

VOLUME – IA  
Part I & II

TECHNICAL  
CONDITIONS OF  
CONTRACT  
(TCC)

BHARAT HEAVY ELECTRICALS LIMITED



# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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## **VOLUME - IA PART – I CHAPTER – I** **PROJECT INFORMATION** **5X800 MW SETS AT YADADRI TPS**

1	Name of the Project	YADADRI Thermal Power Station
2	Station Capacity	5X800 MW ( Coal based )
3	Owner	Telangana State Power Generation Corporation Limited ( <b>TSGENCO</b> )
4	Site Location	Site is located 7 km from the NH565 (SH2). Veerlapalem village, Dameracherla Mandal, NALGONDA DISTRICT, TELANGANA STATE
5	Latitude	16° 42'20.40 N
6	Longitude	79° 34'41.56 E
7	Nearest Town	30 Km Miryalaguda
8	Nearest Railway Station	6.5 Km Damercherla
9	Nearest Airport	130 Kms (Vijayawada)
10	<b>Site Conditions</b>	
	Ambient Temperature	
	Daily minimum ( average)	10°C
	Daily maximum ( average)	47°C
	Design Ambient Temperature	50°C
	Ambient temperature ( performance)	38°C
	Relative Humidity for design / efficiency	48-84 %
	Annual rainfall, mm	600 mm
	Plant Elevation above MSL	85 m above MSL
	Mean Wind Speed	8 km/h
	Wind Pressure	As per the latest revision of IS 875/1987
	Seismic co-efficient	Zone-II as per IS- 1893 (Part-IV)

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## **VOLUME-IA PART-I CHAPTER – II**

### **SCOPE OF WORKS**

**The scope of works shall comprise of but not limited to the following:**

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified)

- 1.2.1 Erection, Testing and Commissioning of **Power Cycle Piping and all associated Piping & Insulation works** including handling at site stores / storage yard, transporting to site, inspection, pre-assembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints and application of refractory & insulation works as per requirement / as given in the drawings including labeling & flow direction on the piping / over insulation & hangers and supports, pre-commissioning, commissioning, trial operation & handing over to customer and supply & application of final painting, etc. for **Unit-2 and Unit-4 of 5X800 MW Yadadri Thermal Power Project Veerapalem Village, Dhamarchala Mandal, Nalgonda Telengana.**
- 1.2.2 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.
- 1.2.3 Receipt of materials from all the BHEL Stores and Transportation to Erection site, stacking, storage and preservation.
- 1.2.4 The scope of works also includes Erection and Commissioning of piping including pipes, valves, flanges, fittings, fasteners etc. as required, making the system complete in all respects.
- 1.2.5 Erection, testing and commissioning of Flash Tanks and other miscellaneous tanks as per the shipping list provided.
- 1.2.6 Pre assembly, installation, testing and commissioning Trial operation of the erected equipment along with accessories.
- 1.2.7 Lifting, laying, bolt tensioning, bolt torque tightening, supporting and installation, pre and post weld heat treatment, inspection, non-destructive testing including radiography and hydro test, water/steam flushing, card board blasting, air drying, argon / nitrogen purging and other testing of piping installations, above and below ground.
- 1.2.8 Fabrication and installation, setting and commissioning of pipe supports, guides, anchors and spring supports as required.

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- 1.2.9 Obtain Necessary Statutory clearances and approvals, co-ordination with all applicable statutory / Government agencies e.g. IBR, Electrical Inspectorate, Labour Inspectorate etc.
- 1.2.10 Installation and Dismantling of temporary piping.
- 1.2.10.1 Temporary lines for **Detergent flushing of Boiler Feed Lines, Condensate line, Drips and Drains of heaters and Any other associated piping systems shall** be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. All arrangements for erection including welding has to be arranged by the contractor at the rates specifically quoted / accepted for this work. After the successful completion of chemical cleaning, removing all temporary piping, fittings of tanks etc., checking all the valves for any accumulation of foreign materials, welding the valves, pipes which were cut and cleaning, re-fixing as per BHEL Engineer's instructions is within the scope of work/specification. Temporary Piping Erection related to Boiler Chemical Cleaning activity is included in the scope of Boiler Erection Contractor. However, Materials any (if required) for the completion of the Chemical Cleaning of the Boiler may be issued on returnable basis from the temporary piping materials supplied in the piping package also. After completion of the activity, all the temporary lines to be dismantled and restoration of piping to be carried out, within the quoted rates.
- 1.2.10.2 Temporary lines for **Steam blowing** of Power Cycle piping shall be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. All arrangements for erection including welding has to be arranged by the contractor at the rates specifically quoted / accepted for this work. After completion of steam blowing, all the temporary lines to be dismantled and restoration of piping to be carried out, within the quoted rates.
- 1.2.10.3 Apart of clause 1.2.10.1 & 1.2.10.2 any temporary piping to be carried for commissioning of any equipment is within the quoted rates.
- 1.2.11 Installation of any necessary blind or additional valves to isolate lines to facilitate phased commissioning and start-up is covered under the scope within the quoted rates.
- 1.2.12 Execute all mechanical jobs identified during owner / Licensors check list, Technical audits, pre-commissioning and commissioning, including additional supports required to restrain pipe movement avoiding interference with nearby structural / piping.
- 1.2.13 Installation of all valves and other miscellaneous in line / on line items is also included. Open ends of piping valves shall be protected with wooden blanking plates securely fastened with wire or by plastic insert plugs.
- 1.2.14 Cleaning, pickling, if required, water / steam flushing, air drying disposal of fluids offsite, reinstatement, preservation of piping and miscellaneous items following hydro test,

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nitrogen purging, cleaning, chemical cleaning, painting, insulation, as per specifications is covered under the scope within the quoted rates.

- 1.2.15 Insulation of TDBFP Drive turbine piping only (drains, vent lines, seal steam pipelines, etc.), Heat exchangers (HP Heaters, LP Heaters, Dearator, Drain cooler, etc.), Flash tanks, MDBFP, TDBFP pumps, etc along with associated piping and insulation of all the piping covered under this scope of works are also included in the scope of this work within the quoted rates.
- 1.2.16 Testing of welds/flanged joints.
- 1.2.17 Execute final painting and labelling including supply of paints, painting of all equipments, piping (including small bore piping), and structures like platform, supports etc.
- 1.2.18 Preparation of As-Built Drawings.

## **Note to Chapter-II**

- i) The following materials that will go as a part of the permanent system of the plant will be supplied by BHEL at free of any charges:  
Pipes, valves, flanges, fittings, fasteners.
- ii) The number of joints indicated in the welding schedules is approximate only and liable for variation, as per site conditions and also design consideration of manufacturing unit.
- iii) The welding process, weld joint and material specification indicated in the welding schedules may change to suit site requirement.
- iv) Consumables are within the scope of contractor for both temporary and main piping except those which are in BHEL scope. Please refer to SCC Rev-01- Clause 4.1.1 for further details.

**FOR FURTHER DETAILED SCOPE OF WORKS REFER RELEVANT CHAPTERS IN THIS BOOK.**

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## VOLUME IA PART – I CHAPTER – III

### A. FACILITIES & CONSUMABLES IN THE SCOPE OF CONTRACTOR / BHEL (SCOPE MATRIX)

Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.1	<b>PART I</b>			
1.3.1.1	<b>ESTABLISHMENT</b>			
1.3.1.1.1	<b>FOR CONSTRUCTION PURPOSE:</b>			
1.3.1.1.1.1	Open space for office	Yes		Free
1.3.1.1.1.2	Open space for storage	Yes		Free
1.3.1.1.1.3	Construction of bidder's office, canteen and storage building including supply of materials and other services		Yes	
1.3.1.1.1.4	Bidder's all office equipment, office / store / canteen/Consumables.		Yes	
1.3.1.1.1.5	Canteen facilities for the bidder's staff, supervisors and engineers etc		Yes	
1.3.1.1.1.6	Fire fighting equipment like buckets, extinguishers Etc		Yes	
1.3.1.1.1.7	Fencing of storage area, office, canteen etc of the bidder		Yes	
1.3.1.1.2	<b>FOR LIVING PURPOSES OF THE BIDDER</b>			
1.3.1.1.2.1	Open Space	Yes		
1.3.1.1.2.2	Living accommodation		Yes	
1.3.1.2	<b>ELECTRICITY</b>			
1.3.1.2.1	Electricity of Voltage 415 / 440 V For construction purposes			
1.3.1.2.1.1	Single point source	Yes		Free
1.3.1.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	

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<b>1.3.1.2.2</b>	<b>Electricity for the office, stores, canteen etc of the bidder which include:</b>		Yes	
1.3.1.2.2.1	Distribution from single point including supply of materials and service		Yes	
1.3.1.2.2.2	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	Calibration certificate to be provided
1.3.1.2.2.3	Duties and deposits including statutory clearances for the above		Yes	
1.3.1.2.2.4	Demobilization of the facilities after completion of works		Yes	
1.3.1.2.3	Electricity for living accommodation of the bidder's staff, engineers, supervisors etc on the above lines.(in case BHEL provides this facility, the scope should be given without ambiguity)		Yes	Refer the relevant clauses elsewhere in this tender.
<b>1.3.1.3</b>	<b>WATER SUPPLY</b>			
1.3.1.3.1	For construction purposes			
1.3.1.3.1.1	Making the water available at single point	Yes		Free
1.3.1.3.1.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.3.1.3.2	<b>Water supply for bidder's office, stores, canteen etc</b>			
1.3.1.3.2.1	Making the water available at single point	Yes		
1.3.1.3.2.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
<b>1.3.1.4</b>	<b>LIGHTING</b>			
1.3.1.4.1	For construction work (supply of all the necessary materials) At office storage area At the preassembly area At the construction site /area		Yes	

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1.3.1.4.2	For construction work (Execution of the lighting work / arrangements) At office storage area At the preassembly area At the construction site /area		Yes	
1.3.1.5	<b>COMMUNICATION FACILITIES for site operations of the bidder</b>			
1.3.1.5.1	Telephone, Fax, internet, intranet, email etc		Yes	
1.3.1.6	<b>COMPRESSED AIR SUPPLY</b>			
1.3.1.6.1	Supply of Compressor and all other equipments required for compressor & compressed air system including pipes, valves, storage systems etc		Yes	
1.3.1.6.2	Installation of above system and operation & maintenance of the same		Yes	
1.3.1.6.3	Supply of the all the consumables for the above system during the contract period		Yes	

Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
1.3.2	<b>PART II</b>			
1.3.2.1	<b>ERCTION FACILITIES</b>			
1.3.2.1.1	Engineering works for construction	Yes		
1.3.2.1.2	Providing the erection drawings/ documents for all the equipment covered under this scope	Yes		
1.3.2.1.3	Drawings for construction methods		Yes	
1.3.2.1.4	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes		Yes	In consultation with BHEL
1.3.2.1.5	Shipping lists etc for reference and planning the activities	Yes		
1.3.2.1.6	Preparation of site erection schedules and other input requirements		Yes	

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1.3.2.1.7	Review of performance and revision of site erection schedules in order to achieve the end dates and other commitments		Yes	In consultation with BHEL
1.3.2.1.8	Weekly erection schedules based on SI No 1.3.2.1.6		Yes	
1.3.2.1.9	Daily erection / work plan based on SI No 1.3.2.1.8		Yes	
1.3.2.1.10	Preparation of preassembly bay		Yes	
1.3.2.1.11	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	
1.3.2.1.10	Preparation of preassembly bay		Yes	
1.3.2.1.11	Laying of racks for gantry crane if provided by BHEL or brought by the contractor / bidder himself			Not applicable

## 1.3.3 OPEN SPACE:

1.3.3.1 Minimum Open space will be provided at free of charges to the contractor within the plant premises or adjacent to the plant boundary for construction of temporary office shed, contractor's stores shed(s). Contractor shall adopt pre-engineered / pre-fabricated constructions made of steel with single / double skin, insulated for un-insulated roof and wall coverings (fabricated out of permanently color coated metal sheets) for his site office, covered store or any other temporary building. Alternatively, contractor can adopt readymade 'porta cabin" or similar construction.

1.3.3.2 Only Land for Labour colony and staff colony will be provided by BHEL adjacent to the plant boundary to contractor at free of cost. Contractor has to make labour colony and residential accommodation to his staff at his cost.

1.3.3.3 Contractor has to furnish along with their offer, the details of requirements of area of space for his office, stores, storage shed, labour colony etc.

1.3.3.4 Location and area requirement for office/storage sheds/ fabrication yard shall be discussed and mutually agreed to.

## 1.3.4 ELECTRICITY:

1.3.4.1 The construction power (415V) will be provided at a single point for construction purpose free of charge. Construction power shall be provided from the nearest

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Substation / tapping point within the plant premises. For the purpose of measurement of power consumed, the contractor shall provide Energy meter with valid calibration certificate. Distribution from this source to different locations is to be arranged by the bidder at his cost.

- 1.3.4.2 Electricity for labour colony and staff colony will be provided at single point on chargeable basis at the prevailing rate of TSGENCO. Distribution from this source to different locations is to be arranged by the bidder at his cost.
- 1.3.4.3 Any duty, deposit involved in getting the Electricity shall be borne by the bidder. As regards to contractor's office shed also, all such expenditure shall be borne by the contractor. Demand charges if any to be borne by the contractor
- 1.3.4.4 Provision of distribution of electrical power from the given single central common point to the required places with proper distribution boards, approved cables and cable laying including supply of all materials like cables, switch boards, pipes etc., observing the safety rules laid down by electrical authority of the State / BHEL / their customer with appropriate statutory requirements shall be the responsibility of the tenderer / contractor.
- 1.3.4.5 BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variations in voltage / frequency or interruptions in power supply.
- 1.3.4.6 Necessary "Capacitor Banks" to improve the Power factor to a minimum of 0.8 shall be provided by the contractor at his cost. Penalty if any levied by customer on this account will be recovered from contractor's bills.

## 1.3.5 CONSTRUCTION WATER

- 1.3.5.1 Water (Raw water) shall be provided by BHEL at one point within the plant premises free of charge for construction purpose and bidder has to make their own arrangement for further distribution by arranging required pipes, valves, pumps, etc.
- 1.3.5.2 Water (Raw water) for labour colony and staff colony shall be provided at single point on chargeable basis at the prevailing Government Tariff and bidder has to make their own arrangement for further distribution by arranging required pipes, valves, pumps, etc.
- 1.3.5.3 In case of non-availability of water, the contractor shall make his own arrangements for uninterrupted work. No separate payment shall be made for any contingency arrangement made by contractor, due to delay / failure for providing water supply. Contractor has to make his own arrangements for his water requirement for his labour colony at his cost.

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## 1.3.6 DRINKING WATER

1.3.6.1 Bidder shall provide drinking water at their cost.

## 1.3.7 ONLINE SITE CONSTRUCTION MANAGEMENT SYSTEM [SCMS]:

Contractor has to provide minimum 2 computers [along with one operator per PC] per package for online material management, reporting of daily progress, billing and other similar activities, within the quoted rate. Computers shall have minimum configuration of Windows 7 OS, 4GB RAM and Internet Explorer 8 or above.

## 1.3.8 CONSUMABLES:

1.3.8.1 Any special welding electrodes / consumables as provided by manufacturing units for Power Cycle Piping, will be supplied by BHEL free of cost. All other electrodes including stainless steel electrodes required shall be arranged by the contractor at his cost. The Contractor shall use the BHEL / Customer approved quality electrodes only. The utilization of the welding electrodes issued by BHEL shall be duly accounted for exercising maximum care and ensuring economical usage for minimum wastage. If during erection, it is found that the consumption of electrodes is more than the actual requirement by improper usage, the cost for the additional quantity so consumed shall be recovered from the contractor

1.3.8.2 The contractor shall provide within finally accepted price / rates, all consumables like welding electrodes (including alloy steel and stainless steel), all gases (inert, welding, and cutting), soldering material, dye penetrants, radiography films. Other erection consumables such as wrap cloth, tapes, jointing compound, grease, lubricants, M-seal, Araldite, petrol, CTC / other cleaning agents, grinding and cutting wheels are to be provided by the contractor. Steel, H&S, packers, shims, wooden planks, scaffolding and pre-assembly materials, hardware items etc required for temporary works such as supports, scaffoldings, bed are to be arranged by him. Sealing compounds, gaskets, gland packing, wooden sleepers, for temporary work, required for completion of work except those which are specifically supplied by manufacturing unit are also to be arranged by him.

1.3.8.3 All consumables to be used for the job shall have to be approved by BHEL prior to use.

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- 1.3.8.4 All the shims, gaskets and packing, which go finally as part of equipment, shall be supplied by BHEL free of cost.
- 1.3.8.5 In the event of failure of contractor to bring necessary and sufficient consumables, BHEL shall arrange for the same at the risk and cost of the contractor. The entire cost towards this along with standard BHEL overhead shall be deducted from the contractor's immediate due bills.

## 1.3.9 **GASES:**

- 1.3.9.1 All the required gases like Oxygen / Acetylene / Argon / Nitrogen required for work shall be supplied by the Contractor at his cost. It shall be the responsibility of the contractor to plan the activities and store sufficient quantity of these gases. Non availability of gases cannot be considered as reason for not attaining the required progress.
- 1.3.9.2 BHEL reserves the right to reject the use of any gas in case required purity is not maintained.
- 1.3.9.3 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.
- 1.3.9.4 The contractor shall ensure safe keeping of the inflammable cylinder at a separate place away from normal habit with proper security etc.

## 1.3.10 **ELECTRODES SUPPLY AND STORAGE**

- 1.3.10.1 It shall be the responsibility of the contractor to obtain prior approval of BHEL, before procurement, regarding suppliers, type of electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL. The contractor shall inform BHEL details regarding type of electrodes, batch number and date of expiry etc. Test certificates for electrodes and other consumables should be submitted to BHEL Engineer as per requirement.
- 1.3.10.2 Shortage of any of the electrodes or the equivalent suggested by BHEL shall not be quoted as reason for deficiency in progress or for additional rate. Contractor shall submit weekly/ fortnightly/ monthly statement/ report regarding consumption and available stock of all types of electrodes for avoiding stoppage of work on consumable scarcity.
- 1.3.10.3 Storage of electrodes shall be done in an air conditioned / controlled humidity room as per requirement, at his own cost by the contractor.

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- 1.3.10.4 All low hydrogen electrodes shall be baked / dried in the electrode drying oven (range 375 deg. C - 425 deg. C) to the temperature and period specified by the BHEL Engineer before they are used in erection work and each welder should be provided with one portable electrode drying oven at the work spot. Electrode drying oven and portable drying ovens shall be provided by contractor at his cost.
- 1.3.10.5 In case of improper arrangement of procurement of above electrodes BHEL reserves the right to procure the same from any source and recover the cost from the contractor's first subsequent bills at market value plus departmental charges of BHEL communicated from time to time. Postponement of such recovery is not permitted.
- 1.3.10.6 BHEL reserves the right to reject the use of any electrodes at any stage, if found defective because of bad quality, improper storage, date of expiry, unapproved type of electrodes etc. It shall be the responsibility of the contractor to replace at his cost without loss of time.

### 1.3.11 MATERIAL SUPPLY:

BHEL will supply the materials/equipment indicated in the weight schedule from their respective manufacturing units which are to be executed/incorporated in the permanent system. In addition, the material such as lube oil, grease, required for commissioning the erected equipments and chemicals required for chemical cleaning/detergent flushing of equipments will be supplied free of cost by BHEL.

### 1.3.12 POSSESSION OF GENERATORS

As there are bound to be interruptions in regular power supply, power cut/ load shedding in any construction sites, suitable extension of time, if found necessary only be given and contractor is not entitled for any compensation. It shall be the responsibility of the tenderer / contractor to provide, and maintain the complete installation on the load side of the supply with due regard to safety requirements at site. It shall be responsibility of the contractor to have at least 2 diesel operated welding generator (**per package**) sets to get urgent and important work to go on without interruptions. The consumables required to operate the generators are to be provided by tenderers. This may also be noted while quoting.

### 1.3.13 LIGHTING FACILITY:

Adequate lighting facilities such as flood lamps, hand lamps and area lighting shall be arranged by the contractor at the site of construction, pre assembly yard and contractor's material storage area etc. at his cost.

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## 1.3.14 **Other Facilities**

Adequate water less urinals [at least 2 nos per level] shall be arranged by the contractor within quoted rates, with proper disposal arrangement.

## 1.3.15 **BID DRAWINGS**

Bid drawings published in this tender specification are for information and this may get revised during execution.

## 1.3.16 **CONTRACTOR'S OBLIGATION ON COMPLETION**

On completion of work, all the temporary buildings, structures, pipe lines, cables etc. shall be dismantled and leveled and debris shall be removed as per instructions of BHEL by the contractor at his cost. In the event of his failure to do so, the expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.

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## VOLUME-IA PART-I CHAPTER – IV

### T&Ps and MMEs TO BE DEPLOYED BY CONTRACTOR

1.4.1 The following minimum major Tools & Plants (T&P) per package shall be arranged by the Contractor within the quoted rate for execution of the scope of works covered under this contract.

Sl. No.	Description	Qty
01	Trailer ( 20 T/ 30 T)	As required
02	Diesel Generator (2 numbers as mentioned below) providing a rated capacity of 500 KVA as standby for P91 welding)	2 Nos **
03	Fill pump	As required
04	HT pump for hydro test ( up to 50 Kg/Sq.cm) of LP piping	2 Nos
05	Ultrasonic Hardness Testing Machine [ Ultrasonic Contact Impedance (UCI) ]	As Required

\*\*Back-up power capacity as mentioned in Sl. No.2 above can be achieved by deploying either a single DG set of 500 KVA capacity or a combination of 250 KVA or above capacity machines

1.4.2 All the T&Ps required for this scope of work, except the Tools & Plants provided by BHEL are to be arranged by the contractor within the quoted rates.

1.4.3 T&Ps mentioned above is tentative requirement considering parallel working in all areas mentioned in scope of work. However, mobilization schedule and quantity / numbers as mutually agreed at site for major T&Ps, have to be adhered to. Numbers / time of requirement of T&Ps will be reviewed time to time by BHEL site and contractor will provide required T&Ps / equipments to ensure completion of entire work within schedule / target date of completion without any additional financial implication to BHEL. Vendor will give advance intimation and certification regarding capacity etc. prior to dispatch of heavy equipments. Also on completion of the respective activity, demobilization of T&P in total or in part can be done with the due approval of engineer in charge. Retaining of the T&P's during the contract period will be mutually agreed in line with construction requirement.

#### 1.4.4 Facility to be provided by Contractor for P 91 Welding

1.4.4.1 Diesel Generator, as standby supply for P91 Welding (along with required cables, switches, fuel and operator) has to be arranged by the contractor within the quoted rates. In the eventuality of contractor not making necessary arrangements to ensure

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availability of DG set as per requirement at site, BHEL will arrange the same at the contractor's risk and cost. All the necessary certificates and licenses required to operate the DG set are to be arranged by the contractor then and there at his cost.

- 1.4.4.2 Required number of operators / Technician / Electrician for installation, Commissioning & Operating continuously.
- 1.4.4.3 Ultrasonic Flaw Detector with recording device & complete accessories (Digital Type-Krautkramer model USN 50 or equivalent capable of storing calibration Data. All recordable indications will be stored in memory of digital Flaw detector and in PC (to be provided by the contractor) for review at later period.
- 1.4.4.4 GE or Kraut Kramer or Microdur make or reputed branded ultrasonic hardness testing machine (Ultrasonic Contact Impedance (UCI))
- 1.4.4.5 MPI / LPI kits with consumables.
- 1.4.4.6 Only One set of Annealing cable (2 nos) will be supplied by BHEL irrespective of number of Induction Heating Equipments deployed by BHEL. Additional sets of annealing cables have to be arranged by the contractor within the quoted rates.
- 1.4.4.7 Gas Burners arrangement with required gas for maintaining temperature in the event of power failure.
- 1.4.4.8 Digital Temperature Indicator.
- 1.4.4.9 Consumables
  - i). Glass Fibre Cloth -1mmx1000mm–Temp Rating 1260°C.
  - ii). Glass fibre cord Dia 3mm (twisted)- Temp Rating 1260°C.
  - iii). Ceramic Fibre Blanket -RT Grade, density 96 kg/m<sup>3</sup> –Temperature rating 1260°C.
  - iv). Ceramic fibre rope- Fibre Glass Braided, Dia 12 mm –Temperature rating 1260°C.
  - v). K Type Thermocouple- 0.5 mm Dia Single Strand individual fibre glass insulated.
  - vi). Heavy Duty TC connectors for K Type Thermocouple.
  - vii). All other consumables / equipments to carry out the work.

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

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- 1.4.5 The contractor to furnish a list of Tools and plants including cranes, tractors / trailers / trucks etc. which contractor proposed to deploy for this work.
- 1.4.6 Fill pumps shall be arranged by the contractor, wherever required.
- 1.4.7 For testing LP lines necessary Hydraulic Test pumps/ Hand pumps are to be arranged by the contractor.
- 1.4.8 For handling at store and transportation, contractor shall make his own arrangement.
- 1.4.9 For transportation, material handling, loading & unloading of all components / equipments, the contractor has to make his own arrangements at his own cost. BHEL will not provide any crane / T&Ps for unloading the above components. All necessary T&P such as, Trailers, Cranes Winches, Welding generators, Slings, Jacks, Sleepers, Rails etc. are to be arranged by the contractor.
- 1.4.10 All the T & P, lifting tackles including wire ropes, slings, shackles and electrically operated equipment shall be got approved by BHEL Engineer before they are actually put on use. Test certificates obtained from the statutory authority should be submitted before their usage.
- 1.4.11 Required **Mobile Crane for completion of piping system has to be arranged by contractor**. The age of the contractor deployed cranes upto 150 T should be within 15 years as on date of deployment. Contractor has to provide documentary proof for the age of the crane at the time of deployment to the BHEL Engineer.
- 1.4.12 In the event of non-mobilization of Tools, Plants, Machinery, Equipment, Material or non-availability of the same owing to breakdown and as a result progress of work suffered, BHEL reserves the right to make alternative arrangement (available or higher capacity) in line with SCC clause no. 4.2.1. 7 and hire charges shall be applicable as under:

**Case 1: BHEL provides its own Capital T&P:** If BHEL provides owned T&P then BHEL, hire charges (as per BHEL norms) will be recovered from the contractor as per the prevailing BHEL Corporate hire charges applicable (as enclosed in Volume I Book I TCC- Volume 1A Part II) as per following cases

- In case the T&P is specifically listed in “T&Ps to be deployed by Contractor”, ‘Rates of hire charges applicable to outside agencies other than contractors working for BHEL’ will apply.
- In case the T&P is not specifically listed in “T&Ps to be deployed by Contractor”, ‘Rates of hire charges applicable to contractors working for BHEL’ will apply.

The hire charges of Capital Tools & Plants are exclusive of operating expenses e.g., Operator, fuel & Consumables and the same shall be arranged by the contractor at his cost.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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**Case 2: BHEL provides hired T&P:** In all cases other than that specified in SI No. 1 above, actual expenses incurred by BHEL along with applicable overheads will be back-charged to the contractor.

The present rates of BHEL's Corporate Crane hire charge, are enclosed in part II of Technical Conditions of Contract (Volume-I Book-I). This may get revised further as per the BHEL corporate guidelines. The prevailing rates as on date of execution shall be applicable.

- 1.4.13 All the T & P arranged by contractor including electrical connections wherein required shall be reliable / proven / tested with necessary test certificate.
- 1.4.14 All instruments, measuring tools etc. are to be calibrated periodically as per the requirement of BHEL and necessary calibration certificates are to be submitted to BHEL before use.
- 1.4.15 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.
- 1.4.16 Also Refer clauses in connection with BHEL T&Ps in chapter V of this booklet.
- 1.4.17 Other Relevant clauses shall be referred in Special Conditions of Contract (SCC) published in Volume IB of Book II.
- 1.4.18 Also refer clause 1.3.7 on providing computers in chapter-III of Technical Conditions of Contract (VOLUME-IA PART- II) of this booklet.

## **Note to Chapter-IV:**

- i. The induction heating equipment and other equipment shall be drawn from BHEL stores, transported and installed & commissioned wherever required. For routine maintenance & attending all type of break-down maintenance, contractor shall deploy sufficient manpower, tools and plant within the quoted rate.
- ii. The contractor shall provide electrical cables & switches required for extending power supply to the induction heating equipment. All the equipment shall be protected by providing covers or sheds at site by the contractor with in the quoted rate.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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## VOLUME-IA PART-I CHAPTER – V

### **1.5 T&Ps & MMEs TO BE DEPLOYED BY BHEL ON SHARING BASIS**

1.5.1 List of Tools & Plants to be made available by BHEL to contractor on free of hire charges on sharable basis for execution of works within the scope of this tender for each unit are as below.

Sl. No.	Description	Qty.
01	EOT Crane at TG Hall without operator	1 No.
02	Induction Heating Machines	As Required
03	Spot Welding Machine	1 No.
04	Chemical Cleaning Pumps with accessories	As Required
05	Suitable capacity Hydro Test pump for HP lines	1 No.

1.5.2 All the T&Ps mentioned in clause 1.5.1 above shall be issued to contractor on shareable basis and the allotment is made by BHEL on need basis for erection / pre-commissioning activities only.

1.5.3 Apart from the above mentioned T&Ps, any other Tools & Plants required for satisfactory completion of the work has to be arranged by the contractor.

1.5.4 EOT Crane – Allotment will be made only on need basis. Trained operators are to be arranged by the contractor within the quoted rates. Contractor has to plan the activities on item wise where the EOT crane is required to be used and submit to BHEL site for approval. In case the erection can be carried out by using other T&Ps, contractor shall make his own arrangement. The decision of BHEL Site I/c on this will be final and binding. Providing manpower assistance required for free movement of trailing cable of EOT Crane is included in the scope of this contract.

1.5.5 BHEL will not provide crane operators for EOT cranes. Trained operators for EOT crane to be arranged by the contractor at his cost.

1.5.6 P91 WELDING

Facility and Consumables to be provided by BHEL for P91 Welding free of any charges:

- Required no. of Induction heating machine.
- Spot Welding machine for fixing thermocouple

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

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- c) Compensating cables.
- d) Only One set of Annealing cable (2 nos) will be supplied by BHEL irrespective of number of Induction Heating Equipments deployed by BHEL. Additional sets of annealing cables have to be arranged by the contractor within the quoted rates.
- e) Filler wire and Welding Electrodes for P91 Welding as supplied by manufacturing units. In case of additional requirements of the Filler Wire and Welding electrodes, the same shall be arranged by Bidder at own cost. BHEL will provide the Filler Wire and Electrodes as per the shipping list only.

1.5.7 For P91 welding, BHEL will only provide the facility and Consumables as indicated in TCC. Other consumables and facility required to complete the work shall be arranged by the contractor with in the quoted rate.

1.5.8 The contractor at his cost shall arrange for grouting of anchor points of T&Ps issued to him. Necessary grout materials are to be arranged by the contractor at his cost

1.5.9 Necessary electrical / water / air connection required for operation of any of the above equipment shall be Contractor's account.

1.5.10 The Contractor shall be responsible for the safe and proper use of the above equipments issued to him. Day-to-day maintenance and operation of equipment's shall be the contractor's responsibility and shall be as per instructions / standard practice of BHEL Engineer

1.5.11 In case of non-availability of the above, due to any unavoidable reason, like breakdown, overhaul etc., the contractor shall make arrangement at his own cost to meet the erection schedules. No extra claim will be admitted due to the non-availability of any of the above equipment. No delay in execution of work shall be accepted on this account.

1.5.12 The contractor shall return the T & P issued to him by BHEL in good working condition as and when so desired by BHEL. (Completion or reduction in work load) for diversion for other work. If such return is delayed by contractor due to his fault without written consent of BHEL, hire charges as applicable according to BHEL policy will be levied from such time it was requisitioned by BHEL to the time of actual return and the amount so decided and arrived at, will be recovered from the contractor's bill.

1.5.13 Contractor shall have at all times experienced operators and technicians for routine and breakdown maintenance of the equipment. Any delay in rectification of defects will warrant BHEL rectifying the defect and charging the cost to the contractor.

1.5.14 If at any time it is noticed that contractor is not using any of the T & P or equipment properly according to the instructions of BHEL, BHEL will have the right to withdraw any and all such equipment and any cost due to this shall be contractor's account.

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

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- 1.5.15 All the T&P would be issued only at BHEL stores and it shall be the responsibility of the contractor to take delivery from BHEL stores, transport the same to site and return the same to BHEL stores in good condition after use.
- 1.5.16 Contractor shall make good any loss or damage to the equipments supplied to him and day to day maintenance and operations of equipments shall be borne by the contractor including all consumables like petrol, oil and air filters etc.
- 1.5.17 Any Loss / Damage of tools by the contractor, the same shall have to be replaced by the contractor or otherwise cost thereof shall be recovered from the contractor. Any loss / damage to any or part of the above equipments shall be to contractor's account and the expenditures on these account will be recovered from contractor's bills in case contractor fails to make good the loss.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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## VOLUME-IA PART-I CHAPTER – VI

### 1.6 TIME SCHEDULE

#### 1.6.1 TIME SCHEDULE

1.6.1.1 The entire work of erection, testing and commissioning of Power Cycle Piping and all **associated** Piping & Insulation works for Unit-2 and Unit-4 as detailed elsewhere in the Tender Specification shall be completed within Twenty (**20**) months from the date of commencement of work at site. There is no phase shift between the two units, both units shall start parallel. During the total period of contract, the contractor has to carry out the activities in a phased manner as required by BHEL and the program of milestone events.

1.6.1.2 The erection work shall be commenced on the mutually agreed date between the bidder and BHEL engineer and shall be deemed as completed in all respect only when both units are in operation. The decision of BHEL in this regard shall be final and binding of the contractor. The scope of work under this contract is deemed to be completed only when so certified by the site Engineer.

1.6.1.3 The contractor is required to refer Form 15 in Volume-I Book-II for all the instructions to be taken immediately after receipt of LOI.

#### 1.6.2 COMMENCEMENT OF CONTRACT PERIOD

1.6.2.1 The date of commencement of contract period shall be the mutually agreed date between the bidder and BHEL engineer at site to start the work. In case of discrepancy, the decision of BHEL engineer is final.

#### 1.6.3 MOBILISATION FOR ERECTION, TESTING, ASSISTANCE FOR COMMISSIONING ETC.,

1.6.3.1 The activities for erection, testing etc. shall be started as per directions of Construction Manager of BHEL.

1.6.3.2 The contractor has to augment his resources in such a manner that following major milestones of erection & commissioning are achieved on specified schedules mentioned below.

#### 1.6.4 TENTATIVE MILESTONES: (For each unit)

Milestone Activity	Milestone Month
Start of Erection	1 <sup>st</sup> Month
Readiness for Boiler Light Up	9 <sup>th</sup> Month
Readiness for Steam Blowing	12 <sup>th</sup> Month
Readiness for Synchronisation	15 <sup>th</sup> Month
Readiness for Full Load & Trial Operation	18 <sup>th</sup> Month

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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Completion of Contractual Obligations	20 <sup>th</sup> Month
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1.6.4.1 In order to meet the schedule in general, and any other intermediate targets set, to meet customer/ project schedule requirements, Contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL Engineer.

## 1.6.5 CONTRACT PERIOD

1.6.5.1 The contract period for completion of entire work under scope for each package shall be **Twenty (20) months** from the "COMMENCEMENT OF CONTRACT PERIOD" as specified earlier for completion of the entire work.

## 1.6.6 MAJOR INTERMEDIATE MILESTONES for Penalty:

Sl. No.	Description	Month	Intermediate Milestone for each unit
1	Readiness for Steam Blowing	12 <sup>th</sup> Month	M1
2	Readiness for Synchronisation	15 <sup>th</sup> Month	M2

### 1.6.6.1 Penalty for Intermediate Milestones

- M1 and M2 shall be intermediate Milestones for this work.
- In case of slippage of these identified Intermediate Milestones, Delay Analysis shall be carried out on achievement of each of these two Intermediate Milestones in reference to Form 14.
- Incase delay in achieving M1 milestone is solely attributable to the contractor, 0.5% per week of executable contract value\* limited to Maximum 2% of executable contract value will be withheld.
- Incase delay in achieving M2 milestone is solely attributable to the contractor, 0.5% per week of executable contract value\* limited to maximum 3% of executable contract value will be withheld.
- Amount already withheld, if any, against slippage of M1 milestone, shall be released only if there is no delay attributable to contractor in achievement of M2 milestone.
- Amount required to be withheld on account of slippage of identified intermediate milestone(s) shall be withheld out of respective milestone payment and balance amount (if any) shall be withheld @10% of RA Bill amount from subsequent RA bills.

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- Final deduction towards LD (if applicable), on account of delay attributable to contractor shall be based on final delay analysis on completion / closure of contract. Withheld amount, if any due to slippage of intermediate milestones shall be adjusted against LD or released as the case may be.
- In case of termination of contract due to any reason attributable to contractor before completion of work, the amount already withheld against slippage of intermediate milestones shall not be released and be converted in to recovery.
- Note: \*Executable contract value-value of work for which inputs/fronts were made available to contractor and were scheduled for execution till the date of achievement of that milestone.

## 1.6.7 GUARANTEE PERIOD FOR EACH UNIT

1.6.7.1 The guarantee period of **Twelve Months** shall commence from the date of handing over of each Unit to Customer or six months from the date of first synchronization of the set, whichever is earlier (Provided all erection, testing, and commissioning works are completed in all respects).

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## VOLUME-IA PART-I CHAPTER – VII **TERMS OF PAYMENT**

### **Terms of payment**

1.7.1 The progressive payment for erection, testing and commissioning on accepted price of contract value will be released as mentioned below.

