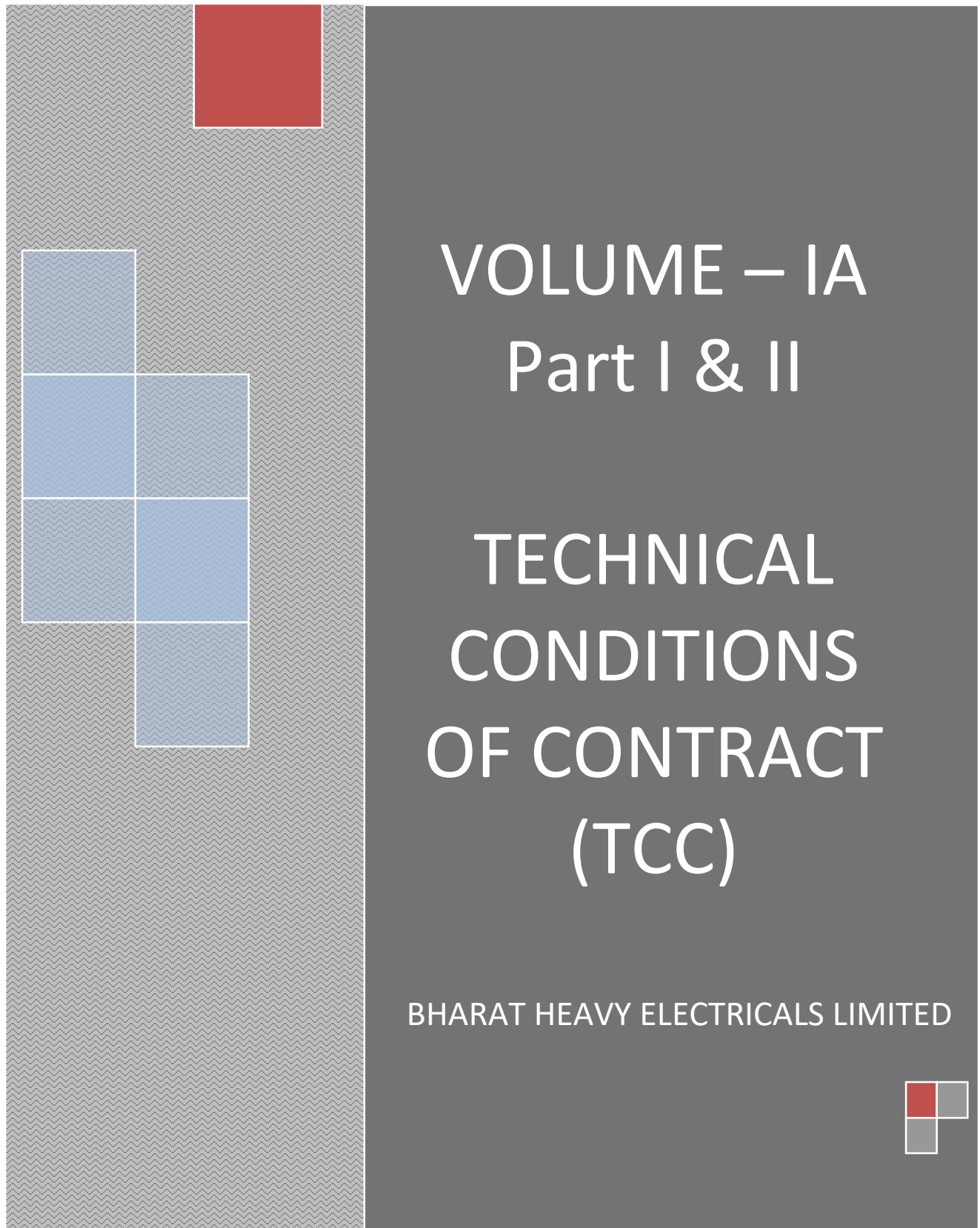




TECHNICAL CONDITIONS OF CONTRACT

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VOLUME - IA PART – I CHAPTER – I

1.1 PROJECT INFORMATION

INTRODUCTION

KOTHAGUDEM TPS UNIT 12 [1 x 800 MW] is being set up by TELANGANA STATE GENERATION CORPORATION at a site in Paloncha Village near Kothagudem district, Telangana, India. The Bidder shall acquaint himself by a visit to the site, if felt necessary, with the conditions prevailing at site before submission of the bid. The information given here in under is for general guidance and shall not be contractually binding on BHEL/Owner. All relevant site data /information as may be necessary shall have to be obtained /collected by the Bidder.

