying/erection of power, control and instrument cables. It includes cable glands, cable lugs, ferrule, cable tie etc.

4. CABLE TRAYS & ACCESSORIES: - 1 SET

Ladder /perforated type GI cable trays out of the applicable sizes/width of 150mm, 300mm, 450mm and 600 mm, its accessories & related support structure, wherever necessary, will be provided for the above mentioned cables.

27. EQUIPMENT EARTHING, LIGHTING PROTECTION & SOIL RESISTIVITY

EQUIPMENT EARTHING: -

1.Equipment earthing shall be provided only for electrical equipment in BHEL scope.

2.BHEL supplied equipment shall be connected to the nearest pigtail/peripheral conductor provided by the customer.

3.Galvanized iron flats or cables of suitable sizes as per equipment requirement shall be used along with accessories like clamps, sheaths, terminals and other miscellaneous items for making ground connections

4.Soil resistivity of power house shall be carried out as per pre-bid reply no. 18 & 48. However, designated locations & other relevant details are to be furnished by customer prior to taking up the activity.

5.Scope of Lightning Protection shall be as below;

Outdoor earth flat down-corners & related material in the existing lightning system wherever necessary shall be replenished.

Note: Underground network/ Earthing grid/ electrodes/ riser/ ring main etc. shall not be in Contractor's scope since this is an R&M project as it is not a part of tender document.

28. GENERATOR TRANSFORMER, UNIT AUXILLARY TRANSFORMER, STATION SERVICE TRANSFORMER (11/0.433 Kv)

The following oil filled transformer/ dry transformer shall be provided.

(i) Generator transformer – 1 no.
HV : 110kV
LV : 11kV
Location : outdoor
Phase:3
Vector group: Ynd11

(ii) Unit auxiliary transformer – 1 no.

HV: 11 kV
LV : 415V
Location: indoor
Phase: 3

(iii) 11/0.415 kV Station Service transformer — 1 no.

Rating: 500 kVA
System Voltage (Max): 12kV
HV: 11.0 KV
LV: 0.433 KV

Vector Group: Dynll
Cooling: ONAN
Location: Outdoor
Phase: 3

The above transformers shall be supplied with all the necessary accessories such as bushing, winding temperature detectors, current transformers, instruments, fittings etc. Transformer impedance including other parameters shall be as per IS-2026.

29. OPTICAL FIBRE CABLE

Armoured Optical Fibre cable between Power house and Valve House:

12 core, single mode, armoured optic fibre cable will be provided between Power house and Valve House. (to be laid along existing line/route between power house and valve house). The length of Cable for is considered as 2.6 Km.

30. LAVT, NGT

The following equipment's are covered in the scope of supply per set basis:

ITEM NO. 1: LAVT CUBICLE 01 SET

LAVT Cubicle shall have drawn out type VT mounted on trolleys, fabricated out of 2 mm thick CRCA steel sheet and complete with illuminating lamps, space heaters, busbars, mounting insulator, marshalling box etc. Each set shall comprise of the following:

a) Single phase epoxy cast dry type VT 06 Nos.
b) Lightning arrestor 03 Nos.
c) Surge Capacitor 03 Nos.

ITEM NO. 2: NG CUBICLE 01 SET

Each NG Cubicle shall be fabricated out of 2 mm CRCA steel sheet and complete with lluminating lamps, space heaters, bus bar mounting insulator, marshalling box etc. Each set shall comprise of the following:

a) Neutral grounding Transformer 01 No.
b) Neutral grounding resistor 01 No.
c) NG CT 01 No.

31. PROTECTION PANEL

GENERATOR, GT, ET & UAT PROTECTION PANEL

1.2.8 ELECTRICS

Scope of contractor will also include following:

Dismantling of existing panels (incl cables), Storage, erection and commissioning of electrical systems as per BOQ. Minor civil works required for fixing of electrical equipment/ panels/ cables, bus duct opening, support and reinforcement of existing foundation etc.

The Contractor will be responsible for complete satisfactorily working of system with guaranteed parameters.

Miscellaneous Activities

Following miscellaneous works will also be included in the scope of Contractor:

- Obtaining certificate from Chief Electrical Inspectorate of the state for installation and energizing the complete electrical system and equipment covered under the package. Any fees payable for the services of electrical inspectors or any officer appointed to assist the electrical inspectors shall be borne by the contractor.
- Any modification or additional requirements by Statutory Authorities will have to be carried out without time and cost implication to the BHEL.
- Necessary clearance for the charging of equipment's from electrical inspector is to be obtained by the contractor. Arranging any other statutory approval, if required.

a. ERECTION, TESTING COMMISSIONING:

The scope of Contractor will include erection & commissioning of all electrical equipment required for the power plant units and auxiliaries covered under their scope for R&M of units 1 with new TG of Kodayar Power House at Tirunelveli generation circle.

The major equipment covered under scope will be as follows:

- Vertical Shaft Pelton Turbine complete with all accessories, auxiliary equipment suitable for coupling vertical shaft

synchronous generator

- Digital Programmable electronic type governor complete with all accessories, including oil pumping units, pressure and sump tanks, allied valves and piping.
- Main inlet valve of spherical type including oil pumping units (OPU), Pressure tank and sump tank, allied valves and piping
- Nozzle injector assembly, Needle servomotor, Deflector servomotor & knives etc... (3 jets) - complete with all accessories and controls – 1 set.
- Penstock butterfly valve of spherical type including oil pumping units (OPU), Pressure tank and sump tank, allied valves and piping
- 77.78MVA Synchronous generator at Rated conditions with 10% continuous overload capacity and its associated equipment , direct driven , vertical shaft, complete with thrust and guide bearings, brackets, fire fighting , other components and auxiliaries.
- Excitation system and digital voltage regulator including accessories
- Fire protection system comprising fire hydrant system, fire detection and alarm system and water spray system MVWS and HVWS etc., Portable fire extinguishers.
- Cooling water system and accessories
- Compressed air system
- 11/110kV , 3 x27 MVA, Single phase generator transformer complete with all accessories, auxiliary equipment
- 11/0.415 kV , 300 KVA, 3 phase cast resin, dry type unit auxiliary transformer (UAT) complete with all accessories, auxiliary equipment
- 11KV Generator system distribution board including Generator LAVT panel and Neutral grounding cubicle, generator transformer panel, UAT panel etc.
- 415V unit auxiliary board and Station auxiliary board.
- 11/0.433 kV, 500 KVA , three phase, oil natural air natural (ONAN), Station transformer with complete accessories, auxiliary equipment
- DC System
- Uninterrupted Power Supply System (1+1 standby),30kVA, 240VAC, Single phase, 50Hz with a common plante / tubular battery set
- Control and monitoring system incl SCADA , control boards, control and metering desks incl synchronizing and annunciations, protection panel for generator, GT, UATs, SATs , color video display units, LSD, control networks, optical cable, printer units, operating keyboard etc.
- Electrical protection system for generating units, generator step up transformer, link line, bus bar, outgoing transmission lines etc. complete with all accessories, wiring and cubicle etc.
- HT & LT power and control cables, instrumentation cables and

special cables supporting structures, GI cable trays and associated accessories.

- Cable supporting structures, GI cable trays (ladder type and perforated type), cable racks, other associated accessories and fire sealing materials for laying, termination and sealing of cables are supplied by supplier. Cable trestles, if needed within the battery limit for supporting contractor's cables, will be in the contractor's scope. Contractor will lay separate trays for laying different type of cables like power, control and screened cables.
- Illumination system, earthing and miscellaneous items
- Replacement of turbine housing / discharge chamber/ distributor housing 4 jets.
- Welding sockets (415V), Power receptacles, 240 V sockets, 240V Industrial type sockets etc. are included in the scope of the contractor.
- 110 kV Switchyard (Material handling only)

b. Following items to be refurbished: (refurbishment of existing plant and equipment)

- Removal of existing distributor and placing of new distributor
- Refurbishment of foundation plates and anchorages
- Refurbishment of Drainage and dewatering system.
- Refurbishment of Penstock
- Refurbishment of existing LP compressed air system.

Following are also the scope of Contractor:

- Supply of hand gloves and shock treatment charts in English, Hindi and Tamil.
- All the test required for successful commissioning of the system (Transformer, CT/PT) is to be done by vendor after arranging necessary instruments/equipment's like SFRA, DGA, PPM, BDV, Tan-delta test etc as per the guidelines issued by concerned supplier. Agencies to carry out these test are to be deployed among the approved list of the supplier (to be provided in due course of time). These tests are to be repeated till charging clearance from the supplier.
- Electrical Protection System: The protection required for the various electrical equipment e.g generator, generator transformer, 110/11 kV, 500 KVA Station transformer, unit aux. transformers, station auxiliary transformer, auxiliary motor etc. All the relays including generator protection relays will be microprocessor based numeric type irrespective of their use with communication facilities.
- Common electrical system to erected, tested and commissioned with the first unit for which RMU is carried out.
- Arrangement of temporary work yards, material depots and access as required, as well as removal from site of all erection equipment, packing

materials etc.

- Any item not mentioned in the specification, but considered by the Contractor necessary for satisfactory operation and maintenance of the plant will be included by the Contractor in his scope of installation.

c. DISMANTLING

The scope of the Contractor will also include the following;

- Dismantling of all equipment within battery limit. Contractor has to remove all the old/existing equipment along with cables. All the unused existing equipment will be removed, packed and placed in a proper place within 3 km as decided by the purchaser. Following major existing equipment will be dismantled.
- Turbine and associated equipment including Turbine shaft, runner, guide bearing incl distributor and housing.
- Nozzle servomotors, deflector servomotors assembly
- Generator and associated equipment including stator, rotor, generator shaft, Thrust bearing, guide bearings, Generator Air Coolers and brackets
- Excitation System including Pilot Exciter, Main Exciter, Slip rings, Excitation panels etc.
- 11kV Bus ducts, Power, Control and other cables
- 11 KV switchboards, Unit Auxiliary board panels, Control panels, Protection panels
- Governing system incl piping
- All electrical panels including 11 kV Switchboards, Unit Aux. Board, Station Aux. Boards and control cables pertaining to Units # 1
- All station switchboard
- Battery banks, battery chargers and DCDBs
- HT, LT and Control cables
- Cable trays, supporting structures, cable racks etc
- Generator control & relay panel, generator metering panel, generator transformer control, relay & metering panel.
- CTs, PTs, LAs etc.
- All steel structures required under battery limit to complete the job.
- Cabling (Cables, Cable supporting materials, trays etc)
- All HT/LT power, control cables and cable accessories supporting structures, cable installation, cable terminations with necessary junction boxes and fire sealing are under the scope of Contractor for all areas and also including all HT cables includes cables from station transformer to 11kV switchboard and 11 kV switchboard to Station Auxiliary Transformer.
- All control and protection cables required for connection to relays, meters, signaling alarm, control, monitoring etc. at main station building will be provided, laid glanded and terminated at both ends by the Contractor. Existing cables will be removed and placed in proper

condition in a place identified by the purchaser's store.

- In addition to the above equipment dismantling and storage of other equipment / structures etc. as required to complete the job is in the scope of Contractor.

d. BATTERY LIMITS AND TERMINATION POINTS

Generator Transformer Side

Power evacuation up to generator transformer will be included in Contractor's scope. Control cable including cable termination at both ends wherever signals are required to be tapped/transmitted including control cable termination in yard equipment is in contractor scope.

Auxiliary Side

Existing DG set

SECTION IIB: CONTROL & INSTRUMENTATION:

a)GENERAL

This specification is intended to define the basic requirements of instrumentation & control system for R&M with New TG for the Unit no.- 1 along with their auxiliaries as specified in the contract document. The basic philosophy of C&I system will cover in totality and will be based on the state–of– the–art microprocessor based control system. The C&I system will ensure safe, efficient and smooth operation of the plant and equipment with minimum intervention of the operating personnel during normal working of the plant, load fluctuation/shut-down and start-up of the unit.

b)SCOPE OF WORK

The scope of work will include transportation to site, storage, erection, testing and commissioning of all instrumentation and control equipment, cables, pipes, auxiliaries and erection hardware necessary for completion and handing over of instrumentation and control work for the unit after integrated final commissioning.

The Contractor shall do all erection and commissioning of the complete Control and Instrumentation system including Distributed Control System (DCS) or Programmable Logic Control (PLC) based system, Primary and Secondary Instruments, Panels, Control Desks, Alarm Annunciation System, Electric Power Supply System, Actuators, Instrumentation Cables and Process Connection impulse tubing, Actuators/MOV (Motor Operated Valve).

The scope of work will also include all civil works, like chipping, digging, concreting including filling material etc. associated with erection of instruments and associated equipment. Installation of all HT/LT power, control cables and cable accessories supporting structures, cable installation, cable terminations with necessary junction boxes and fire sealing are under the scope of Contractor for all areas covered in the scope including all HT cables. All control and protection cables required for connection to relays, meters, signaling alarm, control, monitoring etc. at main station building will be provided, laid glanded and terminated at both ends by the Contractor. Existing Panels, cables will be removed and placed in proper condition in a place identified by the purchaser's store. All existing Impulse tubes, conduits will be replaced by new SS impulse tubes and conduit. Erection, testing and commissioning of the total equipment for successful commissioning/completion of the project are in scope of contractor.

Measurement and control equipment will be complete in all respect and any equipment / accessories not explicitly indicated in this specification, but considered essential for proper functioning of equipment and process will be included in the Contractor's scope of work. The instrumentation system will cover for New TG and its auxiliaries.

A proven dedicated 1:1 hot redundant centralized Distributed Control System (DCS)/ PLC based system for the unit will be envisaged with this package. Redundant Electro Hydraulic Turbine Control system with redundant actuator will be envisaged for the turbine. Electro – Hydraulic control unit will be envisaged for Servo Rotary Valves. The instrumentation equipment for unit no. 1 of Hydel power plant with their auxiliary facilities as covered in the specification and also as felt necessary by the BHEL shall be completed by Contractor for the completeness of the job. Fully wired panels, cabinets, desks, racks, transmitter cabinets and junction boxes. All signal, control & Power cables will be FRLS armoured types or manufacturer standards cables required for instrumentation work. All field instruments (4-20mA) will be replaced by new SMART type 2 wire transmitters. All local field mounted instruments for New TGs will be newly envisaged. Turbine Vibration monitoring system and measurements with sensor and converter box will be provided for New TGs as per manufacturer standards. Erection, calibration, testing and commissioning of the total equipment included in this specification. All tools and tackles, special testing equipment and consumables required for erection and commissioning activities will be arranged by the contractor.

MISCELLANEOUS

I. The equipment and piping shall be erected in conformity with the provisions of standards/ specifications and as may be directed by BHEL. The method of welding (Arc, gas, TIG, MIG/MAG or other method) may be indicated in the detailed drawing/ schedules. BHEL engineer will have option of changing the method of welding as per site requirements.

II. On the discretion of BHEL site engineer, which is depending upon the site requirement, some of the material may be directly unloaded in the powerhouse/work site with EOT Cranes or own crane or suitable alternative own arrangement of contractor. Contractor shall keep record of the same. For such works contractor shall be paid under material-handling work of packages.