1.7.2 Progressive payment against monthly running bills will be made up to 85% of the value of the erected tonnage pro rata as per Cl. 1.7.2.1 to 1.7.2.13 of the following table in each unit (as per the following table) for the tonnage erected

Cl. No.	Description	Piping			Insulation	
		1) P91 2) HP 3) LP 4) SS	1) H&S 2) Others	1) Tanks	1) Temp Piping Steam blowing/ Chemical cleaning	1) Fixing components 2) Mineral wool 3) Aluminum 4) Sealing compound
<b>Pro rata payments (85%)</b>						
1.7.2.1	On pre assembly where ever applicable (if not applicable this portion shall be clubbed with placement in position)	20	15	-	-	-
1.7.2.2	Placement in position	20	25	-	-	50
1.7.2.3	Alignment	10	15	-	-	15
1.7.2.4	Welding/ Bolting/ Fixing	15	30	-	-	20
1.7.2.5	Completion of NDT (if not applicable , then this portion to be paid along with welding)	5	-	-	-	-
1.7.2.6	Installation of temp. piping	-	-	-	60	-
1.7.2.7	Dismantling of temp. piping, edge preparation and return to BHEL stores, area cleaning	-	-	-	25	-
1.7.2.8	Hangers & Supports etc. wherever necessary as per drawing	10	-	-	-	-
1.7.2.9	Hydraulic test / Pneumatic test	3	-	-	-	-
1.7.2.10	Floating of lines, final adjustment of supports for cold & hot values (if not applicable, this portion to be	2	-	-	-	-

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

Cl. No.	Description	Piping			Insulation	
		1) P91 2) HP 3) LP 4) SS	1) H&S 2) Others	1) Tanks	1) Temp Piping Steam blowing/ Chemical cleaning	1) Fixing components 2) Mineral wool 3) Aluminum 4) Sealing compound
	clubbed along with hydraulic test/ pneumatic test)					
1.7.2.11	Erection of tanks and vent silencers	-	-	30	-	-
1.7.2.12	Alignment of tanks & vent , silencers and their associated approach platform with ladders etc.	-	-	40	-	-
1.7.2.13	Testing & commissioning of Tanks & Vent silencers	-	-	15	-	-
	Total for pro rata payments (85%)	85	85	85	85	85

1.7.3 Further 15% payment on pro-rata basis common to all PG shall be released on achievement of the following stage/mile stones events in each unit (as per the following table) for the tonnage erected

Cl. No.	Description	Piping			Insulation	
		1) P91 2) HP 3) LP 4) SS	1) H&S 2) Others	1) Tanks	1) Temp Piping Steam blowing/ Chemical cleaning	1) Fixing components 2) Mineral wool 3) Aluminum 4) Sealing compound
<b>Stage/ Milestone payments (15%)</b>						
1.7.3.1	Boiler light up	1	1	1	-	1
1.7.3.2	ABO/Chemical cleaning	-	-	-	-	-
1.7.3.3	Steam blowing (Wherever Steam Blowing is not applicable, this may be payable for Chemical /detergent cleaning as applicable)	1	1	2	-	1
1.7.3.4	Safety Valve Floating	1	1	1	-	1
1.7.3.5	Rolling and synchronization	1	1	2	-	1
1.7.3.6	Coal firing	-	1	1	-	1
1.7.3.7	Full load	1	1	1	-	1

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Cl. No.	Description	Piping			Insulation	
		1) P91 2) HP 3) LP 4) SS	1) H&S 2) Others	1) Tanks	1) Temp Piping Steam blowing/ Chemical cleaning	1) Fixing components 2) Mineral wool 3) Aluminum 4) Sealing compound
1.7.3.8	Trial operation of Unit	2	2	1	-	2
1.7.3.9	Completion of all drains and vents to respective locations and placement of instrument sensors after steam blowing	2	-	1	-	-
1.7.3.10	Painting	1	1	2	-	-
1.7.3.11	Area cleaning, temporary structures cutting/removal and return of scrap	1	2	-	-	3
1.7.3.12	Punch list points/pending points liquidation	1	1	1	-	1
1.7.3.13	Submission of as built drawings	1	1	-	-	-
1.7.3.14	Material reconciliation	1	1	1	15	2
1.7.3.15	Completion of contractual obligation	1	1	1	-	1
	<b>Total for stage/ milestone payments (15%)</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>

## Notes to Terms of payment:

- For PVC, ORC, RA Bill payment, compensation for Quantity variation, Retention amount, Security Deposit, please refer relevant clauses in TCC and Vol IA Part-II, Chapter-1: Corrections / Revisions in Special Conditions of Contract, General Conditions of Contract and Forms & Procedures of Technical Conditions of Contract (Volume-I, Book-I).
- Base date for the purpose of calculation of PVC for this contract (in line with clause 2.17.5 of GCC) shall be as follows:  
Base date shall be calendar month of the scheduled completion date (i.e. actual start date + scheduled contractual completion period as per letter of intent/ award and/or work order).

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## **VOLUME-IA PART-I CHAPTER - VIII**

### **TAXES AND OTHER DUTIES**

1.8.1 Goods and service Tax (GST) & Cess

1.8.1.1 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.

1.8.1.2 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

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

BHEL GSTN - 36AAACB4146P1ZG

NAME - BHARAT HEAVY ELECTRICALS LIMITED

ADDRESS - Yadadri Thermal Power Station, 5X800 MW (Coal based), Veerlapalem village, Dameracherla Mandal, Nalgonda District, Telangana, India

1.8.1.4 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.

1.8.1.5 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.

1.8.1.6 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.

1.8.1.7 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.

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

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- 1.8.1.8 TDS under GST (if/ as & when applicable) shall be deducted at prevailing rates on gross invoice value from the running bills.
- 1.8.1.9 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.
- 1.8.1.10 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.

### 1.8.2 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.

### 1.8.3 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.

### 1.8.4 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.

### 1.8.5 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.

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## VOLUME-IA PART-I CHAPTER -IX

### 1.9.0 BILL OF QUANTITY

As mentioned in the Volume II, Price Bid, Part-C

#### 1.9.1 WEIGHT SCHEDULE - SUMMARY

S.NO.	DESCRIPTION	APPROX WT (In MT) for UNIT-2	APPROX WT (In MT) for UNIT-4	Rate Schedule
1	P91 Piping	796.29	796.29	1a
2	HP Piping	1252.59	1223.01	1b
3	LP Piping	351.33	351.98	1c
4	SS Piping	5.39	5.39	1d
5	Hangers and Supports including Tanks, Vessels, Pumps, etc	668.37	668.06	1e
6	Temporary Piping for Chemical Cleaning	103.24	103.24	2A
7	Temporary Piping for Steam Blowing	193.63	193.63	2B
8	Fixing components	7.7	7.7	3A
9	Mineral wool	593.67	593.67	3B
10	Aluminium Sheets	149.54	149.54	3C
<b>TOTAL WEIGHT (in MT)</b>		<b>4121.75</b>	<b>4092.51</b>	
<b>TOTAL WEIGHT for Unit-2 &amp; Unit-4 (in MT)</b>		<b>8214.26</b>		

#### 1.9.2 PGMA WISE WEIGHT DETAILS

PGMA	Description	Tonnage In MT UNIT#2	Tonnage In MT UNIT#4	Category	Rate Schedule ID
80300	MS FROM SUPER HEATER TO BOILER STOP VALVE	46.18	46.18	P-91	1a
80301	MS FROM BOILER SV TO ESV	267.53	267.53	P-91	1a
80303	MS HEADER TO AUX PRDS	3.96	3.96	P-91	1a
80304	MS HEADER TO HPBP VALVE	17.29	17.29	P-91	1a
80307	HP AND LP BYPASS WARM UP	0.45	0.45	P-91	1a
80310	HRH FROM REHEATER TO IV VALVE	364.67	364.67	P-91	1a

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PGMA	Description	Tonnage In MT UNIT#2	Tonnage In MT UNIT#4	Category	Rate Schedule ID
<b>80312</b>	LPBP VALVE UPSTREAM AND DOWNSTREAM	96.21	96.21	P-91	1a
<b>80320</b>	CRH FROM TURBINE TO REHEATER	207.19	207.19	HP PIPING	1b
<b>80321</b>	HPBP VALVE TO CRH PIPING	13.58	13.58	HP PIPING	1b
<b>80322</b>	CRH PIPING TO DEAERATOR HEATER	18.56	18.56	HP PIPING	1b
<b>80323</b>	STEAM TO BFP TURBINE	6.74	6.74	HP PIPING	1b
<b>80324</b>	CRH HEADER TO AUX PRDS	1.28	1.28	HP PIPING	1b
<b>80329</b>	EXTRACTION STEAM TO BFP DRIVE TURBINE	10.72	10.41	HP PIPING	1b
<b>80332</b>	EXTRACTION STEAM TO LP HEATER 3	9.92	9.91	HP PIPING	1b
<b>80334</b>	EXTRACTION STEAM TO LP HEATER 5	9.96	9.96	HP PIPING	1b
<b>80335</b>	EXTRACTION STEAM TO DEAERATOR HEATING	15.68	15.68	HP PIPING	1b
<b>80336</b>	EXTRACTION STEAM TO HP HEATER 6	7.93	7.93	HP PIPING	1b
<b>80337</b>	EXTRACTION STEAM TO HP HEATER 7	6.32	6.32	HP PIPING	1b
<b>80338</b>	EXTRACTION STEAM TO HP HEATER 8	5.62	5.62	HP PIPING	1b
<b>80339</b>	AUX STEAM TO BFP TURBINE	1.71	1.71	HP PIPING	1b
<b>80340</b>	AUX STEAM HEADER	9.43	9.43	HP PIPING	1b
<b>80341</b>	AUX STEAM HEADER INTERCONNECTION BETWEEN UNITS	0.30	1.00	HP PIPING	1b
<b>80342</b>	AUX STEAM TO SCAPH	11.77	11.77	HP PIPING	1b
<b>80343</b>	AUX STEAM TO AH SOOT BLOWERS	4.39	4.39	HP PIPING	1b
<b>80344</b>	AUX STEAM TO FO SYSTEM TP	2.00	5.00	HP PIPING	1b
<b>80345</b>	AUX STEAM TO DEAERATOR HEATING	7.24	7.24	HP PIPING	1b
<b>80349</b>	AUX STEAM TO GLAND SEALS	1.00	1.00	HP PIPING	1b
<b>80351</b>	AUX STEAM TO MILLS-SG SCOPE	19.03	19.03	HP PIPING	1b

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PGMA	Description	Tonnage In MT UNIT#2	Tonnage In MT UNIT#4	Category	Rate Schedule ID
<b>80355</b>	STEAM TRACING PIPING	1.00	1.00	HP PIPING	1b
<b>80395</b>	AUX STEAM TO FUEL OIL ATOMISING	0.32	0.32	HP PIPING	1b
<b>80418</b>	ERCTION MATERIALS FOR INSTRUMENTS	0.73	0.73	HP PIPING	1b
<b>80420</b>	BOILER FEED PUMP SUCTION	25.13	25.13	HP PIPING	1b
<b>80421</b>	BOILER FEED RECIRCULATION	13.50	13.50	HP PIPING	1b
<b>80423</b>	BOILER FEED PUMP TO HPH INCLUDING BYPASS	146.00	147.71	HP PIPING	1b
<b>80424</b>	BFD BETWEEN HEADERS AND GROUP PROTECTION VALVES	105.12	105.43	HP PIPING	1b
<b>80425</b>	BFD FROM FINAL HPH TO SG TP	64.89	64.89	HP PIPING	1b
<b>80430</b>	SPRAY WATER TO HPBP	3.05	3.05	HP PIPING	1b
<b>80433</b>	SPRAY WATER FROM BFP INTERSTAGE	13.82	13.82	HP PIPING	1b
<b>80650</b>	FUEL OIL SUPPLY AND RETURN	30.00	50.00	HP PIPING	1b
<b>80901</b>	SUB DELIVERY VALVES FOR LIGHT UP	7.03	6.76	HP PIPING	1b
<b>80992</b>	WELDING ELECTRODES	10.42	10.42	HP PIPING	1b
<b>81411</b>	DIRECT GUAGES FOR STEAM LINES	0.72	0.72	HP PIPING	1b
<b>81412</b>	DIRECT GUAGES FOR NON-STEAM LINES	0.75	0.75	HP PIPING	1b
<b>81416</b>	PG TEST MATERIAL	1.79	1.79	HP PIPING	1b
<b>80363</b>	EXHAUST STEAM FROM PRIME MOVERS-TG SCOPE	30.95	30.95	LP PIPING	1c
<b>80370</b>	HP Flash Drain Tank to Condenser	77.22	77.22	HP PIPING	1b
<b>80371</b>	DRAIN FLASH TANK VENT TO CONDENSER	4.10	4.29	LP PIPING	1c
<b>80373</b>	AUX STEAM HEADER SV EXHAUST	2.70	2.70	LP PIPING	1c
<b>80375</b>	UNLISTED SC EXHAUST-TG EXHAUST	0.51	0.51	LP PIPING	1c
<b>80379</b>	HP SV EXHAUST TO FLASH TANK	6.11	6.11	LP PIPING	1c
<b>80381</b>	HP HEATER VENTS	4.40	4.40	LP PIPING	1c
<b>80382</b>	LP HEATER VENTS	1.76	1.76	LP PIPING	1c

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PGMA	Description	Tonnage In MT UNIT#2	Tonnage In MT UNIT#4	Category	Rate Schedule ID
<b>80385</b>	VENT FROM UNLISTED PPG/EQPT TO CONDENSER	7.13	7.13	LP PIPING	1c
<b>80388</b>	CONDENSER AIR EVACUATION PIPING	7.95	7.95	LP PIPING	1c
<b>80400</b>	CONDENSATE SUCTION PIPING	9.03	9.03	LP PIPING	1c
<b>80401</b>	CD FROM PUMP TO LPH1/DC INLET TEE AND RECIRCULATION	32.40	32.40	LP PIPING	1c
<b>80402</b>	CD FROM LPH1/DC INLET TEE TO TG TP	11.33	11.33	LP PIPING	1c
<b>80403</b>	CD FROM TG TP TO DEAERATOR	17.98	17.98	LP PIPING	1c
<b>80407</b>	CONDENSATE FOR SEALING OF VACCUM	2.80	2.80	LP PIPING	1c
<b>80408</b>	CONDENSATE DUMP FROM HEADER	1.23	1.23	LP PIPING	1c
<b>80419</b>	DEAERATOR SV EXHAUST TO ATMOSPHERE	4.71	4.71	LP PIPING	1c
<b>80435</b>	UNLISTED SPRAY WATER-TG SCOPE	1.97	1.97	LP PIPING	1c
<b>80436</b>	SPRAY WATER TO LP HEATER DESUPERHEATER	4.92	4.92	LP PIPING	1c
<b>80439</b>	TURBINE FLASH TANK DRAIN TO CONDENSER	0.20	0.20	LP PIPING	1c
<b>80442</b>	GLAND STEAM COOLER DRAINS	0.33	0.33	LP PIPING	1c
<b>80443</b>	LP HEATER 1 TO CONDENSER	7.01	7.01	LP PIPING	1c
<b>80444</b>	LP HEATER DRIPS AND DRAINS	7.06	7.06	LP PIPING	1c
<b>80446</b>	DEAERATOR HEATER OVERFLOW AND DRAINS	3.53	3.53	LP PIPING	1c
<b>80447</b>	HP HEATER DRAINS	32.81	33.22	LP PIPING	1c
<b>80448</b>	DRAINS FROM UNLISTED EQUIPMENTS	10.53	10.53	LP PIPING	1c
<b>80449</b>	TG CYCLE PIPING DRAINS	10.83	10.83	LP PIPING	1c
<b>80451</b>	BOILER INTEGRAL PIPING DRAINS	25.17	25.22	LP PIPING	1c
<b>80452</b>	HP PIPING DRAINS	28.68	28.68	LP PIPING	1c
<b>80453</b>	LP PIPING DRAINS	16.30	16.30	LP PIPING	1c
<b>80454</b>	SCAPH DRAINS	1.98	1.98	LP PIPING	1c
<b>80455</b>	DRAINS FROM UNLISTED EQUIPMENTS	33.44	33.44	LP PIPING	1c
<b>80457</b>	MANIFOLS FOR HP FLASH BOX AND CONDENSER	1.56	1.56	LP PIPING	1c
<b>80459</b>	HP FLASH TANK DRAIN TO CONDENSER	0.84	0.84	LP PIPING	1c
<b>80473</b>	DM WATER SYSTEM	1.33	1.33	LP PIPING	1c
<b>80493</b>	HP FLASH TANK VENT TO CONDENSER	2.41	2.41	LP PIPING	1c

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PGMA	Description	Tonnage In MT UNIT#2	Tonnage In MT UNIT#4	Category	Rate Schedule ID
<b>80494</b>	LP FLASH TANK VENT TO CONDENSER	3.49	3.49	LP PIPING	1c
<b>80495</b>	LP FLASH TANK DRAIN TO CONDENSER	2.77	2.77	LP PIPING	1c
<b>80545</b>	LP CONDENSATE PIPING WITHIN TG HALL	9.08	9.08	LP PIPING	1c
<b>80673</b>	LUBE OIL PIPING SYSTEM	0.00	0.00	LP PIPING	1c
<b>80601</b>	LP DOSING	3.41	3.41	SS PIPING	1d
<b>80412</b>	HOTWELL MAKE UP	1.98	1.98	SS PIPING	1d
<b>80830</b>	H&S FOR CRITICAL PIPING	194.68	194.37	H&S	1e
<b>80920</b>	H&S FOR HYDRO TEST	3.48	3.48	H&S	1e
<b>80921</b>	H&S FOR LIGH UP STEAM LINE	55.58	55.58	H&S	1e
<b>80928</b>	H&S FOR BOILER LIGHT UP	19.83	19.83	H&S	1e
<b>80930</b>	H&S FOR SYSCHRONISATION	52.85	52.85	H&S	1e
<b>80933</b>	H&S FOR LP PIPING	49.10	49.10	H&S	1e
<b>80935</b>	ALH AND CLD FOR MS PIPING	2.80	2.80	H&S	1e
<b>80936</b>	VLH AND CLH FOR SG PIPING	6.16	6.16	H&S	1e
<b>80937</b>	VLH AND CLH FOR CRITICAL PIPING	48.30	48.30	H&S	1e
<b>80940</b>	Aux Structure for Critical Piping and CD bay	205.42	205.42	H&S	1e
<b>80941</b>	VLH AND CLH FOR BFD PIPING	11.65	11.65	H&S	1e
<b>80942</b>	VLH AND CLH FOR TG CYCLE PIPING	5.85	5.85	H&S	1e
<b>81036</b>	CW STORAGE TANK	7.49	7.49	H&S	1e
<b>81100</b>	CONDENSATE PUMP	4.50	4.50	H&S	1e
<b>81417</b>	INSTRUMENTATION FOR STARTUP SYSTEM	0.30	0.30	H&S	1e
<b>81110</b>	Cooling water Pump With Motor	0.38	0.38	H&S	1e
<b>81318</b>	FIXING COMPONENT FOR MISCELLANEOUS PPG INSULATION	7.70	7.70	INS-IRON	3A
<b>81325</b>	MINERAL WOOL MATTRESS	58.67	58.67	INS- WOOL	3B
<b>81341</b>	SEALING COMPOUND FOR INSULATION	0.27	0.27	INS-ALU	3C
<b>81350</b>	ALUMINIUM CLADDING FOR INSULATION	19.27	19.27	INS-ALU	3C
<b>80399</b>	STEAM BLOWING PIPING TEMPORARY	181.32	181.32	TEMP	2B
<b>80604</b>	ACID CLEANING PIPING	93.33	93.33	TEMP	2A
<b>80926</b>	H&S FOR LIGH UP NON STEAM LINE	12.31	12.31	TEMP	2B
<b>80927</b>	H&S ACID CLEANING PIPING	9.91	9.91	TEMP	2A
<b>TRICHY VALVES</b>					

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PGMA	Description	Tonnage In MT UNIT#2	Tonnage In MT UNIT#4	Category	Rate Schedule ID
XXXX	PIPING VALVES	290.73	287.02	HP PIPING	1b
<b>HYDERABAD</b>					
xxxx	Recirculation valves/Strainers of BFP, BOOSTER PUMP.	15.00	15.00	HP PIPING	1b
xxxx	Drive Turbine Insulation	5.00	5.00	INS- WOOL	3B
<b>PEM BOI</b>					
xxxx	ALUMINIUM SHEETS-INSULATION	100.00	100.00	INSU-ALU	3C
xxxx	MINERAL WOOL MATTRESS	530.00	530.00	INSU- WOOL	3B
xxxx	ANCILLARY MATERIALS	30.00	30.00	INSU-ALU	3C
xxxx	VALVES	25.00	25.00	HP PIPING	1b
xxxx	ME BELLOWs, STEAM AND AIR TRAPS, BUTTERFLY VALVES ETC.	50.00	50.00	HP PIPING	1b

## Note to Weight Schedule:

1	The weights mentioned above are approximate and liable to vary as per design consideration. There will be change in PG, weight, description etc. However, payments will be made to the contractor for the tonnage actually erected at the respective category as per the quoted / accepted rate. Quantity Variation will be dealt as per clause 2.14 of General Conditions of Contract (Volume I Book II).
2	There may be variation or addition of PGAs, description, weights etc., and any additional scope of work supplied under the above package shall be erected by the contractor and payment will be made as per the quoted/accepted rate in the respective category.
3	The temporary piping for Chemical Cleaning & steam Blowing will be issued as and where conditions in cut pieces. The scope includes cutting and edge preparation and erection as per the site condition & dismantling after the process is over and return to store with identification mark as instructed by the BHEL/Engineer. The quoted rate shall be inclusive of all this.
4	The erection & dismantling of temporary piping, pumps, tanks, dummy plates & other miscellaneous equipment etc. for pre-commissioning and commissioning activities like hydraulic test, chemical cleaning, steam blowing, etc. are covered in this contract and shall be carried out as a part of work. There will not be any separate payment for this works.
5	Also refer Erection welding schedule in part II of Technical Conditions of Contract (Volume-I Book-I)

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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## VOLUME-IA PART-I CHAPTER -X

### GENERAL

1.10.0 **In addition to the clause 2.8 of General Conditions of Contract (Volume-1C of Book-II) the contractor shall comply with the following:**

1.10.1 Payment Bidders are requested to furnish the following at PSSR-HQ, Chennai immediately after release of Letter of Intent (LOI)

- I. Security Deposit and Additional Security Deposit (As applicable).
- II. Unqualified Acceptance for Detailed LOI/ Work Order.
- III. Rs.100/- Stamp Paper for preparation of Contract Agreement.

1.10.2 Bidders are requested to furnish the proof of documents for the following at PSSR- Site.

- I. PF Regn No.
- II. Labour License No.
- III. Workmen Insurance Policy No.

1.10.3 **In addition to the clause 2.8 of General Conditions of Contract (Volume-1C of Book-II) the contractor shall comply with the following.**

1.10.4 **BOCW Act & BOCW Welfare Cess Act**

1.10.4.1 The Contractor Should Register their Establishment under BOCW Act 1996 read with rules 1998 by submitting Form I (Application for Registration of Establishment) and Form IV (Notice of Commencement /Completion of Building Other Construction Work) to the respective Labour Authorities i.e.,

- a) Assistant Labour Commissioner (Central) in respect of the project premises which is under the purview of Central Govt.–NTPC, NTPL etc.
- b) Appropriate State authorities in respect of the project premises which is under the purview of State Govt.

1.10.4.2 The Contractor should comply with the provisions of BOCW Welfare Cess Act 1996 in respect of the work awarded to them by BHEL

1.10.4.3 The contractor should ensure compliance regarding Registration of Building Workers as Beneficiaries, Hours of work, welfare measures and other conditions of service with particular reference to Safety and Health measures like Safety Officers, safety committee, issue of Personal protective equipments, canteen, rest room, drinking water, Toilets, ambulance, first aid centre etc.,

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- 1.10.4.4 The contractor irrespective of their nature of work and manpower (Civil, Mechanical, Electrical works etc) should register their establishment under BOCW Act 1996 and comply with BOCW Welfare Cess Act 1996.
- 1.10.4.5 Contractor shall make remittance of the BOCW cess as per Act in consultation with BHEL as per the rates in force (presently 1%). BHEL shall reimburse the same upon production of documentary evidence. However, BHEL shall not reimburse the Fee paid towards the registration of establishment, fess paid towards registration of beneficiaries and contribution of beneficiaries remitted.
- 1.10.4.6 Non-compliance to provisions of the BOCW act and BOCW welfare Cess act is not acceptable. In case of any non-compliance, BHEL reserves the right to withhold any sum it deems fit. Only upon total compliance to the BOCW act and also discharge of total payment of Cess under the BOCW Cess act by the contractor, BHEL shall consider refund of the amounts.

### **1.10.5 PROVIDENT FUND**

- 1.10.5.1 The contractor is required to extend the benefit of Provident Fund to the labour employed by the contractor in connection with this contract as per the Employees Provident Fund and Miscellaneous Provisions Act 1952. For due implementation of the same, the contractor is hereby required to get themselves registered with the Provident Fund authorities for the purpose of reconciliation of PF dues and furnish to us the code number allotted to them by the Provident Fund authorities within one month from the date of issue of this letter of intent. In case the contractor is exempted from such remittance an attested copy of authority for such exemption is to be furnished. Please note that in the event of contractor's failure to comply with the provisions of said Act, if recoveries therefore are enforced from payments due to BHEL by the customer or paid to statutory authorities by BHEL, such amount will be recovered from payments due to the contractor.
- 1.10.5.2 The final bill amount would be released only on production of clearance certificate from PF / ESI and labour authorities as applicable.

### **1.10.6 OTHER STATUTORY REQUIREMENTS**

- 1.10.6.1 The Contractor shall submit a copy of Labour License obtained from the Licensing Officer (Form VI) u/r25 read with u/s 12 of Contract Labour (R&A) Act 1970 & rules and Valid WC Insurance copy or ESI Code (if applicable) and PF code no along with the first running bill.
- 1.10.6.2 The contractor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act

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1952 and copy of renewed WC Insurance policy or copies of monthly return of ESI contribution with Challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.

- 1.10.6.3 The Contractor should ensure compliance of Sec 21 of Contract Labour (R&A) Act 1970 regarding responsibility for payment of Wages. In case of "Non-compliance of Sec 21 or non-payment of wages" to the workmen before the expiry of wage period by the contractor, BHEL will reserve its right to pay the workmen under the orders of Appropriate authority at the risk and cost of the Contractor.
- 1.10.6.4 The Contractor shall submit copies of Final Settlement statement of disbursal of retrenchment benefits on retrenchment of each workman under I D Act 1948, copies of Form 6-A (Annual Return of PF Contribution) along with Copies of PF Contribution Card of each member under PF Act and copies of monthly return on ESI Contribution – Form 6 under ESI Act1948 (If applicable) to BHEL along with the Final Bill.
- 1.10.6.5 In case of any dispute pending before the appropriate authority under I D act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserve the right to hold such amounts from the final bills of the Contractor which will be released on submission of proof of settlement of issues from the appropriate authority under the act.
- 1.10.6.6 In case of any dispute prolonged/pending before the authority for the reasons not attributable to the contractor, BHEL reserves the right to release the final bill of the contractor on submission of Indemnity bond by the contractor indemnifying BHEL against any claims that may arise at a later date without prejudice to the rights of BHEL.

### 1.10.7 DEPLOYMENT OF SKILLED / SEMI-SKILLED TRADESMEN

The following clause is applicable in case the contract value / contract price is Rs. Five crores and above.

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

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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.

### 1.10.8 RECOVERY OF COMPENSATION PAID TO VICTIM(S) BY BHEL IN CASES OF DEATH/ PERMANENT INCAPACITATION OF PERSON DUE TO AN ACCIDENT DURING THE WORKS

BHEL shall recover the amount of compensation paid to victim(s) by BHEL towards loss of life / permanent disability due to an accident which is attributable to the negligence of contractor, agency or firm or any of its employees as detailed below.

1.10.8.1 Victim: Any person who suffers permanent disablement or dies in an accident as defined below.

1.10.8.2 Accident: Any death or permanent disability resulting solely and directly from any unintended and unforeseen injurious occurrence caused during the manufacturing / operation and works incidental thereto at BHEL factories/ offices and precincts thereof, project execution, erection and commissioning, services, repairs and maintenance, trouble shooting, serving, overhaul, renovation and retrofitting, trial operation, performance guarantee testing undertaken by the company or during any works /during working at BHEL Units/ Offices/ townships and premises/ Project Sites.

1.10.8.3 Compensation in respect of each of the victims:

(i) In the event of death or permanent disability resulting from Loss of both limbs: Rs. 10,00,000/- (Rs. Ten Lakh)

(ii) In the event of other permanent disability: Rs. 7,00,000/- (Rs. Seven Lakh)

1.10.8.4 Permanent Disablement: A disablement that is classified as a permanent total disablement under the proviso to Section 2 (I) of the Employee's Compensation Act, 1923.

### 1.10.9 GENERAL

#### 1.10.9.1 Site Visit by the Bidder

The bidder prior to submitting his tender for the work, shall visit, examine and acquire full knowledge & information of necessary conditions prevailing at the site and its surroundings of the plant premises together with all statutory, obligatory, mandatory requirements of various authorities about the site of works at his own expense, and obtain and ascertain for himself on his own responsibility that may be for preparing his tender and entering into a contract, and take the same into account in the quoted contract price for the work.

1.10.9.2 The bidder shall satisfy themselves about the following factors:

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- i) Site conditions including access to the site, existing and required roads and other means of transport/communication for use by him in connection with the work including diverting and re-routing of services.
- ii) Requirement and availability of land and other facilities of his enabling works, establishment of his nursery, office, stores etc.
- iii) Ground conditions including those bearing upon transportation, disposal, handling and storage of materials required for the work or obtained there-from.
- iv) Source and extent of availability of suitable materials, including water etc., and labour (skilled and unskilled) required for work, and laws and regulations governing their use and employment.
- v) Geological, meteorological, topographical and other general features of the site and its surroundings as are pertaining to and needed for the performance of the work.
- vi) The limit and extent of surface and subsurface water to be encountered during the performance of the work, and the requirement of drainage and pumping.
- vii) The type of equipment and facilities needed, for and in the performance of the work;
- viii) The extent of lead and lift required for the work in complete form over the entire duration of the contract, and
- ix) All other information pertaining to and needed for the work including information as to the risks, contingencies and other circumstances which may influence or affect the work or the cost thereof under this contract.

1.10.9.3 The bidder should note that information, if any, in regard to the local conditions, as contained in these tender documents, has been given to tenderer merely for guidance and is not warranted to be complete.

1.10.9.4 A bidder shall be deemed to have full knowledge of the site, whether he inspects it or not, and no extra charges consequent on any misunderstanding or otherwise shall be allowed.

1.10.9.5 The bidder and any of his personnel or agents will be granted permission by the Site-In-Charge or his authorized nominee, on receipt of formal application in respect thereof a week in advance of the proposed date of inspection of site, to enter upon his premises and lands for purpose of such inspection, but only on the express condition that the tenderer (and his personnel and agents) will relieve and indemnify the Employer (and his personnel and agents) from and against all liability in respect thereof and will be responsible for personal injury (whether fatal or otherwise), loss of or damage to property and any other loss, damage, costs and expenses however caused which, but

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for the exercise of such permission, would not have arisen.

- 1.10.9.6 The work covered under this specification requires quality workmanship, engineering and green belt management along with the supply of all consumables, tools and tackles and testing instruments. The contractor shall ensure timely completion of work. The contractor shall have adequate tools, measuring instruments etc. in his possession. He shall also have adequate trained, qualified and experienced engineers, supervisory staff and skilled personnel. The manpower deployment identified by contractor shall match with above scope of works.
- 1.10.9.7 It is not the intent to specify herein all details of all material. Any item related this work not covered by this but necessary to complete the system will be deemed to have been included in the scope of the work.
- 1.10.9.8 All the necessary certificates and licenses required to carry out this scope of work are to be arranged by the contractor then and there at no extra cost.
- 1.10.9.9 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations.
- 1.10.9.10 The contractor shall carryout additional tests, if any, which the Engineer feels necessary because of site conditions and also to meet system specification.
- 1.10.9.11 The work shall be executed under the usual conditions without affecting power plant construction / operation and in conjunction with other operations and contracting agencies at site. The contractor and his personnel shall co-operate with the personnel of other agencies, co-ordinate his work with others and proceed in a manner that shall not delay or hinder the progress of work as a whole.
- 1.10.9.12 All the work shall be carried out as per instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.
- 1.10.9.13 Wherever Construction sequences are furnished by BHEL, the contractor shall follow the same sequence. Contractor shall execute the supply and works as per sequence prescribed by BHEL at site engineer. No claims for extra payment from the contractor will be entertained on the grounds of deviation from the methods of execution of similar job in any other site or for any reasons whatsoever.
- 1.10.9.14 If required by BHEL, the contractor shall change the sequence of his operation so that work on priority sectors can be completed within the projects schedule. The contractor shall afford maximum assistance to BHEL in this connection without causing delay to agreed completion date.
- 1.10.9.15 Contractor shall, transport all materials to site and unload at site / working area for

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inspection and checking. All material handling equipment required shall be arranged by the contractor.

- 1.10.9.16 Contractor shall retain all T&P / Testing instrument / Material handling equipment's etc. at site as per advice of BHEL engineer and same shall be taken out from site only after getting the clearances from engineer in charge.
- 1.10.9.17 The contractor at his cost shall arrange necessary security measures for adequate protection of his machinery, equipment, tools, materials etc. BHEL shall not be responsible for any loss or damage to the contractor's construction equipment and materials. The contractor may consult the Engineer-in-Charge on the arrangements made for general site security for protection of his machinery equipment tools etc.
- 1.10.9.18 The Contractor may have to execute work in such a place and condition where other agencies also will be under such circumstances. However, completion time for construction, agreed will be subject to the condition that contractor's work is not hampered by the agencies.
- 1.10.9.19 Contractor has to work in close co-ordination with other agency at site. BHEL engineer will co-ordinate area clearance. In a project of such magnitude, it is possible that the area clearance may be less / more at a particular given time. Activities and Construction program have to be planned in such a way that the milestones are achieved as per schedule/ plans. Contractor shall arrange & augment the resources accordingly.
- 1.10.9.20 The contractor must obtain the signature and permission of the security personnel of the customer / BHEL for bringing any of their materials inside the site premises. Without the Entry Gate Pass these materials will not be allowed to be taken outside.
- 1.10.9.21 Contractor shall remove all scrap materials periodically generated from his working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. Failure to collect the scrap is likely to lead to accidents and as such BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect.
- 1.10.9.22 The contractor shall ensure that his premises are always kept clean and tidy to the extent possible. Any untidiness noted on the part of the contractor shall be brought to the attention of the contractor's site representative who shall take immediate action to clean the surroundings to the satisfaction of the Engineer-in-Charge.
- 1.10.9.23 The contractor is strictly prohibited from using BHEL's regular components like angles, channels, beams, plates, pipe / tubes, and handrails etc. for any temporary supporting or scaffolding works. Contractor shall arrange himself all such materials. In case of such misuse of BHEL materials, a sum as determined by BHEL engineer will be recovered from the contractor's bill. The decision of BHEL engineer is final and binding on the contractor.

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- 1.10.9.24 No member of the already erected structure / buildings, other component and auxiliaries should be removed / modified without specific approval of BHEL engineer.
- 1.10.9.25 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on latest ISO 9001 Standards.
- 1.10.9.26 Some time it may be required to re-schedule the activities to enable other agencies to commence / continue the work so as to keep the overall project schedule.
- 1.10.9.27 The terminal points decided by BHEL are final and binding on the contractor for deciding the scope of work and effecting the payment for the work done up to the terminals.
- 1.10.9.28 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.
- 1.10.9.29 On Completion of work, all the temporary buildings, structures, pipe lines, cable etc. shall be dismantled and leveled 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 expenditure towards clearance of the same will be recovered from the contractor. The decision of BHEL Engineer in this regard is final.
- 1.10.9.30 It is the responsibility of the contractor to do the checking, testing etc. if necessary, repeatedly to satisfy BHEL Engineer with all the necessary tools and tackles, manpower etc. without any extra cost. The testing will be completed only when jointly certified so, by the BHEL Engineer.
- 1.10.9.31 If any item not covered but requires being executed, same shall be carried out by the contractor. Equivalent or proportional unit rate shall be considered wherever possible from the BOQ. The rates quoted by the contractor shall be uniform as far as possible for similar items appearing in rate schedule.
- 1.10.9.32 The contractor's work shall not hinder other work, either underground or over ground, such as electrical, phone lines, water or sewage lines, etc. In areas of overlap, the contractor shall work in coordination with other related contractors. Any damage by the landscape contractor's team to such utilities will be penalized and contractor shall be responsible for cost for such damages.
- 1.10.9.33 The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work. If the contractor has drawn materials in excess of design requirements, recoveries will be effected for such excess drawls at the rate prescribed by manufacturing units.
- 1.10.9.34 Contractor has to clear the front, expeditiously and promptly as instructed by BHEL Engineer for other agencies, like Boiler, piping, Turbine, Generator erection, Cabling, instrumentation, insulation etc., to commence their work from / on the equipments

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coming under this scope.

1.10.9.35 For the purpose of planning, contractor shall furnish the estimated requirement of power (month wise) for execution of work in terms of maximum KW demand.

## 1.10.9.36 SITE INSPECTION

1.10.9.36.1 BHEL or his authorized agents may inspect various stages of work during the currency of the contract awarded to him. The contractor shall make necessary arrangements for such inspection and carry out the rectification pointed out by the owner / employer without any extra cost to the owner / employer. No cost whatsoever such duplication of inspection of work be entertained.

1.10.9.36.2 BHEL / Customer will have full power and authority to inspect the works at any time, either on the site or at the contractor's premises. The contractor shall arrange every facility and assistance to carry out such inspection. On no account will the contractor be allowed to proceed with work of any type unless such work has been inspected and entries are made in the site inspection register by customer / BHEL.

1.10.9.36.3 The contractor shall maintain at site a joint protocol for recording actual measurement of work carried out at site, inspection and witnessing of various tests conducted by the contractor.

1.10.9.36.4 Field Quality Assurance (FQA) Formats: -

It is the responsibility of the contractor to collect and fill up the relevant FQA log sheets of BHEL and present the same to BHEL after carrying out the necessary checks as per the log sheets and obtaining the signature of BHEL and Owner as token of their acceptance. Payment to the contractor will be inked with the submission of these FQA log sheets.

1.10.9.36.5 Site testing wherever required shall be carried out for all items / materials installed by the contractor to ensure proper installation and functioning in accordance with drawings, specifications and manufacturer's recommendations

1.10.9.36.6 Contractor shall, transport all materials to site and unload at site / working area for inspection and checking. All material handling equipment required shall be arranged by the contractor.

## 1.10.9.37 DOCUMENTATION

1.10.9.37.1 Record of Quantity of FREE / Chargeable items issued by BHEL must be maintained during contract execution. Also reconciliation statement to be prepared at regular intervals.

1.10.9.37.2 The under mentioned Records/ Log-books/ Registers applicable to be maintained.

a) Hindrance Register.

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- b) Site Order Book.
- c) Test Check of measurements.
- d) Steel & Cement Supply and Consumption Daily Register
- e) Records of Test reports of Field tests.
- f) Records of manufacture's test certificates.
- g) Records of disposal of scraps generated during and after the work completion.
- h) List of T&Ps and MMEs

1.10.9.37.3 Other documents / records as specified in chapter -Progress of work in PART- I of Technical conditions of Contract Volume IA (Volume I Book I).