A. PROJECT INFORMATION

1	Project Title	:	KOTHAGUDEM THERMAL POWER STATION STAGE-VII, UNIT#12
2	Station Capacity	:	1X800 MW (Coal based)
3	Owner	:	Telangana State Power Generation Corporation Limited (TSGENCO)
4	Site location	:	The mentioned plant has been installed adjacent to the existing D colony of Kothagudem thermal power station at Kothagudem
5	Latitude	:	17° 37' N
6	Longitude	:	80° 42' E
7	Nearest Town	:	Kothagudem
8	Nearest Railway Station	:	Bhadrachalam road (Known as Kothagudem)
9	Nearest Airport	:	180 Kms (Vijayawada)
10	Site Condition		
	Ambient Temperature		
i.	Daily minimum (average)	:	12.9°C

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ii.	Daily maximum (average)	:	44.9°C
iii.	Design Ambient Temperature	:	50°C
iv.	Ambient temperature (performance)	:	38°C
v.	Ambient temperature (for efficiency guarantee)	:	28°C
vi.	Relative Humidity for design / efficiency	:	35-82%
vii.	Plant Elevation above MSL	:	89 m above MSL
viii.	Mean Wind Speed	:	5.8 km/h
ix.	Wind Pressure	:	As per the latest revision of IS 875/1987
x.	Seismic co-efficient	:	Zone-III as per IS- 1893 (Part-IV)

VOLUME-IA PART-I CHAPTER – II

1.2 SCOPE OF WORKS

- 1.2.0** Broadly, scope of works covers geo-technical investigation and topographical survey of area of FGD system. It is not intent herein to specify all details. Any item related to this work, not covered here under but necessary to complete the system will be deemed to have been included in the scope of work.
- 1.2.1 Geotechnical investigation:**
- 1.2.1.1** For detailed scope refer enclosed bill of quantity (rate schedule), standard specification for geo technical investigation & layout drawing.
- 1.2.2 Topographical survey:**
- 1.2.2.1** For detailed scope refer enclosed bill of quantity (Rate schedule), standard specification and layout.

Note:

The bidder should visit site and acquire full knowledge & information about site conditions and acquaint themselves with the conditions prevailing at site and in & around the plant premises, together with all statutory, obligatory, mandatory requirements of various authorities before submission of bid.

VOLUME IA PART – I CHAPTER – III

1.3 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	ESTABLISHMENT			
1.3.1.1	FOR CONSTRUCTION PURPOSE:			
A	Open space for office	Yes		As provided by TSGENCO
B	Open space for storage	Yes		As provided by TSGENCO
C	Construction of bidder's office, canteen and storage building, cement storage shed including supply of materials and other services		Yes	
D	Bidder's all office equipment's, office / store / canteen consumables		Yes	
E	Canteen facilities for the bidder's staff, supervisors and engineers etc.		Yes	
F	Firefighting equipment's like buckets, extinguishers etc.		Yes	
G	Fencing of storage area, office, canteen etc. of the bidder		Yes	
1.3.1.2	FOR LIVING PURPOSES OF THE BIDDER			
A	Open space	Yes		As provided by TSGENCO
B	Living accommodation		Yes	
1.3.2	ELECTRICITY			
1.3.2.1	Electricity For construction purposes		Yes	

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SI.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
	PART I			
1.3.2.1.1	Single point source		Yes	
1.3.2.1.2	Further distribution for the work to be done which include supply of materials and execution		Yes	
1.3.2.2	Electricity for the office, stores, canteen, labour hutments, etc of the bidder which include:		Yes	
1.3.2.2.1	Distribution from single point including supply of materials and service		Yes	
1.3.2.2.2	Supply, installation and connection of material of energy meter including operation and maintenance		Yes	
1.3.2.2.3	Duties and deposits including statutory clearances for the above		Yes	
1.3.2.2.4	Demobilization of the facilities after completion of works		Yes	
1.3.2.3	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	
1.3.3	WATER SUPPLY			
1.3.3.1	For construction purposes:		Yes	
1.3.3.1.1	Making the water available at single point		Yes	
1.3.3.1.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	