III. EOT cranes shall be provided free of hire charges and on sharing basis with TANGEDCO. The contractor will have to provide additional qualified operator for operating the EOT cranes round the clock if required or as per requirement.

IV. Penstock, Power House, EOT Crane (1 Nos of capacity 135/20 Ton), and Tailrace are constructed/installed and to be utilized for the proposed Unit.

V. Construction drawings and documents shall be provided at site to the contractor for erection of work. The Contractor shall be provided with construction power at 400V, 3-phase for the purpose of the erection/construction under the Contract only at single one point and is chargeable. The Contractor shall make his own arrangements to lay

and maintain necessary supply lines for temporary power from a single point. The Contractor shall make his own further distribution arrangement. All temporary wiring must comply with Indian Electricity Rules and Act and will be subject to the customer's inspection and approval before connection to supply and later. Non-availability of power from the customer shall not be an excuse for delay in completion of erection/construction.

VI. On the discretion of BHEL site engineer**, Construction power to other BHEL contractors/vendors shall be provided by contractor on chargeable basis. The charge towards electricity consumption by other contractors shall be decided by BHEL site in-charge.** However, electricity bill raised by power supplier is to be paid by contractor. The bill may include fixed charges, minimum consumption charges, taxes, duties etc.

VII. Display of danger board signs in Hindi, Tamil and English languages near switches is to be ensured by the Contractor. The Contractor will supply and install all distribution cables, wires and switches, etc. of rated capacity for the work starting from the source of power at his own cost. He will employ Electricians having valid Electrical License for carrying out the installations as well as for the maintenance works.

VIII. Bidder shall also install DG set of suitable capacity for backup power in case of power failure as per site requirement for construction power.

IX. Installation, maintenance and operation of Hydra/ Mobile Crane shall be in scope of contractor. Hydra/ Mobile crane of suitable capacity to be deployed by the contractor

X. Heaviest consignment to be handled is approx. 40T/or may be higher. The contractor shall deploy of the suitable capacity crane on his own as and when required to complete the work (within the quoted rates). No crane shall be provided by BHEL in storage yard/dumping yard for any purpose.

XI. Dismantling of stator shall be done in erection pit/ service bay/ dumping yard as per customer requirement. Generator/Transformer/cable etc. will be dismantled by the contractor. Dismantled materials will be properly recorded with TANGEDCO and to be stored in PH space provided by BHEL/TANGEDCO and within 3 Km of power house (storage space provided by BHEL/ TANGEDCO).

XII. There is one rotor erection pit in power house. The ways and means of cutting and dismantling of rotor within transportable limit of power house shall be responsibility of the Contractor. Necessary procedure for the same shall be submitted by the Contractor to owner for information/acceptance.

XIII. Stator and rotor assembly of unit to be done parallel in service bay by the contractor.

XIV. In the workshop of TANGEDCO there are equipment's/machine like drilling machine, lathe etc. Contractor shall deploy qualified operator as and when required within the quoted price.

XV. Chain pulley blocks, jacks, pull lift machines, D-shackles and general T&P shall be arranged by the sub- contractor at his own cost with due test certificates.

XVI. Details of Major equipment along with weights & Dimensions, supplied by BHEL & its vendor under this scope are given in (Volume-IA, Part-I, Chapter-IV). However, changes on account of change in design may occur, for which no compensation will be payable and contractor shall complete the entire work as detailed in the tender specifications within finally accepted rates/ prices. As per instructions of BHEL site engineer and or due to space constraint at service bay/power house /work site/stores, some of the assemblies, devices like the Stator/rotor lifting devices, hydraulic test device, other T&Ps may require multiple handling and multiple stacking for shifting from power house/work site to BHEL stores and stores to power house /work site. This shall be responsibility of contractor and for this no additional payments shall be made to contractor.

XVII. The welding electrodes required for site welding of major components of turbine like Turbine casing, distributor, Inlet /outlet pipes of MIV/IDV, some high pressure piping and any other special consumables **which are supplied by manufacturing units** along with plant material shall be issued to contractor for subject work free of cost. Contractor shall maintain proper records for all those consumables and submit the signed copy of consumption certificate (along with respective RA bills) from the respective package Incharge nominated by Engineer Incharge. **However general purpose electrodes for systems like piping of generator, Turbine and its auxiliaries bus ducts and other auxiliary pipelines etc. Electrodes /filler wires shall be the responsibilities of contractor. Contractor shall arrange BHEL approved general purpose electrodes.**

XVIII. Field efficiency test of (Turbine & Generator) shall be done in the unit.

XIX. **COMMENCEMENT OF GUARNTEE PERIOD:** The Guarantee period shall commence only after completion & taking over certificate by Customer TANGEDCO of the entire work of this tender. The BHEL engineer shall certify to the contractor the date on which the work is completed & Taking over and the date thereof for commencement of Guarantee Period. The duration of guarantee period shall be as per VOLUME – I A (PART – I): Chapter- III Time Schedule, clause 1.3.5.

XX. **PAINTING: -** All the plant equipment's /items shall be painted with required coat of red oxide primer & required coat of synthetic enamel

paint, color as per drawings and site requirement. Paint shall be supplied by BHEL supplying units. The quantity to be supplied by manufacturing units is fixed. Contractor has to follow the painting procedure strictly, any deficiency in quantity of paints due to wrong procedure shall be borne by the contractor.

XXI. The contractor shall have to deploy adequate experienced/qualified engineers and supervisors for material handing work, dismantling work and erection, commissioning, pre-commissioning, testing/checking work, trial run and attending pending points of the unit, minimum man-months deployment required shall not be less than the following: -

Sl No	Type of Manpower	Quantity (Nos)	Minimum Man-months
1	Engineer (Degree holders)	02	24
2	Supervisor (Diploma holders)	04	48
3	Welding Supervisor / NDT level-II (Qualified)	01	12
4	Safety supervisor (Qualified)	01	12

The above figures for deployment of engineers and supervisors for material handing work and erection, commissioning, pre-commissioning, testing/checking works are tentative only and if need for any additional manpower over and above the mentioned figures are required as per site requirement, the same shall be arranged by the contractor at no extra cost to BHEL. If the contractor fails to deploy the minimum man-months of each above category manpower at appropriate time at Kodayar HEP site as per site requirement then deduction shall be made from his bills at the rate of Rs.50,000/- per man month for Engineer (at Sr No 1) and Rs. 25,000/- per man month for supervisors (at Sr No 2,3,4). If any of the above category is not utilized fully, it shall be converted in to other category keeping in view the rates at the discretion of BHEL.

Utilization report of all above man-months shall be maintained and submitted the signed copy of utilization report certificate (along with respective RA bill) from the respective package In charge nominated by Engineer In charge.

XXII. The contractor under this contract shall also provide services of skilled/semiskilled/unskilled persons for total contract period free of cost exclusively for use by BHEL. This manpower will be required for following services:

- Skilled workers for office, colony, stores.

•Semi-Skilled workers for office, colony, stores.

•Un-Skilled workers for office, colony, stores.

Persons so deployed shall have to work in extended hours whenever required. Workmen provided as per the above provisions shall be fully trained and experienced in the nature of work for which they are deployed. ***In case contractor fails to provide above-mentioned manpower as desired by BHEL, the latter shall have the right to hire such services from other agencies at the risk and cost of the contractor. During extended contract period, contractor shall continue to provide the above categories of workers for BHEL use.*** Utilization report of all above man-months shall be maintained and submitted the signed copy of utilization report certificate by the contractor (along with respective RA bill) from the respective package Incharge nominated by Engineer Incharge.

"the contractor shall, at all stages of work deploy skilled/semi-skilled tradesmen who are qualified and possess certificate in particular trade from CPWD Training Institute/ Industrial Training Institute/ National Institute of Construction Management and Research (NICMAR), National Academy of Construction, CIDC or any similar reputed and recognized Institute managed/ certified by State/ Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled/ semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

VOLUME – I A (PART – I): Chapter- III
Time Schedule

1.3 TIME SCHEDULE

MOBILIZATION, TIME SCHEDULE, CONTRACT PERIOD AND GRACE PERIOD

1.3.1 INITIAL MOBILIZATION:

After receipt of LOA, Contractor shall discuss with Project Manager / Construction Manager/Engineer Incharge of BHEL regarding initial mobilization. Contractor shall mobilize necessary resources (considering the immediate requirement of the site and agreed by Engineer Incharge) within 15 days of issue of letter of award or as per the directive of Project Manager / Construction Manager/Engineer Incharge of BHEL. Such resources shall be progressively augmented to match the schedule and commissioning.

1.3.2 MOBILIZATION FOR DISMANTLING, ERECTION, TESTING AND COMMISSIONING ETC.

The activities for Dismantling, erection, testing etc shall be started as per directions of Project Manager / Construction Manager/Engineer Incharge of BHEL. Contractor shall mobilize further resources as per requirement to commence the work of erection, testing etc as per scope of work, and progressively augment the resources to match schedule of the project.

1.3.3 COMMENCEMENT OF CONTRACT PERIOD AND TENTATIVE SCHEDULE

Planned date of Dismantling/actual date of Dismantling at site whichever is earlier shall be considered as "start of contract period". Site mobilization and material handling will not be considered as start of contract period. The contractor has to subsequently augment his resources in such a manner that following tentative schedule of erection & commissioning are achieved on specified schedules:

SN	TENTATIVE SCHEDULE	START/ COMPLETION
1	Site Mobilization	15 days from Award of LOA or as decided by BHEL.
2	Start of contract period (Zero date)	Start of dismantling of unit as decided by Project Manager of BHEL.
3	Start Dismantling of unit	from zero date
4	Complete Dismantling of Unit.	End of 1st Month.
5	Completion of Unit axis alignment of Unit.	End of 10th Month.
6	Completion of Trial Run of Unit.	End of 11th Month.

7	Completion of all facilities at site including completion of punch point and site closing.	End of 12th Month.

1.3.4 CONTRACT PERIOD

The contract period for completion of entire work under scope shall be **12 MONTHS** from the "START OF CONTRACT PERIOD" as specified earlier.

The period from the commencement of preparatory work for dismantling/erection till the actual "start of contract period" shall not be reckoned for the above purpose.

1.3.5 PERFORMANCE GUARANTEE FOR WORKMANSHIP

Even though the work will be carried out under the supervision of BHEL Engineers the Contractor will be responsible for the quality of the workmanship and shall guarantee the work done for a period of 24 (Twenty-four) months from the date of Initial Takeover of the unit by TANGEDCO, for good workmanship and shall rectify free of cost all defects due to faulty erection detected during the guarantee period. In the event of the Contractor failing to repair the defective works within the time specified by the Engineer, BHEL may proceed to undertake the repairs of such defective works at the Contractor's risk and cost, without prejudice to any other rights and recover the same from the Security Deposit.

If it becomes necessary for the contractor to replace or renew any defective portions of the plant under this clause the provisions of this clause shall apply to the portion of the plant so replaced or renewed until the expiry of (24) twenty-four months from the date of such replacement or renewal. Guarantee shall be extended only for the defective replacement and to the particular replaced equipment and not for the entire unit.

Initial Takeover:
After synchronizing the unit with grid, Initial Takeover by TANGEDCO shall be after completion of 30 days trial run including 72 hours continuous full load test.

1.3.6 CONSEQUENCE OF DELAY

In case of delay in completion is attributable to the contractor, LD shall be imposed on contractor as per GCC clause 2.7.9.

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VOLUME – I A (PART – I): Chapter – IV
Tentative weight Schedule

1.4 Tentative Package Wise Weight Schedule

Tentative weight schedule (New material) / Details have been given below

	Item/ component		**Weight in MT**
1	Turbine		138.2
2	SPHERICAL VALVE		65.3
3	GOVERNING SYSTEM		17.5
4	BUTTERFLY VALVE		15.2
5	LP COMPRESSED AIR SYSTEM		8
6	Cooling Water System		12
7	GENERATOR		310.55
a	Wound Stator Segment	117	
b	Poles + Rim Punching + Spider	92.8	
c	Top Shaft	4	
d	Bottom Shaft	9	
e	Brackets + coolers	56.5	
f	Misc. items	31.25	
8	Control and monitoring system		9
9	110kV Switchyard		210.8
10	STATIC EXCITATION SYSTEM		9
11	Fire protection system		43
12	Transformers- Power , UAT and SST		91
13	220V DC Battery, Battery Chargers, DCDB, Inverter and other panels		25
14	Cables		42
15	Protection system		19
16	illumination, HVAC, earthing		22
17	Drainage and dewatering system		8
18	Spares		30

Note: The above weights of items are tentative only and is liable for variation. These are given for only a general idea to vendor. Payment will be made on the lump sum /unit rate/items-wise accepted by BHEL. No claim of subcontractor shall be entertained in case of mismatch of above weights and actual supplied from MUs.

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VOLUME – I A (PART – I): Chapter – V
Rate Schedule/BOQ

1.5 RATE SCHEDULE/BOQ

KODAYAR HEP (1X70 MW) DISMANTLING, ETC & Material handling work:

1.5.1 Contractor shall fully understand equipment description and scope of work before quoting. The scope of work and responsibility of the contractor as mentioned under these specifications shall be covered within the quoted rates.

1.5.2 The tenderer shall quote the rates as per the rate schedule only. No cutting/ erasing / over writing shall be done.

RATE SCHEDULE CUM BOQ

	ITEM NO	DESCRIPTION OF WORK	QTY	% ALLOCATION ON TOTAL CONTACT VALUE
PART 1 HTG (100 % A)	**1**	TOTAL PRICE FOR ERECTION, TESTING, COMMISSIONING AND HANDING OVER THE ENTIRE WORK OF 1X70 MW KODAYAR HEP. (AS PER SCOPE OF WORK OF THIS TENDER, TOTAL WEIGHT APPROX.:- 1075 MT)	**1 Set**	**72 %**
	2	TOTAL PRICE FOR DISMANTLING OF UNIT. (AS PER SCOPE OF WORK OF THIS TENDER	**1 set**	**9%**
	3 (a)	TOTAL PRICE FOR ENTIRE WORK AS DEFINED IN THIS TENDER SPECIFICATION IN RESPECT OF RECEIPT, UNLOADING, ITS VERIFICATION PROPER STORAGE PRESERVATION OF NEW PLANT MATERIALS AT PROJECT STORE/POWER HOUSE /WORK SITE AND TRANSPORTATION TO POWER HOUSE/WORK SITE FROM STORE & VICE VERSA AND UNLOADING :HANDED OVER FOR ERECTION. (AS PER SCOPE OF	**1075 MT**	**12%**

		WORK OF THIS TENDER, TOTAL WEIGHT APPROX.:- 1075 MT)		
	3(b)	TOTAL PRICE FOR TRANSPORTATION OF OLD DISMANTLED ITEMS INCL. LOADING AT POWER HOUSE/ OTHER WORK SITE, UNLOADING AND STACKING AT DISPOSAL YARD OF CUSTOMER AT A DISTANCE OF APPROX. 3 KM. (AS PER SCOPE OF WORK OF THIS TENDER, TOTAL WEIGHT APPROX.:- 975 MT)	**975 MT**	**7%**

NOTES:

a. In case any activity though specifically not covered in above BOQ/price schedule but the same is covered under scope of work as per contractual specification etc, no extra claim on this account shall be entertained.

b. The quantities indicated in scope of works are indicative and are liable to vary depending upon the site requirement. The contractor has to handle/erect/commission/complete all the items indicated by BHEL for achieving completion of work as per the scope. Total payment made to contractor for items shall be on the basis of actual quantity handled/executed as per certification of BHEL.