1.10.9.37.4 Schedule as specified in chapters of Technical conditions of Contract Volume IA (Volume I Book I).

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## VOLUME-IA PART – I CHAPTER - XI

### 1.11.0 PROGRESS OF WORK

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.11.1 Refer forms F -14 to F-18 of volume I D (Forms & Procedure) of volume -I book-II and Vol IA Part II. Plan and review will be done as per the formats
- 1.11.2 The progress reports shall indicate the progress achieved against plan, indicating reasons for delays, if any. The report shall also give remedial actions which the contractor intends to make good the slippage or lost time so that further works can proceed as per the original plan the slippages do not accumulate and affect the overall programme.
- 1.11.3 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.
- 1.11.4 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 nonconformities.
- 1.11.5 The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, 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.
- 1.11.6 The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details: -
  - a. Progress photographs in color.
  - b. Erection progress in terms of tonnage, welding joints, radiography, stress relieving, etc., completed as relevant to the respective work areas against planned.
  - c. Site Organization chart of engineers & supervisors as on the last day of the month with further mobilization plan

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- d. Category- wise man hours engaged during the previous month under the categories of fitters, welders, riggers, khalasis, grinder-men, gas-cutters, electricians, crane operations and helpers. Data shall be split up under the work areas like Piping, Insulation etc.
- e. Consumables report giving consumption of all types of gases and electrodes during the previous month.
- f. Availability report of cranes
- g. Safety implementation report in the format
- h. Pending material and any other inputs required from BHEL for activities planned during the subsequent month.

1.11.7 The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged.

1.11.8 The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.

1.11.9 During the course of erection, if the progress is found unsatisfactory, or if the target dates fixed from time to time for every milestone are to be advanced, or in the opinion of BHEL, if it is found that the skilled workmen like fitters, operators, technicians employed are not sufficient BHEL will induct required additional workmen to improve the progress and recover all charges incurred on this account including all expenses together with BHEL overheads from contractor's bills.

### **1.12.0 FOUNDATIONS AND GROUTING**

**The scope of the work will comprise of but not limited to the following:**

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.12.1 Foundation for the equipments to be erected shall be provided by BHEL / clients of BHEL. The dimensions of the foundations and anchor bolt pits shall be checked by the contractor for their correctness as per drawings. Further, top elevation of foundations shall be checked with respect to bench mark etc. All adjustments of foundations surfaces, enlarging the pockets in foundations etc. as may be required for the erection of equipments / plants shall be carried out by the contractor.
- 1.12.2 Cleaning of foundation surfaces, pocket holes and anchor bolt pits etc., dewatering, making them free of oil, grease, sand and other foreign materials by soda wash, water wash, compressed air or any other approved methods etc., form / shuttering work are within the scope this work.
- 1.12.3 It shall be contractor's responsibility to check the various equipment foundations for their correctness with respect to level, orientation, dimensions etc., and ascertained dimensions shall be measured and submitted to BHEL for approval before erection. Also minor chipping, dressing of foundations up to 30 mm for obtaining proper face for packer plates / shims, and may be required for the erection of the equipment / plants will have to be carried out by the contractor without extra cost
- 1.12.4 The surface of foundations shall be dressed to bring the surface of the foundations to the required level and smoothness prior to placement of equipments / equipments based on the foundations including shear lug provisions / openings.
- 1.12.5 Foundation pockets are to be cleaned thoroughly before placing the supports / columns / equipments. Verticality of foundation bolts to be checked along with correctness of the threads and freeness of the nuts movement. If required cleaning of the threads to be done with proper dies.
- 1.12.6 The concrete foundation, surfaces shall be properly prepared by chipping, as required to bring the top of such foundation to the required level to provide the necessary roughness for bondage and to ensure enough bearing strength. All laitance and surface film shall be removed and cleaned and the packers placed with suitable mortar prior to erection of the equipment.
- 1.12.7 Non shrink cementitious flow able grout shall be used for grouting of pockets and under

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pinning work below base plate of columns. Nominal thickness of grout shall be 50 mm. Non shrink cum plasticizer admixture shall be added in the grout. Crushing strength of the grout shall be generally being one grade higher than that of the base concrete. Minimum grade of grout shall be M30.

- 1.12.8 However, for Equipment Foundations, high strength (Minimum Characteristic Compressive Strength of 60 N/mm<sup>2</sup> at 28 days) ready mixed non-shrink, Chloride free, Cement based, free flowing, non-metallic grout as recommended by Equipment manufacturer shall be used. The ready mix grout shall be of reputed make as approved by the customer. Total grouting of the columns/equipments including pocket grouting, grouting at the gap between foundation and base plates top surface of column / equipments is in the scope of the contractor. The quoted rate shall inclusive of the same.
- 1.12.9 The contractor shall arrange for grouting of foundation bolt holes of equipment and final grouting of equipment as per the drawings / specification as advised by the Engineer or BHEL after preparing the foundation surface for grouting. The contractor has to arrange, a representative from the supplier of special cement for witnessing the grouting and other works at their cost including any miscellaneous expenditure for this activity. BHEL will not pay any service and incidental charges for arranging the supplier representative. The contractor to take note of this aspect and quote accordingly.
- 1.12.10 All equipment bases and structural steel bases and foundations pockets shall be grouted and finished as per the specifications after surface preparation unless otherwise recommended by the equipment manufacturers. The surface preparation includes soda washing of the foundations to remove oil, grease etc. to ensure proper grouting.
- 1.12.11 The certificates of the grout are to be submitted BHEL. If necessary, test cubes are to be made and tested at site to ensure the quality of the grout as per relevant IS standards. In case grouting with Portland cement is approved, necessary cement, sand etc. to be arranged by the contractor including the fine aggregates.
- 1.12.12 All the materials required for grouting including special cements as approved by BHEL and other materials like Portland cement, sand, chips, gravel, etc., are to be arranged by the contractor at his cost. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding suppliers, type of grouting cements before procurement of grouting cements.
- 1.12.13 Certain packer plates and shims over and above the quantity received as part of supplies from manufacturing units of BHEL will have to be cut out from steel plates / sheets at site by the contractor to meet site requirement. However, machining of the packers, wherever necessary, will be arranged by BHEL at free of cost.
- 1.12.14 Providing & grouting of pocket holes, pipe sleeves and under base plate of structural steel work/ machinery/ pipe supporting structures including roughening of surface,

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cleaning, ramming, curing etc. all complete with non-shrink cementitious flow able grout as per specification using non-shrink cum plasticizer admixture. Crushing Strength of the grout shall be one grade higher than that of the base concrete (however grade of grout shall be minimum M30 to max M35 grade).

1.12.15 The contractor at his cost shall arrange for grouting of anchor points of T & P issued to him and also grouting of winches or any other supports required for T & Ps. Necessary grout materials are to be arranged by the contractor at his cost.

1.12.16 Total grouting of the columns/equipments including pocket grouting, grouting at the gap between foundation and base plates top surface of column/equipments is in the scope of the contractor. All the grouting Piping should be carried out by non-shrink cement like Conbextra GPI / Conbextra GP II of 'FOSROC' make / Shrinkkomp or its equivalent etc. This special non-shrink cement shall be arranged by the contractor at his cost. Premixed grout of above mentioned non-shrink cement of crushing strength 650kg/sq cm for major equipment foundation and 450 kg/sq cm for other foundation where concrete grade M30 or higher is provided. The quoted rate shall be inclusive of the same.

### 1.12.17 PROCEDURE FOR GROUTING:

Contractor has to carry out the grouting as per the work instructions for grouting available at site or the grouting is to be carried out as per the supplier's recommendation / IS standard. Copy of those recommendations is to be submitted to BHEL for records.

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## VOLUME-IA PART –I CHAPTER -XIII

### MATERIAL HANDLING, TRANSPORTATION AND SITE STORAGE

**The scope of the work will comprise of but not limited to the following:**

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.13.1 While BHEL will endeavor to store / stack / identify materials properly in their open / closed storage yard / shed it shall be contractor's responsibility to assist BHEL in identifying materials well in time for erection, taking delivery of the same in time following the procedure indicated by BHEL and transport the material safely to pre-assembly yard / erection site in time according to program.
- 1.13.2 The contractor shall identify necessary supervisor / labour for the above work in sufficient quantity as may be needed by BHEL for areas covering their scope.
- 1.13.3 It shall be contractor's responsibility to arrange necessary tractors, trailer or trucks / slings / tools and tackles / labour including operators Fuel lubricants etc., for loading from storage yard and on to transport equipment, move it to erection site/pre-assembly yard and unload the same at pre-assembly yard/ erection site and the quoted rate shall include the same.
- 1.13.4 Any loss / damage to materials issued to contractor shall be made good by him or BHEL will arrange for replacement at cost recovery basis and decision of BHEL shall be final.
- 1.13.5 All welding filler wires / electrodes issued to contractor shall be preserved by him carefully to prevent deterioration of their properties. Special care shall be taken to preserve alloy steel and other special electrodes / filler wires. Contractors shall exercise maximum care in using these electrodes, filler wires to minimize wastage by maintaining a record of all usages.
- 1.13.6 All pipe and tube ends shall be covered with plastic caps or will be closed with wooden plugs as the case may be.
- 1.13.7 All the surplus damaged, unused materials, package materials / containers / special transporting frames, gunny bags etc. supplied by BHEL shall be returned to the BHEL Stores by the contractor and maintain records.
- 1.13.8 The contractor shall take delivery of the components and equipments and special consumables from the storage area after getting the approval of the BHEL Engineer on standard indent forms to be specified by BHEL. At periodic / intervals of work, complete

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and detailed account of the equipment so erected and electrodes used shall be submitted to the BHEL Engineer.

- 1.13.9 The Contractor shall have total responsibility for all equipment and materials in his custody, stores, loose, semi-assembled, assembled or erected by him at site.
- 1.13.10 The contractor shall make suitable security arrangement including employment of security personnel to ensure the protection of all materials / equipments and works from theft, fire, pilferage and any other damage and loss.
- 1.13.11 The contractor shall ensure that the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipments are installed.
- 1.13.12 All equipments shall be handled very carefully to prevent any damage or loss. No bare wire ropes, slings etc. shall be used for unloading and / or handling of the equipments without the specific written permission of the Engineer. The equipments from the storage yard shall be moved to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage for such equipments at site.
- 1.13.13 The contractor shall take all reasonable care to protect the materials and work till such time the erected equipment has been taken over by BHEL/their client. Wherever necessary suitable temporary fencing and lighting shall have to be provided by the contractor as a safety measure against accident and damage of property of BHEL. Suitable caution notices shall be displayed where access to any part may be deemed to be unsafe and hazardous.
- 1.13.14 The contractor shall take delivery of equipment from BHEL / Customer stores and storage yard. He shall also make arrangements for verification of equipment, scrupulously maintain records and keep safe custody watch and ward of equipment after it has been handed over to him till these are fully erected, tested and commissioned and taken over by BHEL's client. The stolen / lost / damaged goods shall have to be made good by the contractor at his own cost.
- 1.13.15 Loading at BHEL / Customer stores and storage yard, transport to site, unloading at site / pre-assembly area / working area of equipment, placement on respective foundation / location, fabrication yard, pre-assembly bay or at working area are in the scope of work. The scope includes taking materials / Equipments from customer stores / storage yard also. Contractors Quoted / Accepted rate shall be inclusive of the same. Required cranes, tractors, trailer or trucks/ slings/ tools and tackles / labour including operators, fuel, lubricants etc. for loading & unloading of materials will be in the scope of contractor.
- 1.13.16 The contractor shall provide any fixtures, concrete blocks & wooden sleepers, sandbags which are required for temporary supporting of the components at their stores at site.

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- 1.13.17 Sometimes it may become necessary for the contractor to handle certain unrequired components in order to take out the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.
- 1.13.18 Materials shall be stacked neatly, preserved and stored in the contractor's shed / work area in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work area / site to enable other agencies to carry out their work, same shall be done by the contractor at no extra cost.
- 1.13.19 The contractor shall take necessary measures to see that all the machined surfaces are preserved and covered.
- 1.13.20 Contractor has to arrange required fire retardant covering materials (tarpaulins) to protect the machined components / assembled parts drawn from BHEL before and after erection at their cost.
- 1.13.21 Any fittings such as thermos-well plugs, radiography plugs which has been assembled and dispatched as a single Dispatch Able Unit (DU) shall be checked before drawing materials from BHEL Stores. If any such attachments / fittings are found missing the same shall be intimated to concern BHEL Officials and recorded before drawing materials. It shall be the contractor responsibility to safeguard such attachments / fittings. If lost at contractor custody, the same shall be arranged by the contractor else BHEL shall arrange at the cost of contractor.
- 1.13.22 Contractor shall plan and transport equipments, components from storage yard to erection site in such a manner and sequence that material accumulation at site does not lead to congestion at site of work.
- 1.13.23 It is the responsibility of the contractor to ensure that the insulation and refractory materials and sheet metal covering issued to him for application are well protected against loss or damage or weather conditions tending to affect its quality by the provision of close / semi closed sheds at his cost. If any damage occurs to the materials due to improper storage or due to any causes attributable to the contractor except for normal breakage or damaged material shall be to the cost of the contractor.

### ERCTION

#### 1.14.1 COMMON TO PIPING AND INSULATION

- 1.14.1.1 The contractor will have to follow the instructions provided in the technical manuals, drawings, and specifications provided by BHEL, to the contractor from time to time. In case of ambiguity or deviation the decision / clarification of BHEL Engineer will have to be followed.
- 1.14.1.2 The work covered under this scope of work is of highly sophisticated nature requiring best quality / precision workmanship engineering and construction management. He should also ensure successful and timely commercial operation of equipment installed. The contractor must have adequate quantity of precision tools, construction aids in possession. Contractor must also have adequate trained qualified and experienced supervisory staff and skilled personnel.
- 1.14.1.3 In case of any class of work for which there is no such specifications as laid down in the contract such as blue matching, welding of stainless steel parts etc., the work shall be carried out in accordance with instructions and requirements of the BHEL engineer at the quoted rates only.
- 1.14.1.4 The equipments / materials from the storage yard shall be moved in sequence to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage / loss of such equipment at site.
- 1.14.1.5 Contractor has to arrange required fire retardant covering materials (tarpaulins) to protect the machined components / assembled parts drawn from BHEL before and after erection at their cost.
- 1.14.1.6 Any fixtures, scaffolding materials, approach ladders, concrete block supports, steel structures required for temporary supporting, pre assembly, checking, welding, lifting & handling during pre assembly and erection and during application of insulations shall be arranged by the contractor at his cost.
- 1.14.1.7 The contractor shall erect scaffolding / temporary platforms for erection as per the guidelines of relevant IS codes. 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 and removed from work site. Only steel scaffolding materials with proper clamps should be used. Use of bamboo / casuarinas shall not be permitted.

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- 1.14.1.8 Contractor shall remove all scrap materials periodically generated from his working area and collect the same at one place earmarked for the same. Load of scraps is to be shifted to a place earmarked by BHEL. BHEL reserves the right to collect and remove the scrap at contractor's risk and cost if there is any failure on the part of contractor in this respect. All the packaging materials, including special transporting frames, etc. shall be returned to the BHEL stores / customer's stores by the contractor and maintain records.
- 1.14.1.9 Contractor shall engage separate gangs throughout the contract period, exclusively for proper housekeeping of the site. The contractor has to make necessary arrangements for collection and for bringing down the scrap from, all locations and taking them away from the erection areas to various locations as indicated by BHEL Engineer. The house keeping must be a routine and continuous activity.
- 1.14.1.10 Any faulty erection shall be removed and re-erected promptly to comply with the design requirements to the satisfaction of Site Engineer.
- 1.14.1.11 Prior to erection of any components, inspection to be done for any foreign materials and damages and they are to be removed / attended as per instructions of BHEL engineer.
- 1.14.1.12 The contractor is strictly prohibited in using any of the BHEL's materials / components like angles, channels, hand-rails for any temporary supporting or scaffolding work or for using as bed for pre-assembly works etc.. In case of such misuse, a sum as determined by BHEL shall be recovered from contractor's bills.
- 1.14.1.13 The temporary structures / items welded to permanent members / pipes are to be cut and removed without any damage. Any damage so to permanent members / pipes to be made good by the contractor at his cost.
- 1.14.1.14 Upon completion of daily work, the contractor shall remove from the vicinity of work all scrap packing materials rubbish, unused and other materials and deposit them in places to be specified by BHEL Engineer.
- 1.14.1.15 Delay in clearance of mechanical equipment and piping for insulations is unlikely to happen. However, if any delay occurs, the contractor shall not claim anything extra, like idle charges.

### 1.14.2 ERECTION OF PIPING

- 1.14.2.1 Handling at site stores / storage yard, transporting to site, inspection, pre-assembly, erection, alignment, welding, NDT, fixing of hangers & supports, chemical cleaning / pickling, oil flushing, water flushing, hydro testing & steam blowing, surface finish, supply & application of primer & finish paints including labeling & flow direction on the piping over insulation & hangers and supports, pre-commissioning, commissioning,

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trial operation & handing over to customer of Power cycle piping and its associated items / systems, hangers and supports, valves and other miscellaneous equipment.

- 1.14.2.2 Brief list of system / sub system, approximate weight of pipes and accessories to be erected by the contractor mentioned in the Bill of Quantity and numbers of joints mentioned in Erection Welding Schedule of this tender specification are meant for giving general idea to the tender only about magnitude of the work involved. The piping components are sent in parts for convenient transportation / layout requirements. They are to be cleaned, pre-assembled in stage by stage, welded, erected and aligned as per the drawing dimensions / tolerance and instructions of BHEL Engineers.
- 1.14.2.3 All the works such as cleaning, leveling, aligning, trial assembly, dismantling of certain components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL Engineer's instructions at site, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up, inspection, edge preparation if required, etc., as may be applicable in such erection works and are necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work within the quoted rate. Major machining work, which is only to be carried out in workshops, will be arranged by BHEL.
- 1.14.2.4 All the works such as cleaning, inspection, edge preparation if required, cutting, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting-up etc., as may be applicable in such erection works and are necessary to complete the work within the quoted rate. Major machining work, which is only to be carried out in workshops, will be arranged by BHEL.
- 1.14.2.5 Erection of all items comprising piping systems such as valves, filters / strainers, expansion bellows, flow elements, hangers and supports, tanks, level instruments, pumps, associated skids are also a part of the scope.
- 1.14.2.6 All Operating / Approach platforms, cross over, canopies, ladders etc. along with their supporting structures, for the equipments / valves / filters etc shall be erected by the contractor as per instruction of BHEL and shall be paid as per accepted Tonnage rate for "Hangers and Supports".
- 1.14.2.7 Additional platforms, Cross over, Canopies, Ladders, etc. for approaching different equipments as per the site requirement, which may not be indicated in drawings, shall be fabricated and erected by contractor. However, the contractor shall be paid for this work on accepted tonnage rate for "Hangers and Supports". The steel materials required for these works shall be supplied by BHEL free of cost and the contractor will have to install them to suit the requirement.

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- 1.14.2.8 If the provision of creep measurement is envisaged in the drawings, stubs erection and welding as per drawing shall be done by the contractor within the quoted rate.
- 1.14.2.9 The work on piping systems (air, water, oil, steam, gas etc.,) will include laying, edge preparation, fixing and welding of the elbows / fittings / valves etc., welded on the lines, NDE, fixing and adjustment of supports / hangers / shock absorbers and carrying out all other activities / works to complete the erection and also carrying out all pre-commissioning / commissioning operations mentioned in the specification as per BHEL Engineer's instructions and/or as per approved drawings / documents.
- 1.14.2.10 Contractor should obtain the formal clearance from Director of Boilers to carry out erection & Welding of piping under IBR purview (Power Cycle Piping, Special tanks, IBD Tank, CBD Tank and any other tanks as applicable). Arrangement for the visit of Boiler inspector for field inspection etc. is in the scope of contractor, and necessary drawing / details only will be given by BHEL. Inspection fee, if any shall be paid by BHEL.
- 1.14.2.11 Contractor shall arrange the necessary clearance from any other statutory authorities as required for installation of the plant and equipment and render all assistance, service required in this regard. Inspection fee, if any will be paid by BHEL.
- 1.14.2.12 Fittings like bends, tees, elbow / bends, reducers, flanges etc., will be supplied as loose items.
- 1.14.2.13 Fittings shall be supplied with standard dimensions. Edge preparation, matching inner diameter of pipes for welding as per the drawing dimensions shall be part of erection works. No separate payment will be made for the correction of pipes, edge preparation of standard fittings such as bends, Tees etc.,
- 1.14.2.14 Normally weld neck valves will have prepared edges for welding. It may be occasionally necessary to prepare new edges or recondition the edges by grinding or chamfering to match the corresponding tubes and pipes. All fittings like tees, weld neck flanges, reducers, elbows, flanges, inserts etc., shall be suitably edge prepared and matched with pipes for welding. No extra cost shall be paid for this.
- 1.14.2.15 In case of piping connected to equipment, matching of flanges for achieving the parallelism and alignment at equipment end by suitably resorting to heat correction or other method as instructed by BHEL Engineer is within scope of work.
- 1.14.2.16 During connection & floating of any decks, etc., before and after pipe connections, adding tentative loads, readjusting of spring to the required level is covered in this scope of work.
- 1.14.2.17 Carrying out erection of piping as per the specification between equipments constituting terminal points, whether the terminal equipments fall within the scope of work / specification, contractor shall carry out the terminal joints at either end. Also

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where the piping connection to the terminal points involve flanged joints, matching of flanges, fixing gaskets, bolting and tightening as per BHEL Engineers instructions is in the scope of work. In case piping connected to equipment, matching of flanges for achieving the parallelism and alignment at the equipment end by suitably resorting to heat correction or other method as instructed by BHEL Engineer, with in the quoted rate.

- 1.14.2.18 Erection of all drains / vents / relief / escape / safety valve, piping to various tanks / sewage / drain canal / flash box / flash tank / condenser / sump / atmosphere etc. from the stubs on the piping to the equipments erected by the contractor is completely covered in the scope of work.
- 1.14.2.19 Contractor has to carryout fabrication works such as welding of stubs / nipples, attachments etc., preparation of surface for rust preventive coating and application of rust preventive within the quoted / accepted rate.
- 1.14.2.20 Attachment, welding of necessary instrumentation tapping points, thermocouple pads, root valves, condensing vessels, flow nozzles and control valves etc., shall be the responsibility of the contractor and the same shall be done as per the instructions of BHEL Engineer. The erection and welding of all above items will be contractor's responsibility even if, the Items are supplied by an agency other than BHEL if they are integral to the scope envisaged under this package.
- 1.14.2.21 All the valves will have to be checked, cleaned, lapped or overhauled in full or in parts before erection, after chemical cleaning and during commissioning. The contractor, at his own cost, shall arrange experienced technicians for the above work, including required consumables.
- 1.14.2.22 The valves, actuators etc., will have to be checked, cleaned or overhauled in full or in part before erection, after chemical cleaning, steam blowing and during commissioning as may be necessary.
- 1.14.2.23 Contractor shall study the layout of LP piping and other site routed piping well before the start of work. Final routing shall be decided after approval from Site erection Engineer for site routed pipe in such a way that it does not foul with critical piping.
- 1.14.2.24 For thermo-well welding with Carbon steel / alloy steel welding applicable combination electrodes shall be arranged by the contractor within the quoted rate.
- 1.14.2.25 During floating of critical lines insulation weights has to be added at hanger locations. Suitable weights like plates, structural members, etc shall be arranged by BHEL on returnable basis. Handling of the items shall be done by the contractor within the quoted rate.
- 1.14.2.26 Immediately after erecting electrically operated valves, Valve Tag Nos shall be painted or stickering shall be done for ease of identification.

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- 1.14.2.27 All the valve packing has to be lubricated as per BHEL Engineer instruction till handing over. Necessary gland packing will be supplied by BHEL.
- 1.14.2.28 All the lifting equipments, actuators / power cylinders, valves / dampers, etc., shall be serviced and lubricated to the satisfaction of BHEL engineer before erecting the same and also during pre commissioning. The required cleaning, servicing and lubrication of bearings to be carried out before commissioning at no extra cost.
- 1.14.2.29 In the case of structural members, pipes, plates, ducts etc, in certain cases, the raw material will be supplied in random lengths and the contractor will have to make up the length / prepare the edges to suit the matching profiles, weld / bolt connect the joints within the quoted rates / prices.
- 1.14.2.30 All the tubes and pipes shall be cleaned and blown with compressed air and shown to the Engineer before lifting. Pipes above 2" diameter have to be cleaned by means of wire brush as per the instruction of BHEL Engineer and subsequently flushed with air before lifting them into position. Pipes below 2" diameter, shall be sponge cleaned with air flushing. After cleaning is over, the end caps shall be put back in tube openings till such time they are welded to other tubes. Required compressors shall be arranged by the contractor at his cost.
- 1.14.2.31 All the equipments / material to be taken inside the plant building shall be cleaned thoroughly before taking them inside and erect. The contractor shall clean, wherever necessary and paint inside surfaces of the equipments like coolers, oil tanks, Rubber expansion joints assembly and other components as per instruction of BHEL Engineer during erection at the quoted rate. The necessary compressor for air cleaning is to be arranged by contractor at his cost.
- 1.14.2.32 Fine fittings and other small bore piping have to be routed according to site conditions and hence shall be done only in position as per the site requirement. Necessary sketch for routing these lines should be got approved from BHEL by the contractor. In case any minor modifications are required in these pipelines after completion to meet the system requirements, the same shall be carried out by the contractor within the quoted rate. The contractor should absorb this cost in his quoted rate.
- 1.14.2.33 Work such as minor rectification of foundation bolts, reaming of holes, drilling of dowels, matching of bolts and nuts, making new dowel pin, etc. are covered in the scope of work.
- 1.14.2.34 Assistance for calibrating / testing the power cylinders/ actuators / valves, gauges, instruments, etc. and setting to actuators shall be provided by contractor within the quoted rates.

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- 1.14.2.35 Before erecting the valves and other mountings, check for the tag for correct rating with valve schedule. Ensure correct flow direction. Ensure easy accessibility for operation and maintenance of valves.
- 1.14.2.36 All the drain lines should have sufficient slope towards drain. Slope of 1:500 shall be maintained towards drain point unless otherwise specified. Expansion loops shall be provided in all the vents and drains as per the drawings.
- 1.14.2.37 Wherever pipes / bends / equipments are supplied in pre-fabricated / assembled packages, there may be necessity to make minor changes, including strengthening by additional welds. This shall be treated as part of the contractor's scope.
- 1.14.2.38 All the oil & gas piping flanges, wherever provided are to be blue matched using surface plates for at least 80% contact area to attain leak proof of joints.
- 1.14.2.39 Wherever drawings indicate site routing and site fabrication, such pipes (in general equal to and less than 2" Dia) will be issued in running meters as straight length. These are to be cut to required site length to suit layout as given in the erection drawing and edge prepared as per the standards / drawings and as per the instruction of BHEL Engineer. In some cases attachments like lugs, stoppers, cleats etc., will be supplied as loose items and to be cut and welded to the pipes at site as per erection drawing necessary drilling of holes on main pipe for welding stubs shall also be done at site by the contractor. The contractor shall weld the joints of site routing piping as per site requirement.
- 1.14.2.40 Certain extra lengths of portions / parts of various site fabricated components / parts / bellows / piping etc. are provided as erection allowance and they shall have to be cut to suit site conditions and layout. Certain small length of portions / components / bellows / piping casing etc., may have to be added to suit conditions and layouts. Preparing edges afresh and adopting specified heat treatment procedure, are in the scope of work. No extra payment will be admitted for such works.
- 1.14.2.41 Some extra lengths in various fabricated pipes given as erection allowance shall have to be cut and edges prepared to suit the site conditions at no extra cost. The contractor shall carry out the edge preparation of weld joints at site in accordance with the details acceptable to BHEL Engineer. Wherever possible machining or automatic flame cutting should be done. Gas cutting will be allowed only wherever edge preparation otherwise is impractical. All slag / burrs shall be removed from the edge and all the hand cuts shall be ground smooth to the satisfaction of engineer. Prepared edges to be preserved / applied with weldable primer.
- 1.14.2.42 Minor adjustment like removal of ovalities in pipes and opening or closing of the fabricated bends by process of heat correction or any other method approved by BHEL

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Engineer to suit the layout, with specified heat treatment procedure shall be carried out by the contractor within the quoted rate.

- 1.14.2.43 For pipes nominal bore size 2" and below routing shall not be shown in piping layouts or in isometrics and the same to be routed / connected as shown in schematics. For the above sizes if the routing is shown in layouts it is only for guidance and the same shall be routed and supported as per site requirement / convenience as per site engineer's advice.
- 1.14.2.44 For Piping of nominal bore size 2" and below, valves, flanges, fittings etc. shall be supplied as commercially available. Hence fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope.
- 1.14.2.45 Contractor should fabricate bends of </=2" diameter size at site from running meters of piping for the above and cut, edge prepare and lay the piping as per BHEL Engineer's instructions.
- 1.14.2.46 Contractor shall use only bolted clamps for achieving alignment of piping. Wherever "L" shaped stoppers and wedges are to be used for aligning piping and equipments, the same shall be subject to the approval of BHEL Engineer. Contractor shall remove the bridge, stopper etc., by grinding / gouging and not by hammering. Any burrs left on the equipments / piping, after welding, shall be ground off or any scar or cavity made good by welding and grinding. NDT tests shall be carried out if necessary to detect surface and sub-surface cracks in these ground areas.
- 1.14.2.47 Flame cutting of piping and other equipment shall be strictly done as per BHEL Engineer's instructions and in his presence only.
- 1.14.2.48 All the weld joints on equipments and piping shall be ground or filed after completion of welding and before radiography as per instructions of BHEL Engineer so as to achieve smooth surface to avoid of ripples, undulations etc.,
- 1.14.2.49 Wherever elbows of 45 deg or any other angle are required, the same shall be cut from 90 deg. elbow supplied and used as per the instructions of BHEL engineer. No extra cost shall be paid.
- 1.14.2.50 Flow nozzles, orifice, spray nozzles etc., shall be mounted / erected after chemical cleaning / flushing / or steam blowing at site.
- 1.14.2.51 Erection of Flow nozzles, flow orifices, flow switches, steam traps, filters, flow meters, flow indicators, other metering elements, spray nozzles, steam traps, flow orifices, flow indicators, control valves, aux. control valves, filters, suction strainers, CRH NRV and other NRVs, HPBP Valve and suction strainers of pumps, servomotors etc. forming part of the system (under this scope of work) irrespective of the suppliers is also to be carried out by the agency without any extra cost after chemical and / or steam blowing / oil flushing at site. This will include collecting from BHEL / Customer stores, transport

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to site, suitably cutting the erected piping, cleaning, erection, welding, radiography, NDE and stress relieving and commissioning.

- 1.14.2.52 Certain instruments like pressure switches, gauges, air sets, regulators, filters, junction boxes, power cylinders, dial gauges, thermometers, flow meters, valve actuators, flow indicators etc., are received in assembled conditions as integral part of equipments. Contractor shall dismount such instruments and re-erect whenever required prior to commissioning. Sometime this may have to be handed over to store or instrumentation contractor.
- 1.14.2.53 Fixing, fitting, welding of thermowells, stubs, hoses, tapping points, root valves and instruments etc., on different lines / equipments (which will be supplied by BHEL) is within the scope of work. Fixing of Pick-Ups, Probes & Accessories for vibration monitoring system is in the scope of this specification.
- 1.14.2.54 Contractor shall also weld small length of piping with root valve to the pressure, flow and level tapping points on piping or flow nozzles / orifices / metering elements fixed on piping as per the instructions of BHEL Engineer.
- 1.14.2.55 Welding of all thermowells, draft, pressure and temperature instrumentation points and all other instrumentation points on piping and auxiliaries and welding of thermocouple pads for permanent system as well as for performance guarantee test is in the scope of work.
- 1.14.2.56 It shall be the responsibility of the contractor to provide ladders on column for initial works till such time stairways are completed. For this the ladder should not be welded on the column and should be prefabricated clamping type ladders. No temporary welding on any structural member is permitted except under special circumstances with the approval of BHEL.
- 1.14.2.57 All thermowells (released under applicable PGAs and loose received along with instruments) are to be fixed into the equipment and piping erected by PIPING agency as per drawing and same to be welded as per FQP within the quoted rates.
- 1.14.2.58 All piping items including pipes, valves, flanges, fittings etc. shall be supplied as commercially available. Hence Fit-ups, edge preparation including welding of stubs, shall be included in the contractor's scope.
- 1.14.2.59 The contractor shall take all reasonable care to protect the materials and equipment during erection. Touch up painting required to be done on any equipment or part during the course of erection will have to be done by the contractor.
- 1.14.2.60 The contractor shall also weld all thermowells, small length of pipes to all pressure, flow and level tapping points, isolating valves and root valves on all equipment under scope of erection of this contract. All embedded temperature measuring elements provided in the bearings will have to be terminated at the junction box by the

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contractor. Thermowells tapping point connections incorporated shall be plugged during the pressure testing and steam blow out of piping systems. Upon completion of blow out operation all thermowells and flow elements with branch pipes be installed and welded.

- 1.14.2.61 The hangers and supports for pipelines and pressure parts may be supplied in dismantled / knocked down condition. It is the responsibility of the contractor to assemble them as per approved drawings and install them in position as per site engineer instructions.
- 1.14.2.62 For hangers and supports the instruction given in the drawings and documents must be followed for handling, erection and setting of cold / hot values and locking etc.
- 1.14.2.63 Where the flange comes welded to the equipment, erection of counter flange, Hydrotesting and Normalisation of the line is under the scope of this contract. Where both the flange and counter flange come as loose items and need to be welded, the entire welding of flange and counter flange, Hydrotesting and Normalisation of the line are under the scope of this contract.
- 1.14.2.64 Wherever hangers and support materials of piping are not received from manufacturing unit in time to suit the erection schedule, contractor shall erect the piping system on temporary supports to ensure the progress of work within quoted rate. The required structural steel materials will be issued on free of charges by BHEL, either from scrap / spare materials. The same shall be removed and returned to BHEL store after erection of permanent supports.
- 1.14.2.65 Plate / Pipe shoes for piping supports shall be fabricated at site by the contractor at no extra cost. Other supports namely Hangers, U-clamps etc., shall be supplied by BHEL duly bent and threaded. Assembly and necessary cutting work etc. shall be carried out at site by contractor within the quoted rate.
- 1.14.2.66 Contractor has to fabricate and erect temporary spool pieces wherever required due to non-receipt of valves in time and after receipt of valves the spool pieces are to be replaced with regular valves at free of cost. For spool pieces materials will be supplied free of cost by BHEL.
- 1.14.2.67 All welded joints should be painted with anti-corrosive paint, once radiography and stress relieving works are over.
- 1.14.2.68 Welding, non-destructive testing and heat-treatment as prescribed in BHEL Welding / Heat treatment manual is to be carried out by the contractor. The contractor shall conduct nondestructive tests like radiography, ultrasonic test for weld defects etc., ultrasonic test for finding thickness, dye penetrant tests, magnetic particle test etc. on weld joints, castings, valve bodies and other equipments etc. as per BHEL Engineer's instructions within the quoted rate.

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- 1.14.2.69 The Matching Pieces / Nozzles / Reducers (including the reducers to be connected with HP Heaters) supplied for connecting BFP discharge piping to Boiler forming part of the systems are also in the scope of work including issue, transportation, suitably cutting the erected piping, cleaning, erection, welding, NDE and stress relieving and commissioning.
- 1.14.2.70 Cutting and removal of dummies for all the shop welded stubs (irrespective of the equipments supplier for the above) for all the terminal points and preparation of edge where the piping is to be terminated is also in the scope of the contractor without any extra payment.
- 1.14.2.71 The contractor shall fabricate piping, install lube oil systems, if any and carry out the acid cleaning of fabricated piping. The contractor shall also service the lub oil system, carry out the hydraulic test of oil coolers. etc.,
- 1.14.2.72 For skid mounted equipment, the checking and re-alignment required at site is in the scope of work.
- 1.14.2.73 All Rotating machineries and equipment shall be cleaned, lubricated, checked for their smooth rotation, if necessary dismantling and refitting before erection. If in the opinion of BHEL Engineer, the equipment is to be checked for clearance, tolerance at any stage of work or during commissioning period, all such works are to be carried out by contractor at his cost.
- 1.14.2.74 All the shafts of rotating equipment shall have to be properly aligned to those of matching equipment to perfection, accuracy as required and the equipment shall be free from excessive vibration so as to avoid overheating of bearings or other conditions which may tend to shorten the life of the equipment.
- 1.14.2.75 All the bearings, gearboxes etc., of the equipment / actuators and electrical motors to be erected are provided with protective greases only. Contractor shall arrange as and when required by the engineer for cleaning the bearing / gear boxes etc., with kerosene or some other agent if necessary by dismantling some of the parts of the equipment during erection and shall arrange for re-greasing / lubricating them with recommended lubricants and assembling back. Lubricants will however be supplied by BHEL at free of cost.
- 1.14.2.76 The actuators / motors of valves may be supplied in loose parts, contractor shall have to match / assemble and align at site as per instructions of BHEL Engineer including placement on foundation.
- 1.14.2.77 All dimensions / elevations refers to centerline of pipe unless otherwise specified, the pipe routing shall be carried out as per the drawing. Wherever the dimensions are not specified / shown as approximate the same may be routed as per site requirement / convenience as per site engineer's advice.

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- 1.14.2.78 Pipelines shall be cleaned off welding slag and burrs by hand files, wire brushes and flexible grinders wherever required and using cloth.
- 1.14.2.79 All welded joints shall be subjected to acceptance by BHEL Engineer.
- 1.14.2.80 Please refer the “FIELD / ERECTION WELDING SCHEDULES” published under Chapter-13 of volume IA part II of this booklet.
- 1.14.2.81 Also refer “GUIDELINES FOR HEAT TREATMENT” and “GUIDELINES FOR WELDING” published under Volume IA Part II of this booklet.

### 1.14.3 INSTALLATION OF INSULATION

- 1.14.3.1 Handling at site stores / storage yard, Transportation to site of work, Application of refractory & Insulation materials and connected works for Power cycle, LP and Turbine Piping, Gland Steam Piping, Vessels, equipments like Feed Pumps, Flash Tanks, HP and LP Heaters, Deaerator, FST, TDBFP and MDBFP Pumps etc., and binding and cladding with sheets etc., using their own tools plants, tackles, all consumables, supervisor and men as enumerated in the scope of contract.
- 1.14.3.2 Application of refractory, wool insulation, sheet metal cladding, welding of hooks / supports to hold insulation and refractories under this contract including but are not limited to the following. Insulation of HP & LP piping, temporary acid cleaning and steam blowing piping connected tubes, all drain lines, traps, flanges, fine fittings, sampling lines etc.
- 1.14.3.3 Bidders to note that application of Insulation of Main Turbine, Turbine Integral Piping under Hardwar scope of supply, TDBFP Drive Turbine, Boiler and ESP are excluded from the scope of this contract.
- 1.14.3.4 All insulations and refractory materials including iron components and other sheets casing materials, etc., required as per drawing will be supplied by BHEL and the same have to be erected / applied as per the drawings and specifications of BHEL by the contractor.
- 1.14.3.5 Clean the Surface to be insulated from Rust, Dust, Grease, Loose scale, Oil, Moisture, etc. Care shall be taken that flexible insulation is not unduly compressed. After insulating the equipment, the gaps / joints shall be filled with loose wool / moulded insulation as applicable.
- 1.14.3.6 Painting of inner side of sheet metal covering over the insulation walls with two coats of anti-corrosive paint (IS-158) to be applied to the entire satisfaction of BHEL Engineer and application of bituminous sealing compound on cladding / sheet metal joints shall also be carried out by the contractor. Retainer type 'A' must be coated with Aluminium paint. For which the required amount of paint, thinner and other

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accessories for painting, cleaning the surfaces etc., shall be SUPPLIED by the contractor within the quoted rate.