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SI.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
	PART I			
1.3.3.2	Water supply for bidder's office, stores, canteen, labour hutments, etc.		Yes	
1.3.3.2.1	Making the water available at single point		Yes	
1.3.3.2.2	Further distribution as per the requirement of work including supply of materials and execution		Yes	
1.3.4	LIGHTING			
1.3.4.1	For construction work (supply of all the necessary materials) At office storage area At the preassembly area At the construction site / area		Yes	
1.3.4.2	For construction work (Execution of the lighting work / arrangements) At office storage area At the preassembly area At the construction site /area At the labour hutment		Yes	
1.3.5	COMMUNICATION FACILITIES for site operations of the bidder	-		
1.3.5.1	Telephone, Fax, internet, intranet, email etc		Yes	

SI.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
	PART II			
	CONSTRUCTION FACILITIES			
1.3.6	Engineering works for construction			
1.3.6.1	Providing the construction drawings for all the equipment covered under this scope	Yes		

TECHNICAL CONDITIONS OF CONTRACT

Sl.No	Description	Scope to be taken care by		Remarks
		BHEL	Bidder	
	PART II			
1.3.6.2	Detailing of drawings for construction		Yes	In consultation with BHEL
1.3.6.3	As-built drawings – wherever deviations observed and executed and also based on the decisions taken at site- example – routing of small bore pipes	Yes	Yes	”
1.3.6.4	Shipping lists etc for reference and planning the activities	Yes	Yes	”
1.3.6.5	Preparation of site construction schedules and other input requirements		Yes	In consultation with BHEL, As per requirement of BHEL targets
1.3.6.6	Review of performance (Form-14) and revision of site construction schedules in order to achieve the end dates and other commitments		Yes	
1.3.6.7	Weekly construction schedules based on SI No 3.2.1.5		Yes	
1.3.6.8	Daily construction / work plan based on SI No 3. 2.1.7		Yes	For daily monitoring meeting at site
1.3.6.9	Periodic visit of the senior official of the bidder to site to review the progress so that works are completed as per schedule. It is suggested this review by the senior official of the bidder should be done once in every two months.		Yes	

1.3.7 OPEN SPACE:

- 1.3.7.1. Availability of land within plant boundary is very limited and the contractor has to plan and use the existing land considering the use of land by other Civil /mechanical/ electrical contractors and the storage of plant machineries and materials. The existing land shall be shared by all erections agencies. Land will be allocated free of cost as provided by TSGENCO, with certain time frame and to the extent available/ considered

TECHNICAL CONDITIONS OF CONTRACT

necessary, and will be reviewed by BHEL depending upon the area availability. The contractor will be responsible for handing back all lands, as handed over to him by BHEL.

Land for labour colony shall be provided by BHEL approximately 2 KM from site. The contractor to construct labour colony/ hutment as per his requirements after obtaining approval of formalities from statutory body. The contractor shall provide adequate water arrangement for drinking/washing/bathing with required toilets, drainage system, and electrification etc. in labour colony at his own cost. Suitable paved area to be provided in the labour colony at contractor's own cost.

1.3.8 **ELECTRICITY:**

- 1.3.8.1. The contractor shall make his own arrangement for all the electricity requirement for execution of his scope of work, including his labour hutment. Any duty, deposit involved in getting the electricity shall be borne by the bidder.

1.3.9 **WATER:**

- 1.3.9.1. Contractor has to make his own arrangements for all water requirement for executing the scope of works and for his labour accommodation at his own cost

1.3.10 **MATERIAL SUPPLY:**

- 1.3.10.1. All materials required for the work are in the scope of the contractor.