VOLUME – I A (PART – I): Chapter – VI
Terms of payment

1.6 TERMS OF PAYMENT

1.6.1 The 'Engineer' will certify regarding the actual work executed in the measurement books and bills, which shall be accepted by the contractor in measurement book.

1.6.2 Contractor shall submit bills for the work completed under the specification, once in a month detailing work done during the month. The format for billing shall be approved by BHEL before raising invoices.

1.6.3 Shortage / damage reports to be submitted on BHEL standard materials management forms. No payment shall be released till the contractor submits these reports and are verified by the Engineer.

1.6.4 PRICE VARIATION COMPENSATION- is applicable for this contract as per clause 2.17 of GCC.

1.6.5 OVERRUN COMPENSATION - is not applicable for this contract.

1.6.6 RETENTION AMOUNT AND PAYMENTS: - Retention amount shall be withheld from each RA bill as per provision of clause 2.22 of GCC regarding retention amount and payments

1.6.7 Subject to any deduction which BHEL may be authorized to make under the contract, the contractor on the certificate of the Engineer at site be entitled for payment as explained hereunder.

1.6.7.1 Interest bearing recoverable advance: Not Applicable.

1.6.7.2 PROGRESSIVE PAYMENT SHALL BE RELEASED ON PRORATA BASIS

PART 1 ITEM 1 OF THE RATE SCHEDULE

90 % of contract rate of item No. 1 of rate schedule shall be payable on pro-rata basis on completion of activities as detailed in Annexure -A (enclosed)

5% percent of the value of the contract price for the works completed will be paid after successful completion of Performance Guarantee Test (PG Test) of complete package and written acceptance of PG test results by TANGEDCO.

The final amount of 5% of the value for the works completed shall be released after closure of Works Contract, after fulfillment of all contractual obligations and after adjusting all dues including LD, based on the Billing Break up for the works completed.

NOTE: Further break-up and/or minor changes in the Annexure A referred above, if required depending upon the site conditions, can be done at site entirely at the discretion of BHEL site.

PART 1 ITEM 2 OF THE RATE SCHEDULE

90 % of contract rate of item No. 1 of rate schedule shall be payable on pro-rata basis on completion of activities as detailed in Annexure -B (enclosed)

5% percent of the value of the contract price for the works completed will be paid after successful completion of Performance Guarantee Test (PG Test) of complete package and written acceptance of PG test results by TANGEDCO.

The final amount of 5% of the value for the works completed shall be released after closure of Works Contract, after fulfillment of all contractual obligations and after adjusting all dues including LD, based on the Billing Break up for the works completed.

NOTE: Further break-up and/or minor changes in the Annexure B referred above, if required depending upon the site conditions, can be done at site entirely at the discretion of BHEL site.

PART 1 ITEM 3 (a) OF THE RATE SCHEDULE

i. 35 % of the rate shall be payable on prorate basis after the materials are safely unloaded by using their (vendor) Cranes, shifted to stores and updating in store material register / store stocks registers as per BHEL practices such as GR/LWB/loading advice/box packing slip subject to furnishing of following information along with the bills as per above clause.

- Proof of claim lodged with Railways/Transporters in respect of shortage/open delivery.
- Material Management forms duly filled/Records generated in stocks (Stock registers and computers) and certified by BHEL Engineer.

ii. 15% of the rate shall be payable on prorata basis after verification, stacking /re-stacking safekeeping, in line with documents and records as per BHEL standards is ensured. Opening of cases/ repacking, wherever necessary (with contractors own T&P and labour).

iii. 20 % of the rate shall be payable on prorate basis after Updation of verification details in material stock registers, submission of reports as per specified formats for shortage/open delivery, lodging of police report if required, documents for insurance claims etc and preparation of material receipt certificates in prescribed formats where ever applicable.

iv. 15% of the rate shall be payable on pro-rata basis on completion of identification of material in ready to lift for issue to BHEL/Erection agency (Power house/Work site area and vice versa) and updation of issue details in stores records.

v. 5% on completion of material reconciliation.

vi. 5% percent of the value of the contract price for the works completed will be paid after successful completion of Performance Guarantee Test (PG Test) of complete package and written acceptance of PG test results by TANGEDCO.

vii. The final amount of 5% of the value for the works completed shall be released after closure of Works Contract, after fulfillment of all contractual obligations and after adjusting all dues including LD, based on the Billing Break up for the works completed.

PART 1 ITEM 3 (b) OF THE RATE SCHEDULE

i. 85 % of the rate shall be payable on prorate basis after the dismantled materials are safely unloaded by using their (vendor) Cranes, shifted to the disposal/ junk yard

ii. 5% on submission of material receipt for dismantled material.

iii. 5% percent of the value of the contract price for the works completed will be paid after successful completion of Performance Guarantee Test (PG Test) of complete package and written acceptance of PG test results by TANGEDCO.

iv. The final amount of 5% of the value for the works completed shall be released after closure of Works Contract, after fulfillment of all contractual obligations and after adjusting all dues including LD, based on the Billing Break up for the works completed.

Note: -

1. If non-availability of EOT Cranes at power house, the contractor shall use his own crane or make alternative arrangement which is acceptable to BHEL site engineer for material handling work.
2. In case the specified activities under all the above categories (i to iv) are not performed, the admissible payment against the performed activities shall be regulated as per the specified break- up only.

1.6.8 GST compliant tax invoice is mandatory for releasing of payment. GST amount shall be released separately on submission of proof as per Cl. TAXES AND OTHER DUTIES. E-Invoice as applicable is mandatory for releasing the payment.

1.6.9 Payment for the first running bill will be released only on production of the following.

i. PF Regn. No.
ii. Labour License No.
iii. Workmen Insurance Policy No.
iv. Wage sheet along with every bill duly certified by the contractor to be submitted.
v. Unqualified Acceptance for Detailed L.O.I.
vi. Initial 50% Security Deposit.
vii. Rs 100 /- Stamp Paper for Preparation of Contract agreement.

1.6.10 Contractor shall submit CHECK LIST TO BE SUBMITTED WITH EACH RUNNING BILL (attached with this tender) with each running bill along with the documents mentioned there.

VOLUME – I A (PART – I): Chapter-VII
Taxes and other Duties

1.7.1 Goods and service Tax (GST) & Cess

1.7.1.1 The successful bidder shall furnish proof of GST registration with GSTN Portal in the State in which the Project is being executed, covering the services under this contract. Registration should also bear endorsement for the premises from where the billing shall be done by the successful bidder on BHEL for this project/ work.

1.7.1.2 Contractor's price/rates shall be exclusive of GST & Cess (if applicable) (herein after termed as GST). Contractor shall submit to BHEL the GST compliant tax invoice/debit note/revised tax invoice on the basis of which BHEL will claim the input tax credit in its return. Since this is a works contract, the applicable rate shall be @ 18% GST, as applicable presently

1.7.1.3 Bidder shall note that the GST Tax Invoice complying with GST Invoice Rules wherein the 'Bill To' details will as below:

BHEL GSTN - 33AAACB4146P2ZL
NAME - BHARAT HEAVY ELECTRICALS LIMITED
BHEL SITE OFFICE,
C/o Superintending Engineer/Tirunelveli Generation Circle,
KODAYAR POWER HOUSE Stage 1,
TIRUNELVELI GENERATION CIRCLE,
KANYAKUMARI, Kanyakumari, Tamil Nadu, 629102

1.7.1.4 GST charged in the tax invoice/debit note/revised tax invoice by the contractor shall be released separately to the contractor only after contractor files the outward supply details in GSTR-1 on GSTN portal and input tax credit of such invoice is matched with corresponding details of outward supply of the contractor and has paid the GST at the time of filing the monthly return.

1.7.1.5 In case BHEL has to incur any liability (like interest / penalty etc.) due to denial/reversal / delay of input tax credit in respect of the invoice submitted by the contractor, for the reasons attributable to the contractor, the same shall be recovered from the contractor.

1.7.1.6 Further, in case BHEL is deprived of the Input tax credit due to any reason attributable to contractor, the same shall not be paid or Recovered if already paid to the contractor.

1.7.1.7 Tax invoice/debit Note/revised tax invoice shall contain all such particulars as prescribed in GST law and comply to the timelines for issue of the same. Invoices shall be submitted on time to the concerned BHEL Engineer In Charge.

1.7.1.8 TDS under GST (if/ as & when applicable) shall be deducted at prevailing rates on gross invoice value from the running bills.

1.7.1.9 E-way bills / Transit passes / Road Permits, if required for materials / T&P etc., bought into the project site is to be arranged by the Contractor only.

1.7.1.10 BHEL shall not reimburse any amounts towards any interest / penalty etc., incurred by contractor. Any additional claim at a later date due to issues such as wrong rates / wrong classification by contractor shall not be paid by BHEL.

1.7.2 All taxes and duty other than GST & Cess
The contractor shall pay all (except the specific exclusion viz GST & Cess) taxes, fees, license charges, deposits, duties, tools, royalty, commissions, Stamp Duties, or other charges / levies, which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract and the same shall not be reimbursed by BHEL. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

1.7.3 Statutory Variations
Statutory variations are applicable under the GST Acts, against production of proof. The changes implemented by the Central / State Government during the tenure of the contract viz. increase / decrease in the rate of taxes, applicability, etc. and its impact on upward revision / downward revision are to be suitably paid/ adjusted from the date of respective variation. The bidder shall give the benefit of downward revision in favour of BHEL. No other variations shall be allowed during the tenure of the contract.

1.7.4 New Taxes/Levies
In case Government imposes any new levy / tax after submission of bid during the tenure of the contract, BHEL shall reimburse the same at actual on submission of documentary proof of payment subject to the satisfaction of BHEL that such new levy / tax is applicable to this contract.

1.7.5 Direct Tax
BHEL shall not be liable towards Income Tax of whatever nature including variations thereof arising out of this contract as well as tax liability of the bidder and their personnel. Deduction of tax at source at the prevailing rates shall be effected by BHEL before release of payment as a statutory obligation, unless exemption certificate is produced by the bidder. TDS certificate will be issued by BHEL as per the provisions of Income Tax Act.

VOLUME – I A (PART – I): Chapter-VIII
Facilities Matrix in the scope of contractor/BHEL

1.8 Facilities Matrix in the scope of contractor/BHEL:

BHEL/TANGEDCO shall provide limited open space for site office and store free of rental charge. It is the responsibility of the contractor to construct temporary sheds for his own use and to dismantle and clear the site after completion of work or as and when required, as a part of his scope of work as per the instructions of BHEL Engineer.

BHEL/TANGEDCO shall provide space for labour colony. Charges for the same if any shall be decided in consultation with BHEL/TANGEDCO. Contractor shall have to build his own colony/ quarters for his workmen/ staff OR can take houses on rental basis in nearby places. Contractor shall be responsible for providing all necessary facilities to staff and workmen like construction of residential accommodation with electricity & water inside the rooms, proper sanitation, transport, medical facilities etc. at his own cost as required under various labour laws and statutory rules and regulations. Electricity & water connection are to be obtained from the statutory body for labour colony & residential purpose. Running charges are to be born- by contractor.

Contractor has to arrange their own DG sets (backup power source), 1 no. of 125 kVA (rating is only indicative, however bidder has to examine the capacity as per requirement) for Power House area for execution of complete scope of work including construction power for power house, switchyard, other work sites, stores and BHEL office etc. within the awarded rates.

The contractor shall have to arrange the water for construction purpose by himself for powerhouse within the awarded rates. Any further distribution will also be the responsibility of the Contractor as a part of his work.

Provision of distribution lines for electric power from the central points/DG sets to the required places of use (like power house & other construction sites, BHEL office, stores etc) with proper distribution boards observing the safety rules laid down by the electrical authorities of the state shall be done by the contractor, supplying all the materials like cables, distribution board, switch boards, TPN, CBS, ELCBS/ MCCBS/ Copper/ Brass clamps, copper conductor, change over switches pipes etc. at his own cost. If any failure is caused in supply of the power and water, it is the responsibility of the contractor to make alternate arrangements at his cost. The contractor shall adjust his working shifts / hours accordingly and deploy additional manpower if necessary so as to achieve the targets.

On the discretion of BHEL site engineer, **Construction power to other BHEL contractors/vendors shall be provided by contractor on chargeable basis. The charge towards electricity consumption by other contractors shall be decided by BHEL site in-charge.** However electricity bill raised by power supplier is to be paid by contractor. The bill may include fixed charges, minimum consumption charges, taxes, duties etc.

No compensation for idle labour or extension of time for completion of work will be given to contractor unless provided for elsewhere in the tender.

Adequate lighting arrangement such as flood lights, hand lamps and area lighting shall be arranged by the contractor at the site of his work areas within finally accepted rates.

On completion of work or as and when required by BHEL, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and levelled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so, the Engineer will get it done and expenses incurred shall be recovered from the contractor along with prevailing overheads. The decision of BHEL Engineer in this regard shall be final.