1.14.3.7 Bituminous sealing compound will be provided by BHEL free of cost which is supplied by the respective Manufacturing Units. However, supply and application of bituminous coating inside aluminium sheet is within the scope of the Contractor at no extra cost.

1.14.3.8 All the insulation, refractory materials and sheet metal covering etc., issued to the contractor shall be properly stored and handled before application of the same. If any damage occurs to the materials due to improper storage or due to any causes attributable to the contractor except for normal breakage or damaged material shall be to the cost of the contractor.

1.14.3.9 Contractor is liable for the exact accounting of the materials issued to him and any unaccountable losses shall be made good by him. The necessary accounting of the material issued will have to be furnished by the contractor periodically.

1.14.3.10 The contractor shall provide the required quantity of wire, nails and other materials for centering works at their cost.

1.14.3.11 Wherever iron components are to be welded on non-pressure parts, the contractor shall employ only approved structural welders. It shall also be the responsibility of the contractor to weld hooks, flats, plates, supports and other fixtures also. All consumables tools and plants etc., required for the work shall be arranged by the contractor at their cost.

1.14.3.12 Wool insulations are received at site as bonded and unbonded mattresses in standard sizes. These has to be dressed / cut to suit equipment / site work by the contractor.

1.14.3.13 Removal type of insulation to be provided for valves fittings, expansion joints etc., as per the drawings or as directed by BHEL Engineer.

1.14.3.14 All piping insulations shall be carried out in such a manner as to facilitate removal of bolts nuts and washers from the flanges.

1.14.3.15 Fabrication of covering sheets may be necessary like preparing the sheets to the sizes and shapes specified in drawings, beading, swaging, beveling of sheets crowning of the sheets if necessary the same to supports over wool insulation with screws as specified in BHEL drawings or as instructed by BHEL engineer.

1.14.3.16 Fixing or welding of hooks / supports to equipments, piping and other connected equipments to support wool insulation applying of primer paint to welded portion parts welding certain supports, by engaging approved welders on parts other than pressure parts to hold refractory's as per the drawings or as instructed by BHEL Engineer will have to be carried out by the contractor.

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- 1.14.3.17 Fabrication, fixing or welding of hooks / supports to equipment piping and other connected equipments to support wool insulation applying of primer paint to welded portion parts welding certain supports on parts as per the drawings or as instructed by BHEL Engineer will have to be carried out by the contractor.
- 1.14.3.18 The contractor shall leave certain gap and opening while doing the work as per the instructions of BHEL Engineer to facilitate inspection by Boiler Inspector or doing commissioning to fix gauges, fittings, instruments. Those gaps will have to be finished as per drawings at a later date by the contractor at his cost, as required by BHEL
- 1.14.3.19 Cladding sheets shall be suitably pressed along with diagonals to form diamond shape so as to improve the strength of the sheets, to avoid bumpiness and to give aesthetic look.
- 1.14.3.20 Plates, bars, rods and other materials that are to be cut, and re-welded from the fabricated places to suit erection requirements for which no extra payment will be made to the contractor.
- 1.14.3.21 A log book shall be maintained by the contractor for the clearance of the area for application of refractory and insulation. If the contractor does the work on his own accord without prior permission the area should be redone at his cost.
- 1.14.3.22 The contractor shall draw only one week's requirement of material for their work from BHEL stores and keep them in their semi-closed shed near to the work area. The materials required for a particular space of work only shall be taken to the work spot. At the end of the day's work the leftover or unused materials shall be taken back to their semi-closed shed for keeping the materials safe. Necessary records shall have to be maintained by the contractor in respect of the above drawls / deposits, on daily basis as instructed by BHEL.
- 1.14.3.23 Welding of hooks as per pitch, non-pressure parts, applying primer paint to the welded portion as directed as per drawings before application of mineral wool mattresses will have to be done by the contractor.
- 1.14.3.24 Applying different layers of mineral wool as directed and as per drawings and specifications for pipelines valves and other vessels and after fixing require holdings materials, suitably if necessary, fabrication of rings etc., and fixing as directed and as per drawings and specifications shall also form part of this work.
- 1.14.3.25 If necessary the hooks may have to be made from the rods, raw materials supplied in running lengths. The contractor may have to carry out this work also and use the same hooks.
- 1.14.3.26 In case the contractor is required (which is not attributable to contractor) to dismantle and re-erect certain area as and when required for pre-commissioning /

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commissioning activities the rate as indicated in the rate schedule shall be paid by BHEL for erection. However, for dismantling no extra charge will be paid under any circumstances.

- 1.14.3.27 Wherever additional / clamps, frame works, etc., are required to be fabricated and installed even though not indicated in the drawings shall be fabricated and installed at their cost. Only steel materials shall be given by BHEL free of cost , consumables like electrodes, gases etc., are to be arranged by the contractor at his cost.
- 1.14.3.28 The contractor shall provide any fixtures, concrete blocks / wooden sleepers, etc., which are required for temporary supporting of the insulation materials at site.
- 1.14.3.29 Welding of iron components directly on pressure parts and HP piping are to be carried out by certified IBR High Pressure welders.
- 1.14.3.30 Welding of iron components directly on pressure parts and HP piping **is** in the scope of this contract and are to be carried out by certified IBR high pressure welders. Bidder to arrange for the same within the quoted rates.
- 1.14.3.31 Application of insulation and removal of the same for temporary piping under scope of erection of this contract is also included in the scope of the work. However, BHEL will supply the insulation materials free of cost.
- 1.14.3.32 Dressing of insulation to suit site conditions, sheet cladding over insulations, form the part of this work.
- 1.14.3.33 Fabrication, fixing or welding of hooks / supports to equipment of piping and other connected equipments to support wool insulation applying of primer paint to welded portion parts welding certain supports on parts other than pressure parts to hold refractory's (by engaging approved welders) as per the drawings or as instructed by BHEL Engineer will have to be carried out by the contractor.
- 1.14.3.34 Wastages allowance for the materials issued are envisaged as follows:
  - a) Wool mattresses 2%
  - b) Cladding sheets 5%
- 1.14.3.35 In case the contractor is required to dismantle and re-erect certain area as and when required for pre-commissioning / commissioning activities the rate as indicated in the rate schedule shall be paid by BHEL for erection. However, for dismantling no extra charge will be paid under any circumstances.
- 1.14.3.36 Also refer 'General Guidelines for Insulation Works' published under Chapter-9 of Volume IA Part II of this booklet.

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## VOLUME - IA PART – I CHAPTER – XV

### WELDING, HEAT TREATMENT & RADIOGRAPHY AND NON-DESTRUCTIVE TESTING

**The scope of the work will comprise of but not limited to the following:**

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.15.1 The pressure parts, equipments and piping shall be erected in conformity with the provisions of Indian Boiler Regulations and as may be directed, as per other standard / specification in practice in BHEL. The method of welding (viz) ARC, TIG or other methods as indicated in the detailed drawing or as instructed by BHEL Engineer shall be followed. BHEL Engineer will have the option to change the method to suit site conditions.
- 1.15.2 The contractor has to establish the WPS (Welding Procedure Specification) and PQR (Procedure Qualification Requirement) applicable for the scope of work for all the materials involved at his own cost. However, Test Materials for the same will be given by BHEL free of cost.
- 1.15.3 The technical particulars, specifications and other general details of work shall be in accordance with BHEL welding, Heat treatment and NDE manuals or equivalent as decided by BHEL Engineer.
- 1.15.4 Contractor shall carryout Radiography as per welding Manual booklet applicable as per IBR. However, percentage radiography shown in the respective drawings shall be final and binding on the contractors.
- 1.15.5 The field joints are to be radiographed and preheating and post weld heat treatment to be done as per BHEL procedure and manuals.
- 1.15.6 Erection of equipment involves good quality of Welding, Heat treatment and Non Destructive Testing. Wherever required, 100% dye penetrant tests have to be carried out as per instructions of BHEL Engineer. Contractor's Engineers, Supervisors, Technicians and workers engaged should have adequate knowledge on the above works.
- 1.15.7 All welded joints shall be subjected to acceptance by BHEL Engineer.
- 1.15.8 Welding electrodes for welding shall be procured from Customer / BHEL approved vendors only.
- 1.15.9 For Stainless Steel pipe, welding procedure will be as per BHEL site Engineers directive. During the root runs of stainless steel joints, if required, the contractor shall carry out purging the pipes with inert gas before and during welding.

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- 1.15.10 Welding of pressure parts, piping & fittings (under IBR code), high tensile structural steel shall be done by certified High Pressure welders who possess valid certificate of CIB of the State in which the equipment is erected as per provision of IBR and who are approved by BHEL Engineer. The High pressure welder who possesses necessary certificate shall ensure re-validation as per relevant provisions of IBR and keep the certificate valid till the completion of work. The services of such welders, the validity of whose certificates have expired shall not be utilized for high pressure works.
- 1.15.11 All welders including tack welders, structural and high pressure welder shall be tested and approved by BHEL Engineer before they are actually engaged on work even though they may possess a valid certificate. BHEL reserves the right to reject any welder if the welder's performance is not found to be satisfactory. The contractor shall maintain the records of qualification and performance of welders. BHEL Engineer will issue all the welders qualified for the work, an identity card. The welder will keep the same with him at work place at all times. He may be stopped from work if he is not found in possession of the same.
- 1.15.12 BHEL Engineer is entitled to stop any Welder from the work if his performance is unsatisfactory for any technical reasons or if there is a high percentage of rejection of joints welded by him, which in opinion of the BHEL Engineer, will adversely affect the quality of the welding though the Welder has earlier passed the tests prescribed by BHEL Engineers. The welders having passed qualification tests do not absolve the contractor of contractual obligation to check the welder's performance.
- 1.15.13 The contractor shall carry out the root run welding of all HP / LP piping, valves by TIG welding method as specified in the drawings / EWS (Erection welding Schedule). Contractor to note that the EWS forms the part of this booklet (Volume-IA) of this tender specification. The contractor shall have to carry out full TIG welding of butt weld joints of tubes / pipes of lesser thickness if required.
- 1.15.14 The contractor shall carry out the root run welding of all HP / LP piping, valves by TIG welding method only. 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.
- 1.15.15 All butt Joints shall be carried out by TIG root run and subsequent runs by Arc welding. Full TIG welding, wherever necessary shall be carried out within the quoted rates. For oil system piping root run of all the butt joints shall be carried out by TIG welding only.
- 1.15.16 For approval of contractor's welders for engaging in the erection work, all expenses for testing of welders including destructive and Non- destructive tests conducted by BHEL or by the inspecting authority at site or at laboratory shall have to be borne by the contractor only. Limited quantity of tube and pipe material required for making test

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pieces will be supplied by BHEL free of cost and all testing facility shall be made available by the contractor.

- 1.15.17 Only BHEL 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.
- 1.15.18 The electrodes brought to the site will have valid manufacturing test certificate. The test certificate should have a co-relation with the lot number / batch number given on electrode packets. No electrodes will 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. The contractor shall also arrange periodical calibration for the same. Separate ovens shall be used for baking and holding.
- 1.15.19 All butt / fillet welds shall be subject to Non Destructive testing as per the Drawing / Procedures / Welding Schedules / Documents at no additional cost.
- 1.15.20 The contractor shall deploy required number of High pressure welders to carry out the high pressure weld joints. The welding works should not be held up due to shortage / want of I.B.R./ High pressure welders.
- 1.15.21 The contractor shall maintain a record in the format 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, radiographic 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 otherwise of the welds shall be final. All site welds shall be subject to acceptance of BHEL / Customer Engineers.
- 1.15.22 The contractor shall assist BHEL Engineer in preparing complete field welding schedule 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. The contractor shall strictly adhere to such schedules.
- 1.15.23 Faulty welds caused by the poor workmanship shall be cut and re-welded at the contractor's expense. Prior to any repair, approval shall be obtained from BHEL Engineer for the procedure for the repair of defective welds. After the repair has been carried out, the compliance document shall be submitted to the quality engineer.

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1.15.24 All necessary preheating, post heating of welds and stress relieving operation of welds are part of the erection work and shall be performed by the contractor in accordance with the relevant regulations and standards of BHEL practice and to the satisfaction of BHEL Engineer and in accordance with the drawings and specifications.

1.15.25 Pre-heating, radiography and other NDE, post weld heating and stress relieving after welding of tubes, pipes including attachment welding wherever necessary, are parts of erection work and shall be carried out by the contractor in accordance with the instructions of the Engineer and as specified in Erection Welding Schedule, Welding, Heat Treatment & NDT manuals and FQP. Contractor at his cost shall arrange all equipment and consumables essential for carrying out the above process.

1.15.26 Contractor shall arrange all necessary Preheating, post weld heating, stress relieving equipment with automatic recording devices. The contractor shall arrange for labour, heating elements, thermocouples, thermo-chalks, temperature recorders, thermocouple attachment units, graphs, sheets insulating materials like asbestos cloth, ceramic beads, asbestos ropes etc. required for heat treatment / stress-relieving operations. The contractor should take a note of the following,

- 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.
- 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 Engineer or his representative on the strip chart of the recorder prior to the starting of SR operations.

1.15.27 **P 91 WELDING**

The induction heating equipments and other accessories shall be drawn from BHEL stores, transported and installed & commissioned wherever required. For routine maintenance & attending all type of break- down maintenance contractor shall deploy sufficient manpower, tools, and plant with in quoted price. The contractor shall provide electrical cables & switches required. All the equipments shall be protected by providing covers and sheds at site by the contractor with in quoted rate.

Also refer clauses in Chapter 11 of Volume IA Part II of Technical Conditions of Contract (Volume-I Book-I) regarding P91 welding.

1.15.28 Welding of Hangers, supports, stubs and impulse piping to be carried out by the contractor as per drawing specification and as per BHEL engineer's instructions.

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According to drawing specifications and as per BHEL Engineers instructions pre heating, post heating, stress reliving, etc. have to be carried out by the contractor wherever necessary.

- 1.15.29 The number of joints to be welded as mentioned in the welding schedule consists of butt welds. All other welds viz. attachment welds on pressure parts / non-pressure parts, fillet welds in non-pressure parts welding in the Piping & other equipments has to be carried out by the Contractor within quoted rates.
- 1.15.30 All the prepared / patched edges will have to be suitably protected to prevent rusting or foreign material ingestion.
- 1.15.31 For thermowell welding with carbon steel / alloy steel welding applicable combination of electrodes shall be arranged by contractor with in quoted rate.
- 1.15.32 The regulators used on welding machines shall be calibrated before putting these into use for work. The Contractor at his cost shall also arrange periodic calibration for the same.
- 1.15.33 The thermostat and thermometer of electrode drying oven shall be also calibrated. All welders shall have electrodes drying portable oven at the work spot.
- 1.15.34 The contractor shall also be equipped for carrying out other NDT like LPI / MPI / Hardness test etc. as required as per welding schedules / drawings within the finally accepted price / rates. Ultrasonic testing, wherever required, will be arranged by contractor within the quoted rate.
- 1.15.35 The technical particulars, specification and other general details for radiography work shall be in accordance with ASME, IBR or ISO as specified by BHEL.
- 1.15.36 The contractor for radiography work shall use iridium-192 / Cobalt 60; the geometric un-sharpness shall not exceed 1.5 mm. The contractor should take adequate safety precautions while carrying out radiography. Contractor at his cost shall arrange necessary safe guards required for radiography (including personnel from BARC).
- 1.15.37 Low speed high contrasts, fine grain films (D-7 or equivalent) in 10 cm width only are used for weld joint radiography. Film density shall be between 1.5 and 2.0.
- 1.15.38 All radiographs shall be free from mechanical / chemical process marks to the extent they shall not confuse the radiographic image and defect finding. Penetrometer, as per ASME or ISO or IS must be used for each exposure.
- 1.15.39 Lead numbers and letters are to be used (generally 6mm size) for identification of radiographs. Contract number, joint identification, source used, welder's identification and SFD are to be noted down on paper cover of radiograph.
- 1.15.40 Lead intensifying screens for front and back of the film shall be used as per ASME specification or as per the instructions of BHEL Engineer.

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- 1.15.41 The weld joint is to be marked with permanent mark A, B, C, etc. to identify the segments. For this a low stress stamp shall be used to stamp the pipe on the downstream side of the weld. For multiple exposures on pipes, an overlap of about 25 mm of film shall be provided.
- 1.15.42 Since radioisotopes are being used, all precautions and safety rules as prescribed by BHEL / BARC / Customer shall be strictly followed. BARC / DRP certificate to be provided before taking up the work.
- 1.15.43 The percentage of Radiography are tentative, which may be increased depending upon the quality of joints at the discretion of BHEL.
- 1.15.44 In case of radiography of less than 100%, the joints identified by BHEL at random shall be radiographed.
- 1.15.45 Contractor shall note that 100% radiography will be done at the initial stages on all the piping welding joints. Subsequently radiographic inspection will be done on the basis of quality of welding. However minimum percentage of joints to be radio graphed shall not be less than the requirement of BHEL welding schedule / IBR / Customer's requirements. The percentage may be increased depending upon the quality of joints and at the discretion of BHEL. Radiography on LP piping joints is not envisaged. However other NDT test as called for in the FQP including LPI, MPI and HT will have to be carried out.
- 1.15.46 All the radiographs shall be properly preserved in air-conditioned rooms and shall become the property of BHEL. They are to be reconciled with the work done, joints radiographed and submitted to BHEL / customer.
- 1.15.47 Radiography of joints shall be so planned after welding, that the same is done either on the same day or next day of the welding to assess the performance of High Pressure welders. If the performance of welder is unsatisfactory, he is to be replaced immediately.
- 1.15.48 Heat treatment and radiography may be required to be carried out at any time (day and night) to ensure the continuity of the progress. The contractor shall make all necessary arrangements including labour, supervisors/ Engineer required for the work as per directions of BHEL.
- 1.15.49 All arrangements for carrying out radiography work including radiography source & equipments and consumables, dark room and air conditioner and other accessories shall be provided by contractor within the space allotted for office at his cost. As an alternative the contractor may deploy an agency having all above facilities and who are duly approved / accredited by BARC and / or other Regulatory authorities. Detailed particulars of such agencies shall be submitted and got approved by BHEL Engineer before the actual deployment of agency for radiography work.

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1.15.50 The contractor shall arrange air conditioned dark room, radiography equipments, films, chemicals and other dark room facilities. The air conditioned dark room shall be fully equipped with radiography equipment, film (un-exposed), chemicals and any other dark room accessories. All radiography films shall be developed in the dark room at site. There must be sufficient number of radiographic personnel with sufficient experience and certified by BARC for field radiographic inspection. Further, the contractor must follow strictly the safety rules laid down by BARC, from time to time, contractor's radiographers shall also be registered with BARC for film badge service.

1.15.51 Radiography personnel with sufficient experience and certified by M/s BARC for conducting radiographic tests in accordance with safety rules laid down by Division of Radiological protection only have to be deployed. These personnel should also be registered with DRP / BARC for film badge service.

1.15.52 Contractor shall provide all skilled, unskilled work men required for the job, which will include Engineers, supervisors, operators, as required for timely and satisfactory execution of radiography work. Also contractor has to provide necessary labour required such as Riggers, Helpers etc. to assist the technicians for carrying the above radiography work and making other arrangements. Such as providing scaffolding, approaches, platform lighting arrangements at his cost as per the instructions of BHEL. It may please be noted that invariably the radiography will be carried out after the normal working hours only.

1.15.53 All welds shall be painted with primer as specified in the painting schedule, once radiography and stress relieving works are over. Necessary consumables and scaffolding etc including paints shall be provided by contractor at his own cost.

1.15.54 The defects as pointed out by the Engineer shall be rectified immediately to the satisfaction of Engineer and Re-radio graphed. The decision of Engineer regarding acceptance or otherwise of the joint shall be final and binding on the contractor.

1.15.55 Wherever radiographs are not accepted on account of poor exposure / bad shot, joints shall be re-radiographed and the film of the same shall be submitted for evaluation. Radiographs shall be taken again on joints after carrying out repairs. However, if the defect persists after first repair, further repair work followed with radiography shall be repeated till the joint is made acceptable. In case the joint is not repairable, the same shall be cut, re-welded and re-radio graphed at contractor's cost.

1.15.56 The contractor shall also be equipped / arrange for carrying out other NDT like dye penetrant inspection, magnetic particle inspection, Ultrasonic testing, Hardness test etc as per welding schedules / drawings as and when required within the quoted rates.

1.15.57 For carrying out ultrasonic testing of welded joints of large size tubes and pipes, it will be necessary to prepare the surface by grinding to a smooth finish and contour as

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desired by BHEL Engineer. The contractor's scope of work includes such preparation and no extra charges are payable for this.

1.15.58 It may also become necessary to adopt inter layer radiography / MPT / UT depending upon the site/technical requirement necessitating interruptions in continuity of the work and making necessary arrangements for carrying out the above work. The contractor shall take all this into account and quote the price inclusive of all such work and radiography.

1.15.59 The welded surface irrespective of place of welding shall be cleaned of slag and painted with primer paint to prevent corrosion at no extra cost towards this including supply of Paint for this purpose.

1.15.60 All welders shall be tested and approved by BHEL Engineer before they are actually engaged on work though they may possess the IBR certificate. BHEL reserves the right to reject any welders without assigning any reason. The welder Identification code as approved by the BHEL Engineer shall be stamped by the welder on each joint done by them. The contractor will be responsible for the periodic renewal, retesting of the welders as demanded by BHEL.

1.15.61 The welding process, weld joint details, joint configuration and material specification may change to suit the design requirements. The contractors quoted rates shall be inclusive of each contingency. All welds involved in the erection of temporary pipe lines for hydraulic test, chemical cleaning, steam blowing etc. to be carried out within the quoted rates.

1.15.62 Heat treatment details of welds indicating minimum, Temperature recorded, Heating rate, cooling rate, soaking time etc. shall also be recorded and documented by the contractor as per BHEL Engineers instructions. Welder's performance record shall be furnished every month. The performance report of welders shall be indicating the percentage of repair for each welder.

1.15.63 All the data such as heating temperatures, heating rate, soaking time, maximum temperature reached during heat treatment shall be properly recorded and documented which will be property of BHEL.

1.15.64 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 engineer or his representative on the strip chart of the recorder prior to starting of SR operations.

1.15.65 For higher thickness joints for which radiography plugs are not provided, alternate NDE methods such as ultra sound examination as instructed by BHEL engineer shall be conducted with in the quoted rate.

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1.15.66 Quantum of radiography (percentage of joints) shall be enforced as per specifications and as per the drawings. BHEL Engineer reserves the right to alter the quantum of radiography of joints. The decision of the BHEL Engineer in this regard is fixed and final and binding on the contractor. Any defects as pointed out by BHEL Engineer shall have to be rectified by the contractor at his cost.

1.15.67 If the contractor does not carry out radiography work in time due to non-availability of film, chemical etc. BHEL shall get the work done through some other agency at the risk and cost of the contractor.

1.15.68 Radiography work of the welds connected with this contract shall be arranged by the contractor including provisions of services of technicians and necessary equipment and consumables like Isotope camera, X-Ray films, chemicals and other dark room facilities etc. Also contractor has to provide necessary labour required such as Riggers, Helpers etc. to assist the technicians for carrying the above radiography work and making other arrangements. Such as providing scaffolding, approaches, platform lighting arrangements at his cost as per the instructions of BHEL. It may please be noted that invariably the radiography will be carried out after the normal working hours only.

1.15.69 Radiography inspection of welds shall be performed in accordance with the requirements and recommendations of BHEL Engineer. The minimum extent of radiographic inspection shall be as per BHEL drawings / IBR Regulations. At the discretion of BHEL Engineer / Boiler inspection authority, they may however be increased depending upon the performance of the individual welder. It is the responsibility of the contractor to get the IBR clearance, wherever required including arranging for IBR Inspection.

1.15.70 All field joints shall be subjected to dye penetrant examination as specified in the respective drawings and shall have to be accepted by BHEL Engineer. Any rectifications required shall have to be done by the contractor at his cost.

1.15.71 Oxy-acetylene flame heating or exo-thermic chemical heating for stress relieving is not permitted. Heating shall be by means of Electric Induction coil or Electric resistance coil. Potentiometric type recorders shall only be used for temperature recording purposes.

1.15.72 Please refer the "FIELD / ERECTION WELDING SCHEDULES" published under volume IA part II of this booklet.

1.15.73 Also refer "GUIDELINES FOR HEAT TREATMENT" and "GUIDELINES FOR WELDING" published under Volume IA Part II of this booklet.

1.15.74 Also refer the clauses on FACILITY TO BE PROVIDED BY THE CONTRACTOR FOR P91 WELDING in Technical Conditions of Contract (Volume-I Book-I).

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1.15.75 Also refer the clause on extra work rate for welding published elsewhere in Volume-IA Part-I of this booklet.

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## VOLUME-IA PART-I CHAPTER – XVI

### Hydraulic testing, Pre-commissioning, commissioning and Post commissioning

**The scope of the work will comprise of but not limited to the following:**

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

- 1.16.1 All required tests indicated by BHEL and their clients for successful commissioning are included in the scope of these specifications. These tests / activities may not have been listed in these specifications. Specialized test equipment, if any, shall be provided by BHEL/ its client free of hire charges. The contractor shall carryout all tests as desired by BHEL Engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning, commissioning, and operation, to demonstrate the completion of any part or whole work performed by the contractor.
- 1.16.2 It is the responsibility of the contractor to provide necessary manpower, tools, tackles and consumable till the completion of work under these specifications including for trial operation, commissioning of piping and the other equipments, even though the delay reasons are not attributable to the contractor.
- 1.16.3 The contractor shall carryout the required tests on the equipments & pipelines, such as gas tightness test / air tightness test, kerosene test, hydrostatic test and rectify all the defects caused due to contractor's fault at his own cost. Contractor may have to replace old / damaged gaskets / packing etc. of equipments and the same shall be carried out by contractor as per requirement. Compressed air for pneumatic testing is to be arranged by contractor. The contractor shall carry out the trial run of motors including checking the direction of rotation in the uncoupled condition, checking, aligning and coupling the motor to the respective driven equipment. Before starting the motor IR values of insulation shall be recorded and if found necessary dry out to be done by the contractor to improve the IR value at no extra cost.
- 1.16.4 During the initial stages of work, trenches for draining water may not be available after Leak test, Hydro test, Flushing or mass flushing. For discharging / emptying the equipment, system and piping, necessary low point drains and temporary piping up to safe location are be erected by the contractor at his cost. The materials will be provided by BHEL.
- 1.16.5 In case any erection defect and / or malfunctioning is detected during various tests / operations, trial runs as detailed above, such as loose components, undue noises, vibration, strain on connected equipment, steam / oil / water leakage, etc. the contractor shall immediately attend these defects and take necessary corrective measures. If any

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readjustment and re-alignments are necessary, the same shall be done as per BHEL Engineer's instructions. If any part needs repairs rectification and replacement the same shall be done by the contractor at no extra cost. The parts to be replaced shall be provided by BHEL free of cost. If insulation is to be removed to attend any of the defects the cost of removal and reapplication of insulation should be borne by the contractor.

- 1.16.6 For conducting Hydro test / steam blowing of MSL, CRH & HRH internals of valves and NRVs (LP BP, ESV, IV & LP BP Valves & NRVs) are to be removed, Hydro Test devices are to be fixed and after Hydro Test the internals are to be re-assembled by the contractor as instructed by BHEL without any additional cost.
- 1.16.7 Temporary blinds / lugs / caps of piping and associated equipments like tanks, pumps etc. required for oil flushing / alkali cleaning / acid cleaning of piping & other equipments during erection & pre-commissioning shall be erected by contractor within the quoted rate.
- 1.16.8 During Commissioning, opening / closing of valves, changing of gaskets, attending to leakage and adjustments of erected equipment may arise. Contractor may have to replace old / damaged gaskets / packing etc. for equipments and the same shall be carried out by contractor as per requirement. The finally accepted price / rates shall also include all such work.
- 1.16.9 Replacing / cleaning of filters of the erected equipments and piping system etc., during pre-commissioning / commissioning stage is within the scope of work.
- 1.16.10 During steam blowing operations the required manpower for fixing the target plates shall be arranged by the contractor as per the instructions of BHEL Engineer within the quoted rates. The manpower for the above operation may be required round the clock if necessary. The contractor shall carry out the above operation as per the instructions of BHEL Engineer within the quoted rates.
- 1.16.11 Main Steam Line Strainers bodies are erected first before steam blowing of the lines. After Hydraulic Test, the strainer elements are fixed. During trial operation, if required the strainers are removed for inspection of debris & cleaning. Contractor has to carry out the work as part of his work without any extra cost.
- 1.16.12 Cleaning of strainers erected is the responsibility of the contractor during pre-commissioning and commissioning activities.
- 1.16.13 It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers along with Supervisors during pre-commissioning, commissioning and post commissioning of equipment, transporting & adding of chemicals / consumables and attending any problem in the equipment erected by the contractor till handing over. The contractor will provide necessary consumables in his scope, T&Ps,

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IMTEs etc., and any other assistance required during this period. Association of BHEL's / Client's staff during above period will not absolve contractor from above responsibilities.

1.16.14 **After synchronization, the commissioning activities and trial operations will continue up to handing over. It shall be the responsibility of the contractor to provide various categories of workers in sufficient numbers as per the work requirement along with supervisors including necessary consumables, hand tools, supervision etc. as part commissioning assistance for equipment erected by the contractor till handing over of sets to customer.** The rate quoted shall include all these contingencies also. The various categories of workers required for pre-commissioning, commissioning and post-commissioning activities are as follows.

- a. Pipe fitters
- b. Mill Wright Fitters
- c. HP / Structural welders
- d. Riggers
- e. Unskilled workers
- f. Supervisors
- g. Electricians
- h. Any other category of workers as may be required

Further in addition to the above, contractor has to arrange the following manpower exclusively for assisting BHEL commissioning engineers during stabilization and trial operation period. This manpower will be directly controlled by BHEL commissioning engineers only.

- 1. One supervisor per shift for three shifts
- 2. Two fitters per shift for three shifts
- 3. Two helpers per shift for three shifts.

It shall be specifically noted that the contractor may have to work round the clock during the pre-commissioning, commissioning and post-commissioning period along with BHEL Engineers and hence considerable overtime payment is involved. The contractor's quoted rates shall be inclusive of all these factors.

1.16.15 Steam blowing of system piping if required will involve laying of temporary pipe lines, valves, etc. and dismantling & restoration of piping. The required steam shall be provided at a central point by BHEL.

1.16.16 All pressure parts and some of the Low Pressure parts shall be subjected to hydraulic test as per the Standard / statutory requirements. The contractor shall supply necessary labour and other services and make necessary arrangements to carry out the required tests as per the instructions and directions of the BHEL Engineers.

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- 1.16.17 Contractor has to arrange Hydraulic Test pump / Hand Pump at his cost for Hydraulic testing of LP lines.
- 1.16.18 Hydraulic testing pumps for High Pressure lines shall be provided by BHEL free of hire charges. The testing pumps will be issued to the contractor in working conditions. Installation, electrical connection, erection, testing and dismantling and returning to BHEL stores, etc., shall be carried out by the contractor as part of this work without any extra charges. In case any servicing of the test pump is to be done during the course of the test, the contractor shall provide the necessary labour for the same and spares will be arranged by BHEL.
- 1.16.19 Contractor shall lay all necessary electric cables and switches etc. required for the hydraulic tests and other tests, flushing etc., and maintain the system till the tests are completed satisfactorily.
- 1.16.20 Contractor at his cost shall lay all necessary temporary piping, install the pumps, blanks, valves required for the test, pressure gauges etc. Required pipes, valves, plates etc., will be given by BHEL. Temporary piping, pumps, valves, flanges, blanks etc. shall be removed by him and returned to BHEL. All thermowell points are to be seal welded, with plug in position. All Temperature Element points are to be provided with blanks and welded. Necessary blanks will be provided by BHEL.
- 1.16.21 All welded joints for temporary piping required for alkali flushing, acid cleaning and steam blowing should be got done by High Pressure welders only. The root run should be done by TIG welding. All arrangements required for the above shall be the responsibility of the contractor at no additional cost.
- 1.16.22 Welding and stress relieving of temporary blanks or suitably fixing temporary blank flanges with gaskets and fasteners and welding and providing suitable de-aeration / venting / draining points with valves as per BHEL Engineer's instructions, for performing hydro-test of piping and other equipments is within the scope of work. Gaskets, valves, fasteners will be provided free of cost by BHEL. Contractor shall cut steel blanks from steel provided without charging extra. After completion of hydraulic test, welded blanks shall be cut and removed and weld burrs ground finished and cavities / scars of cutting weld filled and ground as per BHEL Engineer's instructions.
- 1.16.23 The contractor shall make all necessary arrangements including making of temporary closures / dummy on piping / equipment for carrying out the hydro-static testing on all piping, equipment covered in the specification at no extra cost. Necessary blanks will be provided by BHEL.
- 1.16.24 Providing dummy / plugs for the thermowell points during hydro test / steam blowing shall be done by the contractor within the quoted rate. During hydro test, pipe end

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dummy if required shall be supplied by BHEL, plates shall be cut for the requirement and shall be returned back to BHEL Stores.

- 1.16.25 After hydro test / steam blowing during the restoration works, it is the responsibility of the contractor to ensure the removal of dummy/plugs and edge preparation for the thermowell stubs if required within the quoted rate.
- 1.16.26 Hanger adjustment / readjustment during erection, before and after Hydraulic Test, before and after steam blowing, during and after full load operation, are to be carried out by the contractor within Quoted Rate.
- 1.16.27 In general, Hydraulic testing of piping shall be performed after all eventual pipe branches have been completed and valves installed. Should it be required to hasten erection work, pressure tests may be performed by sections. For this scope of work, the erected pipe lines shall be hydraulically tested as per site requirement in segments. For conducting hydraulic test, both ends of pipe lines shall be blanked by welding of plates. Only one or two set of plates and structural materials for blanking required for one segment will be provided by BHEL free of charge. After completion of hydraulic test in one segment, the same plates are to be cut and removed and utilized / welded on the other segment of the pipe lines, to carry out the hydraulic test for the respective segments. No separate plates for blanking for each segment will be provided. After completion of Hydraulic test, the required edge preparations shall be carried out on the end of pipe lines and to be welded with the respective pipe lines. In such cases joint connection shall be checked during a final and additional test, if required. The contractor shall note this aspect and quote accordingly.
- 1.16.28 During hydraulic test, the pipes being tested shall be isolated from the equipments to which they are connected.
- 1.16.29 All temporary supports shall be removed in such ways that pipe supports are not subjected to any sudden load. During hydraulic testing of pipes, all piping having variable spring type supports shall be held securely in place by temporary means while constant spring type support hangers shall be pinned or blocked solid during the test.
- 1.16.30 The contractor shall carry out all the required tests and pre-commissioning and commissioning activities required for successful and reliable operation. These would include hydraulic test of piping, pre-boiler system detergent flushing / chemical cleaning, steam blowing, water washing etc. as instructed by BHEL using contractors own labour and scaffoldings etc.,
- 1.16.31 All the tests shall be repeated till all the pipelines / equipments satisfy the requirements / obligation of BHEL to their customer. As far as the hydraulic pressure test is concerned, the same shall be conducted at various stages to the satisfaction of BHEL / Boiler

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Inspector / Customer Engineers. Any rectifications required shall have to be done / redone by the contractor at his cost.

1.16.32 Test records shall be made for pressure testing of above piping system. These records shall contain the following information:

- a) Date of test
- b) Identification of piping tested
- c) Test fluid
- d) Test pressure
- e) Approval of the Engineer.

1.16.33 The scope of pre-commissioning activities covers installation of all necessary equipment including temporary piping, supports, valves, blanking, pumps, tanks, with access platforms valves, dummy plates & other miscellaneous equipment etc. along with accessories required for hydro test, pre-boiler system detergent flushing / chemical cleaning, steam blowing or for any other tests on piping. The scope also covers the offsite disposal of effluents.

1.16.34 The erection & dismantling of temporary piping, pumps, tanks, dummy plates & other miscellaneous equipment etc. for pre-commissioning and commissioning activities like hydraulic test, chemical cleaning, steam blowing, etc. are covered in this contract and shall be carried out as a part of work. The quoted rate shall be inclusive of all this.

1.16.35 Temporary lines for chemical cleaning shall be erected as per the instructions of BHEL Engineer. Necessary pipes and other items will be supplied by BHEL free of cost. After the chemical cleaning has been successfully completed, removing all temporary piping, fittings of tanks etc. checking all the valves for any accumulation of foreign materials, welding the valves, pipes which were cut and cleaning, re-fixing as per BHEL Engineer's instructions is within the scope of work/specification.

1.16.36 Temporary lines for Steam blowing / chemical cleaning of Power Cycle piping shall be erected as per the instructions of BHEL Engineer. Necessary pipes, valves and other items will be supplied by BHEL free of cost. All arrangements for erection including welding has to be arranged by the contractor at the rates specifically quoted / accepted for this work. After completion of steam blowing chemical cleaning, all the temporary lines to be dismantled and restoration of piping to be carried out, within quoted rate. The required steam shall be provided at a central point by BHEL.

1.16.37 Contractor shall lay the temporary pipelines with fittings, accessories and erection & commissioning of pumps, tanks and other installations as instructed by BHEL Engineer for the purpose of chemical cleaning / alkali flushing / steam blowing / steam washing / steam flushing / water flushing / water washing / oil flushing etc., of piping and other equipments are within the scope of work. Necessary materials for this will be provided

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## TECHNICAL CONDITIONS OF CONTRACT (TCC)

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by BHEL. Overhauling / cleaning / revisioning / servicing of valves, fittings in temporary system and acid cleaning tanks for re-commissioning activities / operation like water flushing / steam blowing / washing / flushing / passivation / chemical cleaning etc., and also over hauling / revisioning of the pumps & equipments and also to carry out the repairs to attend leaks etc., in the temporary piping & equipments, prior & while carrying out the above operations / activities. All the above works are within the scope of work. All the chemicals will be supplied by BHEL free of cost.

1.16.38 Chemical cleaning (Acid cleaning of piping / alkali flushing) will involve the installation of temporary piping, valves, cutting of some of the existing valves, placing the rubber, wedges in the valves, gagging of valves, and installation of temporary tanks for chemical and for mixing. Necessary temporary access platforms to mixing tank are to be made by the contractor. The dissolving tank, neutralizing tank etc. required for acid pickling will have to be carried out by the contractor. Required materials will be provided by BHEL free of cost. Chemicals for chemical Cleaning will be provided by BHEL. All other consumables are to be provided by the contractor.