1.3.11 **CONSUMABLE:**

- 1.3.11.1. All consumables, like gas, electrodes, chemicals, lubricants etc. required for the scope of work, shall be arranged by the contractor at his cost unless otherwise specifically mentioned in the contract. In the event of failure of contractor to bring necessary and sufficient consumables, BHEL may arrange for the same at the risk and cost of the contractor. The entire cost towards this along-with overhead shall be paid by the contractor or deducted from the contractor's bills.

1.3.12 **LIGHTING FACILITY:**

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

1.3.13 **CONTRACTOR'S OBLIGATION ON COMPLETION:**

- 1.3.13.1. 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

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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

1.3.14 **BID DRAWINGS:**

1.3.14.1. Plot plan drawing enclosed for information and this may get revised during execution.

VOLUME-IA PART-I CHAPTER – IV

1.4 T&Ps TO BE DEPLOYED BY CONTRACTOR

- 1.4.1 All the T&Ps like total station, survey equipments, rotary rigs, SCPT equipment, lab equipment etc required for completion of the scope of works are to be arranged by the contractor within the quoted rate. Any other tools & plants required for this scope of work are to be arranged by the contractor within the quoted rate.
- 1.4.2 All the distribution boards, connecting cables, hoses, etc and temporary connection work including electrical connections shall have to be arranged by the contractor at his cost.
- 1.4.3 1 nos rig to be mobilized within 1 week from start of work at site. Additional rigs if required, shall be brought to site after discussion with engineer in-charge without any extra cost to BHEL..
- 1.4.4 Contractor shall finalize type and number of such T&Ps required for completion of entire scope of work within the stipulated time, within one week of placement of LOI after discussion with engineer in-charge. Accordingly, all the equipment shall be mobilized at site. If delay of work is on the account of the contractor, additional T&Ps shall be deployed to complete the work within the stipulated time. For such additional requirements, no extra cost for mobilization of rig is payable by BHEL

VOLUME-IA PART-I CHAPTER – V
1.5 T&Ps TO BE DEPLOYED BY BHEL ON SHARING BASIS

- 1.5.1 BHEL shall not provide any T&Ps
- 1.5.2 BHEL shall not provide any MMEs

VOLUME-IA PART-I CHAPTER – VI

1.6 TIME SCHEDULE

1.6.0 TIME SCHEDULE

1.6.1 The date of commencement of work at site shall be mutually agreed date between bidder and BHEL.

1.6.1.1.1 Entire work as detailed in the tender specification shall be completed within 03 (Three) months from the date of commencement of work at site.

1.6.1.1.2 During the total period of contract, the contractor has to carry out the activities / tests in a phased manner as required by BHEL and the program of milestone events

1.6.1.1.3 The work shall be deemed as completed in all respect only when so certified by the site engineer. The decision of BHEL in this regard shall be final and binding on the contractor..

1.6.1.1.4 Intermediate milestone is not applicable for this work.

1.6.1.2 The contractor is required to refer Form 15 in Volume 1- BOOK 2 for all the instructions to be taken immediately after receipt of LOI.

1.6.2 MOBILISATION:

1.6.2.1 The activities shall be started as per directions of construction manager of BHEL. The contractor has to augment his resources in such a manner that following activities are achieved on specified schedule:

Sl. NO.	STRUCTURE DESCRIPTION	Time of completion from date of commencement of work
1.	Commencement of work	As mutually agreed in site between contractor and BHEL site in charge
2.	“DRAFT REPORT” shall be submitted including all field data and laboratory reports to BHEL-PEM, New Delhi with copy to BHEL- PSSR, Chennai and site	45 days from the date of commencement of work
3.	On approval of draft report from BHEL/ PEM, the submission of “FINAL REPORT” to be duly vetted by reputed institution viz. IIT/ NIT/ similar reputed institute	70 days from the date of commencement of work

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4	Final Bill submission	90days from the date of commencement of work
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1.6.3 The above time allowed for completion of work including Sundays and holidays is from date of commencement of work. Detailed program to be prepared by the tenderer taking into consideration of the completion schedules.

1.6.4 In order to meet above schedule in general, and any other intermediate target set, to meet customer/ project schedule requirements, contractor shall arrange & augment all necessary resources from time to time on the instructions of BHEL site in charge.