PART I: ESTABLISHMENT/FACILITY

Sl.No	Description	Scope / to be taken care by		Remarks
		BHEL/ TANGEDCO	Bidder	
1.1.0	**ESTABLISHMENT**			
1.1.1	**FOR CONSTRUCTION PURPOSE:**			
A	Open space for office	Yes		Free of rental charge
B	Open space for storage	Yes		Free of rental charge
C	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
D	Bidder's all office equipment's, office / store / canteen consumables		Yes	
E	Canteenfacilitiesfor the bidder's staff, supervisors and engineers etc.		Yes	
F	Firefighting equipment's like buckets, extinguishers etc.		Yes	
G	Fencing of storage area, office, canteen etc. of the bidder		Yes	
1.1.2	**FOR LIVING PURPOSES OF THE BIDDER**			
A	Open space	Yes		Charges for the same if any shall be decided in consultation with TANGEDCO/BHEL
B	Living accommodation		Yes	
1.2.0	**ELECTRICITY**			

1.2.1	**POWER FOR CONSTRUCTION PURPOSE**			415V (+/- 10%) Power supply at one point shall be made available to the Contractor on chargeable basis for Works only as per availability. The Contractor shall lay cables as per his requirement from this point. Complete network beyond the one point supply (Provided by Employer) as stated above shall be responsibility of Contractor. Although, 415V (+/- 10%) power supply shall be provided by Employer on chargeable basis, however, Contractor shall deploy adequate backup power by DG sets on his own cost so that construction schedule is not hampered on account non-availability of power. Exact location for installation of DG Sets will be decided by the contractor in consultation with the customer, whose decision shall be final and binding on the contractor.
1.2.1.1	Payment of electricity consumption		**Yes**	
1.2.1.2	Maintenance of lighting, distribution boards of power at suitable working areas		**Yes**	
1.2.1.3	Providing of the consumables such as sockets, switches, MCCB, bulbs etc.		**Yes**	
1.2.2	**POWER FOR BHEL STORES**			
1.2.2.1	Responsibilities of obtaining connection		**Yes**	
1.2.2.2	Charges for obtaining connection		**Yes**	

1.2.2.3	Payment of electricity consumption at BHEL Store(s)		**Yes**	Electricity bill raised by power supplier is to be paid by bidder . The bill may include fixed charges, minimum consumption charges, taxes, duties etc
1.2.2.4	Payment of electricity consumption at BHEL Office in BHEL Store(s)	Yes		
1.2.2.5	Maintenance of lighting, distribution boards of power at suitable working areas		**Yes**	
1.2.2.6	Providing of the consumables such as sockets, switches, MCCB, bulbs etc .		**Yes**	
1.2.3	**POWER for the office, stores, etc of the bidder**			
1.2.3.1	Responsibilities of obtaining connection		**Yes**	
1.2.3.2	Charges for obtaining connection		**Yes**	
1.2.3.3	Payment of electricity consumption		**Yes**	
1.2.3.4	Distribution from single point including supply of materials and service		**Yes**	
1.2.3.5	Demobilization of the facilities after completion of works		**Yes**	
1.3.0	**WATER SUPPLY**			
1.3.1	**For construction purposes at Power House:**		**Yes**	
1.3.1.1	Making the water available at single point		**Yes**	
1.3.1.2	Further distribution as per the requirement of work		**Yes**	
1.3.2	**Water supply for bidder's office, stores, etc**		**Yes**	
1.3.2.1	Making the water available at single point		**Yes**	
1.3.2.2	Further distribution as per the requirement of work		**Yes**	

1.3.3	**Water supply for BHEL office, and stores, etc**			
1.3.3.1	Water supply for BHEL office, near power house.		**Yes**	
1.3.3.2	Water availability at BHEL Store		**Yes**	
1.4.0	**LIGHTING/ ILLUMINATION**			
1.4.1	For construction work (supply and execution of all the necessary materials such as lamps, extension boards, hand lamps, cable etc): 1. At construction site 2. At preassembly area 3. At storage area		**Yes**	
1.4.2	Lighting for the living purposes of the bidder at the colony / quarters		**Yes**	
1.5.0	**COMMUNICATION FACILITIES FOR SITE OPERATIONS OF THE BIDDER**		**Yes**	
1.6.0	**COMPRESSED AIR SUPPLY**			
1.6.1	Supply of Compressor and all other equipment's (including pipes, valves, storage systems etc) required for supply of compressed air at site		**Yes**	
1.6.2	Installation of the above system, operation, and maintenance of the same.		**Yes**	
1.6.3	Supply of the all the consumables for the above system during the contract period		**Yes**	

PART II ERECTION FACILITIES

Sl.No	**Description**	**Scope / to be taken care by**		**Remarks**
		BHEL/ TANGEDCO	**Bidder**	
2.1.0	Engineering works for E&M construction	Yes		
	Engineering works for Civil work			

2.1.1	Providing the erection drawings for all the equipment's covered under this scope	Yes		
2.1.2	Drawings for construction Methods	Yes	Yes	In consultation with BHEL
2.1.3	As-built drawings – where ever deviations observed and executed and also based on the decisions taken at site-example – routing of small bore pipes	Yes	Yes	As Built drawing to be prepared by BHEL. Bidder to help BHEL in making as built drawings
2.1.4	Shipping lists etc for reference and planning the activities	Yes		
2.1.5	Preparation of site erection schedules and other input requirements	Yes	Yes	Bidder to prepare in consultation with BHEL
2.1.6	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments	Yes	Yes	To be jointly done on regular basis
2.1.7	Weekly erection schedules based on Sl No 2.1.5		Yes	
2.1.8	Daily erection / work plan based on Sl No 2.1.7		Yes	
2.1.9	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	
2.1.10	Preparation of preassembly bay		Yes	

VOLUME – I A (PART – I): Chapter – IX
T&Ps and MMEs to be deployed by Contractor

A	**TOOL & PLANTS (T&Ps)- INDICATIVE LIST OF T & Ps**		
Sl. No.	**EQUIPMENT**	**Quantity**	**Deployment Period**
1	General purpose Hand tools	As per requirement	As per requirement
2	Drilling Machines 1/4", 1/2", 3/4", 1" & 1.5”	As per requirement	As per requirement
3	Welding Machines	As per requirement	As per requirement
4	Gas cutting set	As per requirement	As per requirement
5	Trucks 50T/ Trucks 20T	As per requirement	As per requirement
6	Lorries /Trailer of adequate capacity	As per requirement	As per requirement
7	Hydra -14T	As per requirement	As per requirement
8	Hydraulic Crane - 55T	As per requirement	As per requirement
9	Torque Wrenches up to 2000 NM.	As per requirement	As per requirement
10	Fork lift – 3T	As per requirement	As per requirement
11	Impact Wrench (Pneumatic) up to 2400 NM	As per requirement	As per requirement
12	Chain pulley block of various capacities (2T, 5T, 10T,20T)	As per requirement	As per requirement
13	Turn Buckle (2T, 5T, 10T etc)	As per requirement	As per requirement
14	Hydraulic / Mechanical Jacks of various capacities (5-10-20-100T)	As per requirement	As per requirement
15	Air Arc Gouging Arrangement	As per requirement	As per requirement
16	Hydraulic pump (hand operated)	As per requirement	As per requirement
17	125 KVA DG set (rating is only indicative, however bidder has to examine the capacity as per site requirement)	As per requirement	As per requirement
18	MIG Welding machine set	As per requirement	As per requirement
19	Winches	As per requirement	As per requirement

20	**Precision tools (S No a-d below) (Quantity & Deployment period) - As per requirement.** a.0.02 accuracy block level / Dumpy level with accessories / Theodolite work station. b. Inside micrometer / Outside micrometer of range -0-25, 25/50, 50-75, 75-100, 100-150. c. Vernier calipers range 150, 300 / Telescopic gauge / Slip gauge / Feeler gauges. d. Dial gauge with magnetic stand.
NOTES	1. The above list is only indicative and these T&Ps may not be required for entire contract period but contractor will ensure that these T & Ps are provided as per need. Contractor will assess actual quantity and period of requirement based on his experience. **Contractor has to mobilize / maintain adequate numbers of T& P for meeting the work schedule as notified by BHEL Engineer.** 2. If any one of T&P mentioned above is not needed for proper execution of scope of work, provided contractor has not utilized BHEL free issued T&P for completing such work, no recovery from contractor shall be applicable. 3. Any additional item required in addition to above mentioned T&P for proper execution of scope of work, contractor has to arrange such T&P within quoted rate on the instruction of BHEL in writing in a reasonable period within two weeks from the written instruction from BHEL.
	4. In case deployment of T&P w.r.t requirement, is delayed or deployed for a shorter period or abnormal down time of T&P or in case T&P w.r.t requirement was not deployed by the contractor as per instruction of BHEL and BHEL had to deploy either its own T&P or from outside, the recovery shall be done from the contractor as under: a. In case BHEL had to deploy its own T&P, hire charges of T&P applicable for outside agencies as per extant guidelines for "Hire Charges on issue of Capital Tools & Plants" shall be recovered. b. In case BHEL had to deploy the T&P from outside, actual hiring cost plus applicable overheads shall be recovered. 5. Other terms and conditions regarding T&Ps / MMEs please also refer clause for T&Ps & MMEs in SCC. 6. All the tools and plants required for this scope of work are to be arranged by the contractor within the quoted rates. The list is suggestive in nature. Any additional T&Ps required to be arranged by the contractor. 7. If work gets delayed due to non-availability of T&Ps, BHEL reserves the right to get the work done at the risk and cost of contractor without prejudice to rights of BHEL as in GCC.

B	MONITORING AND MEASURING EQUIPMENTS (MMEs)- INDICATIVE LIST OF MMEs TO BE PROVIDED BY CONTRACTOR AS PER REQUIRMENT AT SITE		
SL NO	**EQUIPMENT**	**Quantity**	**Deployment Period**
1	General purpose Hand tools-	As per requirement	As per requirement
2	Digital/Analog Multi-meter AC & DC-	As per requirement	As per requirement
3	Megger 0-1000-2000-5000V	As per requirement	As per requirement
4	Primary current injection kit – 1000A	As per requirement	As per requirement
5	Tong Testers DC-30/60/300A, AC-50/100/500/1000A	As per requirement	As per requirement
6	Digital Multimeter 4&half digit	As per requirement	As per requirement
7	Phase sequence indicator 110-450V	As per requirement	As per requirement
8	Frequency meter 0-100 HZ (0-110-230-415 V)	As per requirement	As per requirement
9	Single phase variac 0-220 V, 15A	As per requirement	As per requirement
10	Three phase variac 0-415,25A	As per requirement	As per requirement
11	Digital micro Ohm meter	As per requirement	As per requirement
12	A.C. H.V. Test Kit – 50/60KV	As per requirement	As per requirement
13	Dead weight Tester for calibration of pressure gauge.	As per requirement	As per requirement
14	Precision Thermometer	As per requirement	As per requirement
15	Sound level meter 150 db.	As per requirement	As per requirement
16	Digital Handhold Temperature meter	As per requirement	As per requirement
17	Digital Recorder	As per requirement	As per requirement
18	Total station	As per requirement	As per requirement
19	Auto Level	As per requirement	As per requirement
20	Measuring tape	As per requirement	As per requirement
21	Plumb bobs	As per requirement	As per requirement

Notes:	**1.** The above list is only indicative and these MMEs may not be required for entire contract period but contractor will ensure that these T&Ps are provided as per need. Contractor will assess actual quantity and period of requirement based on his experience. **2.** If any one of T&P mentioned above is not needed for proper execution of scope of work, provided contractor has not utilized BHEL free issued T&P for completing such work, no recovery from contractor shall be applicable. **3.** Any additional item required in addition to above mentioned T&P for proper execution of scope of work, contractor has to arrange such T&P within quoted rate on the instruction of BHEL in writing in a reasonable period within two weeks from the written instruction from BHEL. **4.** In case deployment of T&P w.r.t requirement, is delayed or deployed for a shorter period or abnormal down time of T&P or in case T&P w.r.t requirement was not deployed by the contractor as per instruction of BHEL and BHEL had to deploy either its own T&P or from outside, the recovery shall be done from the contractor as under: 4.1 In case BHEL had to deploy its own T&P, hire charges of T&P applicable for outside agencies as per extant guidelines for "Hire Charges on issue of Capital Tools & Plants" shall be recovered. 4.2 In case BHEL had to deploy the T&P from outside, actual hiring cost plus applicable overheads shall be recovered. **5.** Other terms and conditions regarding T&Ps / MMEs please also refer clause for T&P& MMEs in SCC. **6.** All the MMEs required for this scope of work are to be arranged by the contractor within the quoted rates. The list is suggestive in nature. Any additional MMEs required to be arranged by the contractor. If work gets delayed due to non-availability of MMEs, BHEL reserves the right to get the work done at the risk and cost of contractor without prejudice to rights of BHEL as in GCC.

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LIST OF T&P BEING PROVIDED BY BHEL FOR USE OF CONTRACTOR FREE OF HIRE CHARGES ON SHARING BASIS

S.NO.	EQUIPMENT	CAPACITY	QTY
1.	EOT CRANE (Power House)	135/20 MT	01

NOTE: The above mentioned suitable capacity crane without slings & lifting tackles will be provided by BHEL on sharing basis. The operation and maintenance of cranes shall be the responsibility of contractor. The fuel/power shall be also given by contractor.

1 EOT cranes will be provided by BHEL free of hire charges & on sharing basis for subject work with exclusions as advised. Routine maintenance shall be taken care by the contractor under this scope of work. However, contractor will not be entitled for any compensation due to non-availability of EOT crane.

2 The contractor will have to provide qualified operator adequate in numbers for operating the mobile and EOT cranes round the clock if required or as per requirement.

3 All other terms & conditions shall be as per SCC clause no. 4.2.1 & 4.2.2

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ANNEXURES

ANNEXURE A

BILLING BREAK UP FOR SUB- CONTRACTOR FOR RENOVATION & INSTALLATION WORK OF 1x70 MW KODAYAR HEP

Sl.	**EXISTING FACILITY FOR RENOVATION/**	**UNIT NO. / COMMAN**	**TOTAL % = (F1)**	Total in Rs. = (A1xF1)/ 100
No.	**PACKAGE FOR INSTALLATION/ REFURBISHMENT**	**I (%)**		
1	Generator Stator pre-assembly and HV Test at Service Bay	10%	10.00%	
2	Generator Rotor Pre-assembly And HV test at Service Bay	10%	10.00%	
3	MIV Assembly	3.75%	3.75%	
4	MIV testing and commissioning	1.25%	1.25%	
5	BF valve Assembly	3.75%	3.75%	
6	BF testing and commissioning	1.25%	1.25%	
7	Penstock - assembly of new expansion joints, cleaning and Painting	0.63%	0.63%	
8	Distributor Assembly and testing	8.75%	8.75%	
9	Nozzles assembly & Alignment	3.75%	3.75%	
10	Runner along with Shaft Lowering	1.88%	1.88%	
11	Lowering of Generator Stator	2.50%	2.50%	
12	Lowering of Generator Rotor	2.50%	2.50%	
13	Assembly of Cooling Water System	2.50%	2.50%	
14	Testing and commissioning of Cooling Water system	1.25%	1.25%	
15	Assembly of Governing System	2.50%	2.50%	
16	Testing and commissioning of Governing system	0.63%	0.63%	
17	Assembly of Compressed air system	1.25%	1.25%	
18	Testing and commissioning of Compressed air system	0.63%	0.63%	
19	Levelling, Alignment of Generator and turbine shafts	3.75%	3.75%	
20	Box-up of Unit	2.50%	2.50%	
21	Erection of Main Transformers	6.25%	6.25%	
22	Testing and commissioning of Main Transformers	1.25%	1.25%	
23	Erection of ET (Excitation transformer)	2.50%	2.50%	