1.16.39 All items / materials (Including Chemicals) required for conducting hydraulic test, pre-Boiler system detergent flushing / chemical cleaning, steam blowing etc., will be supplied by BHEL. However, fabrication, servicing, erection, dismantling and returning of the same to stores are the responsibility of the contractor who is erecting the equipment / piping. The contractor may note that no separate payment shall be released for any temporary works that are to be carried out for conducting pre-commissioning and commissioning tests. Bidders are advised to include expenses on temporary works along with the rates being quoted by them. Broadly the work on temporary systems will be as under erection etc. of all temporary piping including valves, tanks, effluent pumps, electrical control panel and cabling along with insulation and supports for steam blowing;

Chemical cleaning and effluent disposal are to be carried out as part of work.

Contractor will be responsible for their operation and any servicing required during the pre-commissioning activities. He will also service the equipment and handover the equipment to the other agency for further erection / commissioning activities. All the pumps, motors and electrical control panels/ switch gear, valves and actuators will be furnished to the contractor after due servicing.

Dismantling of the temporary equipment and piping will be done by the agency that has erected the equipment. He will also return the equipment to the stores. The quoted rate shall be inclusive of all this.

The above is only a broad breakup of the temporary works. The Engineer at site will make final break up. His Decision will be final and binding by all the parties.

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

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- 1.16.40 During commissioning opening of valves changing of gaskets attending to leakages, minor modification, and rectification works may arise. The contractor has to carry out these works at his cost by providing required manpower with T & Ps in all the three shifts.
- 1.16.41 If any equipment / part is required to be inspected during pre-commissioning and commissioning, the contractor will dismantle / open up the equipment / part and reassemble / redo the work without any extra claim.
- 1.16.42 Contractor shall cut open the works if needed, as per BHEL Engineer's instructions during commissioning for inspection, checking and make good the works after inspection is over. This contingency shall be included within the quoted value.
- 1.16.43 In case, any rework is required because of contractor's faulty erection, which is noticed during pre-commissioning and commissioning, the same has to be rectified by the contractor at his cost.
- 1.16.44 All the valves, Actuators will have to be checked, cleaned, lapped or overhauled / serviced in full or in parts before erection, prior to pre – commissioning, during commissioning and Trial operation. 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 and valve actuators are left un-serviced. Wherever necessary as required by BHEL Engineer, the contractor shall arrange to lap / grind valve seats. The contractor, at his own cost, shall arrange experienced technicians for the above work, including required consumables.
- 1.16.45 Necessary scaffolding and approaches for conducting the above shall also be within the scope of the contract.
- 1.16.46 During commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement / requirement is involved, the same shall be carried out by the contractor promptly and expeditiously.
- 1.16.47 During this period, though BHEL's and customer's staff also be associated in the work, it is the contractor's responsibility to make available the resources in his scope till such time the commissioned units are taken over by the customer / BHEL.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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## **VOLUME-IA PART-I CHAPTER – XVII**

### **PAINTING**

**The scope of the work will comprise of but not limited to the following:**

(All the works mentioned hereunder shall be carried out within the accepted rate unless otherwise specified.)

#### **1.17 FINAL PAINTING**

- 1.17.1 The scope of work shall also include supply and application of final painting of all the erected equipments as required and specified in the BHEL / Customer / Customer Consultant's painting specification / scheme that forms the part of this tender for the components of all piping & its auxiliaries and other equipments erected under the scope of this tender. Supply & application of primer & finish paints are included in the scope of work.
- 1.17.2 Required paints, thinner other consumable such as wire brush, brush etc. shall have to be arranged by the contractor at their own cost. The required manpower, other required consumables, T & P etc. shall be provided by the contractor within the quoted rate. The arrangement of primer/paint will be in contractor's scope.
- 1.17.3 In the case of steel fabricated items, raw steel after fabrication has to be cleaned and subsequent painting to be carried out.
- 1.17.4 All the exposed metal parts of the equipments including piping, structures, hangers etc., wherever applicable after installation unless otherwise specified the surface protected, are to be first painted with at least one coat of suitable primer and required number of finish coats as indicated in the Painting Specification in TCC which matches the shop primer paint used, after thoroughly cleaning the dust, rust, scales, grease oil, and other foreign materials by wire brushing scrapping and chemical cleaning and the same being inspected and approved by BHEL engineers for painting. Afterwards the above parts shall be finished with as per the instructions of BHEL/Customer official.
- 1.17.5 Normally Paint shall be applied by brushing as per the instruction of BHEL Engineer. It shall be ensured that brush marks are minimum. If needed and insisted either by BHEL engineer or the BHEL client, in certain cases, spray painting has to be done wherever brush painting is not accessible, by the contractor, within the quoted rates. Contractor has to carryout painting as per the procedure lay down by the customer.
- 1.17.6 No paint shall be applied when the surface temp is above 55 deg. Centigrade or below 10 deg. Centigrade, and when the humidity is greater than 90% to cause condensation on the surface or frost / foggy weather.

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

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- 1.17.7 Paint used shall be stirred frequently to keep the pigment in suspension. Paint shall be of the ready mix type in original sealed containers as packed by the paint manufacturer. No thinners shall be permitted. Paint manufacturer's instructions shall be followed in method of application, handling, drying time etc.,
- 1.17.8 All surfaces shall be thoroughly cleaned, free from scales, dirt and other foreign matter. Each coat shall be applied in an even & uniform film free from lumps, streaks, runs, sags and uncoated spots. Each coat (Primer, intermediate, finish) shall have a minimum thickness of dry film thickness (DFT) in microns and the DFT of finish paint shall not be less than the specified. Necessary instrument for measuring the thickness of paint applied is to be arranged by the contractor.
- 1.17.9 Before applying the subsequent coats, the thickness of each coat shall be measured and recorded with BHEL / Customer.
- 1.17.10 Finish coat paint, Number of coat and DFT shall be as indicated in the painting specification enclosed in this tender / relevant BHEL document / customer's specifications. The painting specification mentioned in Volume-IA part-II Chapter-12 of this booklet which is forming part of this tender shall be used as guidelines to be followed.
- 1.17.11 The scope of painting includes application of color bands, lettering the names of the systems equipments; tag Nos. of valves, marking the directions of flow and other data required by BHEL within the quoted rate.
- 1.17.12 The actual color to be applied shall be approved by the customer before starting of actual painting work.
- 1.17.13 Primer & finish paint shall be of reputed paint supplier approved by BHEL / Customer. Contractor has to procure paints from the BHEL / Customer approved agencies only, and the paints should be as per the customer painting specification. The quality of the finish paint shall be as per the standards of IS or equivalent as approved by BHEL / Customer. Before procurement of paint the contractor has to obtain the clearance from BHEL authorities. The batch certificates of paints to be submitted to BHEL Engineer before using the same.
- 1.17.14 Before commencement of final painting, contractor has to obtain written clearance from BHEL / Customer for effective completion of surface preparation.
- 1.17.15 Primer painting after proper surface cleaning wherever required to be done as per site requirement over all surfaces to be insulated prior to the application of the insulation. This is to be done as a part of contract without any additional charges.
- 1.17.16 Painting of inner side of sheet metal covering over the insulation walls with two coats of anti-corrosive paint (IS-158) to be applied to the entire satisfaction of BHEL Engineer and application of bituminous sealing compound on cladding / sheet metal joints shall

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## TECHNICAL CONDITIONS OF CONTRACT (TCC)

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also be carried out by the contractor. Retainer type 'A' must be coated with Aluminium paint. For which the required amount of paint, thinner and other accessories for painting, cleaning the surfaces etc., shall be arranged by the contractor within the quoted rate.

- 1.17.17 The contractor shall effectively protect the finished work from action of weather and from damage of defacement and shall cover the finished parts, then and there, for their protection.

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

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## VOLUME-IA PART – II CHAPTER 1

### **CORRECTIONS / REVISIONS IN SPECIAL CONDITIONS OF CONTRACT, GENERAL CONDITIONS OF CONTRACT AND FORMS & PROCEDURES**

#### **SI No: 1**

Clause 4.1.11 of SCC is deleted.

#### **SI No: 2:**

#### **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 Rev01) enclosed.

#### **Chapter IX Clause 9.1.1 to 9.1.25 stands deleted.**

#### **Chapter IX Clause 9.2 to 9.62 stands deleted.**

#### **SI No: 3:**

#### **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.

#### **SI No: 4**

**The following clause is added under clause 1.10 Security Deposit in General Conditions of Contract (Volume I Book II):** “1.10.8 Bidder agrees to submit Security Deposit required for execution of the contract within the time period mentioned. In case of delay in submission of Security Deposit, enhanced Security Deposit which would include interest (Base rate of SBI +6%) for the delayed period, shall be submitted by the bidder. Further, if Security Deposit is not

## TECHNICAL CONDITIONS OF CONTRACT (TCC)

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submitted till such time the first bill becomes due, the amount of Security Deposit due shall be recovered as per terms defined in NIT/contract, from the bills along with due interest.”

### **SI No: 5: Void**

### **SI No: 6**

Existing format on Monthly Performance Evaluation of Contractor, as available in Form No F-14 of Volume ID Forms and procedure stands Deleted. Form No.- F-14 (Rev 01) is enclosed.

### **SI No: 7**

Existing format on Monthly Performance Evaluation of Contractor, as available in Form No F-15 of Volume ID Forms and procedure stands Deleted. Form No.- F-15 (Rev 03) is enclosed.

### **SI No: 8**

Existing format for Integrity Pact, as available in Volume ID Forms and procedure stands Deleted. Revised Format is enclosed in NIT.

### **SI No: 9**

Existing format for BANK GUARANTEE FOR SECURITY DEPOSIT, as available in Form No. F-11 (Rev 00) of Volume ID Forms and procedures stands deleted. Refer Proforma of Bank Guarantee (in lieu of Security Deposit)-Form WAM 22 provided in Part-II of Volume-IA Technical Conditions of Contract.

### **SI No: 10**

Procedure 2.3 that forms the part of Forms and Procedures is published in Volume IA Part II of this booklet (Volume-I Book-I).

# TECHNICAL CONDITIONS OF CONTRACT (TCC)

## **VOLUME-IA PART – II**

### **CHAPTER 2-14**

In the next 404 pages as below:

CHAPTER	Details	No. of sheets
CHAPTER 2	Hire charges on issue of capital Tools & Plants	10
CHAPTER 3	HSE Plan For Site Operations By Subcontractor	82
CHAPTER 4	Form 15 Rev 02	08
CHAPTER 5	Form 14 Rev 01	06
CHAPTER 6	Proforma Of Bank Guarantee (In Lieu Of Earnest Money)- Form WAM 23	03
CHAPTER 7	Proforma Of Bank Guarantee (In Lieu Of Security Deposit)-Form WAM 22	03
CHAPTER 8	Procedure For Conduct Of Conciliation Proceedings	11
CHAPTER 9	General Guidelines for Insulation Works	54
CHAPTER 10	Guidelines for Heat treatment	91
CHAPTER 11	Guidelines for welding including erection welding practice for SA335P91 materials	25
CHAPTER 12	Painting scheme	02
CHAPTER 13	Field / Erection Welding Schedule	95
CHAPTER 14	Guidelines for NDE and Heat Treatment Agency	13
CHAPTER 15	No Deviation Certificate	01

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

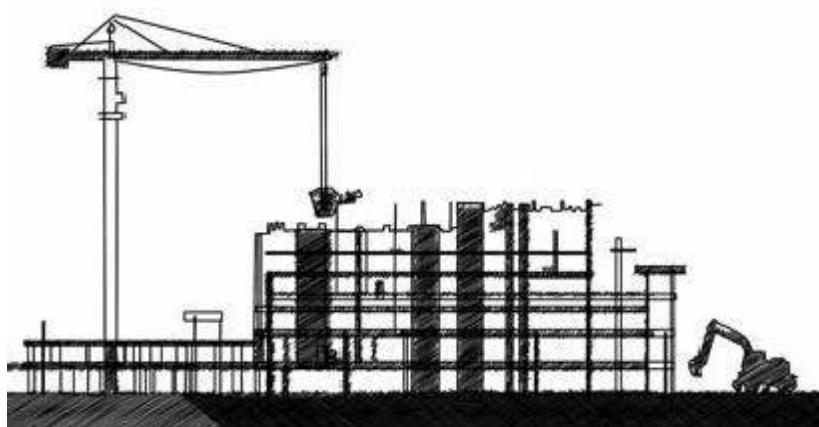
SL NO.	ITEM DESCRIPTION	Revised rates (Rs./Day) valid from 01/06/2019 to 31/5/2021
17	AIR COMPRESSORS 250/300/330/360/350 CFM	3030
18	AIR COMPRESSORS 140/150/190/210 CFM	1010
19	ACID CIRCULATING PUMP WITH MOTOR & STARTER, 200T/HR, 150M, 220 HP	2020
20	Industrial Blower 2000CFM	1410
21	Air Leak Test Blower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

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

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

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

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



# **HEALTH, SAFETY and ENVIRONMENT PLAN**

**for  
SITE  
OPERATIONS  
by  
SUB-  
CONTRACTORS**

**POWER SECTOR**

# HSE PLAN FOR SITE OPERATIONS 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

#### HSE Roles and responsibilities

- Site In-charge- As per clause 7.2.1
- Safety officer- As per clause 7.2.2

#### Qualification

As per Cl. 7.1

PROVIDE

### HSE Planning

for Man, Machinery/Equipment/Tools & Tackles

### HSE INFRASTRUCTURE

- 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

## NON CONFORMANCE

## CHECKS

## 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

<ul style="list-style-type: none"><li>• Welding</li><li>• Rigging</li><li>• Cylinder- storage &amp; Movement</li><li>• Demolition work</li><li>• T&amp;Ps</li><li>• Chemical Handling</li><li>• Electrical works</li></ul>	<ul style="list-style-type: none"><li>• Fire</li><li>• Scaffolding</li><li>• Height work</li><li>• Working Platform</li><li>• Excavation</li><li>• Ladder</li><li>• Lifting</li><li>• Hoisting appliance</li></ul>
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#### HOUSE KEEPING

#### WASTE MANGEMENT

#### TRAFFIC MANAGEMENT

#### ENVIRONMENTAL CONTROL

#### EMERGENCY PREPAREDNESS AND RESPONSE PLAN

#### HSE AUDITS & INSPECTION

<ul style="list-style-type: none"><li>• Daily Checks</li><li>• Inspection of PPEs</li><li>• Inspection of T&amp; Ps</li><li>• Inspection of Cranes &amp; Winches</li></ul>	<ul style="list-style-type: none"><li>• Inspection of Height work</li><li>• Inspection of Welding and Gas cutting</li><li>• Inspection of elevators etc.</li></ul>
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#### HSE PERFORMANCE EVALUATION PARAMETERS

#### 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.

	<b>HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS</b>	Doc no.: HSEP: 14  REV: 01
	POWER SECTOR	
	Date: 20.01.2020	

### 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:  <b>HSEP:14-F30 – Monthly HSE Planning &amp; Review</b> (Page 11, Clause 8.0 - updated)  <b>HSEP:14-F13E-Excavation Inspection Format</b> (part of F30))  <b>HSEP:14-F32B – Job Safety Analysis Format</b> (part of F30)  <b>HSEP:14-F31A – Daily HSE Reporting</b> (Page 18, Clause 10.3 – added)  <b>HSEP:14-F33 – HSE Performance Evaluation</b> (Page 31, Clause 13 – revised)	IOM No.  <b>PSHQHSE/M ONREP/02</b>  Dated 08-Jan-2020	Rohit Kumar		Santosh Nair, GM (MSX & HSE)



**HEALTH, SAFETY AND ENVIRONMENT  
PLAN FOR  
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POWER SECTOR

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## 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.



**HEALTH, SAFETY AND ENVIRONMENT  
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**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**

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## 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 while  
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:**

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## 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.

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**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:

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

**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

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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
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## 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.



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- 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

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## 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.



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### 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 selection, 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.

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- 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.

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#### **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

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- 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:



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<b>A. Construction Area</b>		
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>B. Office</b>		
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)

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- 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

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- 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



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## 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

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- 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.



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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.



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- 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 than 1/4 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.



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- 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  $\frac{1}{4}$ " 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.



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- 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

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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.

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#### 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 one-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



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- 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:

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

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#### 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.

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- 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.

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#### **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.

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- 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.

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#### 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.



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- 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:

<b>SN</b>	<b>Violation of Safety Norms</b>	<b>Fine (in Rs)</b>
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.

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#### 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



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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



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## 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.



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(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 recouptment of the equipment when necessary.



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**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	Y e s	N o	Remarks	Action
<b>HOUSEKEEPING</b>				
Waste containers provided and used				
Passageways and walkways clear				
General neatness of working area				
Other				
<b>PERSONNEL PROTECTIVE EQUIPMENTS</b>				
Goggles; shields				
Face protection				
Hearing protection				
Respiratory masks etc.				
Safety belts				
Other				
<b>EXCAVATIONS / OPENINGS</b>				
Openings properly covered or barricaded				
Excavations shored				
Excavations barricaded				
Overnight lighting provided				
Other				
<b>WELDING, CUTTING</b>				
Gas cylinders chained upright				
Cable and hoses not obstructing				
Fire extinguisher (s) accessible				
Others				
<b>SCAFFOLDING</b>				
Fully decked platforms				
Guard and intermediate rails in place				
Toe boards in place				
Adequate shoring				
Adequate access				
Others				
<b>LADDER</b>				
Extension side rails 1 m above				
Top of landing				
Properly secured				



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Angle + 70° from horizontal				
Other				
<b>HOISTS, CRANES AND DERRICKS</b>				
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				
<b>MACHINERY, TOOLS &amp; EQUIPMENT</b>				
Proper instruction				
Safety devices				
Proper cords				
Inspection and maintenance				
Other				
<b>VEHICLE AND TRAFFIC</b>				
Rules and regulations observed				
Inspection and maintenance				
Licensed drivers				
Other				
<b>TEMPORARY FACILITIES</b>				
Emergency instructions posted				
Fire extinguishers provided				
Fire-aid equipment available				
General neatness				
Others				
<b>FIRE PREVENTION</b>				
Personnel instructed				
Fire extinguishers checked				
No smoking in prohibited areas.				
Hydrants				
Clearance				
Others				
<b>ELECTRICAL</b>				
Proper wiring				
ELCB's provided				
Ground fault circuit interrupters				
Protection against damage				
Prevention of tripping hazards				
Other				
<b>HANDLING &amp; STORAGE OF MATERIALS</b>				
Properly stored or stacked				
Passageways clear				
Other				
<b>FLAMMABLE GASES AND LIQUIDS</b>				
Containers clearly identified				
Proper storage				
Fire extinguisher nearby				



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Other				
<b>WORKING AT HEIGHT</b>				
Safety nets				
Safety belts				
Safety helmets				
Anchoring of safety belt to the life line rope				
<b>ENVIRONMENT</b>				
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.				
<b>HEALTH CHECKS</b>				
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.				



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**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



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(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



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**ANNEXURE 04 : SAFETY FORMATS**

**&**

**ANNEXURE 05 : WORK PERMIT FORMATS**

**POWER SECTOR****INSPECTION OF FIRST AID BOX**

FORMAT NO: HSEP:14-F01  
REV NO.: 00  
PAGE NO. 01 OF 02

<b>Name of Site :</b>	
<b>Name of Sub-Contractor :</b>	
<b>Inspected by :</b>	
<b>Date of Inspection :</b>	

**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.		

**POWER SECTOR****INSPECTION OF FIRST AID BOX**

FORMAT NO: HSEP:14-F01  
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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****HEALTH CHECK UP**

FORMAT NO: HSEP:14-F02

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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	
<u>General Physical Examination</u>		
Height	:	
Weight	:	
BMI	:	
Built And nourishment	:	
Pallor	:	
Temperature	:	
Chest Expansion	: Inspiration	Expansion
Lymph Node Enlargement	:	
<u>Ear, Nose, Throat</u>		
Ear	:	
Nose	:	
Throat	:	



**POWER SECTOR**

**HEALTH CHECK UP**

FORMAT NO: HSEP:14-F02

REV NO.: 00

PAGE NO. 2 OF 02

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

**Signature of the examining doctor**



## POWER SECTOR

## HSE INDUCTION TRAINING

FORMAT NO: HSEP:14-F03

REV NO.: 00

PAGE NO. 01 OF 01

<b>Name of Site :</b>	
<b>Name of Sub-Contractor :</b>	
<b>Date :</b>	
<b>Name of Training Co-ordinator</b>	

**Signature of Training co-ordinator :**



## POWER SECTOR

## TOOL-BOX TALK

FORMAT NO: HSEP:14-F04

REV NO.: 00

PAGE NO. 01 OF 01

<b>Name of Site :</b>	
<b>Sub-Contractors Name :</b>	
<b>Date :</b>	

**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

<b>Name of Site :</b>	
<b>Name of Sub-Contractor :</b>	
<b>Date of Inspection :</b>	

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

<b>Name of Site :</b>	
<b>Name of Sub-Contractor :</b>	
<b>Inspected by :</b>	
<b>Date of Inspection:</b>	

**Crane Reg. No (Make/Model)** \_\_\_\_\_**Name of Driver/Operator** \_\_\_\_\_

<b>Sl.no.</b>	<b>Description</b>	<b>Observation</b>	<b>Measures</b>
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 fully extendable		
20	Tyre pressure		
21	Condition of Battery And Lamps		

**POWER SECTOR****INSPECTION OF CRANES AND WINCHES**

FORMAT NO: HSEP:14-F09

REV NO.: 00

PAGE NO. 2 OF 03

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?				

**POWER SECTOR****INSPECTION OF CRANES AND WINCHES**

FORMAT NO: HSEP:14-F09

REV NO.: 00

PAGE NO. 3 OF 03

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?				
	<b>Total Number of NO:</b>				
	<b>Total Number of NA:</b>				
	<b>% Compliance :</b>				

**Signature of Site I/C of subcontractor :**

**POWER SECTOR****INSPECTION OF HEIGHT WORKING**

FORMAT NO: HSEP:14-F10

REV NO.: 00

PAGE NO. 01 OF 02

<b>Name of Site :</b>	
<b>Name of Sub-Contractor :</b>	
<b>Inspected by :</b>	
<b>Date of Inspection:</b>	

<b>Sl. No.</b>	<b>Descriptions</b>	<b>Observation (Yes/No)</b>	<b>Remarks</b>
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.		
<b>ACCESS/EGRESS</b>			
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?		

**POWER SECTOR****INSPECTION OF HEIGHT WORKING**

FORMAT NO: HSEP:14-F10

REV NO.: 00

PAGE NO. 02 OF 02

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.		
	<b>Housekeeping</b>		
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.		
	<b>PPE And Safety Devices</b>		
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

<b>Name of Site</b>	
<b>Name of Sub-Contractor</b>	
<b>Inspected by</b>	
<b>Date of Inspection</b>	

<b>Welding</b>				
Sl.no.	Description	Y e s	N o	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

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

**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

<b>Name of Site</b>	
<b>Name of Sub-Contractor</b>	
<b>Inspected by</b>	
<b>Date of Inspection:</b>	

<b>Sr. No.</b>	<b>Contents</b>	<b>Yes/No</b>	<b>Remarks</b>
<b>A</b>	<b>Cable</b>		
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>B</b>	<b>DBs/SDBs</b>		
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?		
<b>C</b>	<b>ELCB</b>		
1.	Whether the connections are routed through ELCB?		
2.	Is ELCB sensitivity maintained at 30 mA?		

**POWER SECTOR****INSPECTION OF ELECTRICAL INSTALLATION**

FORMAT NO: HSEP:14-F12

REV NO.: 00

PAGE NO. 02 OF 02

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?		
<b>D</b>	<b>Grounding</b>		
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.		
<b>E</b>	<b>Electrically operated Machines or Accessories.</b>		
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

<b>Name of Site</b>	
<b>Name of Sub-Contractor</b>	
<b>Inspected by</b>	
<b>Date of Inspection</b>	

<b>Sr. No.</b>	<b>Description</b>	<b>Remarks</b>
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**  
**Inspection of Excavation**

FORMAT NO: HSEP:14-F13E  
REV NO.: 00  
PAGE NO. 01 OF 01

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 )

**POWER SECTOR****HSE PENALTY**

FORMAT NO: HSEP:14-F14

REV NO.: 00

PAGE NO. 1 OF 02

**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.

**POWER SECTOR****HSE PENALTY**

FORMAT NO: HSEP:14-F14

REV NO.: 00

PAGE NO. 2 OF 02

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)

**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 for Monthly HSE Planning & Review

FORMAT NO: HSEP:14-F30

REV NO.: 00

PAGE NO. 01 OF 3

**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: Fo1	Areas 1. ... ...	
2	Health check-up as per Format: Fo2	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: Fo3	Minimum No. of workers:	
4	Toolbox talks (TBT) conducted before start of work as per Format: Fo4	Locations of TBTs & No. of workers 1. ...	
5	PPE usage and issue as per Format: Fo6		
6	Inspection of T&Ps as per Format: Fo7	List of T&Ps to be inspected 1.	
7	Identification & Inspection Status of T&Ps as per Format: Fo8		
8	Inspection of Cranes & Winches as per Format: Fo9	List of Cranes & Winches & Nos. 1. ...	
9	Inspection of Height Working as per Format: Fo10	Areas: 1. ...	
10	Inspection of Welding & Gas Cutting operations as per Format: Fo11	Areas: 1. ...	
11	Inspection of Electrical Installations as per Format: Fo12	Locations: 1. ...	
12	Inspection of Elevators (as applicable) as per Format: Fo13	Locations: 1. ...	
13	Inspection of Excavation as per Format: Fo13E	Locations: 1. ...	



## POWER SECTOR

### Format for Monthly HSE Planning & Review

FORMAT NO: HSEP:14-F30  
REV NO.: 00  
PAGE NO. 02 OF 3

SN.	Description of HSE Activity & Formats	Plan & Targets for the month	Review
14	Job Safety Analysis as per Format F32B	<b>Activities:</b> 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	<ol style="list-style-type: none"><li>1. Clean drinking water</li><li>2. Toilets</li><li>3. Cleanliness &amp; Hygiene</li><li>4. Grass cutting,</li><li>5. Fogging</li><li>6. Electrical Inspection ...</li></ol>	



## POWER SECTOR

### Format for Monthly HSE Planning & Review

FORMAT NO: HSEP:14-F30

REV NO.: 00

PAGE NO. 03 OF 3

SN.	Description of HSE Activity & Formats	Plan & Targets for the month	Review
28	Availability of dust/ waste bins at various locations	Locations: <b>1.</b> ...	
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. <b>1.</b> ...	
32	Tree plantation	Locations & Nos. <b>1.</b> ...	
33	Waste disposal & Scrap Bins	Locations <b>1.</b> ...	
34	Illumination checks	Locations <b>1.</b> ...	
35	Safety award function: 1. Display of good practices Award presentation	Minimum 1 per month	
36	<b>Submission of Daily Reports as per Format No.F31A</b>	<b>Daily Reports (Night &amp; Day Shifts)</b>	

<u>PLAN</u>		<u>REVIEW</u>	
<u>Agency</u> Name:  Sign:  Date:	<u>BHEL</u> Name:  Sign:  Date:	<u>Agency</u> Name:  Sign:  Date:	<u>BHEL</u> Name:  Sign:  Date:



## POWER SECTOR

## Format for Daily HSE Reporting

FORMAT NO: HSEP:14-F31 A  
REV NO.: 00  
PAGE NO. 01 OF 1

**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						Subcontractor			
Night	Day	SHIFT	Submitted By	Work Area(s)	Month		Day		
		Staff		Man-Power	Vertigo Test (Numbers Tested)				
				Safety Officers	On-the-Job Training (Topic & participants)				
					Work Permits				
					Job Safety Analyses conducted				
					Height Work Inspection				
					Other Hazardous Activities Inspection				
					NA	T&P Inspection (Names & Nos. Inspected)			
						Safety Walk (Designation, Areas)			
					NA	NA			
						HSE Meeting			
						NA	Safety Reward (Details)		
						NA	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		

**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**

<b>HAZARDS</b>				<b>PRECAUTIONS</b>	
(Name)	Submitted By (Agency HSE)		Reviewed By (BHEL Execution)		Approved By (BHEL HSE)
(Sign)					
(Date)					



## Checklist for Evaluation of HSE Performance

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



## Checklist for Evaluation of HSE Performance

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 <sub>2</sub> 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.



<b>SAFETY WORK CLEARANCE</b>		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**



<b>SAFETY WORK CLEARANCE</b>		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**



Regd Office: BHEL House, Siri Fort, New Delhi-110049

## MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Form No.: F-15 (Rev 03)

Page 1 of 5

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

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

## MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Form No.: F-15 (Rev 03)

Page 2 of 5

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

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

## MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Form No.: F-15 (Rev 03)

Page 3 of 5

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

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

## MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Form No.: F-15 (Rev 03)

Page 4 of 5

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

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

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

## MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Form No.: F-15 (Rev 03)

Page 5 of 5

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

## Note:

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

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

Monthly Safety Performance Evaluation of Contractor

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

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

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

**Note:**

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

## MONTHLY PLAN & REVIEW WITH CONTRACTOR

PSSR

PSSR

PSSR

Name of Project \_\_\_\_\_  
Name of Work \_\_\_\_\_

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

## **PART-A: PLAN/REVIEW OF WORK FOR THE MONTH OF**

BHEL  
(Sign)

BHEL  
(Sign with name, designation and date)

CONTRACTOR  
(Sign with name, date)

 <b>PSSR</b>	<b>MONTHLY PLAN &amp; REVIEW WITH CONTRACTOR</b>	
	<b>Page 2 of 6</b>	

**PART- A: Contd.....**

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

Note 2: Percentage Shortfall attributable to contractor w.r.t. "Plan - Shortfall attributable to BHEL" for the month =  $[(\Sigma E - \Sigma B) / (\Sigma A - \Sigma D)] \times 100$   
 In case,  $(\Sigma E - \Sigma B)$  is negative, then it shall be treated as zero percent."

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

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

**BHEL**  
 (Sign with name, designation and date)

**CONTRACTOR**  
 (Sign with name, designation and date)

<b>PSSR</b>	<b>MONTHLY PLAN &amp; REVIEW WITH CONTRACTOR</b>		
	Page <b>3 of 6</b>		

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

**PART – B-1: PLAN/REVIEW OF DEPLOYMENT OF MAJOR T&Ps FOR THE MONTH OF .....**  
**CONTRACTORS SCOPE: -**

PLAN				DEPLOYMENT STATUS			
SN.	Major T&P to be deployed as per work planned for the month	QTY	Deployment Period (in days)	Weightage assigned to planned T&P (in fraction such that $\Sigma C = 1$ )	Actual Deployed Quantity	Actual Deployment Period (in days)	Weighted T&P Deployed
A	B			C	D	E	$F = (C \times D) / (A \times B)$

Note: In case,  $E > B$ , it shall be considered as  $E = B$ . Similarly, in case  $D > A$ , it shall be considered as  $D = A$ .  
 Percentage of T&P Deployed =  $\Sigma F \times 100$

**BHEL SCOPE: -**

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

**CONTRACTOR**  
 (Sign with name, designation and date)

**BHEL**

(Sign with name, designation and date)



## MONTHLY PLAN & REVIEW WITH CONTRACTOR

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

### PART – B-2: PLAN/ REVIEW OF DEPLOYMENT OF MANPOWER FOR THE MONTH OF .....

#### CONTRACTOR'S SCOPE: -

SN.	Area of Work	Category of Labour	No. of Labour required as per category	Deployment Period (in days)	No. of Labour actually deployed	Actual Deployment Period (in days)	REMARKS	
							A	B

Percentage of Manpower Deployed= $100 \times \frac{\sum(C \times D)}{\sum(A \times B)}$

BHEL  
(Sign with name, designation and date)

CONTRACTOR  
(Sign with name, designation and date)

 <b>BHEL</b> PSSR	<b>MONTHLY PLAN &amp; REVIEW WITH CONTRACTOR</b>
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Name of Project	Contract No.
Name of Work	Name of Contractor

**PART – C: PLAN(PHYSICAL) FOR THE NEXT MONTH i.e. ....**

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

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

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

**BHEL**  
(Sign with name, designation and date)

**CONTRACTOR**  
(Sign with name, designation and date)

 <b>BHEL</b> PSSR	<b>MONTHLY PLAN &amp; REVIEW WITH CONTRACTOR</b>
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Page **6** of **6**

Name of Project	Name of Work

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

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

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

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

BHEL  
(Sign with name, designation and date)

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

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

Bank Guarantee No.....  
Date.....

To  
(Employer's Name and Address)

.....

Dear Sirs,

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

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

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

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

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

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

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

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

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

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

This Guarantee shall be irrevocable and shall remain in force upto and including.....<sup>7</sup> and shall be extended from time to time for such period as may be desired by the Employer.

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

We, ..... Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

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

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

For and on behalf of  
(Name of the Bank)

(Signature of Authorised signatory)

Date.....

Place of Issue.....

<sup>1</sup> Details of the Invitation to Bid/Notice Inviting Tender (Tender Ref. No. Eg. - BHEL PSSR SCT XXXX)

<sup>2</sup> Name of Tenderer

<sup>3</sup> REGISTERED Office Address of the Tenderer

<sup>4</sup> Details of the Work i.e Tender Description

<sup>5</sup> EMD Amount as mentioned in Notice Inviting Tender

<sup>6</sup> BG Amount in words and Figures (BG Amount shall be Minimum of EMD amount less Rs. 2 Lakhs)

<sup>7</sup> Validity Date

<sup>8</sup> Date of Expiry of Claim Period (Claim Period shall be minimum of 3 Months after the validity date of Bank Guarantee)

Note:

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

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

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

(On non-Judicial paper of appropriate value)

(Para 4.7.6 of Works Accounts Manual)

Bank Guarantee No.....

Date.....

To

(Employer's Name and Address)

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

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

Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. \_\_\_\_\_<sup>5</sup>.

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

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

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

be desired by the Employer. Unless a demand or claim under this guarantee is made on us in writing on or before the \_\_\_\_\_<sup>7</sup>, we shall be discharged from all the liability under this guarantee thereafter.

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

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

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

We, ..... BANK lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Employer in writing.

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....<sup>5</sup>
- b) This Guarantee shall be valid up to .....<sup>6</sup>
- c) Unless the Bank is served a written claim or demand on or before \_\_\_\_\_<sup>7</sup> all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

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

Date \_\_\_\_\_ Day of \_\_\_\_\_ for \_\_\_\_\_ (indicate the name of the Bank)

(Signature of Authorised signatory)

<sup>1</sup> NAME OF VENDOR /CONTRACTOR / SUPPLIER

<sup>2</sup> REGISTERED OFFICE ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

<sup>3</sup> LETTER OF INTENT(LOI) REFERENCE NO. WITH DATE

<sup>4</sup> CONTRACT VALUE (AS MENTIONED IN LOI)

<sup>5</sup> BG AMOUNT IN FIGURES AND WORDS

<sup>6</sup> VALIDITY DATE

<sup>7</sup> DATE OF EXPIRY OF CLAIM PERIOD (CLAIM PERIOD SHALL BE MINIMUM OF 3 MONTHS AFTER VALIDITY DATE)

Note:

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

## **Procedure-2.3**

### **PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS**

1. The proceedings of Conciliation shall broadly be governed by Part-III of the Arbitration and Conciliation Act 1996 or any statutory modification thereof and as provided herein:
2. The party desirous of resorting to Conciliation shall send an invitation/notice in writing to the other party to conciliate specifying all points of Disputes with details of the amount claimed. The party concerned shall not raise any new issue thereafter. Parties shall also not claim any interest on claims/counter-claims from the date of notice invoking Conciliation till the conclusion of the Conciliation proceedings. If BHEL is to initiate Conciliation, then, the invitation to Conciliate shall be extended to the concerned Stakeholder in **Format 7** hereto. Where the stakeholder is to initiate the Conciliation, the notice for initiation of Conciliation shall be sent in **Format-8** hereto.
3. The party receiving the invitation/notice for Conciliation shall within 30 days of receipt of the notice of Conciliation intimate its consent for Conciliation along with its counter-claims, if any.
4. The Conciliation in a matter involving claim or counter-claim (whichever is higher) up to Rs 5 crores shall be carried out by sole Conciliator nominated by BHEL while in a matter involving claim or counter-claim (whichever is higher) of more than Rs 5 crores Conciliation shall be carried out by 3 Conciliators nominated by BHEL. The appointment of Conciliator(s) shall be completed and communicated by the concerned Department/Group of BHEL Unit/Division/Region/Business Group to the other party and the Conciliator(s) within 30 days from the date of acceptance of the invitation to conciliate by the concerned party in the **Format-9**. The details of the Claim, and counter-claim, if any, shall be intimated to the Conciliator(s) simultaneously in **Format-5**.
5. The Parties shall be represented by only their duly authorized in-house executives/officers and neither Party shall be represented by a Lawyer.
6. The first meeting of the IEC shall be convened by the IEC by sending appropriate communication/notice to both the parties as soon as possible but not later than 30 days from the date of his/their appointment. The hearings in the Conciliation proceeding shall ordinarily be concluded within two (2) months and, in exceptional cases where parties have expressed willingness to settle the matter or there exists possibility of settlement in the matter, the proceedings may be extended by the IEC by a maximum of further 2 months with the consent of the Parties subject to cogent reasons being recorded in writing.