1.6.5 **GUARANTEE PERIOD**

Guarantee period is not application for this tender

VOLUME-IA PART-I CHAPTER – VII

1.7 TERMS OF PAYMENT

1.7.0 Terms of Payment

1.7.1 Secured Advance

1.7.1.1 Not Applicable

1.7.2 Advance for Mobilization

1.7.2.1 Advance for mobilization is not applicable for this tender.

1.7.3 Terms of Payment

The progressive payment against monthly running bills for the completed items will be released on accepted rate/ price of contract value as mentioned below from clause no. 1.7.3.1 to 1. 7.3.3 on prorata basis (for the measured and accepted quantity).

Sl. no.	Activity/ work description	% of unit rate
1.7.3.1	On completion of field test and submission of data in line with respective item (for the measured and accepted quantity)	50%
1.7.3.2	On submission of DRAFT REPORT consisting of detailed bore log, sub-soil sections, field test results, laboratory observations and test results in both tabular as well as graphical forms, practical and theoretical considerations for the interpretation of test results, the supporting calculations for the conclusions/ recommendation drawn, etc, duly accepted and approved by BHEL/ PEM and against contractors invoice (for the measured and accepted quantity)	30%
1.7.3.3	On submission of FINAL REPORT to BHEL/ PEM after duly vetted by reputed institution viz. IIT/ NIT/ similar reputed institute and acceptance, duly accepted and approved by BHEL/ PEM etc. thereof by BHEL against contractors invoice (for the measured and accepted quantity)	20%

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Note:

1. Detailed definition of the terms “DRAFT REPORT” & “FINAL REPORT”, preparation and submission of reports shall be in line with the technical specification attached.
2. Please Refer Chapter-1 in Part-II of Technical Conditions of Contract (Volume-IA Book-I) for Retention amount, performance security deposit, etc.

1.7.4 METHOD OF MEASUREMENT

Mode of measurement shall be as per relevant IS 1200 in conjunction of IS code 3385. In case the same is also not available, the standard procedure adopted in CPWD shall be adopted. In case, the same is also not available in CPWD, the measurement of the work done will be based on the mutual agreement between BHEL and contractor. In all the above cases, the interpretation of BHEL will be final and binding to the contractor. Measurement guidelines as a ready reference is also available in the technical specification.

- 1.7.5 NO CLAIM WHAT SO EVER MAY BE, WILL BE ENTERTAINED UNDER THIS CONTRACT, AFTER DULY SIGNING THE FINAL BILL ALONG WITH MEASUREMENT BOOKS AND ACCEPTED BY BHEL.**

VOLUME-IA PART-I CHAPTER - VIII

1.8 PROGRESS OF WORK

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

1.8.0 PROGRESS AND MONITORING OF WORK

- 1.8.1** Refer forms F -14 to F-18 of volume I D of volume -I book-II. Plan and review will be done as per the formats.
- 1.8.2** Contractor is required to draw mutually agreed monthly construction programs in consultation with BHEL well in advance monthly. Contractor shall ensure achievement of agreed program and shall also timely arrange additional resources considered necessary at no extra cost to BHEL. 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.
- 1.8.3** The contractor shall submit daily, weekly and monthly progress reports, manpower reports, materials reports, consumables (gases / electrodes / ferules / lugs) report, T&Ps availability report and other reports as per Performa considered necessary by the Site Engineer as per the BHEL formats.
- 1.8.4** The contractor shall submit weekly / fortnightly / monthly statement report regarding consumption of all consumables for cost analysis purposes.
- 1.8.5** The monthly report as a booklet shall be submitted at the end of every month and shall contain the following details: -
- a) Colour Progress photographs to accompany the report should be submitted.
 - b) Construction progress in terms of as finalized between contractor and BHEL site in charge.
 - c) Site Organization chart of engineers & supervisors as on 24th of the month with further mobilization plan
 - d) Category- wise man hours engaged during the previous month.

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- e) Consumables report giving consumption of all types of gases and electrodes during the previous month.
- f) Availability report of T&Ps
- g) Safety implementation report in the format
- h) Pending material and any other inputs required from BHEL for activities planned during the subsequent month.