24	Testing and commissioning of Excitation transformer	1.25%	1.25%	
25	Erection of UAT (Unit Auxillary transformer)	1.25%	1.25%	
26	Testing and commissioning of Unit Aux transformer	2.50%	2.50%	
27	Erection of SAT (Station transformer)	2.50%	2.50%	
28	Testing and commissioning of Station transformer	1.25%	1.25%	
29	Erection of DAVR	1.25%	1.25%	
30	Testing and commissioning of DAVR	1.25%	1.25%	
31	Erection of Fire protection system for Power House	1.25%	1.25%	
32	Testing and commissioning of Fire protection system for Power House	0.63%	0.63%	
33	Erection of SCADA and protection panels	2.50%	2.50%	
34	Testing and commissioning of SCADA and protection panels	1.25%	1.25%	
35	Erection of Fire fighting system of Generator	0.63%	0.63%	
36	Testing and commissioning of Fire fighting system of Generator	0.63%	0.63%	
37	Erection of 415V Power boards	1.25%	1.25%	
38	Testing and commissioning of 415V Power boards	0.31%	0.31%	
39	Cable Laying and terminations for Unit	2.50%	2.50%	
40	Testing & Commissioning illumination system	0.31%	0.31%	
41	Spinning of the unit	0.63%	0.63%	
42	Synchronisation and loading of the Unit.	1.25%	1.25%	
43	Refurbishment of illumination system	0.59%	0.59%	
GRAND TOTAL FOR RENOVATION & INSTALLATION WORK OF 1 X 70 MW KODAYAR HEP			**100%**	

Note - : A1 = 0.72 x A; Where 'A = Total Lump sum Value Quoted'

ANNEXURE B

BILLING BREAK UP FOR SUB- CONTRACTOR FOR DISMANTLING OF UNIT NO. 1 OF 1x70 MW KODAYAR HEP

Sl. No	**PACKAGE to be DISMANTALED**	**UNIT NO./ COMMAN I (%)**	**TOTAL % = (F2)**	Total in Rs. = (A2xF2)/100
1	Turbine and associated equipment including Turbine shaft, runner, guide bearing incl housing	10%	10.00%	
2	MIV and BF valve incl associated equipments	5%	5.00%	
3	Nozzle servomotors, deflector servomotors assembly	10%	10.00%	
4	Generator and associated equipment including stator, rotor, generator shaft, Thrust bearing, guide bearings, Generator Air Coolers and brackets	15%	15.00%	
5	Excitation System including Pilot Exciter, Main Exciter, Slip rings, Excitation panels etc.	10.00%	10.00%	
6	Cooling water system including, pump- motor sets, pipe, valves, filters, etc	10.00%	10.00%	
7	Power, Control and other cables	15.00%	15.00%	
8	Unit Auxiliary board panels, Control panels, Protection panels	10.00%	10.00%	
9	Governing system incl piping	5.00%	5.00%	
10	Against completion of complete dismantling of the unit	10.00%	10.00%	
GRAND TOTAL FOR DISMANTALING OF UNIT 1 AT 1 X 70 MW KODAYAR HEP			**100%**	

Note : A2 = 0.09xA ; Where 'A = Total Lumpsum Value Quoted'

VOLUME – I A (PART – I): Chapter - XII GENERAL

12.0 GENERAL

BHEL has been awarded the work of Dismantling, Design, Manufacture, Supply, installation, erection, testing & commissioning of **1X70 MW KODAYAR HYDRO ELECTRIC POWER PROJECT.** The scope of work under the contract shall include Dismantling, renovation & repairs including capital repairs, transportation, material handling, loading, unloading storage & preservation, erection, testing, commissioning & Performance Guarantee Tests under Renovation & Modernization with New TG of the Unit NO. 1 and its associated facilities of Kodayar hydroelectric project.

12.1 SCOPE OF WORK

A. Receiving and Unloading of consignments from the Trucks/Trailers arriving from BHEL manufacturing units and its suppliers/vendors.
B. Proper Stacking and Preservations of all the material.
C. Keeping records and status of all materials as per BHEL practices. Verification of all the material received by contractor. Prepare shortages/damaged reports, if any.
D. Transportation of materials from site stores to the powerhouse service bay or the pre assembly area as per site requirement and the instructions of site engineer.
E. Construction of temporary shelters on some of the special items as per the instruction of the site engineer.
F. Unloading and stacking of certain items in the service bay / work area with the help of EOT cranes / loading arrangement as per the instruction of BHEL engineer.
G. Proper Housekeeping and safe working.
H. Handing over of all the spares to customer at their stores.
I. Handling and Transportation of scrap from power house to TANGEDCO stores / scrap yard as per the instructions of BHEL engineer.
J. Re-conciliation of materials with BHEL and TANGEDCO.
K. Dismantling, Erection, Testing, Commissioning and handing over as per BHEL drawing, contract specifications and as per the instructions of the BHEL engineer.

The materials will be supplied from our manufacturing units located all over the country as well as our vendors located both inland and overseas. The scope of work under this tender consists of taking delivery of the materials from transporters,

unloading, shifting to their designated locations, verification & stacking etc. The delivery of these materials will mostly be inside the project campus by road transport. However, delivery of some items may also have to be taken from Godowns of transporters.

The contractor has to handle whatever actual materials are dispatched for the project irrespective of any variations and payments shall be released for the actual gross tonnage handled for material handling purposes.

Though most of the material is being planned to be made available at site well in time for erection requiring proper handling, verification and storage. However certain items may be delayed, requiring direct delivery at site for erection. In such cases contractor has to unload the material directly in powerhouse/ work place and verification to be carried out. Contractor for subject work will be eligible for payment as per the rate schedule. Besides above BHEL at its discretion may get the material handling/ unloading done at any location in the premises of powerhouse, store depending upon availability of space in powerhouse/ stores.

12.2 Tenderer may note that as the place of work is inside the POWER PROJECT and the premises is being manned by Security/Safety Force of TANGEDCO, all necessary system related to entry of men, vehicle & material, safety & security systems, work permit system etc. as applicable will have to be followed by the contractor

VOLUME – I A (PART – I): Chapter – XIII
Preliminary & Civil Works

13.0 **Preliminary & Civil Works**

13.1 The contractor shall as a first field activity check all the foundations for the correctness of the same as per the drawings and satisfy himself in all respects such as location of foundations, absence of voids, levels, correctness of bolt holes, pocket levels, centre lines etc. and all measurements should be recorded and submitted to engineer for approval before erection.

13.2 Before starting erection job, contractor shall ensure that area connected to his scope of work is sufficiently enclosed against ingress of dust and water and all debris have been cleared of from the floor to a designated area as per instruction of engineer. The contractor shall arrange to get the working area and surroundings cleared daily to ensure the dust free atmosphere for working and shall maintain sufficient labour for general cleaning of work areas. Delay of work on this account will not be acceptable.

13.3 The contractor shall cover all opening on floor and put temporary hand railing on all sides of the floor to avoid any accident to the working personnel.

13.4 Contractor shall fix up and maintain plates, supports for X & Y axis and elevation at different locations as required for each unit and **transfer the same from bench mark and XY axis given at one point by BHEL's client.** Joint protocol records for such benchmarks shall be got signed from BHEL's Engineer/TANGEDCO's Supervisory and QA Engineer.

13.5 Once X-Y axis and elevation are fixed at different floors and protected, marking for other equipment's shall be transferred from these and joint protocol as above shall be got signed for each equipment or as required as per drawings.

13.6 All matching surfaces of components shall be well cleaned with cleaning agent and burrs shall be removed by filling and blue matched. Wherever necessary sealing/lubricating/anti-sieze compounds shall be applied as per recommendation of Engineer. Machining/grinding required for fitting of keys, pins, packers, dowels etc. shall be carried out by contractor.

13.7 The accuracy of all equipment/ instruments and its functioning shall be established before they are permitted for use on the job. If the Engineer doubts the accuracy of the precision tools, at any time during erection, the contractor shall arrange the checking of tools/ equipment/ instruments at his cost.

13.8 All the works shall be performed to the lines, grades and elevations indicated on the drawings. The contractor shall be responsible to locate and layout

the works. The horizontal & vertical control points established by the engineer shall be used as datum for the works under this contract. Any work done without being properly located may be removed and dismantled by the Engineer at the contractor's expenses if the contractor refuses to do it.

13.9 The contractor shall create all the facility at storage site as per the tender scope of work for unloading the equipment, its safekeeping and proper record and well protected. No material should be lying loose any where in the power house as well as in stores.

13.10 De-watering of the areas/ floors in general will be carried out by TANGEDCO. However, contractor has to take care of general cleanliness in his area of work. For area cleaning within the premises of his work, the cleanliness shall be the total responsibility of contractor. Contractor within his scope of work shall keep the separate gang of workers for cleanliness operations. If the area under the scope is found unclean, BHEL can take measures on its own for cleaning and deduct the amount so spent from the running bills of contractor.

13.11 Necessary civil works during Erection of unit shall be done by Contractor. The dimensions & locations shall be checked by the contractor for its correctness as per drawings. Further, top elevation and axis/ centrelines of all the foundations shall be checked with respect to benchmark etc. During the civil works, contractor shall check for all the block-outs, dimensions as required in its various mechanical drawings for installation of components/ assemblies and help BHEL wherever required for checking. All adjustments of foundation level, dressing and chipping of foundation surfaces, enlarging the pockets in foundations etc., and repair of same as may be required for the erection of equipment shall be carried out by the contractor.

13.12 Besides above, any works required for safe and efficient operation of tools and tackles like grouting/ excavation/ casting of foundation/ anchor points for derricks, winches, guy ropes fastening scaffoldings etc. or any other temporary supports shall also be the contractor's responsibility. For these works all materials including cement/ steel and required facilities will have to be arranged by contractor at his own cost.

13.13 While on the job, care is essential to avoid too much chipping and resultant lowering of level. In case of excess chipping, contractor has to arrange additional packing plates as per requirements provided BHEL Engineer allows it. When required as per drawings/ manufacturing unit, the embedded sole plates shall be scraped and checked with Prussian blue to get the required contact with frames at no extra cost to BHEL.

13.14 The contractor shall ensure perfect matching of packer plates including scraping and blue matching with foundation by dressing the foundation, as well as perfect matching between the packer plates and the base plate of equipment to the satisfaction of BHEL Engineer.

13.15 The contractor shall provide his T&P stores for special tools and instruments at a convenient place near to the working area.

13.16 All mechanical works of machine related to civil works including foundations, grouting, concreting, erection of chequered plates along with embedment in concrete, grouting of liners, any civil works relating to setting of anchor bolts and foundation bolts including preparation of bolt holes will be in the scope of contractor.

13.17 Storage area open shall be made available by TANGEDCO for storage of new items/ equipment at a distance of about 3 Km from Power House building. BHEL will construct closed stores at one location. This area shall be used for storage of further plant material received from various manufacturing units of BHEL. BHEL shall be providing the General Security arrangement at stores and powerhouse. However, responsibility of security (watch and ward) arrangement of plant material/equipment during handling, in stores of BHEL, in stores of contractor, in power house, in valve house and all plant and equipment's whether erected/ yet to be erected shall lie with the contractor.

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VOLUME – I A (PART – I): Chapter-XIV
Material Management at Stores & Power House

14.0 Materials Management at Stores & Power House

14.1 The scope of work mainly involves receipt, unloading from road carriers(Trucks/Trailers etc) of total materials for unit no.1 of 1 x 70 MW Kodayar RMU Power Station at site or bringing from road carrier godowns to site stores/ storage yards and shifting from place of unloading to actual storage area (stores developed by BHEL), proper storing, stacking/ restacking of materials/ equipment (in closed store sheds/ open storage yards/ project site), verification of components including opening of cases, re-packing/ stacking and preservation of the same after verification including liasioning with carrier for waiver/ reduction of demurrage, security arrangement of plant material/equipment shall lie with the contractor. Firefighting equipments including fire extinguishers is to be provided in closed, open storage yard and power house. Scope also includes transportation of materials to erection site as and when required, transportation of old and dismantled item to customer disposal yard. The contractor is to use Cranes and trucks/trailers (arranged by contractor) for the above work. Any other T&P required for transportation and material handling shall be arranged by the contractor.

The contractor shall maintain record of material such as receipts, issue, return, in Day – Book, ledgers, stock registers and computers, issue gate passes, record of shortages & MDR etc as per BHEL procedures and instructions. The contractor shall also assist BHEL for all correspondence regarding the insurance including preparation of claims.

14.2 The tentative weight of total new materials and dismantled material to be handled for unit as indicated in Chapter-IV, Part-I of TCC is of the order of 2000 MT. However, the contractor required handling whatever actual materials are dispatched for the project irrespective of variations in weight and dimensions. Refer Chapter II, Part –I of TCC. The bidders are required to take note of above points while quoting.

14.3 Chapter-IV, Part-I of TCC gives the general idea for tender's information about the weights and quantity of some major components/ equipment which are to be supplied by various BHEL manufacturing units. The weights and quantities shown are approximate and are liable to vary. No increase in quoted/ accepted rates/ prices should be allowed due to change in weights and dimensions of the equipment/ materials.

14.4 The contractor shall deploy adequate number of supervisors, storekeepers, riggers, carpenter, fitters and other skilled and unskilled workers as per requirement having adequate experience of jobs of similar nature till completion of work.

14.5 Contractor shall provide all necessary preservatives, paints, thinners, rust preventives, grease, lubricants etc. for preservation of components. All tools and tackles and other consumables required for the contractor at his own cost shall also provide preservation of components including supervision. Preservation of components also includes applying preservatives, paints, rust preventives, greasing of threaded portions, repainting of work order Nos./ DU nos./component codes etc. After preservation wherever necessary, components will be stacked properly as per original stacking for which no additional payment shall be made.

14.6 It shall be the responsibility of the contractor to keep in touch with Engineer at site and find out arrival of road consignments. The Contractor shall collect all the lorry waybills from BHEL site office either personally or through an authorised representative. The TANGEDCO or his authorized representative shall, for the purpose, visit the said office every day and collect available LWB, PWB etc. While collecting the LWB, PWB contractor or his authorized representative will sign the register maintained for the purpose indicating the date and time of collection. The contractor shall keep in touch with carriers and arrange to effect delivery of consignments immediately on its receipts. Delay may cause deterioration of goods apart from attracting demurrage charges. Contractor shall also maintain a register indicating date of LWB, PWB date of collection of the materials from road transport agencies/ lorries and date of stacking them at storage yard of BHEL.

14.7 The contractor is required to find out and follow up regularly with carriers regarding arrival of consignments even prior to the receipt of GR, if any, and take delivery of the same on 'INDEMNITY BOND'. Indemnity bonds would be executed by BHEL when the Contractor furnishes intimation regarding arrival of consignment.

14.8 It is possible that in certain cases, LWBs, PWB may not be received in time but BHEL may receive Photostat copies of the same, it is, therefore, the responsibility of contractor to collect such Photostat copies while furnishing indemnity bond from BHEL authorities at site.

14.9 Payment of all demurrages/ wharfages that results due to contractor's faults would be the responsibility of contractor and to his account. If BHEL have to make payment of demurrage/ wharfage together with freight, the amount so paid as demurrage/ wharfage for the reasons stated above shall be paid by the contractor forthwith or would be recovered from bills of the contractor.

14.10 In any case contractor will pursue with concerned Carrier authorities at all level (local/ HQ etc) for waiver/ reduction to the minimum of such demurrage /wharfage charges. Whenever such demurrages/ wharfages become payable due to reasons not attributable to contractor, contractor will immediately bring it to the notice of BHEL with specific request to bear such charges. The decision of the Engineer in such case will be final and binding on the contractor.