7. The IEC shall thereafter formulate recommendations for settlement of the Disputes supported by reasons at the earliest but in any case within 15 days from the date of conclusion of the last hearing. The recommendations so formulated along with the reasons shall be furnished by the IEC to both the Parties at the earliest but in any case within 1 month from the date of conclusion of the last hearing.
8. Response/modifications/suggestions of the Parties on the recommendations of the IEC are to be submitted to the IEC within time limit stipulated by the IEC but not more than 15 days from the date of receipt of the recommendations from the IEC.
9. In the event, upon consideration, further review of the recommendations is considered necessary, whether by BHEL or by the other Party, then, the matter can be remitted back to the IEC with request to reconsider the same in light of the issues projected by either/both the Parties and to submit its recommendations thereon within the following 15 days from the date of remitting of the case by either of the Parties.
10. Upon the recommendations by the Parties, with or without modifications, as considered necessary, the IEC shall be called upon to draw up the Draft Settlement Agreement in terms of the recommendations.
11. When a consensus can be arrived at between the parties only in regard to any one or some of the issues referred for Conciliation the draft Settlement Agreement shall be accordingly formulated in regard to the said Issue(s), and the said Settlement Agreement, if signed, by the parties, shall be valid only for the said issues. As regards the balance issues not settled, the parties may seek to resolve them further as per terms and conditions provided in the contract.
12. In case no settlement can be reached between the parties, the IEC shall by a written declaration, pronounce that the Conciliation between the parties has failed and is accordingly terminated.
13. Unless the Conciliation proceedings are terminated in terms of para 22 (b), (c) & (d) herein below, the IEC shall forward his/its recommendations as to possible terms of settlement within one (1) month from the date of last hearing. The date of first hearing of Conciliation shall be the starting date for calculating the period of 2 months.
14. In case of 3 members IEC, 2 members of IEC present will constitute a valid quorum for IEC and meeting can take place to proceed in the matter after

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

- 15.** The Draft Settlement Agreement prepared by the IEC in terms of the consensus arrived at during the Conciliation proceedings between the Parties shall be given by the IEC to both the parties for putting up for approval of their respective Competent Authority.
- 16.** Before submitting the draft settlement agreement to BHEL's Competent Authority viz. the Board Level Committee on Alternative Dispute Resolution (BLCADR) for approval, concurrence of the other party's Competent Authority to the draft settlement agreement shall be obtained by the other party and informed to BHEL within 15 days of receipt of the final draft settlement agreement by it. Upon approval by the Competent Authority, the Settlement Agreement would thereafter be signed by the authorized representatives of both the Parties and authenticated by the members of the IEC.
- 17.** In case the Draft Settlement Agreement is rejected by the Competent Authority of BHEL or the other Party, the Conciliation proceedings would stand terminated.
- 18.** A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.
- 19.** The Settlement Agreement shall thereafter have the same legal status and effect as an arbitration award on agreed terms on the substance of the dispute rendered by an arbitral tribunal passed under section 30 of the Arbitration and Conciliation Act, 1996.
- 20.** Acceptance of the Draft Settlement Agreement/recommendations of the Conciliator and/or signing of the Settlement Agreement by BHEL shall however, be subject to withdrawal/closure of any arbitral and/or judicial proceedings initiated by the concerned Party in regard to such settled issues.
- 21.** Unless otherwise provided for in the agreement, contract or the Memorandum of Understanding, as the case may be, in the event of likelihood of prolonged

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

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

- a.** On the date of signing of the Settlement agreement by the Parties; or,
- b.** By a written declaration of the IEC, after consultation with the parties, to the effect that further efforts at conciliation are no longer justified, on the date of the declaration; or,
- c.** By a written declaration of the Parties addressed to the IEC to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,
- d.** By a written declaration of a Party to the other Party and the IEC, if appointed, to the effect that the Conciliation proceedings are terminated, on the date of the declaration; or,
- e.** On rejection of the Draft Settlement Agreement by the Competent Authority of BHEL or the other Party.

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

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

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

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

- 24.** The parties will bear their own costs including cost of presenting their cases/evidence/witness(es)/expert(s) on their behalf. The parties agree to rely upon documentary evidence in support of their claims and not to bring any oral evidence in IEC proceedings.
- 25.** If any witness(es) or expert(s) is/are, with the consent of the parties, called upon to appear at the instance of the IEC in connection with the matter, then, the costs towards such witness(es)/expert(s) shall be determined by the IEC with the consent of the Parties and the cost so determined shall be borne equally by the Parties.
- 26.** The other expenditures/costs in connection with the Conciliation proceedings as well as the IEC's fees and expenses shall be shared by the Parties equally.
- 27.** Out of the lump sum fees of Rs 75,000/- for Sitting Fees, 50% shall be payable after the first meeting of the IEC and the remaining 50% of the Sitting Fees shall be payable only after termination of the conciliation proceedings in terms of para 22 hereinabove.
- 28.** The travelling, transportation and stay at outstation shall be arranged by concerned Unit as per entitlements as per Serial No. 4 of the Table at para 23 above, and in case such arrangements are not made by the BHEL Unit, the same shall be reimbursed to the IEC on actuals limited to their entitlement as per Serial No. 4 of the Table at Para 23 above against supporting documents. The IEC Member(s) shall submit necessary invoice for claiming the fees/reimbursements.
- 29.** The Parties shall keep confidential all matters relating to the conciliation proceedings. Confidentiality shall extend also to the settlement agreement,

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

- 30.** The Parties shall not rely upon or introduce as evidence in any further arbitral or judicial proceedings, whether or not such proceedings relate to the Disputes that is the subject of the Conciliation proceedings:
  - a.** Views expressed or suggestions made by the other party in respect of a possible settlement of the Disputes;
  - b.** admissions made by the other party in the course of the Conciliator proceedings;
  - c.** proposals made by the Conciliator;
  - d.** The fact that the other Party had indicated his willingness to accept a proposal for settlement made by the Conciliator.
- 31.** The Parties shall not present the Conciliator(s) as witness in any Alternative Dispute Resolution or Judicial proceedings in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
- 32.** None of the Conciliators shall act as an arbitrator or as a representative or counsel of a Party in any arbitral or judicial proceeding in respect of a Disputes that is/was the subject of that particular Conciliation proceeding.
- 33.** The Parties shall not initiate, during the Conciliation proceedings, any arbitral or judicial proceedings in respect of a Disputes that is the subject matter of the Conciliation proceedings except that a Party may initiate arbitral or judicial proceedings where, in his opinion, such proceedings are necessary for preserving his rights including for preventing expiry of period of limitation. Unless terminated as per the provisions of this Scheme, the Conciliation proceedings shall continue notwithstanding the commencement of the arbitral or judicial proceedings and the arbitral or judicial proceedings shall be primarily for the purpose of preserving rights including preventing expiry of period of limitation.
- 34.** The official language of Conciliation proceedings under this Scheme shall be English unless the Parties agree to some other language.

**FORMAT-5**

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

1. Chronology of the Disputes
2. Brief of the Contract/MoU/Agreement/LOI/LOA
3. Brief history of the Disputes:
4. Issues:
5. Details of Claim(s)/Counter Claim(s):

<b>SI. No.</b>	<b>Description of claim(s)/Counter Claim</b>	<b>Amount (in INR)Or currency applicable in the contract</b>	<b>Relevant contract clause</b>

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

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

**FORMAT-7**

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

To,

M/s. (Stakeholder's name)

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

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

Dear Sir/Madam,

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

Sl. No.	Claim description	Amount involved

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

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

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

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

Thanking you  
Yours faithfully

**Representative of BHEL**

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

**FORMAT-8**

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

To,

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

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

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

Dear Sir/Madam,

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

Sl. No.	Claim description	Amount involved

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

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

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

Thanking you  
Yours faithfully

**Representative of the Stakeholder**

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

**FORMAT-9**

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

To,

M/s. (Stakeholder's name)

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

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

Sir,

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

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

Name and contact details of Conciliator(s)

- a) .....
- b) .....
- c) .....

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

Yours faithfully,

**Representative of BHEL**

CC: To Conciliator(s)... for Kind Information please.

Encl: As above

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

# **GENERAL GUIDELINES FOR INSULATION WORKS**

This booklet is given as a general guideline to this tenderers about insulation works, However instructions given in the drawings & other schedule issued during execution of the work shall be final and binding of the contractor.



**Bharat Heavy Electricals Limited  
( A Govt. Of India Undertaking)  
Power Sector Southern Region  
690, Anna Salai , Nandanam,  
Chennai – 600 035**

## **GENERAL NOTES ON ERECTION OF INSULATION**

1. It is important that the sheet metal covering is done, by a experienced and competent tinsmith.
2. Person, who is doing the actual job, can alter the following said methods of fixing the sheet metal, as and when necessary, only after consulting the BHEL Erection Engineer.
3. Fixing pin of corresponding thickness of insulation shall be welded by **STUD WELDING** process.
4. Circumferential and axial overlapping of outer casing should be 50 mm unless specified otherwise.

### **5. FOR HORIZONTAL AND INCLINED DUCT AND PIPE:**

- 1) All overlapping in axial direction should be at the bottom of the duct and pipe. Provision of beading and Sealing compound is not required.
- 2) For circumferential overlapping of inclined duct and pipe, provision of beading and Sealing compound is not required.
- 3) For circumferential overlapping of horizontal pipe and duct, provide beading. Apply Sealing compound if necessary.

### **5A. FOR VERTICAL DUCT AND PIPE:**

- 1) For overlapping in the axial direction provide beading. Apply Sealing compound if necessary.
- 2) For circumferential overlapping provision of beading and Sealing compound is not required.
6. The joints of wool mattresses should be staggered in both circumferential and axial direction. The Wire netting at the joints of Wool mattresses are to be sewn together by G.I. sewing wire dia 0.71 mm.
7. In case more than one layer of Wool mattress is to be applied for pipe insulation the inner layer should be tied by two turns of G.I binding wire dia 1.22 mm at a pitch of 240 mm, and the outer layer should be tied by two turns of G.I. binding wire dia 1.22 mm at a pitch of 160 mm. The ends of the wire should be twisted and pressed in to the insulation.

8. All the overlapping of outer casing should be made such that no rain water enters into the insulation through the joints.
9. Incase of insulation fixing pin welding to tubes, equal circumferential pitch is to be maintained. Use a minimum number of 4 pins, at 90 degree radial spacing.
10. The inner side of the Aluminum / G.I sheet of outer casing should be painted with two coats of anticorrosive Paint (IS:158). Retainer – Type A must be coated with Aluminum paint to avoid bi-metal corrosion or Neoprene strip must be provided between Retainer – Type A and Casing support.

The above mentioned paints are not in BHEL scope of supply

11. Self tapping screws should be fixed over the circumferential overlapping. The axial joints should be on the Casing supports and outer casing should be fixed to Casing supports with Self tapping screws at a pitch of 150 mm approximately.
12. The outer casing should be wound tightly around the insulation and then fixed with Self tapping screws when there is not any Fixing pin for insulation.
13. Loose wool can be taken from the Wool mattresses wherever required.
14. Clean the surface to be insulated of rust, dust, grease, loose scale, oil, moisture, etc.
15. Care shall be taken that flexible insulation is not unduly compressed.
16. After insulating the equipment with Calcium silicate / Mineral wool mattress, all voids in the joints shall be filled with Moldable insulation / loose mineral wool respectively.
17. Each day application of insulation should be weather proofed overnight by either with the final protective casing or with some temporary weatherproof covering so that it does not get drenched in rain.
18. The indicated thickness of insulation is the minimum requirement which should be provided. Any alteration in the thickness of insulation should be done only after getting the prior approval from the Design Engineer.
19. The layers of Wool mattresses are to be taken as indicated below:

THICKNESS IN mm	LAYER IN mm				
	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>
250	50	50	50	50	50
230	50	60	60	60	
210	50	50	50	60	
200	50	50	50	50	
190	40	50	50	50	
180	60	60	60		

160	50	50	60
150	50	50	50
140	40	50	50
120	60	60	
100	50	50	
80	40	40	

20. Where junctions between two or three bodies or different dia, occur and different insulation thickness is specified the greater thickness shall be continued for a length equal to one dia of the smaller body then smoothly tapered to the required smaller thickness over a length equal to two dia of the smaller body. When there is a differential thermal expansion between these bodies, they should be insulated individually.
21. The required fixing components and outer casing sheets have been released under PG\_32. The insulation materials have been released under PG-33.

## 22. **STORAGE INSTRUCTIONS:**

- 22a) Mineral wool mattress:

These materials should be stored under fully covered sheds. Stocking must be done over planks and must be out of contact with ground. Height of stacking should not exceed 3 Meters.

Once drenched in water these materials loose all the desired properties and become unsuitable for use. Drying the material does not restore the desired properties.

- 22b) Outer casing sheets:

Outer surfaces are meant for improving the appearances also scratch marks, dents, etc, spoil the appearance.

23. Typical insulation arrangement drawings are indicated below.

1)	Tees	4-00-235-08546
2)	Elbows	4-00-235-08547
3)	Flanges	4-00-235-08548
4)	Expansion joint for pipe	4-00-235-08549
5)	Expansion piece for duct	3-00-235-06258 & 3-00-235-06259
6)	Manhole door for duct	3-00-235-06260

## INSULATION OF DRUM END

### **MATERIAL:**

- 1) FLAT 50 X 6
- 2) FIXING PIN INSLN DIA – 6
- 3) RETAINER TYPE – A
- 4) G.L. BINDING WIRE DIA – 1.22 / 0.914
- 5) WOOL MATTRESS
- 6) OUTER CASING
- 7) SELF TAPPING SCREW – M4 X 13
- 8) G.L. SEWING WIRE DIA – 0.71 / 0.914

### **APPLICATION:**

Install Flat 50 x 6 circumferential bands to fit snugly around the drum.

Flat 50 x 6 lattice bar 8 numbers should be radially placed over the dished end and contouring the same and it is to be welded over circumferential bands.

Weld the Fixing pins to the lattice bars circumferential bands.

Fix the Wool mattress.

Position the Retainer and tack weld to the Pin.

Tie with Binding wire across the Pins.

Fix the outer casing strips by Self tapping screws.

## INSULATION OF PIPES AND BUNCH OF TUBES

### **MATERIAL:**

- 1) WOOL MATTRESS
- 2) G.L. SEWING WIRE DIA-0.71 / 0.914
- 3) G.L. BINDING WIRE DIA – 1.22 / 0.914
- 4) OUTER CASING
- 5) SELF TAPPING SCREW – M4 x 13

### **APPLICATION:**

Fix the insulation over the bunch of tubes / pipes.

Tie the insulation with G.I. binding wire circumferentially.

Fix the outer casing sheet with self-tapping screws.

## **INSULATION OF VERTICAL PIPES (WELDING OF FIXING PINS NOT PERMITTED ON PIPES)**

### **MATERIALS:**

1) FIXING PIN INSLN DIA – 6	9) FLAT 50 x 6
2) RETAINER TYPE – A	10) PACKING CLOTH – 3 MM TK
3) CASING SUPPORT – 850MM	11) HEX HD BOLT M8X40
4) OUTER CASING	12) HEX NUT M8
5) WOOL MATTRESS	13) PNCHD WASHER A9
6) SELF TAPPING SCREW – M4X13	14) GI BINDING WIRE DIA – 1.22 /0.914
7) CLAMP	15) GI SEWING WIRE DIA – 0.71 / 0.914
8) SUPPORTING SHEET	16) SHEET 3.15x30x3000

### **APPLICATION:**

At every three meters provide the Clamps over the pipe with bolt but and washer by using packing cloth in between the pipe and clamp. Fix the sheet 3.15x30x3000 over the pipe and weld to the clamps. Weld the fixing pin over the sheet. Consult the Welding engineer before welding.

Weld the Flat to the Clamps.

Weld the Supporting sheets to the Flats.

Fix the insulation.

Position the Retainer Type – A and tack weld to the Pins.

Tie the insulation to the pipe with GI biding wire circumferentially.

Fix the casing support to the Retainer by using two numbers of Self tapping screws, fixed diagonally for each Retainer.

Fix the outer casing sheet with self tapping screws.

## INSULATION OF VALVE

### **MATERIAL:**

- 1) SM CLAMP FOR DETACHABLE INSULATION TYPE – A (To be used up to 200 mm overall dia)
- 1)a SM CLAMP FOR DETACHABLE INSULATION TYPE – B (To be used above 200 mm overall dia)
- 2) WOOL MATTRESS
- 3) OUTER CASING
- 4) SELF TAPPING SCRES – M4 x 13
- 5) G.I SEWING WIRE DIA – 0.71
- 6) SNAP HD RIVET 3 x 8
- 7) CHS SCREW M4 x 20
- 8) HEX NUT M4

### **APPLICATION:**

The sheeting shall be made in two halves and the Sheet metal clamp mounted.

Wool mattress thickness according to adjacent pipe lines shall be pressed in to two halves.

The two halves shall be fitted over the valve to be insulated and locked by Sheet metal clamp.

Self tapping screws shall be used for clamping the two edges of the outer sheet casing when the length of the valve is more.

After assembling the Clamp put a bit of GI Binding wire as a pin through 1.6 mm hole provided.

## INSULATION OF DUCT / FLAT SURFACE

### **MATERIALS:**

1) FIXING PIN INSLN DIA – 6	5) GI BINDING WIRE DA – 1.22 / 0.914
2) WOOL MATTRESS	6) CASING SUPPORT – 650 MM
3) OUTER CASING	7) SELF TAPPING SCREW M4 x 13
4) RETAINER TYPE – A	8) GI SEWING WIRE DIA – 0.71 / 0.914

### **APPLICATION:**

Weld the Fixing pin over the Duct / Flat surface.

Fix the insulation.

Position the Retainer Type – A and tack weld to the Fixing pins.

The GI Binding wire dia 1.22 shall be wound across the Fixing pins diagonally underneath the Retainer Type – A.

Fix the Casing support – 650 long to the Retainer Type – A by using two numbers of Self tapping screws, fixed diagonally for.

Retainer Type – A.

Fix the outer casing by using Self tapping screws.

### **DUCT STIFFENERS**

When the stiffeners protrudes through the insulation and are exposed to atmosphere, provide an additional 40 mm insulation over the stiffener.

### **DUCT DAMPER & GATE**

Insulation thickness shall be s per the adjacent duct insulation. The stuffing boxes should not be insulated. A clear gap of 50 mm (minimum) should be maintained all around the stuffing boxes.

### **AIR HEATERS**

DO NOT insulate over the axial seal, adjuster seal access covers and basket removal doors insulation should be applied in a manner to permit a free circulation of ambient air around the bearing.

## INSULATION OF DUCT (CLEARING STIFFENERS)

### **MATERIALS:**

1) FIXING PIN INSLN DIA – 6	7) OUTER CASING
2) RETAINER TYPE – A	8) SELF TAPPING SCREW M4X13
3) RETAINER TYPE – C	9) WOOL MATTRESS
4) CASING SUPPORT – 650 MM	10) WELD MESH
5) GI BINDING WIRE DIA – 1.22/0.914	11) CORNER SUPPORT
6) GI SEWING WIRE DIA – 0.71 / 0.914	12) ANGLE 40X40X5 – 100

### **APPLICATION:**

Weld the Fixing pin over the Duct.

Position the Retainer Type – C so that it will be in the same plane as that of the top surface of the stiffener.

Tack weld the Retainer – Type – C to the Fixing pin.

For the top plate of the horizontal duct, spread the Weld mesh over the Retainer Type – C.

This serves as the additional support where people walk over the insulation.

Weld the Corner support to the bottom corners of the duct.

Weld the Angle to the corner support.

This arrangement will help to achieve a sharp corner for the insulation and outer casing.

Fix the insulation.

Position the Retainer Type – A and tack weld to the Fixing pin.

The Binding wire shall be wound across the pins diagonally underneath the Retainer Type – A.

Fix the Casing support - 650 mm long to the Retainer by using 2 numbers of Self tapping screws, fixed diagonally for each Retainer.

Fix the outer casing by using Self tapping screws.

## **PROCEDURE FOR CURING OF CASTABLE REFRACTORY**

### **CURING OF REFRACTORY WORK**

Curing of refractory means retaining the moisture for a minimum period in order to ensure the proper hydration of the binder. Curing of exposed castable surfaces should start after the surface has become firm. This can be tested when a finger rubbed across the surface comes away clean or when the surface feels warm to the touch. Moisture loss for the first 24 hours, after the material has been installed shall be retarded. Initial set occurs within one or two hours.

Castables should be cured for 24 hours. Moist conditions can be maintained by protection with damp sacking or plastic sheet which should not come into immediate contact with the refractory or alternatively by dry coating the castable with an impervious organic based sealing compound. In some instances, satisfactory results can be obtained by sparkling water over the surface. It should be watered for a period of 20 to 24 hours after 4 to 5 hours of construction. The rate of water applicable should be carefully controlled to prevent washing of the fines and to prevent collection of pools in low spots. Shield the surface from direct sunlight at least for about 48 hours. 8 hours after casting and pouring, remove the wooden frames which have no load bearing function in order to permit watering of the lateral parts of the structures. In case of steel frames apply water without stripping them. On completion of the curing period the application of moisture should be stopped. The exposed castable should be allowed to air dry for 24 hours. Naturally air drying of castable after curing will actually cause slight increase in strength. The castable can be all dried indefinitely without adverse effect. Optimum results can be obtained with a drying period of 48 hours.

Before lighting the boiler for drying the setting shall be attended.

1. All dirt and foreign objects sticking to tube surface are to be removed to ensure a thoroughly clean surface.
2. Expansion joints are to be cleaned and inspected for the proper functioning of expansion during operation.
3. Test sample of castable refractory is to be taken from entry door regions to determine the moisture content in the laboratory.

Sample of castable are to be taken for the determination of moisture content before and after drying. When the moisture content drops below 0.58 the castable is considered to be dry and the boiler is ready for commissioning. All result of measurement should be duly recorded.

## **CARE OF THE REFRactory WORK**

The refractory work is subjected to considerable thermal stresses during boiler operation. Sudden application of heat or cooling introduces severe stresses and endangers the refractory work. Even when the boiler is operated in the recommended regime possibilities of damage occurring to the refractories (due to severed reasons such as bad workmanship, poor quality, slag deposition, corrosive atmosphere etc) must be kept in mind. The following simple rules to be observed.

- (i) Avoid sudden cooling of the furnace after a shut down. A cooling rate of 20° to 30° per hour for the refractory lining in the initial period is recommended. This means that FD fans must be stopped after a shut down of the boiler. Ventilation of the furnace by natural draft is permissible only after six hours of shut down. Forced cooling can be started only after 16 hours.
- (ii) Avoid quick heating of the furnace. Boiler starting diagram is usually a reliable guide.
- (iii) Thoroughly examine the refractory work during shot downs for cracks, chipping off spelling etc. During operation also this can be checked periodically by visual examination through observation holes.

Whenever defects are notice arrange for their quick alimentation, by shutting down the boiler at the earliest depending on the scarceness of the defect.
- (iv) Abnormal heating of outside metal sheet covering of the boiler and hot spots are usually a good indication of damaged refractory and insulation in this area. The leakage of flue gas will spoil the property of good mattresses within a short time.
- (v) Deep the access door, observation doors, etc. properly shut. They are entry points for cold air and this cold air can damage the refractory work by localized cooling.
- (vi) Sufficient quantity of water is to be added to the castable refractory for mixing before application as per supplier's recommendations.

## **METHOD OF APPLICATION AND CURING OF POURABLE INSULATION**

- (i) Typical application are for insulating behind buckstays and areas such as roofs having multiplicity of hangers, rods and other penetrations.
- (ii) The application of pourable insulation cab be pumping and gunning.
- (iii) Density of the pourable insulation installed and cured is around 600 to 650 Kgs/ M
- (iv) Pourable insulation is a hydraulic setting insulation additive or air entrainment agents shall not be used.
- (v)
  - (a) Empty the entire bag at a time and mi the while material so that segregated particles get mixed.
  - (b) The pourable insulation should be thoroughly mixed with coal clean water to develop casing and pump consistencies.
  - © The correct quantity of water shall be placed in the mixer before adding the dry pourable insulation normally about 70 to 100 by weight. However this has to be confirmed from the supplier while purchasing this material.
  - (d) Mixing time shall not to be less than the minutes or more than five minutes.
  - (e) Dried out material shall not be remixed.
  - (f) Pourable insulation once mixed must be in place within half an hour.
- (vi)
  - (a) All areas where pourable insulation will be placed must be free of scale, rust, dust or other loose materials.
  - (b) All porous forms used such as wood etc shall be oiled before pouring.
  - © All absorbent surface such as insulation brick, concrete, shall be wet down thoroughly to prevent water absorption.
  - (d) Waiting of wall insulation used as forms at buckstay levels is not required.
- (vii)
  - (a) The surface of pourable insulation once in place will become firm in approximately two hours. The surfaces should be kept damp with an occasional light spray or covering with a cloth that is kept damp for the entire 24 hours curing period.
  - (b) For mixing and spraying the water should be clean and cold.
  - © Application of moisture after 24 hours should be stopped forms etc should be removed and the materials allowed to air dry for 24 hours.
- (viii) The shuttering scaffolding moulds should be removed after about 36 hours of casing.

## APPLICATION OF INSULATION FOR BOILER PIPING, PIPING AND EQUIPMENTS / VESSELS AND ACCESSORIES.

Bonded mattress having standard thickness to 25, 10, 50, 60, 75 mm confirming IS 8103 having a density of 150 kg/cubic meter and light bonded mattress having a density of 150 kg/cubic meter and light bounded mattress having standard thickness of 25, 40, 50, 60, 75 mm conforming to IS 9842 having a density of 144 kg/cubic meter and pipe section in the standard thickness of 25, 40, 50, 60, 75 mm confirming IS 9842 having density of 144 kg/cubic meter will be 100 kg/cubic Mtr.

The application of insulation will be done as per general notes/ drawings enclosed. The application commissioning shall be as per latest editions of IS 7413 code of practice for application and finishing of thermal insulation materials between 40° C to 700° C of Bs 5970 code for practice for thermal insulation of pipe work and equipment (in the temperature range – 100° C to + 870° C).

Inspection before application, during the application and after the application of insulation will be carried out by BHEL Field Quality Engineer as per BHEL Field Quality Plan. Every layer of insulation shall be got approved by BHEL Engineer / FQA Engineer.

Prior to applying insulation the surfaces to be insulated shall be made clean and dry and free from dirt and grease. Where cladding is attached to carbons steel or low alloy steels the steel shall be first prime painted with zinc chromate and then painted with Aluminum paintings. Wherever required to provide aluminum foil as protective covering for bolts and other fittings shall be arranged by contractor. The prints wherever required for preservation coating shall be supplied by contractor.

For insulation of piping with performed pipe sections the same shall be applied over pipe and finally be held in position with 15 mm wide aluminum band at greater than 300 mm spacing for mineral wool insulation.

For insulation of piping with mattresses having backing GI wire netting, the required lengths and shapes are to be cut from the blankets and wrapped on the piping and held in position with proper support by fastening the binding to be done circumferential at not greater than 300 mm spacing.

Performed insulation on vertical or near vertical piping must be supported in position by means of metal ring at interval not greater than 960 mm.

The support attachment may be welded or clamped to the pipe, subject to the approval of BHEL Site Engineer Necessary fabrication of support rings to be done as per site requirement.

Piping bends shall be insulated to the same specification as adjacent straight piping and should form a smooth external surface. Where performed material is used it should be cut luster-back fashion and wired or strapped into position.

Pipe insulation shall be cut to fit nearly around hangers and supports. On horizontal lines which are supported directly on pipe racks the insulation and weather proofing shall be sufficiently cut away at the support to accommodate pipe movement.

Protrusions through insulations which themselves do not required insulations such as pipe clamps supports of small pipings instrument take offs etc shall be covered to the same thickness as the adjacent insulation expect for hanger rods.

At outdoor location the hanger rod protraction shall be shielded with metal flashing to deflect rain and protect the insulation from moisture while permitting the movement of the hanger rod.

Arrangement of securing the metal finish even the insulation shall ensure that direct metal contact between the insulated surface and outer meter cladding is avoided. 4mm thick asbestos board packing shall be used at interface to thermally isolate the metal covering from supporting arrangement. All cladding joints shall be vapours tight and shall be able to accommodate thermal movements. Paste type self setting vapours sealing compound shall be used.

Metal cladding on piping shall be screwed with self tapping screws. These joints should be arranged approximately 30° below horizontal centre line so as to shed water on any horizontal pipe line. The screws shall be flat or round head types of 12mm size and overlapping of 50 mm on both longitudinal and circumferential joints. The screws shall be provided at not greater than 150 mm spacing.

Insulation expansion joints shall be provided in all pipelines to allow movements and expansion of the pipe. The recommended intervals of expansion joints are.

<u>Pipe Temperature</u>	<u>Spacing of Insulation Expansion joints</u>
Below 200°C	5.5 M
201° - 300°C	3.5 M
301°C - 400°C	3.0 M
Above 400°C	2.0 M

All joints in the insulation shall be staggered. For multiple layer of insulation the different layers shall be applied so that the butt joints of one layer do not coincide with those of the other layers. At the joint of each layer of insulation loose insulation shall be packed firmly.

## **Equipments Insulation Application Procedure**

For equipment and shells a matrix of insulation support shall be developed by:-

- (a) Welding the insulation support lugs on a frame work prepared with 20 mm x 3 mm size MS Straps where direct welding of lugs to the sheet is not permitted.
- (b) Welding the directly on shell after written permission by Site Engineer. The material of the support shall be similar to the material of the shell in this case.

The support shell be pitched at 300 mm for vertical and underside surfaces and 500 mm for oppressed surfaces. A support shall be located above each vessel flange at a sufficient distance above the flange bolts to allow for easy removal. The top and bottoms supports shall be slotted suitably for attachments of straps and wires.

The support lugs shall be 6 mm

Insulation with back up GI wire noting, shall be cut to fit the equipments and shall be wrapped on the equipment and held in position with proper support and tie wires. All joints between course shall be staggered and tightly butter and adjacent edges laced together with lacing wire.

Insulation shall be fastened in place with MS Straps of 20 x 3 mm, on approx., 300 mm centers where contour of equipment permits. Straps shall be tightened with a banding machine and champed with seals.

Insulation on top of horizontal heads shall be cut to fit the curvature of the head and shall be secured in place with the help of radial straps fixed in between circumferential rings. Insulation on bottom heads shall be wired to nuts welded to head. Insulation shall also be strapped to bottoms insulation support. For outdoor equipments insulation shall be arranged to be weather proof.

Metal jacketing shell be applied directly over the met insulation and neatly fitted to place. All gaps shall be arranged so as to shed water. Suitable flashing and weather proofing shell be provided at all nozzles, manholes and other projections to prevent the entrance of water.

## **VALVES & FLANGES INSULATION APPLICATION**

The insulation on all valves and flanged joints shall be enclosed in a removable jacketing so that it may be removed without disturbing the concerned equipment or piping. The thickness of insulation shall be same as that of the pipe line in which these valves and fittings are located.

The layout of wool mattresses to be adopted to obtain the specified insulation thickness are as per be on unless otherwise specified:

Thickness of Insulation (mm)	Layer	I	II	III	IV
25		25			
40		40	-	-	-
50		50	-	-	-
60		60	-	-	-
65		40	25	-	-
75		75	-	-	-
80		40	40	-	-
100		50	50	-	-
110		60	50	-	-
125		75	50	-	-
135		75	60	-	-
150		75	75	-	-
155		75	40	40	-
160		75	60	25	-
165		75	50	40	-

The material density of boned mineral wool used for pipe having outside diameter more than 355.6 mm is 150 kg/cubic meter IS 8183.

The material density of bonded mineral wool used for pipe having outside diameter less than or equal to 355.6 mm is 144 kg/cubic meter IS 9842.

Cladding material used is galvanised steel sheet as per IS 277 GRADE 375.

Cladding material gauge for pipe outside diameter less than or equal to 300 mm is 24 SWG.

Cladding material gauge for pipe outside diameter greater than 300 is 22 SWG.

For piping up to including 355.6 mm OD, first layer shall be pipe sections and subsequent layer shall be bonded. Wherever pipe sections are not supplied the first layer has to be wrapped using bonded wool material for piping 355.6 mm OD, bonded mattress shall be used or all the layers.

## **Description of type of insulation and the method of Application for Boiler Feed Pumps**

### **1. Type of insulation**

The pumps should be insulated with 125 mm thick flexible wire backed mineral wool mattress of 150 kg/ density.

### **2. Method of Application**

The above insulation is to be applied to 2.0 mm thick flats aluminum sheeting (18 SWG) and secured by 19 mm vide aluminum retaining dips and 1/8 inch diameter aluminum pop rivets, all to be secured by 2 inch long X No.8 spacing to a 40 mm wide x 3 mm thick angle iron frame work of all welded construction bound by 40 mm PVC tape.

<u>SECTION</u>	<u>TITLE</u>	<u>NO. OF SHEETS</u>
A	METHOD OF APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS AND MATERIAL SPECIFICATIONS (ANNEXURE-1)	4
B	THERMAL INSULATION APPLICATION DRAWINGS	13

## **SECTION - A**

## **THERMAL INSULATION FOR PIPING AND EQUIPMENTS**

### **1.0 INTRODUCTION**

In a thermal power station or process plant, thermal insulation or heat lagging of piping and equipment's carrying hot fluids is essential for heat economy and protection of operating personnel. Any pipe which is at a temperature higher than its surroundings will lose heat and the amount of heat lost will depend upon the temperature of the fluid and the thermal conductivity of the piping material/covering.

The heat lost through bare pipe increases with

- a) Increase in the temperature of fluid conveyed
- b) Decrease in ambient temperature and
- c) Increase in wind velocity of the surroundings.

The heat so lost has potential for work and rapidly increasing cost of fuel in the recent past has promoted to find all possible means to conserve energy. Providing proper and adequate insulation on to the piping and equipments controls heat transfer and maintains the required services temperature.

### **2.0 METHOD OF APPLICATION**

The method of application is highly skilled job. Badly fitted/laid insulation can lead to greater heat loss, higher cold surface temperature than that estimated and frequent maintenance. Following are the important points to be considered in the application of the insulation.

- 2.1 Before applying insulation, it should be ensured that all instrument tappings, clamps, lugs and other connections on the surface to be insulated have been properly installed as per relevant drawings.
- 2.2 All surfaces to be insulated shall be cleaned of all foreign materials such as dirt, grease, loose scale, moisture etc.
- 2.3 Welding of lugs, attachments, clips etc. on the surface to be insulated for supporting insulation shall not be carried out without the permission of the authorized person.
- 2.4 All flanged joints shall be insulated only after final tightening and testing.
- 2.5 The insulation shall be applied to all surfaces when they are at ambient temperature.
- 2.6 Where more than one layer of insulation is involved, mattresses should have staggered joints (at 60 deg) and they must be held in close contact with face of

pipes/fittings by means of binding wires / Aluminum bands / seals. Circumferential joints of multilayer insulation should also be staggered by at least 150 mm.

(Refer Drg. No. PE-4-999-169-01).

2.7 For the first layer of insulation and in case of multi layer of insulation, mattresses with hexagonal wire netting will be facing on outer side.

2.8 Insulation mattresses shall be held in place by fastening over with binding wire. Care should be taken to see that the flexible insulation mattresses are not unduly compressed. The ends of binding wire shall be lightly twisted together, bent over and pressed into the insulation. For mattresses, binding wire shall be used at intervals of 300mm.

In the addition Aluminium bands shall also be provided at 300 mm intervals for diameters greater than 500mm. (Refer Drg No. PE-4-99-169-01.)

2.9 Where junctions between bodies of different diameters occur and difference in insulation thickness is specified, the greater thickness is to be continued for a length equal to one diameter of the smaller body and then smoothly tapered to the required smaller thickness over a length equal to two diameters of the small body.

2.10 The indicated thickness of insulation are minimum requirement which should be maintained. Any change in the thickness of the insulation should be done only after prior approval of the design engineer.

2.11 The day-to-day insulation work should be covered with suitable protective materials to prevent the rain water entry, if same is expected.

2.12 The insulation shall be cut to fit the piping O.D / equipment and shall be wrapped on the piping / equipments and held in position with proper support and wires. All the joints should be properly staggered and tightly butted and adjacent edges laced (Refer Drg No. PE-4-999/169/01)

2.13 The insulation of valves and flange joints shall be enclosed in a removable jacketing so that it may be removed without disturbing the concerned equipment or piping. The thickness of insulating shall be same as that of the pip line in which these valves and fittings are located. (Refer Drg No. PE-4-999-169-07.)

2.14 Steam / Air / Gas leakages in and around the pipes to be insulated with be attended before applying insulation.

2.15 In order to provide support to Aluminium cladding, support rings made out of 20 x 3 mm M.S. flats shall be fixed at equal intervals of approximately 850 mm spacing and at every circumferential joints. These rings shall be fixed with 'L'

type lugs and shall be fabricated from 20 x 3 mm M.S flats. To reduce that conductivity through these lugs 20 mm x 3 mm size Ceramic mill board shall be used between rings and lugs (Refer Drg No. PE-4-999-169-04 and PE-4-999-169-13).

- 2.16 Spacing between supporting rings for vertical piping shall be 3 mtrs. Support rings are to be provided only when the vertical height exceeds 3 mtrs. (Refer Drg No. PE-4-999-169-03-and PE-4-999-169-05).
- 2.17 For vertical pipes since support rings is provided ate every 3 mtrs interval, only two spacer rings shall be provided in between support rings.
- 2.18 Spacer rings shall be provided at both ends of elbows/bends, valves and flanges pipe having dia more than 89mm.
- 2.19 Wherever the end of hanger clamp assembly protrudes out of the insulation at the bottom suitable box structure are to be provided. Pipe hangers and supports should be covered in such a way that the moisture cannot penetrate into the insulation.
- 2.20 It is very important that sheet metal cladding should be done by a well experienced and competent fabricator. Person doing the job can alter the method of fixing of cladding sheet after consulting the concerned design engineer.
- 2.21 The longitudinal joint in the outer cladding sheet should always be at the lower half of the circumference for horizontal piping so that no rain water enters the insulation through the joints. (Refer Drg No. PE-4-999-169-01).
- 2.22 The joints of outer cladding should be staggered axially.
- 2.23 Inside surface of all Aluminium sheet will have two coats of Bituminous paint applied uniformly.
- 2.24 Aluminium sheets covering on outdoor horizontal pipes will be provided with 3 mm drain hole at the bottom center line at 6 mtr intervals.
- 2.25 The cladding sheet shall provides directly over the insulation/finishing cement (1F APPLICABLE). Suitable flashing and weather proofing shall be provided at all nozzles, manholes and other projections to prevent the entrance of water.
- 2.26 Loose wool can be taken from wool mattresses. Wherever gaps and voids have to be filled.
- 2.27 Sealing compound to be applied on Aluminum cladding sheet joints.

- 2.28 Support rings/spacer rings shall be provided if the insulation thickness > 40mm and pipe diameter > 89mm.
- 2.29 Equipment's name plates shall not be insulated.
- 2.30 Clips made out of sheet be riveted inside the box for insulation of valves and flanges to hold the insulation in box. (Refer Drg No. PE-4-999-169-06).
- 2.31 The insulation local to the inspection points of the critical piping shall be removable.
- 3.00 For Thermal Insulation Material Specification related to the project refer Annexure – 1.

#### **IMPORTANT POINTS TO BE TAKEN CARE DURING APPLICATION**

- I) Binding wires for all layers of insulation will be at distance of 300mm.
- ii) In addition Aluminum bands/seals also to be provided at distance of 300 mm for sizes above 500mm.
- iii) Aluminum bands/seals to be provided over aluminum sheets at distance of 500mm.
- iv) Ceramic mill boards to be used between all 'L' type lugs and the support rings.
- v) Inside surface of Aluminum sheets to have 2 coats of bituminous paint applied uniformly.
- vi) Gaps to be properly filled with loose wool taken from mattresses.
- vii) End of hanger clamp assembly protruding out of insulation at the bottom should be suitably boxed with Aluminum sheets.
- viii) Valves to be insulated properly in box structure as given in enclosed drawings.
- ix) Multilayer longitudinal and circumferential joints should be staggered.