- 1.8.6** The manpower reports shall clearly indicate the manpower deployed, category wise specifying also the activities in which they are engaged
- 1.8.7** It is the responsibility of the contractor to provide all relevant information on a regular basis regarding construction progress, labour availability, equipment deployment, testing, etc
- 1.8.8** 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
- 1.8.9** The contractor to reflect actual progress achieved during the month and will be submitted to BHEL, so that slippages can be observed and necessary action taken in order to ensure that the situation does not get out of control will update the construction schedule forming part of this contract each month.

VOLUME-IA PART-I CHAPTER - IX

1.9 BILL OF QUANTITY

1.9.0 BILL OF QUANTITY

As mentioned in the Volume II, Price Bid.

VOLUME-IA PART-I CHAPTER -X

1.10 GENERAL

1.10.0 In addition to the clause 2.8 of General Conditions of Contract (Volume-IC of Book-II) the contractor shall comply with the following.

- 1.10.1** Successful Bidder is 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.
 - (iv) Option (whether a or b of said clause) exercised towards Performance Security Deposit for the subject contract as per Sl. No. 16 of Volume IA Part II Chapter 1 of TCC.
- 1.10.2** Successful 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** BOCW Act & BOCW Welfare Cess Act
- 1.10.3.1** 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.
- 1.10.3.2** The Contractor Should comply with the provisions of BOCW Welfare Cess Act 1996 in respect of the work awarded to them by BHEL
- 1.10.3.3** 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,

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safety committee, issue of Personal protective equipments, canteen, rest room, drinking water, Toilets, ambulance, first aid centre etc.,

- 1.10.3.4 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.
- 1.10.3.5 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.
- 1.10.3.6 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.

1.10.4 PROVIDENT FUND

- 1.10.4.1 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.
- 1.10.4.2 The final bill amount would be released only on production of clearance certificate from PF / ESI and labour authorities as applicable.

1.10.5 OTHER STATUTORY REQUIREMENTS

- 1.10.5.1 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.

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- 1.10.5.2 The contractor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r 78(1)(a)(1) of Contract Labour Rules, copies of monthly return of PF contribution with remittance Challans under Employees Provident Fund Act 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.
- 1.10.5.3 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.
- 1.10.5.4 The Contractor shall submit copies of Final Settlement statement of disbursement of retrenchment benefits on retrenchment of each workman under ID 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 Act 1948 (If applicable) to BHEL along with the Final Bill.
- 1.10.5.5 In case of any dispute pending before the appropriate authority under ID Act 1948, WC Act 1923 or ESI Act 1948 and PF Act 1952, BHEL reserves 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.
- 1.10.5.6 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.

1.10.6 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

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scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer-in-Charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer-in-Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.

1.10.7 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.

- a) Victim: Any person who suffers permanent disablement or dies in an accident as defined below.
- b) 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.
- c) 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)
- d) 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.

1.10.8 GENERAL

1.10.8.1 Site Visit by the Bidder

The Bidder shall Prior to submitting his tender for the work, the bidder shall visit, examine and acquire full knowledge & information of necessary conditions prevailing

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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.

1.10.8.2 The bidder shall satisfy themselves about the following factors:

- 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.

1.10.8.3 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.

1.10.8.4 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.

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- 1.10.8.5 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 for the exercise of such permission, would not have arisen.
- 1.10.8.6 Scope of 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.
- 1.10.8.7 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
- 1.10.8.8 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.
- 1.10.8.9 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.
- 1.10.8.10 The contractor shall carryout additional tests, if any, which the Engineer feels necessary because of site conditions and also to meet system specification
- 1.10.8.11 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.
- 1.10.8.12 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.
- 1.10.8.13 Wherever Work sequences are furnished by BHEL, the contractor shall follow the same sequence.

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- 1.10.8.14 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.
- 1.10.8.15 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.
- 1.10.8.16 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.
- 1.10.8.17 The contractor will be responsible for the safe custody and proper accounting of all materials in connection with the work.
- 1.10.8.18 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.
- 1.10.8.19 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.
- 1.10.8.20 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.
- 1.10.8.21 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.
- 1.10.8.22 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.