14.11 The contractor has to ensure the unloading and removal of materials from unloading place within the permitted time and ensure to keep the area free and avoid jamming. Any loss to BHEL on this account shall be recovered from the contractor.

14.12 Any discrepancy/ shortage/ damage found in the consignment after taking delivery from the carriers after giving clear receipt would be the responsibility of the contractor and the amount liable to be lost by BHEL on such accounts is recoverable from the contractor.

14.13 In case of apparent damages/ shortages in consignments/ packing noticed by the contractor, such cases shall be brought to the notice of BHEL and cleared only with their consent/ approval. The contractor shall provide all the necessary assistance to BHEL for lodging the insurance claim and all correspondence with the insurer, surveyor and transport agency. The contractor shall also help in maintaining all the records in connection of insurance claims.

14.14 It would be responsibility of the contractor to examine the packages, consignments etc. on arrival and bring to the notice of carriers and BHEL authorities regarding loss/ damages, if any, observed in the consignments proposed to be taken delivery of.

14.15 Before taking delivery, particularly of consignments in 'smalls' the weight of the package shall be checked with the invoiced weight of the packages and any discrepancy shall be reported immediately to BHEL/ carriers. In all case of loss/ damages the contractor will take open delivery from the carriers and forward such open delivery certificates (ODC) to the engineer within 15 days of receipt of such consignment. All expenses connected there with shall be to the account of contractor. BHEL reserves right to claim losses, if any, accrued to BHEL in the event of contractor non-compliance to above.

14.16 In case of short delivery and non-delivery, immediate notice of loss shall be filed with the carrier at places of dispatch and destination as also at any intermediate stations, if it is different one, under intimation to BHEL authorities at site.

14.17 BHEL reserves the right to recover from the contractor any loss which arises out of undue delay/ discrepancy/ shortage/ damages or any other cause during transit between the carriers godown/ weigh bridges and BHEL storage yard/ store sheds/ project site or during unloading at carrier godown/ storage yard/ store shed/ project site or during stacking or any time during the custody of contractor. This is applicable for optional items.

14.18 Unloading from lorries, transportation, unloading at storage area/ work site of heavy sophisticated equipment like stator, panels etc. shall be done in the presence of and as per the directions of BHEL representative, including stacking and re-stacking, if necessity arises.

14.19 Certain packages are likely to be received by BHEL by passenger bus. The relevant waybills will also be handed over to the contractor for clearing the from the Bus station. It is the responsibility of the contractor to clear the same at the bus station, transport and hand over to BHEL authorities at site under the scope of the contract. All the tender provisions indicated in the tender shall be applicable in this case also.

14.20 Since the trucks/ trailers are expected to arrive during any time of the day/ night, the contractor shall have his workmen round the clock at site as well as other places as required to unload the materials.

14.21 Consignments coming on Sundays and Holidays are also required to be handled by the contractor promptly. It will be the responsibility of the contractor to contact the site engineer /authorized representative of BHEL at their residence, if required, and obtain instructions to make suitable arrangements.

14.22 In the event unloading from the carrier is delayed by the contractor, the detention charges, if any, will be contractors account.

14.23 Under the scope of this contract, it shall be the responsibility of the contractor to provide all necessary facilities to open the packages in the presence of the engineer, verifying the contents of the packages, repackaging where ever and whenever necessary, properly stacking them as may be directed by the engineer so as to facilitate proper handling, periodical verification of material, receipt position, stock taking etc. for this, the contractor shall have experienced person at site who can maintain the records of dispatch/ receipt/ stacking/ verification/ shortages/ damage/ missing items etc. The verification of materials shall be carried out with in 15 days and report shall be submitted as a documentary proof.

14.24 All material shall be stored 6 inches above ground level by use of concrete or wooden sleepers. No material shall be left to remain on ground at any time. Material shall not be stacked in low-lying areas where it is likely flooded during rains. Wooden sleepers/ concrete block and tarpaulins for this purpose, wherever deemed necessary be arranged by the contractor. These items shall be stacked/ stored properly at the location(s) specified by BHEL when not in use.

14.25 The material/ equipment requiring indoor storage will be handed and stacked inside the storage shed (provided by BHEL) by the contractor using material handling equipment like Hydra crane, Fork lift etc.

14.26 For checking/ verification of the components with packing slips/ LWB/ PWB etc. The contractor shall provide sufficient experience persons and other facilities as and when required by the engineer.

14.27 Stacking of the material shall be done as per the instruction and to the satisfaction of engineer. The materials shall be so stacked that the same should facilitate easy handling. In the event of any improper stacking BHEL

may ask the contractor to restock the material properly or failing which BHEL may get the job done by another agency at the risk and cost of the contractor.

14.28 The contractor shall execute the work in the most substantial and workman like manner. The stores shall be handled with care and diligence. Any loss to BHEL due to contractor's lapse /negligence shall have to be made good by the contractor.

14.29 In case contractor is not able to unload, transport, stack the material at a predetermined area, as per direction of the engineer for any reason whatsoever (including non-availability of crane, tractor, trailer and other T&P etc.) BHEL shall be at liberty to get the work done by engaging other agency/ equipment / T&P etc at the risk and cost of the contractor.

14.30 It shall be responsibility of the contractor to keep the storage areas (closed/ open) in neat and tidy conditions. Any vegetation like grass, bushes, sarkandas etc. shall be cut in open storage area and removed as per requirement and instruction of BHEL engineer within the contractual value. All surplus/ unusable packing materials shall be removed and deposited at location(s) specified by BHEL within the project premises (including weighment of the same within the project premises if required).

14.31 Normally the consignments from BHEL manufacturing units/ their sub-suppliers are sent on freight paid basis. In case any consignment is received at any place or freight to pay basis, it will be the responsibility of the contractor to pay the freight and take delivery of such consignments. The amount of freight paid by the contractor at any point of time in such cases will be limited to Rs.5000/-. However, the freight paid by the contractor will be reimbursed by BHEL within a week's time on production of relevant receipt. In case of freight amounts exceed Rs.5000/- contractor may request BHEL well in time to issue cheque/ Draft for such additional amounts in favour of carriers towards freight charges. Receipt of payment and proof of taking delivery of cheque/ drafts as above shall not in any case be taken as a cause of delay in taking delivery of consignment resulting in wharfage / demurrage leviable by carriers.

14.32 In case some materials are required to be dispatched from Site to Manufacturing Units, other sites or any other place, the contractor may be asked by the engineer to get the same packed, loading into carriers godown and get the same booked. The contractor are therefore, requested to quote his rate for this work in rate schedule. In case of material required to be booked as freight paid the freight for the consignment limited to Rs. 3000/- shall be paid by the contractor. However it shall be reimbursed by BHEL on submission of receipt within a week's time. The funds for freight charges exceeding Rs. 3000/- shall be arranged by BHEL. Packing material required shall be provided by BHEL free of cost.

14.33 In case of consignment to be dispatched on full truck/ trailer load basis, where the carriers will place his fleet inside the plant for loading the

contractor may be asked to collect them from different locations of stores shed / yard and load by using his crane and labour. Tenderers are required to quote rates for the work in rate schedule.

14.34 For any exigencies during execution of the contract, the contractor shall have to depute his personnel for collection/ delivery of any material meant for site from/ to outstation if desired and instructed by the Engineer. The contractor will however be reimbursed expenses incurred for such work for person deputed, as below:

a. 2nd class train fare worth reservation / supplementary charges/ bus fare subject to furnishing details regarding ticket nos., journey details, amount of fare etc.

b. Local conveyance charges (Actual bus/ cycle rickshaw/ auto rickshaw fare for local journeys at outstation) as permitted by the Engineer.

c. Daily allowances @ Rs.100/- per day and @ Rs.250/- per day for lodging.

d. Postal/ telegraph/ telephone charges if any subject to production of proof of having incurred such expenditure.

e. Freight and other charges, if any, paid on production of actual receipts.

f. Payment for the above will be made by BHEL within a month from the date of submission of bill along with details/ desired documents by the contractor subject to completion of work assigned to contractor's personnel and to the entire satisfaction of engineer.

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VOLUME – I A (PART – I): Chapter – XV
Materials Handling and Storage & Transportation to Power House

15.0 Material Handling and Storage & Transportation to Power House

15.1 Contractor shall plan in consultation with BHEL engineer, plant/ material to be received/ delivered in powerhouse as per erection progress/ schedules and fill in the requisite formats in standard forms.

15.2 Responsibility of security arrangement shall lie with the contractor. In case any equipment/ material is lost/damaged while in the custody of the contractor, the cost of repair/ replacement if any to bring back the equipment in original order shall be deducted from the contractor's bill. BHEL's decision in this regard shall be final and binding on the contractor.

15.3 All electrical panels, control gear, motors and such other devices shall be dried by heating before they are installed and energized. Exposed parts those required special protection such as bearings, slip rings, commutators and other fragile items shall be protected against moisture ingress and corrosion during storage and are periodically inspected.

15.4 Contractor shall also ensure that lifting heavy equipment such as generator rotor, stator, Main inlet valve, shafts etc. shall be done strictly in accordance with drawing given for the purpose and using of lifting tackles supplied for the purpose. Wherever required rubber/ leather pads shall be given between the slings and the machined parts to avoid any damages, scratches to the machined surface. Contractor shall cover bearing journals with grease and cloth as per direction of engineer to avoid damages to the surface.

15.5 As per the erection requirement contractor shall deliver material to powerhouse/ work site. The maximum care has to be taken during that time of loading the material at storage area, transportation and unloading at powerhouse. No untoward damage should occur to the material at that time. Any loss of item/ damages shall be to the contractors account.

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VOLUME – I A (PART – I): Chapter – XVI
Preservation of Components

16.0 Preservation of Components

16.1 Contractor has to store all items in closed storage shed which require indoor storage not limited to bolts, pins, packing, tools, insulation materials, electrical parts with electrical devices attached, electric motors, electronic Panels, excitation equipment, automation equipment and associated equipment/consumables, instruments, welding material and equipment, all small parts and all parts of the plant which already have been finally painted etc. Partition required inside the closed storage shed for proper storage of items, shall be done by contractor.

16.2 In addition to the above, preservation of the other component shall be done as per Clause 6.2 of SCC.

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VOLUME – I A (PART – I): Chapter – XVII
Cleaning of Equipments

17.0 Cleaning of Equipment's

17.1 The contractor shall thoroughly clean all the components before installation of the components whose surfaces are coated with protective coating and sent to site are to be thoroughly cleaned by suitable mechanical/ chemical means as per the approved procedure.

17.2 Contractor shall ensure that the items identified by BHEL shall be cleaned with kerosene/ petrol/ CRC before assembly and erection of the equipment. For cleaning purposes he shall use only soft cotton cloth. Contractor shall avoid use cotton waste for cleaning any equipment. The electrical equipment before erection shall be cleaned with dry air/ vacuum cleaner.

17.3 The contractor shall clean inside of all pipes and fittings from dirt, sand and loose scales, mechanically/ chemically and by air blowing before being erected. All pipe lines be thoroughly blown/ flushed. If necessary certain pipelines may have to be cleaned by acid pickling/ chemical cleaning. The procedure for the same shall be provided by BHEL. All chemicals and inhibitors shall be arranged by the contractor with in the contract. Disposal of chemical has to be carried out by the contractor at his own cost.

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VOLUME – I A (PART – I): Chapter-XVIII
Erection

18.0 **ERECTION**

18.1 All works such as cleaning, checking, levelling, blue matching, aligning, assembling, temporary erection for alignment / dismantling of certain equipment for checking, cleaning, surface preparation, fabrication at site, cutting, grinding, straightening, chamfering, filing, chipping, drilling, reaming, dowelling, scrapping, machining, surface grinding, shaping, fitting up welding, tube expansion etc. as may be applicable in such erection works are to be treated as incidental to erection and necessary to complete the work satisfactorily & shall be carried out by the contractor as part of the work.

18.2 Any fixtures, scaffolding materials, approach ladder, concrete block supports, steel structures required for temporary supporting, pre-assembly or checking, welding, lifting and handling during pre- assembly and erection shall be arranged by contractor at his cost within the finally accepted rates.

18.3 No members of the ladder/ structure/ platform should be cut without specific approval of BHEL. In case it is necessary to cut, the contractor shall rectify/ repair in a manner acceptable to BHEL/ customer without any additional cost.

18.4 The contractor shall erect scaffolding/ temporary platforms for erection. These should be of adequate capacity and shall never be over loaded. These should be replaced when not found suitable during erection work and dismantled on work completion & removed from work site.

18.5 Corrections like straightening of ladders, tube support plates adjustment/ removal of ovulates in pipes and opening or closing the fabricated bends of piping to suit the layout shall be considered part of the work and the contractor is required to carry out such work within finally accepted price/ rate as per instructions of Engineer.

18.6 The contractor shall fabricate pipes, special bends, etc. threading and welding as required and carry out the chemical cleaning of fabricated piping.

18.7 The servicing and realignment of skid-mounted equipment if required or if directed by BHEL shall be carried out by the contractor at no extra cost to BHEL.

18.8 The contractor shall completely erect & test all the piping systems, covered in the specification including sampling lines up to and including sample coolers, hangers & supports, valves & accessories in accordance with the drawings furnished. This includes all necessary bolting, welding, pre-

heating, stress relieving, testing, cleaning & painting. System shall be demonstrated in condition to operate continuously in a manner acceptable to the Engineer. Welding shall be used throughout for joining pipes except where flanged screwed or other type joints are specified or shown on the drawings. All piping shall be erected true to the lines & elevation as indicated in the drawings.

18.9 Pipes sent in standard length shall be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths. Bends shall be prepared and/or fabricated at site.

18.10 The contractor shall ensure lowering of pipes in position with adequate precautions as to avoid any damage to either material or men. Only the anchoring points earmarked for the purpose of lowering the pipes are to be used.

18.11 Certain adjustments in length may be necessary while erecting pipelines. The contractor should remove the extra lengths/ add extra lengths to suit the final layout after preparing edges a fresh by adopting specified heat treatment procedures, at no extra cost.

18.12 It is possible that a few flanges may not be matching. The contractor shall be required to cut and re-weld the same as and when required without any additional cost.

18.13 The contractor shall be responsible for any modifications of shop fabricated pipes prior to installation to accommodate minor site alteration in pipe which may include cutting/re welding of flanges/pipes for change of angles of bend or length adjustment at no extra cost.

18.14 All vents and drains for piping equipment covered in the scope whether shown in the drawings or not shall terminate in atmosphere and to pit as directed by BHEL.

18.15 Wherever piping erected by the contractor is connected to equipment/ piping erected by the other agencies the joint at the connecting point shall be the responsibility of the contractor of this specification.

18.16 Normally the valves will have prepared edges for welding. But, if it becomes necessary, the contractor will prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes within quoted price. All fittings like `T' pieces, weld neck flanges, reducers etc., shall be suitably matched with pipes for welding. The valves will have to be checked, cleaned or overhauled in full or in part before erection after chemical cleaning and during commissioning.