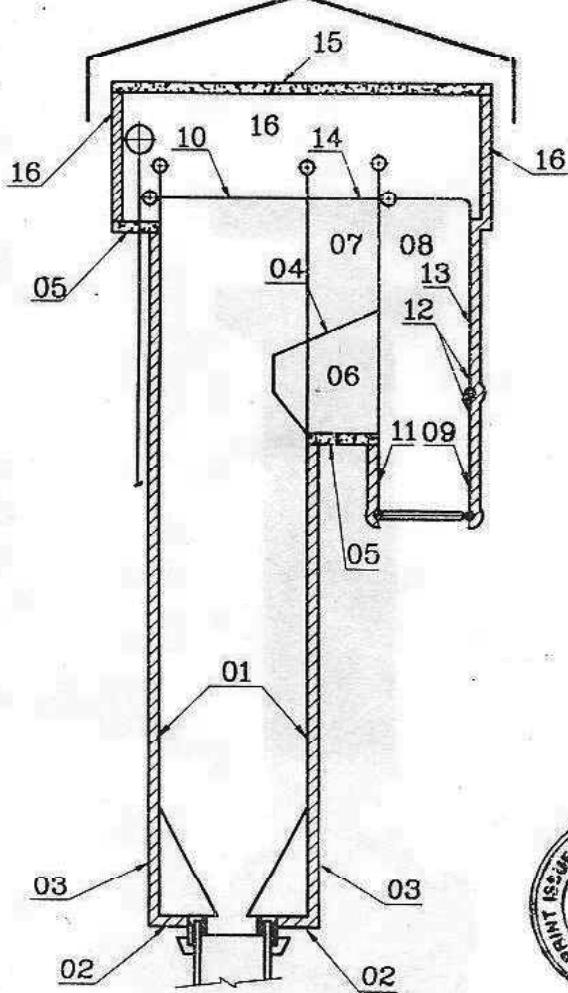
## ANNEXURE – 1

- 1.0 **Thermal insulating materials shall be per the details given below:-**
  - 1.1 **Lightly Bonded Mineral (Rock) wool Mattresses** of density 150 Kg / Cub. Mt with S.S. wire netting will be applied for the first layer of insulation where hot face temperature greater than 400 degree centigrade. For subsequent layers matters of density 150 Kg / Cub. Mtr with G.S. wire netting will be applied.
  - 1.2 **Lightly Bonded Mineral (Rock) wool Mattresses** of density 100 Kg/Cub. Mt with G.S. wire netting will be applied for all layers of insulation for host face temperature less than and equal to 400 degree centigrade.
- 2.0 **Binding and lacing wires:** For insulation matters shall be of stainless steel for all insulation interface temperatures.
- 3.0 **Aluminum cladding sheet** shall be provided over the Mattresses ad per details given below.

18 SWG (1.22 mm thk.)	For pipes with dia over insulation above 450 MM.
20 SWG (0.91 mm thk.)	For pipes with dia over insulation above 150 MM and less than equal to 450MM.
22 SEG (0.71 mm thk.)	For pipes with dia over insulation less than equal to 150mm.

## **SECTION – B**

SHEET 01 OF 09

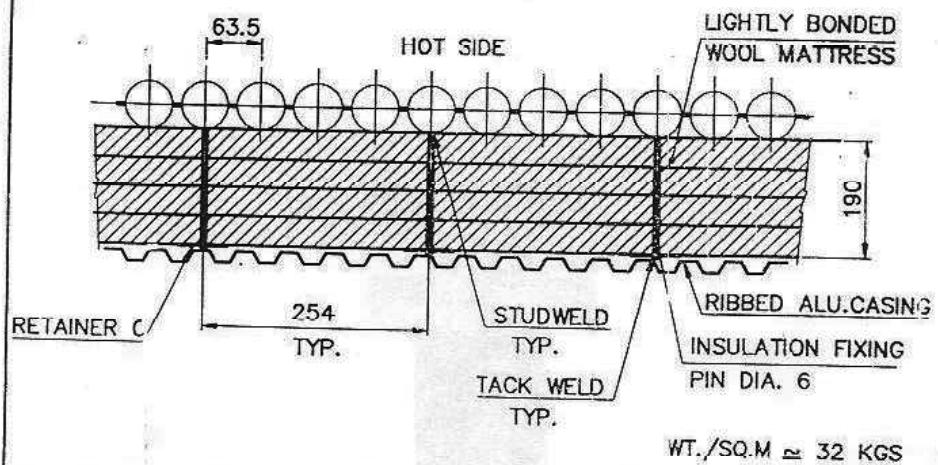
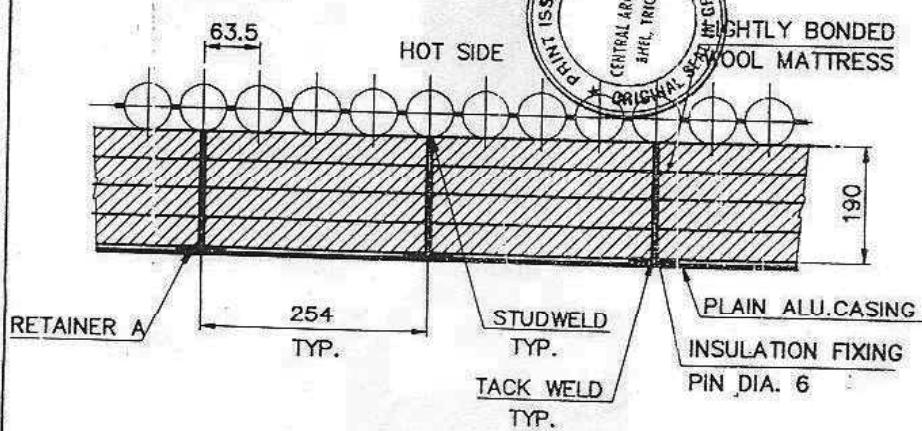


INSULATION	DRN	C.S	DRG.NO.	REV.NO.
	CHD	C.G.S		
	APPD	C.G.S		
			4-00-215-08551	00

CTS001384-0

**DETAIL 01**

SHEET 02 OF 09

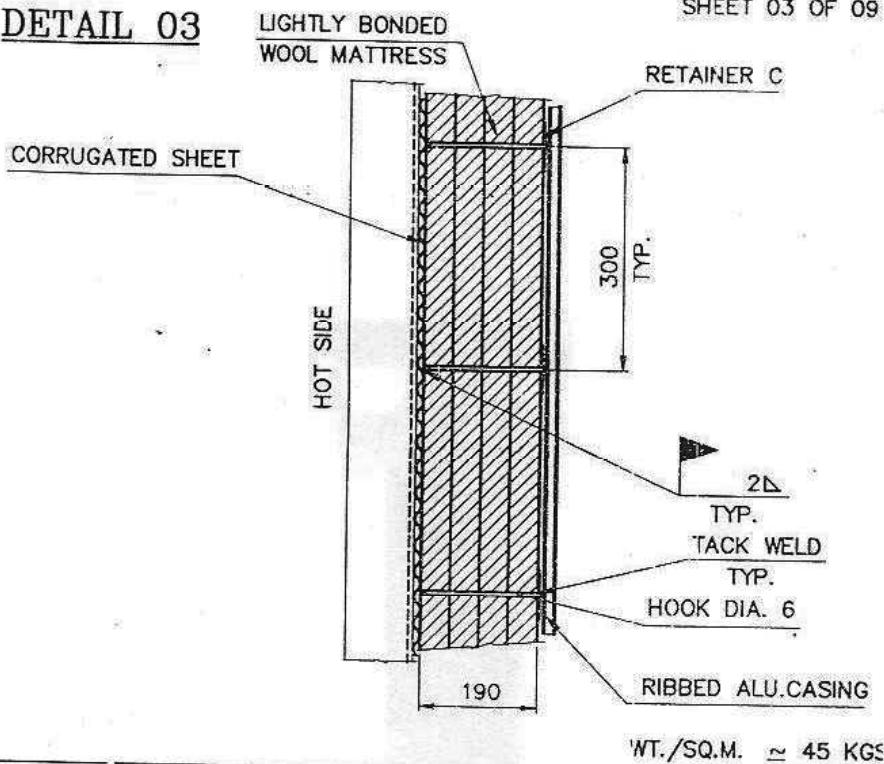
**DETAIL 02**

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	APPD	C.G.S		

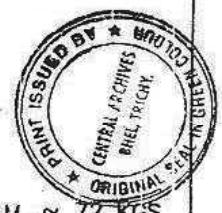
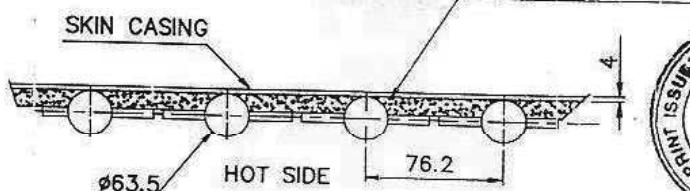
CTS001384-0

**DETAIL 03**

SHEET 03 OF 09

**DETAIL 04**

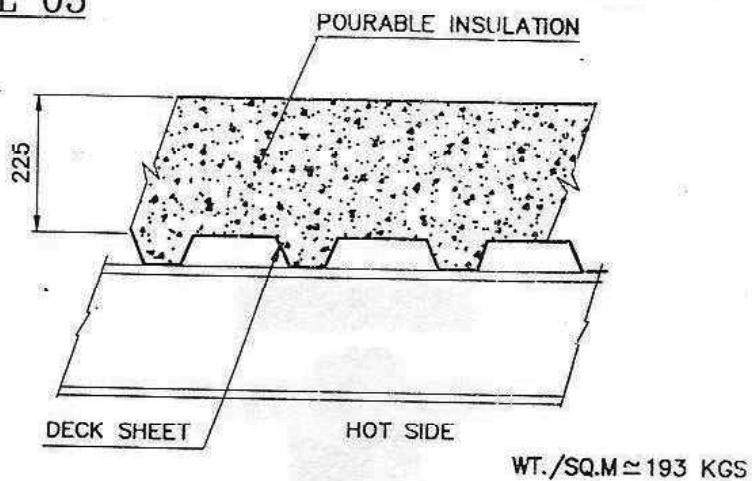
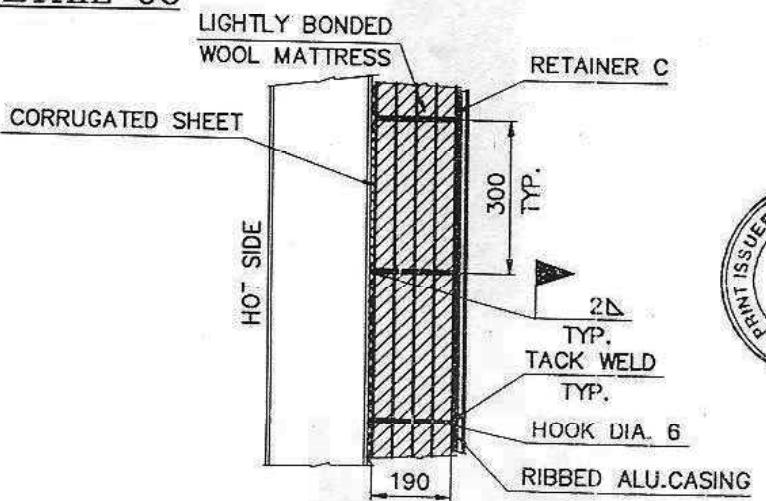
CASTABLE REFRACTORY-C



INSULATION	DRN	C.S.	DRG.NO.	REV.HD.
	CHD	C.G.S.		
	APPD	C.G.S.		
CTS001384-0	4-00-215-08553	00		

**DETAIL 05**

SHEET 04 OF 09

**DETAIL 06**

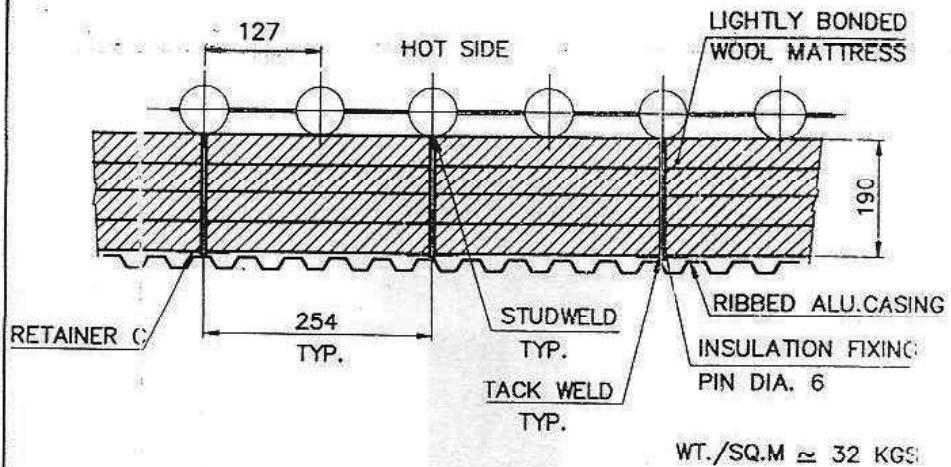
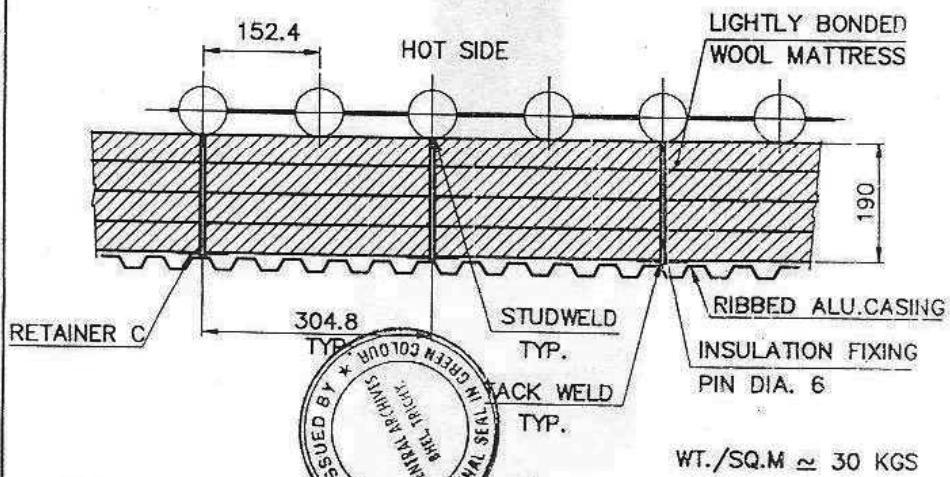
WT./SQ.M ≈ 45 KGS

INSULATION	DRN	C.S	DRG.NO. 4-00-215-08554	REV.NO. 00
	CHD	C.G.S		
	APPD	C.G.S		

CTS001384-0

**DETAIL 07**

SHEET 05 OF 09

**DETAIL 08****INSULATION**DRN C.S. \* P.A. \*  
CHD C.G.S.  
APPD C.G.S.

DRG.NO.

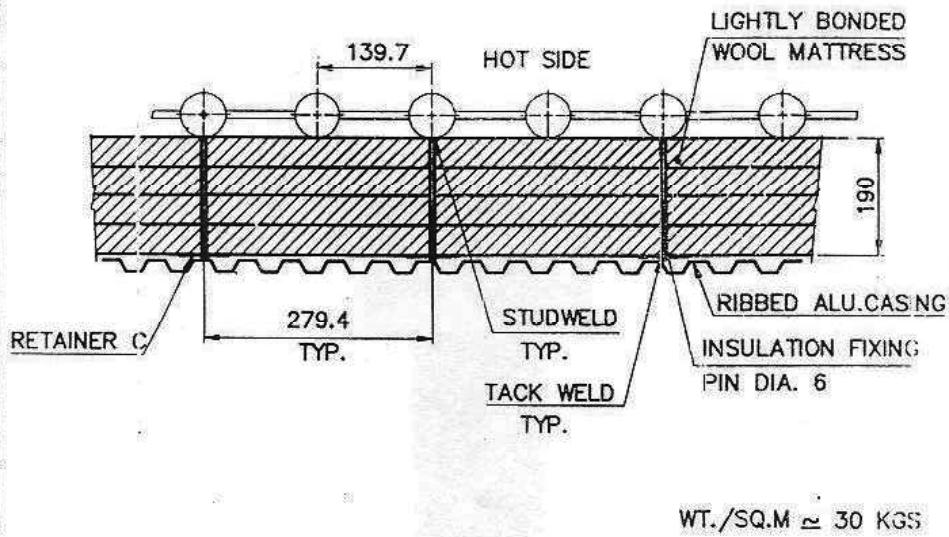
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REV.HD

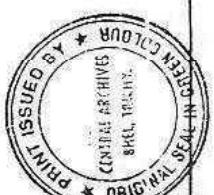
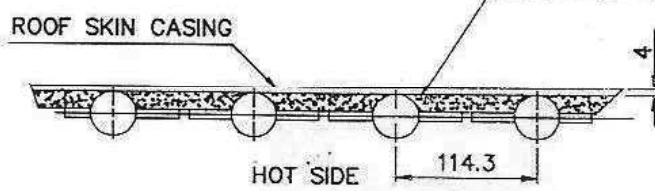
CTS001384-0

**DETAIL 09**

SHEET 06 OF 09

**DETAIL 10**

CASTABLE REFRACTORY-A

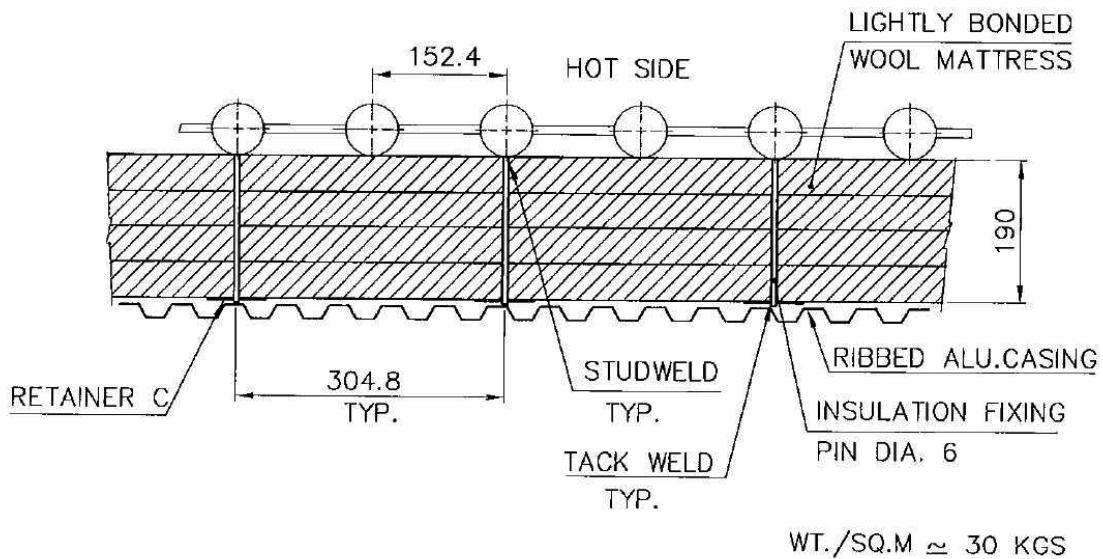
WT./SQ.M.  $\approx$  75 KGS

INSULATION	DRN	C.S.		DRG.NO.	REV.NO.
	CHD	C.G.S			
	APPD	C.G.S		4-00-215-08556	00

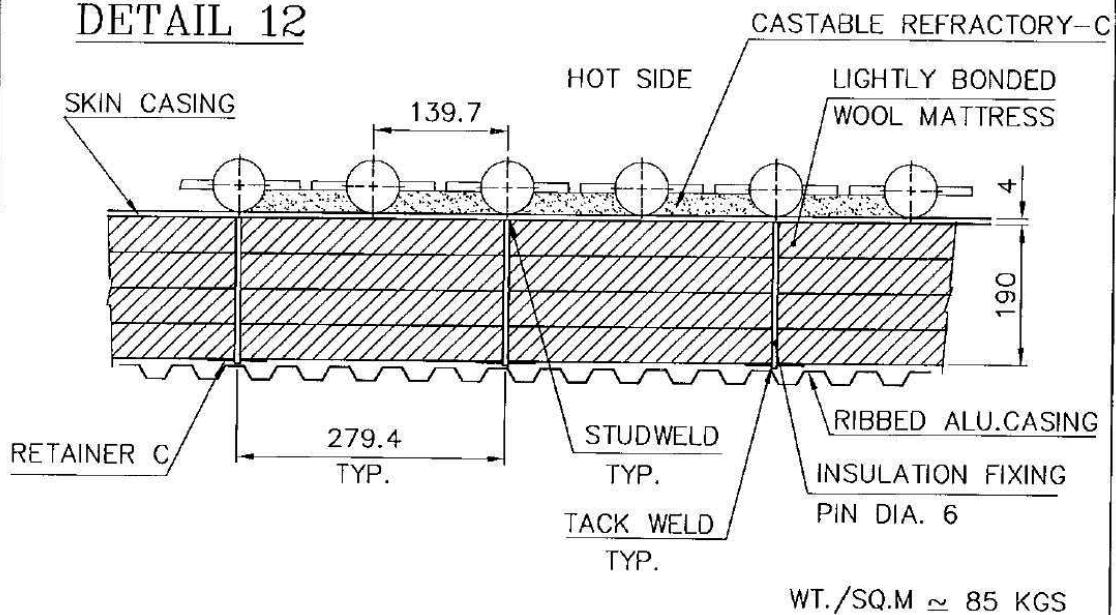
CTS001384-0

DETAIL 11

SHEET 07 OF 09



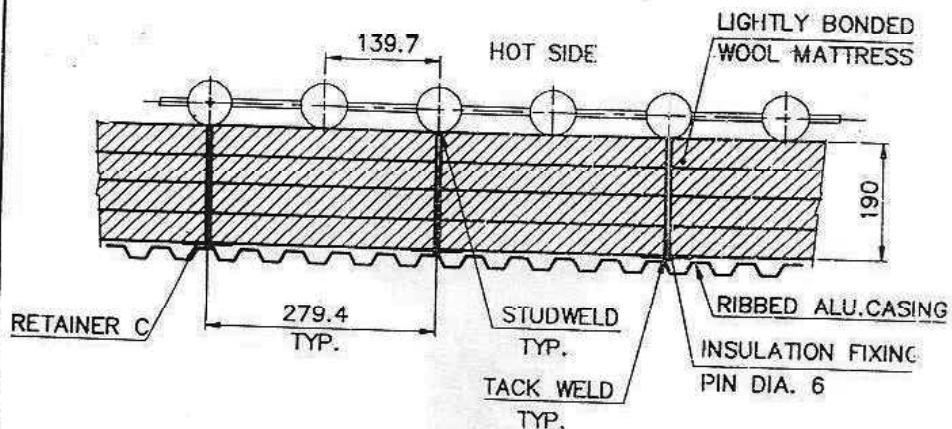
DETAIL 12



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	APPD	C.G.S		

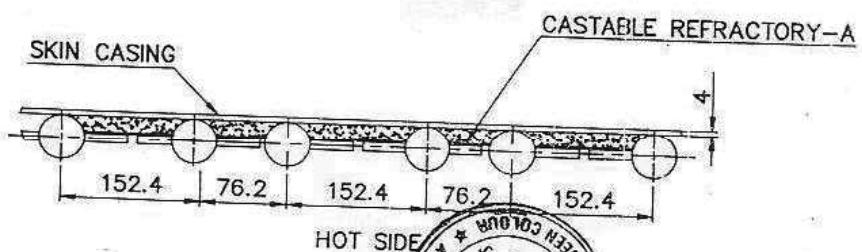
DETAIL 13

SHEET 08 OF 09



WT./SQ.M  $\approx$  30 KGS

DETAIL 14



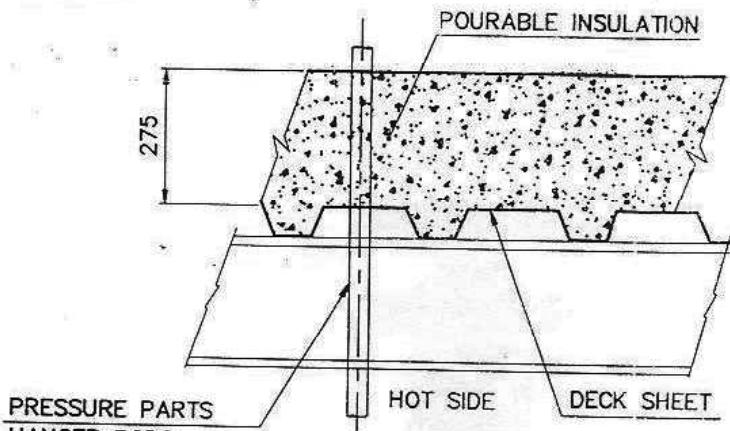
WT./SQ.M.  $\approx$  75 KGS

INSULATION	DRN	C.S.	4-00-215-08558	00
	CHD	C.G.S.		
	APPD	C.G.S.		

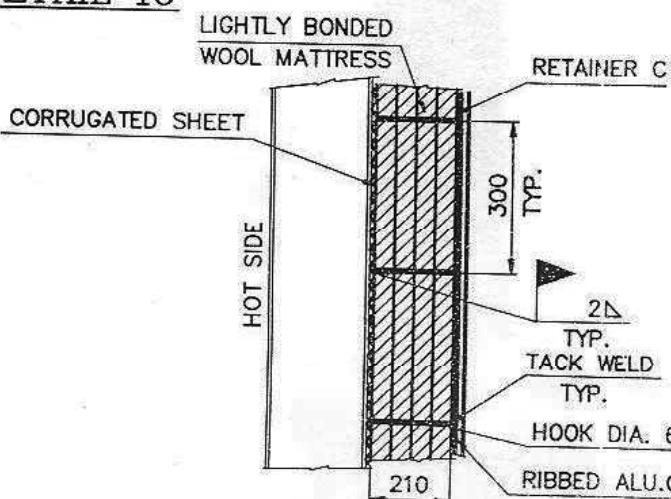
CTS001384-0

**DETAIL 15**

SHEET 09 OF 09



WT./SQ.M ≈ 233 KGS

**DETAIL 16**

WT./SQ.M ≈ 46 KGS

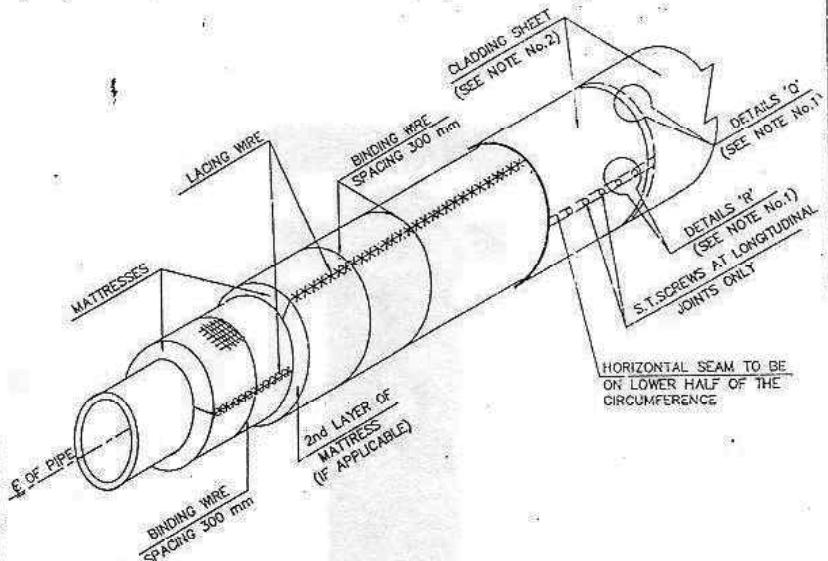
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	CHD	C.G.S.		
	APPD	C.G.S.		
CTS001284-0		4-00-215-08559		00

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FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	REV.	DATE	ALTERED
CHECKED			CHECKED		

JOB NO. STANDARD



NOTES:-

1. FOR DETAILS 'Q' AND 'R' REFER DRG NO. PE-4-999-169-12
2. FOR SHEET SUPPORT REFER DRG NO. PE-4-999-169-04
3. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS".
4. IN ADDITION TO BINDING WIRE ALUMINIUM BANDS TO BE FURNISHED FOR DIAMETERS > 500 MM.

MATERIALS REQUIRED:-

1. MATTRESSES
2. BANDS AND SEALS
3. CLADDING SHEET
4. S.T.SCREWS
5. SEALING COMPOUND
6. LACING WIRE
7. BINDING WIRE



BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECTS ENGINEERING MANAGEMENT  
NEW DELHI

DEPT. MP.	CODE M	SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG	ITEM
TITLE:-					
		INSULATION APPLICATION (HORIZONTAL PIPES WITH MATTRESSES)		DRN. NAME DESIN. S.C.S. SIGN DATE	
				CHD. D.B.S. 9.6.97	
				APPD. S.K.J. 11.6.97	
			CARD CODE	DRAWING NO. PE-4-999-169-01	
			—	SHEET 1 OF 1 REV. 00	

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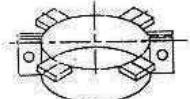
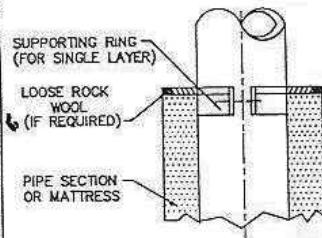
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)							
REV.	DATE	ALTERED CHECKED	KEY.	DATE	ALTERED CHECKED		
						JOB NO. STANDARD	
<p><b>NOTES:—</b></p> <ol style="list-style-type: none"> <li>1. FOR DETAILS 'Q' AND 'R' REFER DRG. No. PE-4-999-169-12</li> <li>2. FOR CLADDING SHEET SUPPORT REFER DRG. No. PE-4-999-169-04</li> <li>3. 2nd &amp; 3rd LAYER IF ANY SHALL BE OF MATTRESSES.</li> <li>4. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS".</li> </ol> <p><b>MATERIALS REQUIRED:—</b></p> <ol style="list-style-type: none"> <li>1. PIPE SECTIONS</li> <li>2. BANDS AND SEAL</li> <li>3. CLADDING SHEET</li> <li>4. S.T. SCREWS</li> <li>5. SEALING COMPOUND</li> </ol>							
		<b>BHARAT HEAVY ELECTRICALS LIMITED</b> POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI					
DEPT. MPL	CODE M		SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG.		ITEM
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CARD CODE				DRAWING NO. <b>PE-4-999-169-02</b> — SHEET 1 OF 1 REV. 00			

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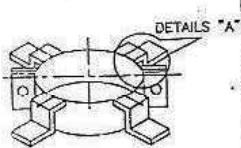
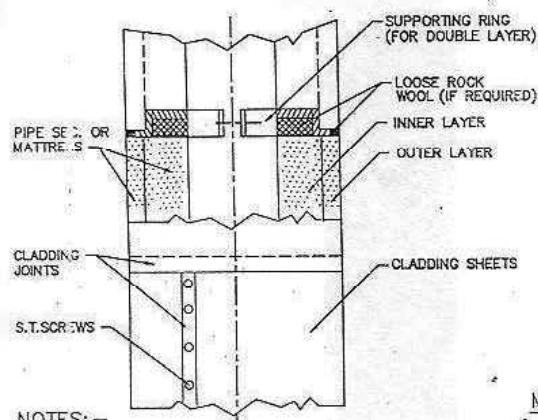
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED

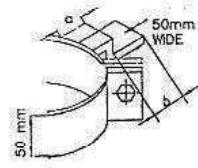
JOB NO. STANDARD



SUPPORT RING  
(FOR SINGLE LAYER)



SUPPORT RING  
(FOR DOUBLE LAYER)



DETAIL 'A'

NOTES: —

1. LENGTH 'a' & 'b' TO BE 12 TO 50mm LESS THAN SPECIFIED INSULATION THICKNESS.
2. SUPPORT RING TO BE FABRICATED OUT OF MS FLATS/STRAPS.
3. SUPPORT RING REQUIRED FOR PIPE 80 N.B & LARGER IF INSULATION THICKNESS LARGER THAN 30mm.
4. SUPPORT RINGS REQUIRED FOR MATTRESS ONLY.
5. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS"
6. SUPPORT RINGS (FOR MATTRESSES ONLY)
7. SUPPORT RINGS (FOR MATTRESSES ONLY)

MATERIALS REQUIRED: —

1. FLATS/STRAPS
2. MATTRESSES/PIPE SECTIONS
3. CLADDING SHEET
4. NUTS AND BOLTS
5. SELF TAPPING SCREWS
6. SEALING COMPOUND
7. SUPPORT RINGS (FOR MATTRESSES ONLY)



BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECTS ENGINEERING MANAGEMENT  
NEW DELHI

DEPT. MPL	CODE M	SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG	ITEM
TITLE: —					
INSULATION APPLICATION (VERTICAL PIPING)				DRN	NAME: <i>DRN</i> SIGN: <i>1</i> DATE: <i>9-6-97</i>
				DESN	S.C.S. <i>DESN</i> D.B.S. <i>DESN</i> S.K.J. <i>DESN</i> DATE: <i>9-6-97</i>
				CHD	
				APPD	
		CARD CODE	DRAWING NO. PE-4-999-169-03		
		—	SHEET 1 OF 1	REV. 00	

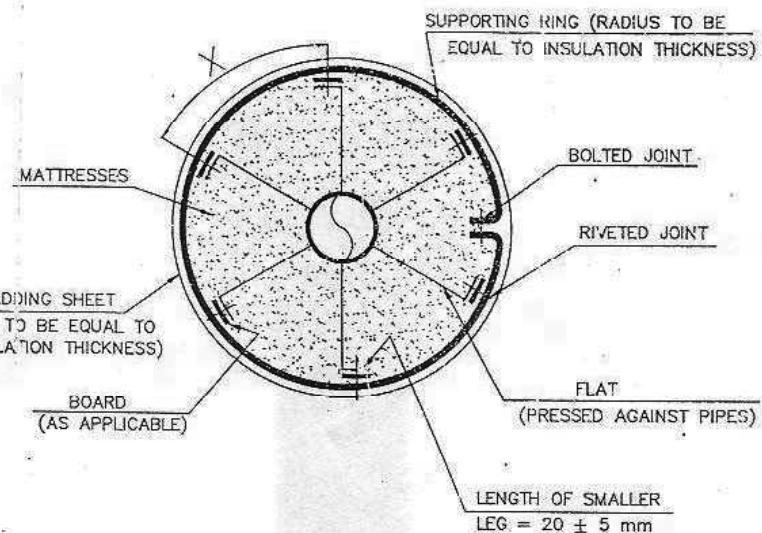
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FIRST ANGLE PROJECTION WALL DIMENSIONS ARE IN MM					
REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHECKED			CHECKED

JOB NO. STANDARD

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X = 150 mm TO 200 mm SO THAT NUMBER OF WEBS IS EVEN NUMBER

MATERIAL REQUIRED:-

1. FLATS
2. RIVETS
3. BOLTS AND NUTS
4. BOARD

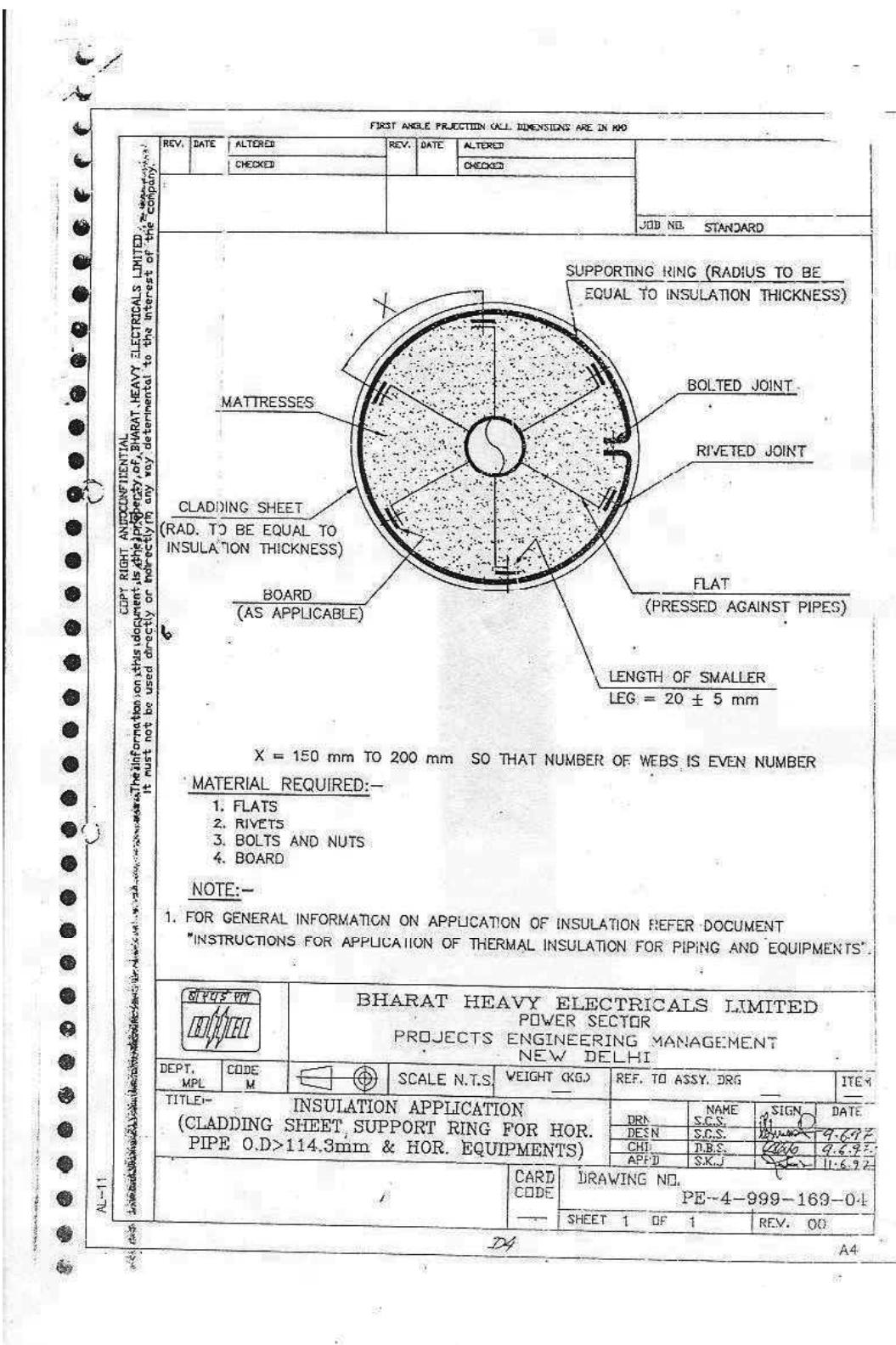
NOTE:-

1. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT  
"INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS".