18.17 The contractor shall be responsible for correct orientation of all valves so that seats, stems & hand wheels will be in desired location. It is the responsibility of the contractor to obtain the information regarding

orientation of valves not fully located on drawings before the same are installed.

18.18 Suspension for piping, etc., will be supplied in running lengths, which shall be cut to suitable sizes and adjusted as required.

18.19 The adjustment of all supports erected for maintaining the proper slopes of piping wherever required is also included in the scope of the contractor.

18.20 No temporary supports should be welded on the piping. In case of absolute necessity prior approval should be taken from BHEL Engineer. In such cases heat treatment if required, shall be carried out by the contractor as part of subject work.

18.21 All supports and anchors shall be installed as per drawing to obtain safe and reliable and complete pipe installation as per instructions of Engineer. Any additional support as called for by Engineer shall have to be fabricated and provided by the contractor. The raw materials required for fabricating such supports shall be arranged by BHEL.

18.22 Contractor shall install piping in such a way that no excessive or destructive expansion forces exist under any condition.

18.23 The contractor shall carry out the tightening of the field bolts on the equipment and piping covered under this specification by using either the calibrated torque wrench method or the turn of part method. The methods used, the tools and the equipment deployed shall be subject to the approval of Engineer. All the torque wrenches shall be calibrated at the start of each day's work and at least once during the day. The bolting work shall be carried out by the competent technicians.

18.24 The contractor shall ensure that all supporting elements, anchors & restraint have been installed and adjusted in accordance with the drawings / sketches & other written instructions of the Engineer.

18.25 Layout of small bore piping as required shall be done as per site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. There is a possibility of slight change in routing the above pipe lines even after completion of erection or from aesthetic point of view which should be carried out at no extra cost.

18.26 All the valves, including motorized valves, flap valves, etc. shall be serviced and lubricated to the satisfaction of Engineer before erecting the same and during pre-commissioning also. Welding or jointing of extension spindle for valves to suit the site conditions and operational facility shall be part of erection work within the quoted rates.

18.27 Additional platforms and ladders of permanent nature incidental to the job for approaching different equipment/ valves as per site requirement, which may not be indicated in drawings, shall be fabricated and installed by the

contractor. The materials required will be supplied by BHEL free of cost. Erection and welding of necessary instrumentation tapping points, valves to be provided on equipment, auxiliaries and pipe lines covered within the scope of this specification, will also be the responsibility of the contractor and will be done as per the instructions of BHEL Engineer at no extra cost.

18.28 All the items will be supplied in pieces/ loose and are to be assembled bolted and welded at site. Contractor has to work as per the drawings and instruction issued at site for erection and testing purposes. Weights for handling and erection are indicative only. No claim will be entertained on account of variations in weights or change from conventional design e.g. from bolted to welded connections and vice versa, increase in number of pieces etc. The bidders should take care of this point while quoting lump sum price for subject works for handling and erection works. It may be possible that during routing /laying of pipelines, cable trays, HVAC ducts etc. may foul with each other, the contractor has to re-route (Minor) the above as per the decision of BHEL without any financial implication to BHEL.

18.29 In view of the tight erection schedule, limited area in service bay and rotor assembly being in critical path, whatever pre-erection preparatory works can be carried out in BHEL store area shall have to be planned accordingly. In particular, the cleaning, de-burring, de-greasing and segregation of rim punching by weight shall definitely be planned and carried out in store area.

Since the unit shall have to be erected/ commissioned in schedule time the contractor shall have to complete the rotor assembly in the service bay by working round the clock in this area. Moreover, two-shift working shall have to be adopted by the contractor to meet the erection schedule.

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VOLUME – I A (PART – I): Chapter-XIX
Welding & NDT

19.0 WELDING, HEAT TREATMENT, ULTRASONIC AND OTHER NON-DESTRUCTIVE TESTING

19.1 The equipment and piping shall be erected in conformity with the provisions of standard/ specification and as may be directed by BHEL The method of welding (arc, gas, TIG, MIG or other method) may be indicated in the detailed drawings/ schedules. BHEL Engineer will have the option of changing the method of welding as per site requirements.

19.2 Welding being a special process, all-welding shall be carried out by skilled and experienced welders holding valid certificates as per requirements of ISO 9002. The certificate shall be checked by BHEL before allowing the welders to be engaged on welding. BHEL at its own discretion may ask any or all welders to undergo welder Qualification Test as per Standard Procedure in accordance with requirements of ISO 9002 and as per welding manual of BHEL. The deployment of qualified welder and subsequent site testing of requisite numbers of welders shall be one of the prerequisite of contractor's site mobilization completion.

19.3 All welders including tack welder, structural and pipe welder shall be tested as per ASME section IX and approved by BHEL Engineer before they are actually engaged on work though they may possess the certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor in Performa given by BHEL Engineer shall maintain the records of qualification of welders. All the welders qualified for the work will be issued an identity card by BHEL Engineer and welder will keep the same with him at work place.

19.4 BHEL Engineer may stop any welder from the work if his performance is unsatisfactory for any technical reason or if there is a high percentage of rejection of joints welded by a particular welder which, in the opinion of the Engineer will adversely affect the quality of the welding though the welder has earlier passed the tests prescribed by Engineer. The welder's having passed qualification tests does not absolve contractor of contractual obligation to continuously check the welder's performance.

19.5 Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor's expenses including cost of materials. The Engineer prior to any repair being made shall approve the procedure for the repair of defective welds. Ultrasonic or any other NDT on completed field welds shall be conducted as per drawings or instructions of BHEL engineer.

19.6 The contractor shall carry out the root run welding of all piping, valves, instrumentation, tapping points etc. by TIG/ SMAW / MIG welding process. The contractor shall have to carry out full TIG welding of butt weld joints of tubes /pipes of lesser thickness if required. During the root runs of

stainless steel joints, the contractor shall before and during welding have to purge the pipes with inert gas in case of stainless steel. All arrangements required for the above shall be the responsibility of the contractor at no additional cost.

19.7 All charges for testing of contractor's welders including consumables for welding / destructive and nondestructive tests conducted by BHEL at site or at laboratory shall have to be borne by the contractor only. The test coupons raw material will be supplied by BHEL free of cost.

19.8 The regulators used on welding machines shall be calibrated before putting these into use for work. Periodic calibration for the same shall also be arranged by the Contractor at his cost.

19.9 Only BHEL/TANGEDCO approved electrodes and filler wire will be used. All electrodes shall be baked and dried in the electric electrode-drying oven to the required temperature for the period specified by the Engineer before these are used in erection work. All welders shall have electrodes drying portable oven at the work spot. The electrodes brought to the site will have valid manufacturing test certificate. The test certificate will have co-relation with the lot No. /batch No given on electrode packets. No electrodes will be allowed to be used in the absence of above requirement. The thermostat and thermometer of electrode drying oven will be also calibrated and test certificate from Govt. approved / accredited test house traceable to National / International standards will be submitted to BHEL before putting the oven in use. Periodical calibration for the same shall also be arranged by the contractor within the finally accepted rates.

19.10 All butt / fillet welds shall be subject to dye penetration test as per drawing and document requirement and have to be carried out as per the instructions of the engineer within the quoted / finally accepted rates for this contract.

19.11 The contractor shall maintain a record in the form as prescribed by BHEL of all operations carried out on each weld and maintain a record indicating the number of welds, the names of welders who welded the same, date and time of start and completion, preheat temperature, ultrasonic results, rejection if any, percentage of rejection etc. and submit copies of the same to the BHEL Engineer as required. Interpretation of the BHEL Engineer regarding acceptability or other wise of the welds shall be final. All site welding joints shall be subject to acceptance by BHEL Engineer

19.12 All welds shall be painted with anticorrosive red oxide paint once ultrasonic and stress reliving works are over. Necessary consumables and scaffolding etc. including paints shall be provided by contractor at his own cost.

19.13 The contractor shall carry out the edge preparation of weld joints at site in accordance with the details acceptable to BHEL. Wherever possible machining or automatic flame cutting will be allowed only wherever edge preparation otherwise is impractical. All slag's / burrs shall be removed

from cuts and all the hand cuts shall be ground smooth to the satisfaction of engineer.

19.14 Pre-heating, ultrasonic and other NDT tests, post heating and stress relieving after welding of tubes, pipes, including attachment welding wherever necessary, are part of erection work and shall be carried out by the contractor in accordance with the instructions of Engineer. All equipment and consumables essential for carrying out the above process shall be arranged by contractor at his cost.

19.15 Contractor shall arrange all necessary stress relieving equipment with automatic recording devices. Also the contractor shall have to arrange for labour, heating elements, thermocouples, etc. insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment/ stress relieving operations. Temperature shall be measured by thermocouple and recorded on a continuous printing type recorder. All the recorded graphs for heat treatment works shall be the property of BHEL. The contractor has to provide thermal chalks, temperature recorders, thermocouple attachment units, graphs sheets, etc. for checking within the finally accepted rates. All stress relieving equipment will be used after due calibration and submission of test certificate to BHEL. Periodic calibration from Govt. approved / accredited Test Houses traceable to National / International standards will also be arranged by the contractor for such equipment at his cost. The contractor shall obtain the signature of BHEL Engineer or his representative on the chart of the recorder after setting up the weld joints for heat treatment operation prior to the starting.

19.16 The contractor shall also be equipped for carrying out other NDT like DP, UT etc. as required (if required) as per welding schedule/ drawings within the finally accepted price/ rates on all equipment welding and also in piping and other areas as applicable Necessary help including surface preparation and scaffolding required for conducting all the shall be rendered by contractor at his own cost.

19.17 The technical particulars, specification and other general details for NDT work shall be in accordance with ASME, ISO or as specified by Drawings and Manuals of BHEL / CUSTOMER.

19.18 The contractor shall assist BHEL Engineer in preparing complete field welding schedule/procedure for all the field welding activities to be carried out in respect of piping and equipment erected by him involving high pressure welding at least 30 days prior to the scheduled start of erection work at site. Such schedules shall be strictly adhered to by the contractor.

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VOLUME – I A (PART – I): Chapter-XX
Testing, Pre Commissioning, Commissioning, Post Commissioning

20.0 TESTING, PRE-COMMISSIONING, COMMISSIONING AND POST-COMMISSIONING.

20.1 On completion of erection of equipment, the contractor shall get the equipment checked up by the TANGEDCO/BHEL, and their deputed supervisors, specialists concerned with the particular item of work. The testing of various equipment will be carried under the supervision of BHEL/ TANGEDCO with the assistance of the Contractor in the manner decided by and in the presence of the owner and other authorized supervisors concerned, and to their entire satisfaction. On completion of these preliminary checks by the equipment supplier, the contractor shall make the equipment ready for conducting the test. The contractor shall rectify all defects found during the checking / testing as directed by the BHEL/ Consortium partner /Owner to ensure satisfactory operation of the equipment.

20.2 The contractor shall carry out the required tests as instructed by BHEL using contractor's own consumables, labour and scaffoldings.

20.3 All the tests shall be repeated till all the equipment satisfy the requirement / obligation of BHEL at various stages. Contractor shall also carry out repair of all the welded joints (site and suppliers) failed during testing.

20.4 The scope of testing activities cover installation of all necessary temporary piping, supports, valves, blanking, pumps, tanks etc. and other accessories with access platforms valves, pressure gauges, electric cables, switches, cutting of some of existing valve, placing of rubber wedges in the valves etc., required for hydro test, chemical cleaning, or for any other tests as the case may be and will carry out above activities under this scope of work as per instructions of BHEL. The scope also covers the off site disposal of effluents.

20.5 For testing of distributor, the necessary test pump and bulk heads shall be supplied by BHEL. Any other item which may be required additionally shall be arranged by contractor. The necessary blanks, pressure gauge, valve etc for testing of piping system including hardware shall be arranged by the contractor within his scope of work.

20.6 It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers along with Supervisors including necessary consumables, T&Ps, IMTEs etc., and any other assistance required during testing of equipment and attending any problem in the equipment erected by the contractor till handing over. Association of BHEL's/ Client's staff during above period will not absolve contractor from above responsibilities.

20.7 It shall be specifically noted that the above employees of the contractor may have to work round the clock along with BHEL Engineers and hence overtime payment by the contractor to his employees may be involved. The

contractor's finally accepted rates/ price shall be inclusive of all these factors also.

20.8 In case, any rework is required because of contractor's faulty erection which is noticed during testing, the same has to be rectified by the contractor at his cost. If any equipment/ part is required to be inspected during testing, the contractor will dismantle /open up the equipment / part and reassemble/ redo the work without any extra claim.

20.9 During testing, opening/ closing of valves, changing of gaskets, realignment of rotating and other equipment, attending to leakage and adjustments of erected equipment may arise. The finally accepted price shall also include all such work.

20.10 The contractor shall make all necessary arrangements including making of temporary closures on piping/ equipment for carrying out the hydro test on all piping equipment covered in the specification at no additional cost.

20.11 In case any defect is noticed during tests such as loose components, undue noise or vibration, strain on connected equipment etc., the contractor shall immediately attend to these defects and take necessary corrective measures. If any readjustment and realignment are necessary, the same shall be done as per Engineer's instructions including repair, rectification and replacement work by the contractor at his cost. The parts to be replaced shall be provided by BHEL.

20.12 The contractor shall carry out cleaning and servicing of valves prior to testing of the equipment under his scope. A system for recording of such servicing operations shall be developed and maintained in a manner acceptable to BHEL Engineer to ensure that no valves are left un-serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats.

20.13 Cleaning & servicing of all the filters/ strainers, toppings of oils coming in the system shall be done by the contractor within the accepted price.

20.14 At the time of each inspection, the contractor shall take note of the decisions / changes proposed by the Engineer and incorporate the same at no extra cost.

20.15 Following tests will be carried out at site after installation:

a. Dielectrics and insulation Test on all electric motors
b. Operation Tests on compressors for minimum 8 hour’s continuous operation to establish trouble free operation without abnormal vibration and noise.
c. Operational tests on control panels and instruments.

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VOLUME – I A (PART – I): Chapter-XXI
Finish Painting

21.0 FINISH PAINTING

21.1 Primer painting wherever peeled off or damaged or if required is to be carried out after thoroughly cleaning of all dirt, rust, scales, grease, oils and other foreign materials by wire brushing, scrapping, any other method as per requirement of BHEL and the same being inspected and approved by the engineer before painting. Bare surfaces / unpainted surfaces shall be provided with two coats of suitable primer. The gas cut stubs / weld seams would require to be cleaned / ground before painting. After applying the primer paints all the equipment / items shall be finished with two coats of enamel paint or any other paint as issued by BHEL. The exterior surface may have to be cement / coal tar painted as directed by BHEL

21.2 As the equipment/ items are to be spray painted, the contractor shall make arrangements of the required equipment for spray painting. Spray painting at the job/ site shall be permitted only items approved by the owner / Engineer.

21.3 While the primers and paints will be issued by BHEL as free issue item, all tools and other consumables including scaffolding materials required for finish painting shall be supplied by contractor within their quoted rate.

21.4 All the plant equipment's /items shall be painted with required coat of red oxide primer & required coat of synthetic enamel paint, color as per drawings and site requirement. Paint shall be supplied by BHEL supplying units. The quantity to be supplied by manufacturing units is fixed. Contractor has to follow the painting procedure strictly, any deficiency in quantity of paints due to wrong procedure shall be borne by the contractor.

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VOLUME – I A (PART – II): Chapter-1
Corrections / Revisions In Special Conditions Of Contract, General Conditions Of Contract And Forms & Procedures

Sl No.: 1

OCCUPATIONAL HEALTH, SAFETY & ENVIRONMENT MANAGEMENT/ QUALITY ASSURANCE PROGRAMME

The following clauses in Occupational Health, Safety & Environment Management / Quality Assurance Programme published in Chapter-IX of Special Conditions of Contract (Volume I Book-II) is revised as under.

Chapter IX Clause 9.1 is modified as below:

Contractor will comply with HSE (Health, Safety & Environment) requirements of BHEL as per the "HSE Plan for Site Operations by Subcontractor" (Document No. HSEP: 14 Rev 01) enclosed.

Sl No.: 2

Clause No. 10.5 on RA Bill Payments, in Special Conditions of Contract (SCC), Volume- IB, Book- II, is revised as under:

The payment for running bills will normally be released within 30 days of submission of running bill complete in all respects with all documents. It is the responsibility of the contractor to make his own arrangements for making timely payments towards labour wages, statutory payments, outstanding dues etc., and other dues in the meanwhile.

Index for Formats

Sl.No.	Description	No.of Pages
01	Claim for refund of security deposit	02 Pages
02	Request for issuance of No Dues	01 Page
03	No Dues Certificate format	01 Page
04	Check list to be submitted with each running bill	02 Pages
05	HR Format	01 Page
06	Form 36B	01 Page

BHARAT HEAVY ELECTRICALS LIMITED
DIVISION …….....……
Claim for Refund of Security Deposit
(Para 4.7.4 of Works Accounts Manual)

Ref No.: Date:

1 Name and address of the contractor
2 Contract Agreement/Work Order No.
3 Date of contract agreement/work order
4 Name of the work undertaken
5 Date of commencement of the work
6 Date of completion of the work
7 Period of Maintenance
8 Date on which the final bill was paid
9 Last date of making good the defect, if any, during maintenance period
10 Expenditure incurred by BHEL during maintenance period, if any, recoverable
11 Date on which security deposit refund falls due as per contract
12 Amount deposited/recovered

Details	Mode	Amount

13 LESS amounts recoverable (with details)
- (i) Amount spent by BHEL on maintenance:
- (ii) Payments made on behalf of contractor :
- (iii) Court dues / penalties / compensation :
- (iv) Other recoveries for services etc. :
- (v) Security deposit released with final bill (%):

14 Net amount recommended for release (12-13):

Details	Mode	Amount

Date: **Signature of Engineer in Charge**

CERTIFICATE TO BE FURNISHED BY THE CONTRACTOR

I/We have no claim or demand outstanding against BHEL.....for the work done or for labor or material supplied or any other account arising out of or connected with the contract agreement/work order (No…..... dated ……) and the payment of this bill shall be in full and final

Date: **Signature of Contractor**

CERTIFICATE TO BE FURNISHED BY SENIOR ENGINEER

Certified that

- The payment recommended for release is in order and there are no demands other than those included in the claim outstanding from the contractor;
- The maintenance period as per the contract agreement is over and the contractor has carried out the works required to be carried out by him during the period of maintenance to our satisfaction, and all expenses incurred by the company on carrying out such works have been included for adjustment;
- All the objections raised so far have been settled;
- A note of refund of security deposit has been made in the measurement book and contract agreement/work order.

Date: **Signature of Senior Engineer**

FOR USE IN FINANCE DEPARTMENT

Passed for

Rs……..(Rupees……..……

……...……only)

Accountant **Accounts Officer**

SUB AGENCY LETTER HEAD

.....

Ref. No: BHEL/PS/SR/SAS/No Due/SITE: .....DATE:.....

To,

The engineer Incharge,

Dept: .....

Project:.....

Unit:.....

(Through BHEL Site In-charge)

Sub : Request for issuance of "NO DUES CERTIFICATE "

Ref : 1) Customer P.O/LOI : ....

2) BHEL P.O/LOI : ....

Dear Sir,

With reference to the above we request for issuance of "NO DUES CERTIFICATE" for the works .... for the Project: ...., Unit: .....

Kindly do the needful at your end please.

Thanking you

Yours faithfully,

(Name: .....)
Site In-charge
Company: M/s.....
Project:..... ..... ,Unit No: .....

.....

Kindly issue "No Due certificate" for the above subject works after due verification of your stores.

With thanks and regards

Site In-charge
BHEL/PSSR/SAS
PROJECT: .... Unit: .....

NO DUES CERTIFICATE

Date: ……

Ref:1) P.O No: …… …… …… …… …… ……

2) Your Lr .No: BHEL/PS/SR/SAS/No Due/Site: …… …….. …… Dtd: ……

This is to certify that, with the above references, M/s …… …… ……., Sub contractor of M/s BHEL/PSSR/SAS returned all the T&P and materials in healthy condition which were received during execution of the works : …….

…… …… ……. …… …. at project : ……

…… …….. of unit No : …….. in the period of …….

This "No dues certificate" issued after due verification of our stores.

Signature of principal customer

Dept :

Seal :

BHEL-PSSR, SAS Secunderabad

CHECK LIST TO BE SUBMITTED WITH EACH RUNNING BILL (R&M WORKS)

Work Order Ref.	**Name of the Agency**
Brief Description of Work :	**RA Bill No. & date :**

Sl.No.	DESCRIPTION	Check list (Tick in the box)	Remarks
1) Documents to be submitted by the Contractor with each RA Bill			
1.1	GST number and billing address should be as per work order. BHEL GST and vendor GST should be present in invoice. HSN Code to be specified in the invoice.		
1.2	Bill/Execution period to be mentioned in Invoice		
1.3	Validity of Labour License and Validity of Bank guarantee/FD etc., submitted towards security deposit to be verified before forwarding invoice		
1.4	Supporting Doc-Wage Sheets (with bank confirmation copy)corresponding to bill execution peroid.		
1.5	Supporting Doc-PF corresponding to bill execution peroid.		
1.6	Supporting Doc-ESI/Insurance corresponding to bill execution peroid.		
1.7	Supporting Doc-HR Format		
1.8	Form-14s for the peroid corresponding to bill execution peroid.		
1.9	WAM-06 joinly prepared by contractor and BHEL Resident engineer.		
1.10	Measurement sheet duly signed by contractor with certification from Resident engineer and Site In-charge.		
1.11	Control Register duly signed by contractor. Soft copy in Microsoft excel format to be forwarded to SAS-Finance department.		
1.12	Protocols related to works as mentioned in invoice. Protocols for milestone activities in case billing is done towards milestone activities.		
1.13	Corresponding LR copies, packing list and DBR register for processing material handling bills.		
1.14	Copies of relavant Indicies while claiming PVC bills.		
1.15	GST Remittance proof		
1.16	Contractor signed in M-Book with "Measurement accepted" with stamp.		
1.17	If the contract period has expired during execution period, vendor to give request for work order extension so that delay note proposal can be initiated by Resident Engineer. As far as possible, M Book entry / Invoice, should be made only after extension of contract to avoid delay in further processing of the bills.		
2) Additional documents to be submitted by the Contractor (in addition to listed at sl. No. 1.1 to 1.17) with First RA Bill			
2.1	Proof of SD remittance (copies of BG, FD, EFT etc.,)		
2.2	Contract agreement copy		
2.3	Letter from contractor regarding option for performance bank guarantee		
2.4	Letter regarding date of start of works certified by resident engineer		
2.5	Power of attorney for contractor representative		
2.6	E Remittance letter		

3) Additional documents to be submitted by the Contractor (in addition to listed at sl. No. 1.1 to 1.17) with Final RA Bill			
3.1	Material reconciliation duly signed by contractor and BHEL resident engineer.		
3.2	WAM-07 joinly prepared by contractor and BHEL Resident engineer.		
3.3	No Dues certificate from customer.		
3.4	No further claim certifcate from contractor and certification of no further claim in M-book		
3.5	Date of completion of works (MOM)/ Date of handing over of unit (customer protocol) for considering completion date.		
3.6	Idemnity bond as per the SCC & GCC.		
3.7	Request letter along with SD refund form (GCC) for refund of SD & Performance bank guarantee.		

Signature of contractor

Sl.No.	DESCRIPTION	Check list (Tick in the box)	Remarks
4. Certifications to be done by BHEL Resident Engineer / Site Incharge			
4.1	To ensure Compliance of all the points listed at Sl. No. 1, 2 & 3 above		
4.2	Ensure Invoice is as per the WO payment terms. Part payments not allowed without approvals. Recoveries/amount to be withheld if any, with reasons to be specified in M-book and claim to be generated accordingly with supporting documents. In case of recommendations for recoveries/amount to be withheld, Vendor's acceptance should also be taken in M-Book to avoid dispute at later stage.		
4.3	If there is any delay in completion of works w.r.t work order completion peroid, request for work order extension should be taken from the vendor and delay note proposal should be initiated. It has been obsrved that delay note approval is taking approx. one month time as the same is to be scrutinised at various level before final approval by Competent authority. Therefore, Proactive action should be taken to initiate delay note around one month prior to contract expiration date.		
4.4	Execution period corresponding to invoice to be certified in M-book.		
4.5	RAB No. & WO Ref. to be certified in M-book.		
4.6	Certification regarding payment, deployment of T&P as per the work order in M-book duly signed by Resident Engineer & Site In-charge.		
4.7	Certification on back side of original invoice.		
4.8	Claim generated and signed by Resident Engineer & Site In-charge.		
4.9	Entry to be made in Payables Management System (PMS) & acknoweldgment number generated in PMS to be mentioned in the claim generated.		

BHEL Resident Engineer/Site Incharge

Work Order Ref:	
RAB Number and Invoice Reference:	
Execution period:	

BHEL: Site, .

State HR Clearance for releasing of First and subsequent Monthly Bill (Details check list)

(To be enclosed along with First and subsequent Monthly Running Bills)

1.	LABOUR LICENCE	AVL/NOT AVL/NA
	LABOUR LICENCE – VALIDITY	CURRENT/OLD/NA
	DISPLAY OF LICENCE	DONE/ NOT DONE/NA
	NOTICE OF COMMENCEMENT (FORM VI A)	SENT/ NOT SESENT/NA
2.	NOTICE BOARD	AVL/NOT AVL/NA
3.	ABSTRA OF CL (R & A) ACT /MINIMUM	DISPLAYED /
	WAGES ACT/CHILD LABOUR ACT	NOT DISPLAYED/NA
4.	REGISTERS TO BE MAINTAINED	
	WAGES REGISTER	YES / NO/NA
	MUSTER ROLL	YES / NO/NA
	FINES REGISTER	YES / NO/NA
	DEDUCTIONS REGISTER	YES / NO/NA
	OVER TIME REGISTER	YES / NO/NA
	LIST OF PERSONS EMPLOYED	YES / NO/NA
5.	EMPLOYMENT CARD	ISSUED/ NOT ISSUED/NA
6.	WAGE SLIPS	ISSUED/ NOT ISSUED/NA
7.	FIRST AID FACILITY	AVL/NOT AVL/NA
8.	LATRINES/ URINALS	AVL/NOT AVL/NA
9.	DRINKING WATER PROVISION	AVL/NOT AVL/NA
10.	WASHING FACILITIES	AVL/NOT AVL/NA
11.	NOTICE OF COMMENCEMENT OF WORK	SENT/ NOT SENT/NA
12.	HALF YEARLY RETURN – CL (R & A) ACT	SENT/ NOT SENT/NA
13.	ANNUAL RETURN – MIN. WAGES ACT	SENT/ NOT SENT/NA
14.	REGISTRATION UNDER BOCW(RE & CS) Act	AVAIALBLE/NOT AVAILABLE
15.	BOCW CESS PAID IN THE MONTH	YES/NO/NA
16.	PF RECOVERY / REMITTANCES (*)	DONE / NOT DONE/NA
17.	ESI RECOVERY / REMITTANCE (*)- IF APPLICABLE	DONE / NOT DONE/NA
18.	WC INSURANCE AVAILABILITY / VALIDITY	AVL/NOT AVL/ VALIDITY EXPIRED/NA

Certified that the details furnished above are true and correct. Further wages / other payments due to the workmen deployed by us are paid full and in time.

Sing. Of Contractor
Seal

The above details have been verified and found to be correct. In addition, payment of wages to the workmen witnessed and certified that correct wages are paid.

(Sign. Of Resident Engineer) (Sign. Of HR In-charge)

(Sign. Of Head/Site or Head/Services)

PROFORMA STATEMENT TO BE OBTAINED FROM THE CONTRACTOR (36B

NAME & ADDRESS OF THE PRINCIPAL EMPLOYER **TN/7835** **MONTH**

NAME & ADDRESS OF THE CONTRACTOR **TN/**

SL NO	Name of the Employee	Father's name	Date of joining (DD/MM/YY)	PF A/c no	No.of days	Total wages paid	Wages for PF (in Rupees)	Contribution

I/We certify that all the above employees who were actually deployed in your establishment during_____2016, have all been covered under EPF & MP Act 2852 and the contributions in respect of them for the month of_____2016 have been remitted by me/us under Code No.TN/_____maintained at_____RO/SRO on _____

DATE: SIGNATURE OF THE CONTRACTOR

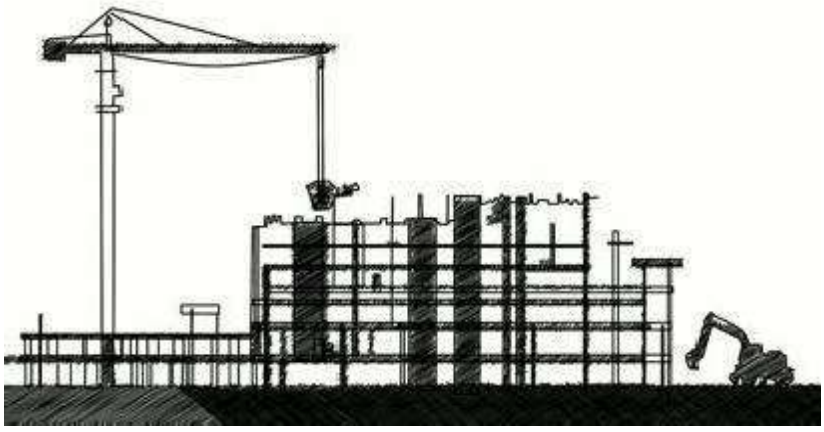
HEALTH, SAFETY and ENVIRONMENT PLAN

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																												
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**