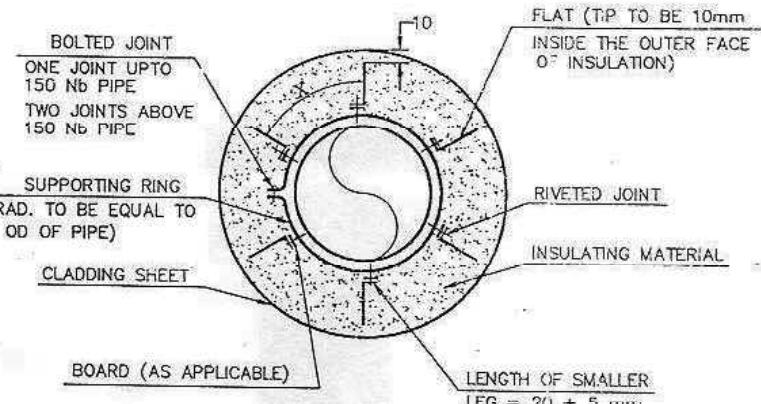
61445 MM 	BHARAT HEAVY ELECTRICALS LIMITED POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI			
DEPT. MPL	CODE M	SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG
TITLE:- INSULATION APPLICATION (CLADDING SHEET, SUPPORT RING FOR HOR. PIPE O.D>114.3mm & HOR. EQUIPMENTS)				DRN S.C.S. SIGN DATE DESIGN S.C.S. 19-6-72 CHIEF P.B.S. 22-6-72 APPROV. SKJ 11-6-72
		CARD CODE	DRAWING NO. PE-4-999-169-04	
			SHEET 1 OF 1	REV. 00

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FIRST WHOLE PROJECTION CALL DIMENSIONS ARE IN MM			REV. DATE ALTERED CHECKED			REV. DATE ALTERED CHECKED			JOB NO. STANDARD		
											
$X = 150 \text{ mm TO } 200 \text{ mm SO THAT NUMBER OF WEBS IS EVEN NUMBER}$ <u>MATERIAL REQUIRED:-</u> <ol style="list-style-type: none"> <li>1. FLATS</li> <li>2. RIVETS</li> <li>3. BOLTS AND NUTS</li> <li>4. BOARD</li> </ol> <p><u>NOTES:-</u></p> <ol style="list-style-type: none"> <li>1. INSULATION DETAILS ON VERTICAL PIPING SHALL BE SAME AS PER FOR HORIZONTAL PIPES.</li> <li>2. SPACING BETWEEN SUPPORTING RINGS SHALL BE 3 Mtrs.</li> <li>3. FOR INSULATION OF END OF VERTICAL EQUIPMENTS REFER DRG. NO. PE-4-999-169-09.</li> <li>4. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS".</li> <li>5. FLATS/RINGS OF REQUIRED LENGTH/DIA SHALL BE MADE BY ERECTING AGENCY AT SITE FROM MS FLATS/STRAPS.</li> </ol>											
			<b>BHARAT HEAVY ELECTRICALS LIMITED</b> POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI								
DEPT. M-L CODE M		SCALE N.T.S.	WEIGHT OKG	REF. TO ASSY. DRG			ITEM				
TITLE:- INSULATION APPLICATION (INSULATION SUPPORT RING FOR VERTICAL PIPING & VERTICAL EQUIPMENTS)							DRN DESN CHD APPD	NAME S.C.S. S.C.S. D.B.S. S.K.J.	SIGN (initials) (initials) (initials) (initials)	DATE 16.7.77 16.7.77 16.7.77 16.9.77	
CARD CODE				DRAWING NO. PE-4-999-169-05			SHEET 1 OF 1 REV. 00				

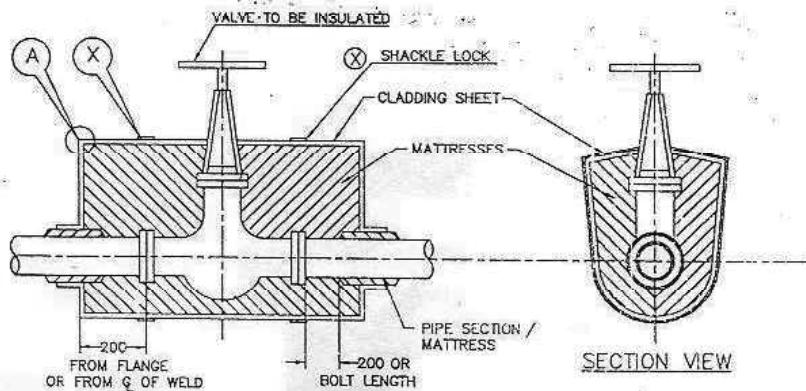
AL-222

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

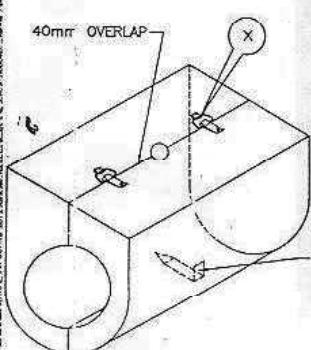
REV.	DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED	

JOB NO. STANDARD

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SECTION VIEW



ASSEMBLED VALVE BOX

MATERIALS REQUIRED:-

1. MATTRESSES
2. CUPS OF SHACKLE LOCKS FABRICATED OUT OF CLADDING SHEET
3. CLADDING SHEET
4. RIVETS
5. SHACKLE LOCKS CONNECTING BUCKLES.  
(REF. DRG. PE-4-999-169-10)
6. SELF TAPPING SCREWS
7. SEALING COMPOUND.

NOTE:-

1. FOR DETAIL A & X REFER DRG. NO. PE-4-999-169-10
2. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION  
REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL  
INSULATION FOR PIPING AND EQUIPMENTS".

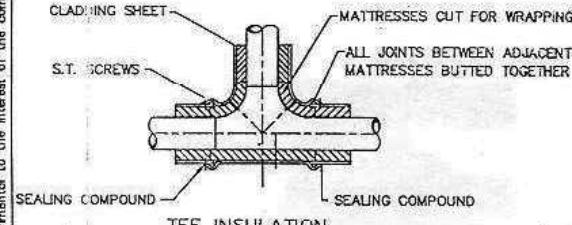
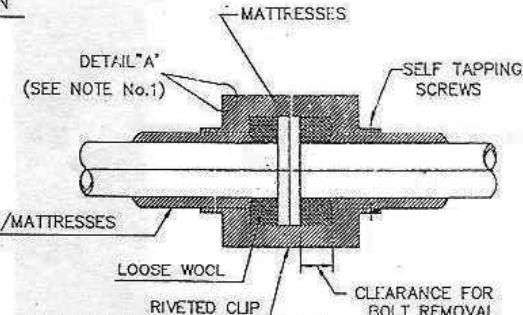


BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECTS ENGINEERING MANAGEMENT  
NEW DELHI

DEPT. MPL	CODE M	SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG	ITEM
TITLE:-					
		INSULATION APPLICATION (VALVES)		DRN DESIN CHD APPD	S.C.S. S.C.S. D.B.S. S.K.J.
					5-6-97 5-6-97 5-6-97 11-6-97
				CARD CODE	DRAWING NO. PE-4-999-169-06
					SHEET 1 OF 1 REV. 00

28

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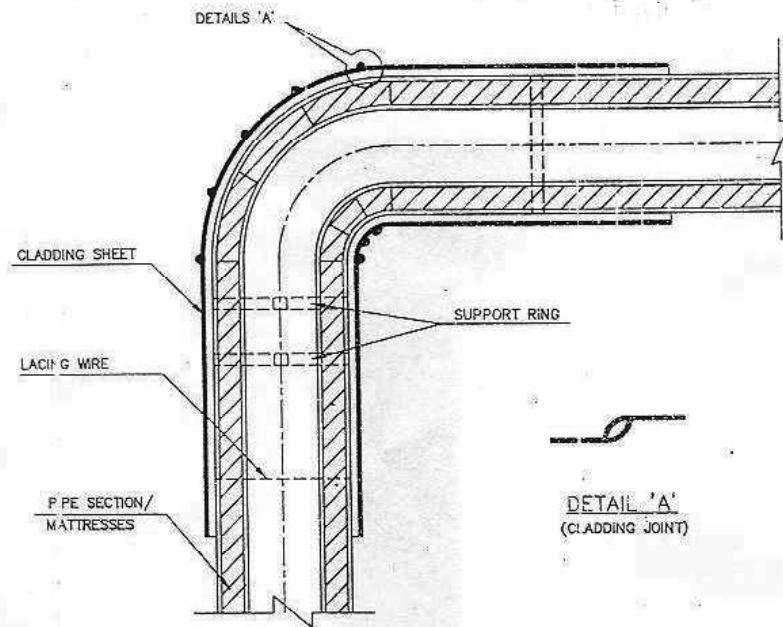
FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)								
REV.	DATE	ALTERED	REV.	DATE	ALTERED			
		CHECKED			CHECKED			
JOB NO. STANDARD								
								
								
<b>MATERIALS REQUIRED:—</b>								
1. PIPE SECTION/MATTRESSES 2. STITCHING WIRE 3. CLADDING SHEET 4. BINDING WIRE 5. SELF TAPPING SCREWS 6. SEALING COMPOUND								
<b>FLANGE JOINT INSULATION</b>								
<b>NOTE:—</b> 1. FOR DETAIL "A" REFER DRG No. PE 4 999-169-10 2. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS."								
		<b>BHARAT HEAVY ELECTRICALS LIMITED</b> POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI						
DEPT. / MPL	CODE / M	 	SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG		ITEM	
TITLE: —		INSULATION APPLICATION (TEES AND FLANGE JOINTS)		—	DRN	NAME	SIGN	DATE
				DESN	S.C.S.	—	9.6.97	
				CHD	D.B.S.	—	9.6.97	
				APPD	S.K.W.	—	9.6.97	
				<b>CARD CODE</b> —	<b>DRAWING NO.</b> <b>PE-4-999-169-07</b> SHEET 1 OF 1 REV. 00			

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FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHECKED			CHECKED

JOB NO. STANDARD



MATERIALS REQUIRED:-

1. MATTRESSES
2. PIPE SECTION (IF APPLICABLE)
3. LACING WIRE
4. CLADDING SHEET
5. BINDING WIRE
6. SELF TAPPING SCREWS
7. SEALING COMPOUND

NOTES:-

1. TWO SELF TAPPING SCREWS TO BE USED FOR EACH SHEET SEGMENT AT INNER SIDE OF BEND.
2. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS."

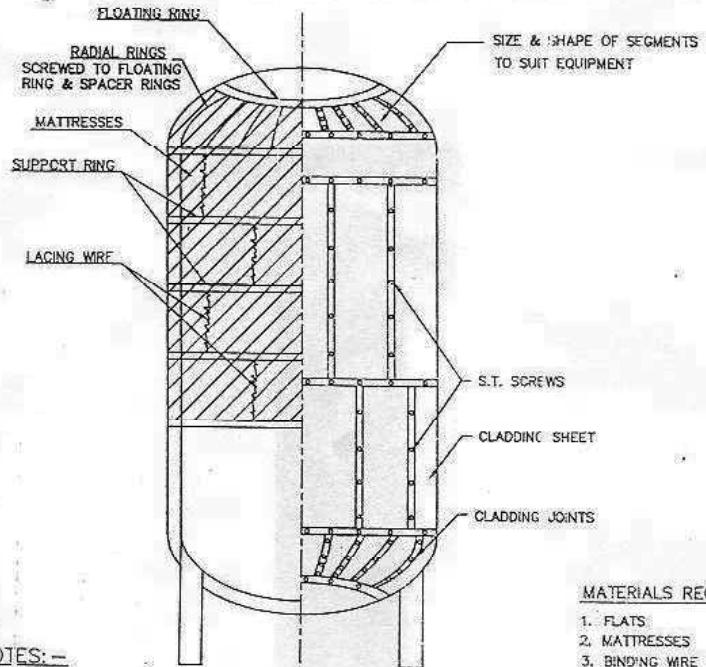
 <b>BHRAT HEAVY ELECTRICALS LIMITED</b> POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI	<b>INSULATION APPLICATION</b> (ELBOWS & BENDS SIZE EXCEEDING 150mm)					
DEPT. MPL	CODE M	SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG.	ITEM	
TITLE:-						
				DRN	NAME	
				DESN	S.C.S.	
				CHO	D.B.S.	
				APPD	S.K.J.	
			CARD CODE	DRAWING NO.		
				PE-4-999-169-08		
				SHEET 1	REV. 00	

D8

A4

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)					
REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHECKED			CHECKED

JOB NO. STANDARD



NOTES:—

1. STI-APS/BANDS CUT FROM SHIFT, WITH SEAL SHALL BE USED OVER FINAL LAYER AT 300mm INTERVALS.
2. INSULATION OF HOR. EQPTS. SHALL BE AS FOR HOR. PIPES. REFER DRG No. PE-4-999-169-01 & PE-4-999-169-02.
3. FOR CLADDING SHEET SUPPORT REF. DRG. No. PE-4-999-169-04.
4. FOR INSULATION SUPPORT REF. DRG. No. PE-4-999-169-05.
5. INSULATION OF ENDS OF HOR. EQPTS. SHALL BE SIMILAR TO THIS DRG.
6. WELDING TO EQUIPMENT NOT PERMITTED.
7. FOR GEN. INF. ON APPLICATION OF INSULATION REF. DOC. "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING & EQPTS".

MATERIALS REQUIRED:—

1. FLATS
2. MATTRESSES
3. BINDING WIRE
4. LACING WIRE
5. CLADDING SHEET
6. GLASS FABRIC/BOARDS (AS APPLICABLE)
7. RIVETS
8. SELF TAPPING SCREWS
9. SEALING COMPOUND
10. STRAPS/BANDS



BHARAT HEAVY ELECTRICALS LIMITED  
POWER SECTOR  
PROJECTS ENGINEERING MANAGEMENT  
NEW DELHI

DEPT.	CODE	SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG	ITEM
TITLE:—					
				DRN	NAME
				DESN	S.C.S.
				CHO	D.B.S.
				APD	S.K.J.
INSULATION APPLICATION (EQUIPMENT)			CARD CODE	DRAWING NO.	DATE
				PE-4-999-169-09	
			—	SHEET 1 OF 1	REV. 00

D9

14

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FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)																																																																							
REV.	DATE	ALTERED	REV.	DATE	ALTERED	JOB NO. STANDARD																																																																	
1		CH-CHECKED			CHECKED																																																																		
<p><u>DETAILS 'A'</u> (LOCKING OF SHEETS)</p> <p><u>MATERIAL REQUIRED:</u> (MAN HOLE)</p> <p>1. MATTRESSES 2. CLADDING SHEET 3. SELF TAPPING SCREWS 4. RIVETS 5. CUPS (TO BE MADE AT SITE) 6. SEALING COMPOUND</p>																																																																							
<p><u>NOTES:-</u></p> <p><u>MATERIAL REQUIRED:</u> (FOR SHACKLE LOCK)</p> <p>1. CLIP (MADE FROM CLADDING SHT.) 2. RIVETS</p> <p>1. FOR GENERAL INFORMATION ON APPLICATION INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS".</p>																																																																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; text-align: center; padding: 5px;"> </td> <td colspan="7" style="text-align: center; padding: 5px;"> <b>BHARAT HEAVY ELECTRICALS LIMITED</b>            POWER SECTOR            PROJECTS ENGINEERING MANAGEMENT            NEW DELHI         </td> </tr> <tr> <td style="width: 20%; text-align: center; padding: 5px;">           DEPT. MPL         </td> <td style="width: 20%; text-align: center; padding: 5px;">           CODE M         </td> <td style="width: 20%; text-align: center; padding: 5px;"> </td> <td style="width: 20%; text-align: center; padding: 5px;">           SCALE N.T.S.         </td> <td style="width: 20%; text-align: center; padding: 5px;">           WEIGHT (KG.)         </td> <td colspan="2" style="width: 20%; text-align: center; padding: 5px;">           REF. TO ASSY. DRG         </td> <td style="width: 10%; text-align: center; padding: 5px;">           ITEM         </td> </tr> <tr> <td colspan="2" style="text-align: center; padding: 5px;">           TITLE:—            INSULATION APPLICATION            (FABRICATED HEAT INSULATING COVER FOR MAN-HOLE)         </td> <td colspan="2"></td> <td style="text-align: center; padding: 5px;">           DRN         </td> <td style="text-align: center; padding: 5px;">           NAME         </td> <td style="text-align: center; padding: 5px;">           SIGN         </td> <td style="text-align: center; padding: 5px;">           DATE         </td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td style="text-align: center; padding: 5px;">           DESN         </td> <td style="text-align: center; padding: 5px;">           S.C.S.         </td> <td style="text-align: center; padding: 5px;"> </td> <td style="text-align: center; padding: 5px;">           9-6-97         </td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td style="text-align: center; padding: 5px;">           CHD         </td> <td style="text-align: center; padding: 5px;">           D.B.S.         </td> <td style="text-align: center; padding: 5px;"> </td> <td style="text-align: center; padding: 5px;">           9-6-97         </td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td style="text-align: center; padding: 5px;">           APPD         </td> <td style="text-align: center; padding: 5px;">           S.K.J.         </td> <td style="text-align: center; padding: 5px;"> </td> <td style="text-align: center; padding: 5px;">           14-6-97         </td> </tr> <tr> <td colspan="4" style="text-align: center; padding: 5px;">           CARD CODE         </td> <td colspan="4" style="text-align: center; padding: 5px;">           DRAWING NO.            PE-4-999-169-10         </td> </tr> <tr> <td colspan="4" style="text-align: center; padding: 5px;">           —         </td> <td colspan="4" style="text-align: center; padding: 5px;">           SHEET 1 OF 1 REV. 00         </td> </tr> </table>									<b>BHARAT HEAVY ELECTRICALS LIMITED</b> POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI							DEPT. MPL	CODE M		SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG		ITEM	TITLE:— INSULATION APPLICATION (FABRICATED HEAT INSULATING COVER FOR MAN-HOLE)				DRN	NAME	SIGN	DATE					DESN	S.C.S.		9-6-97					CHD	D.B.S.		9-6-97					APPD	S.K.J.		14-6-97	CARD CODE				DRAWING NO. PE-4-999-169-10				—				SHEET 1 OF 1 REV. 00			
	<b>BHARAT HEAVY ELECTRICALS LIMITED</b> POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI																																																																						
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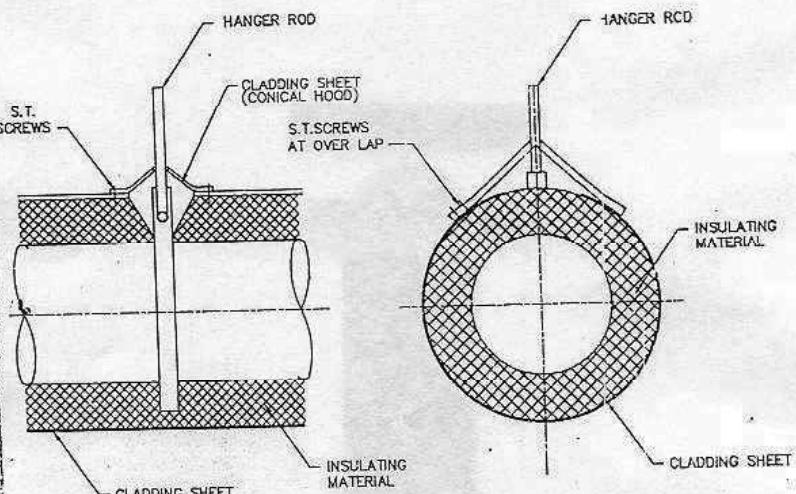
## FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)

REV. 01	DATE 10.5.88	ALTERED <i>Qabab</i>	REV. DATE	ALTERED
CHECKED <i>Wata</i>			CHECKED	

NOTE 2 ADDED.

JOB NO. STANDARD

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## MATERIALS REQUIRED:-

1. MATTRESSES/PIPE SECTIONS
2. CLADDING SHEET
3. SELF TAPPING SCREWS
4. SEALING COMPOUND

## NOTES:-

1. OR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS".
2. WHEREVER THE END OF CLAMP PROTRUDES OUT OF INSULATION AT THE BOTTOM, SUITABLE BOX STRUCTURE TO BE PROVIDED MADE OF ALUMINIUM.

EP 400 F-977	BHARAT HEAVY ELECTRICALS LIMITED POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI			
DEPT. MPL	CODE M	SCALE N.T.S.	WEIGHT (KG.)	REF. TC ASSY. DRG
TITLE - INSULATION APPLICATION (METAL FLASHING ON HANGER ROD PROTRUSION)				DRN S.C.S. SIGN DATE DESN S.C.S. <i>Qabab</i> 15-5-88 CHD D.B.S. <i>Wata</i> 6-6-88 APD S.K.J. <i>Wata</i> 11-6-88
		CARD CODE	DRAWING NO. PE-4-999-169-11	
		SHEET 1 OF 1		REV. 00

DIL

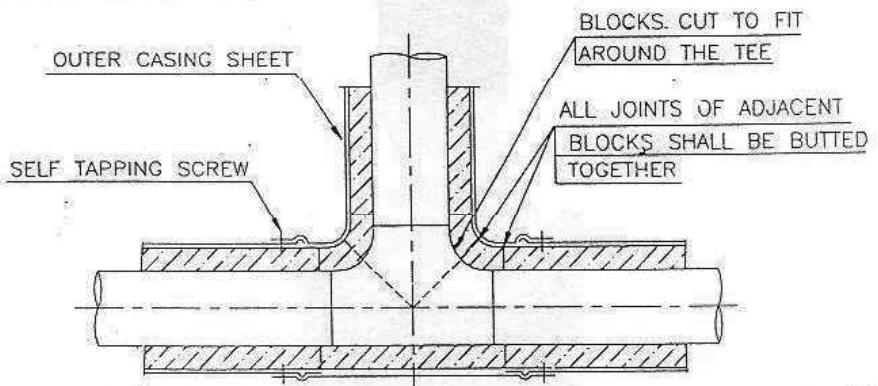
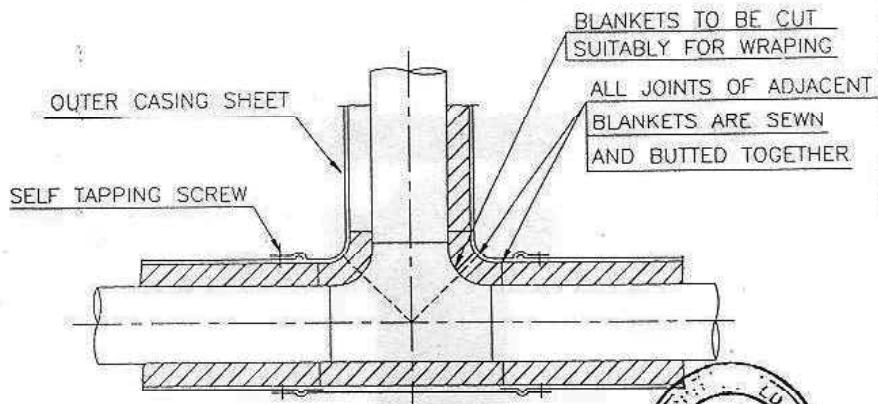
14

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)															
REV.	DATE	ALTERED	REV.	DATE	ALTERED	JOB NO. STANDARD									
		CHECKED			CHECKED										
<p style="text-align: center;"><b>** DETAIL 'R'</b> (LONGITUDINAL JOINT)</p> <p style="text-align: center;"><b>DETAIL 'P'</b></p> <p style="text-align: center;"><b>* DETAIL 'Q'</b> (CIRCUMFERENTIAL JOINT)</p>															
<p style="text-align: center;">*</p> <p>1. JOINTS TO BE MADE AT 45° FROM BOTTOM 2. JOINTS TO BE ON LOWER HALF OF THE CIRCUMFERENCE FOR HORIZONTAL PIPES AND EQUIPMENTS. 3. SEALING COMPOUND WILL BE USED ON ALL LONGITUDINAL JOINTS.</p> <p>1. TELESCOPIC SLIDING JOINTS SHALL HAVE 5 TO 8mm SPACING. 2. THE OVERLAPPING OF TELESCOPIC JOINTS SHALL BE AS BELOW:--</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">CIRCUMFERENCE OF SHEET (mm)</th> <th style="width: 50%;">LONGITUDINAL OVERLAPS (mm)</th> </tr> </thead> <tbody> <tr> <td>≤ 400</td> <td>30</td> </tr> <tr> <td>401 - 500</td> <td>40</td> </tr> <tr> <td>&gt; 500</td> <td>50</td> </tr> </tbody> </table> <p>3. TELESCOPIC JOINT SHALL BE PLAIN.</p>								CIRCUMFERENCE OF SHEET (mm)	LONGITUDINAL OVERLAPS (mm)	≤ 400	30	401 - 500	40	> 500	50
CIRCUMFERENCE OF SHEET (mm)	LONGITUDINAL OVERLAPS (mm)														
≤ 400	30														
401 - 500	40														
> 500	50														
<p>NOTE:--</p> <p>1. ALL JOINTS NEAR OIL PIPING TO HAVE SEALING COMPOUND. 2. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING AND EQUIPMENTS".</p>															
		<b>BHARAT HEAVY ELECTRICALS LIMITED</b> POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI													
DEPT. MPL	CODE M		SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG	ITEM									
TITLE:--		INSULATION APPLICATION (DETAILS OF "P", "Q" AND "R")			DRN	NAME	SIGN	DATE							
					DESN	S.C.S.		9.1.97							
					CHD	D.H.S.		16.9.97							
					APPD	S.K.J.		11.6.97							
		CARD CODE		DRAWING NO. PE-4-999-169-12											
		—		SHEET 1 OF 1		REV. 00									

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM)																	
REV.	DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED	JOB NO. STANDARD											
<p><b>DETAILS OF LUGS:</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>PIPE Nb(mm)</th> <th>No. of LUGS</th> </tr> </thead> <tbody> <tr> <td>1. 33 - 150</td> <td>4</td> </tr> <tr> <td>2. 200 - 300</td> <td>6</td> </tr> <tr> <td>3. 350 - 450</td> <td>8</td> </tr> <tr> <td>4. 500 - 600</td> <td>10</td> </tr> </tbody> </table>								PIPE Nb(mm)	No. of LUGS	1. 33 - 150	4	2. 200 - 300	6	3. 350 - 450	8	4. 500 - 600	10
PIPE Nb(mm)	No. of LUGS																
1. 33 - 150	4																
2. 200 - 300	6																
3. 350 - 450	8																
4. 500 - 600	10																
<p><b>NOTES: -</b></p> <ol style="list-style-type: none"> <li>1. FOR DETAILS 'Q' AND 'R' REFER DRG NO. PE-4-999-169-12</li> <li>2. FOR GENERAL INFORMATION ON APPLICATION OF INSULATION REFER DOCUMENT "INSTRUCTIONS FOR APPLICATION OF THERMAL INSULATION FOR PIPING &amp; EQUIPMENTS".</li> </ol>																	
		<p><b>BHARAT HEAVY ELECTRICALS LIMITED</b> POWER SECTOR PROJECTS ENGINEERING MANAGEMENT NEW DELHI</p>															
DEPT. MPL	CODE N	SCALE N.T.S.	WEIGHT (KG.)	REF. TO ASSY. DRG	ITEM —												
TITLE: - INSULATION APPLICATION (SUPPORT RING FOR PIPE O.D. > 168.3mm)				DRN DES CHD APPD	NAME S.C.S. S.C.S. D.B.S. S.K.J.	SIGN 10/10/96 10/10/96 10/10/96 10/10/96	DATE 9-6-96 9-6-96 9-6-96 9-6-96										
—				CARD CODE	DRAWING NO. PE-4-999-169-13												
—				—	SHEET 1 OF 1 REV. 00												



### TEE INSULATION



INSULATION	PREPARED	ARJOITHIGURUNATHAN	SIGNATURE	DATE	DRAWING NO.	REV.
	CHECKED	K.KALIRAJAN		04.12.03		
	APPROVED	C.GUNASEKARAN			4-00-235-08546	

## ELBOW INSULATION

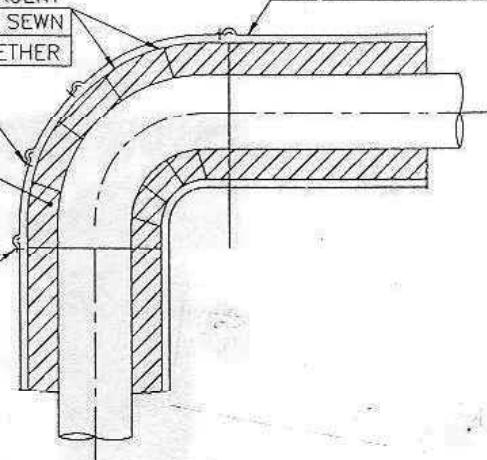
ALL JOINTS BETWEEN ADJACENT  
BLANKETS SHALL BE SEWN  
AND BUTTED TOGETHER

SELF TAPPING SCREW

BLANKETS CUT FOR  
WRAPPING AROUND  
THE ELBOW

ALL SHEETS AT  
JOINTS TO OVERLAP  
BY 40 MM

OUTER CASING SHEET



WITH WOOL MATTRESS

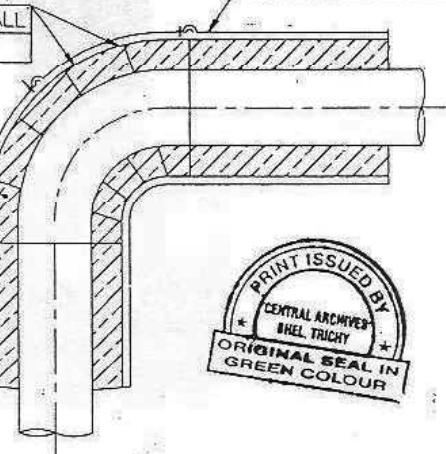
ALL JOINTS BETWEEN  
ADJACENT BLOCKS SHALL  
BE BUTTED TOGETHER

SELF TAPPING SCREW

BLOCKS CUT TO FIT  
AROUND THE ELBOW

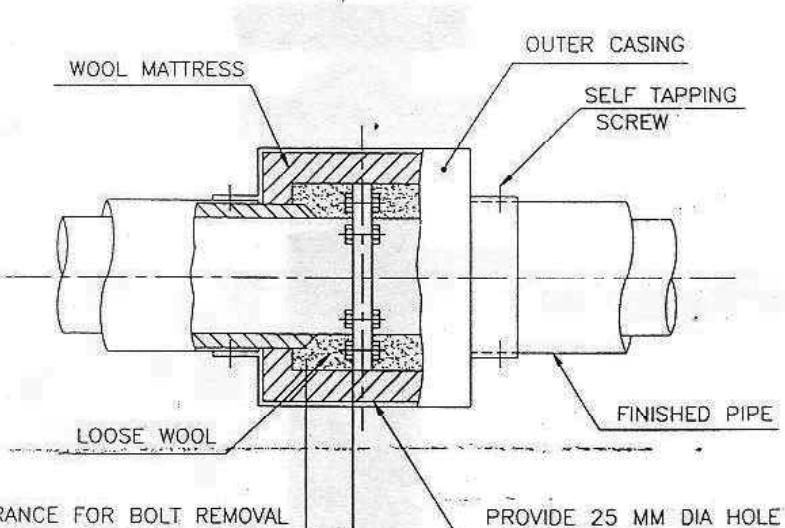
ALL SHEETS AT  
JOINTS TO OVERLAP  
BY 40 MM

OUTER CASING SHEET



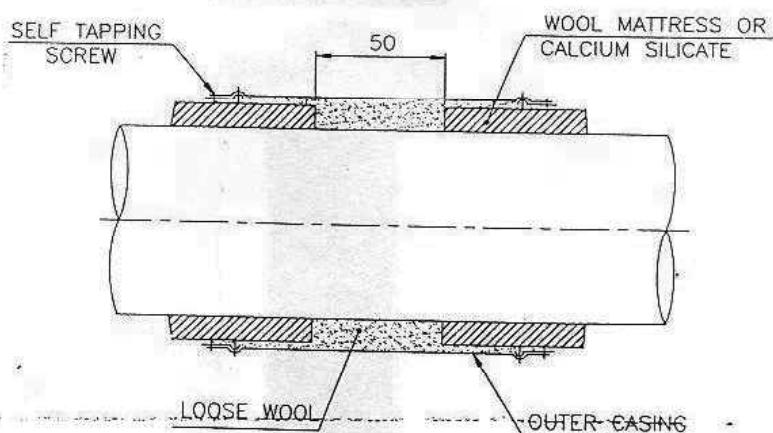
WITH CALCIUM SILICATE

INSULATION	PREPARED	AJITHKUMARAN	ISSUED	DATE	04.12.03	DRAWING NO :	REV
	CHECKED	K.KALURAJAN				4-00-235-08547	
	APPROVED	C.GUNASEKARAN					

		FLANGE INSULATION							
									
<p><b>NOTE:—</b></p> <p>1. WHEREVER THE FLANGES ARE ENVISAGED FOR DISMANTLING, THIS TYPICAL ARRANGEMENT IS TO BE FOLLOWED.</p>									
INSULATION		PREPARED	ARJOITHI GURUNATHAN	REVIEWED	DATE	04.12.03	DRAWING NO :	4-00-235-08548	REV
CHECKED		K.KALIRAJAN							
APPROVED		C.GUNASEKARAN							



## EXPANSION JOINT FOR PIPES

NOTE:—

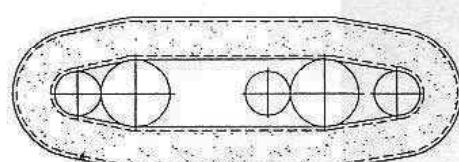
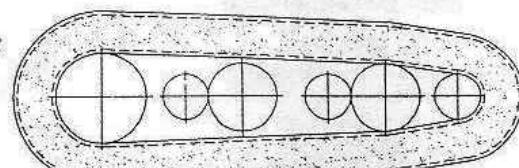
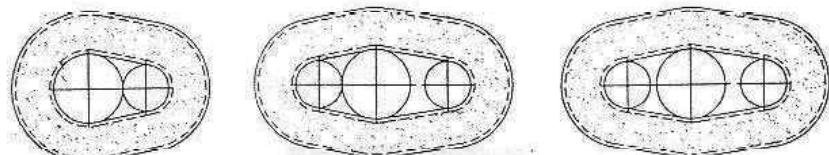
1. THIS ARRANGEMENT IS APPLICABLE FOR BOTH HORIZONTAL AND VERTICAL PIPE LINES, AT EVERY 5 METRES.
2. WHEN THE OPERATING TEMPERATURE IS BELOW 230°C, EXPANSION JOINTS ARE NOT REQUIRED.
3. FOR PIPES, WHERE THE FLOW IS ONLY INTERMITTANT, EXPANSION JOINTS ARE NOT REQUIRED.



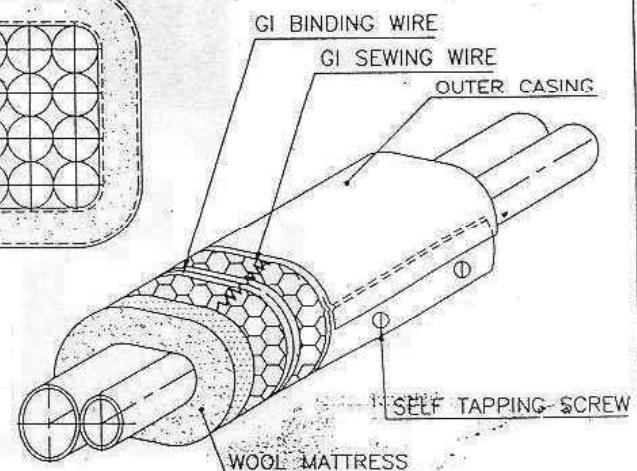
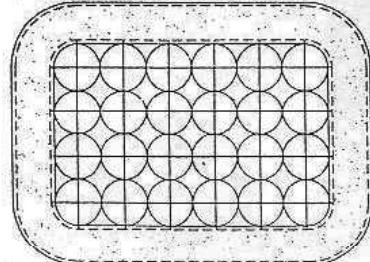
PREPARED	ARJOTHI GURUNATHAN	REVIEWED	DATE	04.12.03	DRAWING NO.:	REV
INSULATION					4-00-235-08549	
CHECKED	K.KALIRAJAN					
APPROVED	C.GUNASEKARAN					



## BUNCH INSULATION



FOR NOTES REFER DRG 4-00-235-08541



INSULATION	PREPARED	ARJOTHURUNIATHAN	SIGNATURE	DATE	DRAWING NO	REV
	CHECKED	K.KALIRAJAN				
	APPROVED	C.GUNASEKARAN			4-00-235-08550	

REV DATE ALTERED : A.R.J 01 01.10.05 CHD & APPD : C.G.S			FOR TOLERANCES OF UNTOLERANCED DIMENSIONS DURING MANUFACTURE REFER PLANT STD. NO TP 023 0299																														
DRAWING ALTERED																																	
<p><b>NOTE:</b></p> <p>01. THE INSULATION SHOWN IS FOR TYPICAL PANEL HEATER HOPPERS. THIS IS TO BE FOLLOWED WHERE EVER PANEL TYPE HEATERS ARE ENVSAGED.</p> <p>02. INSULATION FIXING PINS AND RETAINERS SHOULD NOT FULI WIH THE PANEL HEATERS.</p> <p>03. FOR OTHER INSULATION DETAILS, REFER DRG. 1-00-235-06654.</p>																																	
<table border="1"> <tr> <td colspan="2">  355-056         </td> <td colspan="2">           Bharat Heavy Electricals Ltd            UNIT: HIGH PRESSURE BOILER PLANT            TIRUCHIRAPALLI - 620014         </td> <td>NAME A.R.J</td> <td>DATE 20.09.05</td> </tr> <tr> <td colspan="2"></td> <td>CHD</td> <td>C.G.S</td> <td>22.09.05</td> </tr> <tr> <td colspan="2"></td> <td>APPD</td> <td>C.G.S</td> <td>22.09.05</td> </tr> <tr> <td>DEPT L&amp;I CODE 123</td> <td>ALL DIMENSIONS ARE IN MM</td> <td>PROJECTION ICON</td> <td>SCALE ICON</td> <td>WEIGHT (Kg)</td> <td>REF TO ASSY / OLD DWG</td> </tr> <tr> <td colspan="4">TITLE HOPPER INSULATION DETAIL FOR PANEL TYPE HEATERS</td> <td>DRAWING NO : 4-00-235-08702 01</td> <td>REV</td> </tr> </table>						 355-056		Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014		NAME A.R.J	DATE 20.09.05			CHD	C.G.S	22.09.05			APPD	C.G.S	22.09.05	DEPT L&I CODE 123	ALL DIMENSIONS ARE IN MM	PROJECTION ICON	SCALE ICON	WEIGHT (Kg)	REF TO ASSY / OLD DWG	TITLE HOPPER INSULATION DETAIL FOR PANEL TYPE HEATERS				DRAWING NO : 4-00-235-08702 01	REV
 355-056		Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPALLI - 620014		NAME A.R.J	DATE 20.09.05																												
		CHD	C.G.S	22.09.05																													
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DEPT L&I CODE 123	ALL DIMENSIONS ARE IN MM	PROJECTION ICON	SCALE ICON	WEIGHT (Kg)	REF TO ASSY / OLD DWG																												
TITLE HOPPER INSULATION DETAIL FOR PANEL TYPE HEATERS				DRAWING NO : 4-00-235-08702 01	REV																												