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- 1.10.8.23 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.
- 1.10.8.24 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.
- 1.10.8.25 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.
- 1.10.8.26 No member of the already erected structure / buildings, other component and auxiliaries should be removed / modified without specific approval of BHEL engineer.
- 1.10.8.27 Contractors shall ensure that all their Staff / Employees are exposed to periodical training programme conducted by qualified agencies/ personnel on latest ISO 9001 Standards.
- 1.10.8.28 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.
- 1.10.8.29 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.
- 1.10.8.30 Crane operators deployed by the contractor shall be tested by BHEL before he is allowed to operate the cranes.
- 1.10.8.31 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.

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- 1.10.8.32 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.
- 1.10.8.33 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.
- 1.10.8.34 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 SITE INSPECTION

- 1.10.9.1 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.
- 1.10.9.2 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
- 1.10.9.3 Wherever the performance of work by the contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment, delay in execution of work or any other matter, BHEL shall have the right to engage labour at normal ruling rates and get the work executed through other agency and debit the cost to the contractor and the contractor shall have no right to claim compensation thereof. In such a case, BHEL shall have the right to utilize the materials and tools brought by the contractors for the same work

1.10.10 DOCUMENTATION

- 1.10.10.1 The following information shall be furnished by the bidder within two weeks

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of award of contract for purchaser's approval:

- a) Bar chart covering planned activities at site
- b) Detailed organization chart
- c) Details of T&P available with contractors with documents proofs.

1.10.10.2 The following information shall be furnished by the bidder after testing and inspection: Test certificates of various tests conducted at site. All inspection and test certificates shall be signed by BHEL representative also.

1.10.11 RECORDS TO BE MAINTAINED AT SITE:

1.10.11.1 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.

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

- A. Site Order Book.
- B. Test Check of measurements.
- C. Cement Supply and Consumption Daily Register
- D. Records of Test reports of Field tests.
- E. Records of manufacture's test certificates.
- F. Records of disposal of scraps generated during and after the work completion.

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VOLUME-IA PART – I CHAPTER – XI

1.11 TAXES AND OTHER DUTIES

1.11.1 Goods and service Tax (GST) & Cess

- 1.11.1.1 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.
- 1.11.1.2 Contractor's price/rates 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.
- 1.11.1.3 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 - KOTHAGUDEM THERMAL POWER STATION STAGE-VII,
UNIT#12, PALONCHA KOTHAGUDEM, TELANGANA.
- 1.11.1.4 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.
- 1.11.1.5 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.
- 1.11.1.6 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.

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- 1.11.1.7 Tax invoice/debit Note/revised tax invoice shall contain all such particulars as prescribed in GST law and comply to the timelines for issue of the same. Invoices shall be submitted on time to the concerned BHEL Engineer In Charge.
- 1.11.1.8 TDS under GST (if/ as & when applicable) shall be deducted at prevailing rates on gross invoice value from the running bills.
- 1.11.1.9 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
- 1.11.1.10 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.
- 1.11.2 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.
- 1.11.3 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.
- 1.11.4 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.
- 1.11.5 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

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personnel. Deduction of tax at source at the prevailing rates shall be effected by BHEL before release of payment as a statutory obligation, unless exemption certificate is produced by the bidder. TDS certificate will be issued by BHEL as per the provisions of Income Tax Act.

VOLUME-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 EARNEST MONEY DEPOSIT (EMD) clause 1.9 published in General Conditions of
Contract (Volume I Book-II) is revised as under.**

1.9 EARNEST MONEY DEPOSIT

1.9.1 Every tenderer must furnish the prescribed amount of Earnest Money Deposit (EMD) to BHEL PSSR, only in the following forms: -

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- i. Electronic Fund Transfer credited in BHEL account (before tender opening).
- ii. Earnest Money Deposit (EMD) shall also be paid directly to BHEL- PSSR Through Online EMD payment portal of BHEL with SBI (before tender opening) by following steps as below:-
 1. Visit www.onlinesbi.com -> Go to State Bank Collect (In the tab section)
 2. Click Check box to proceed for payment -> Click on Proceed
 3. Under State of Corporate/Institution -> Select Tamilnadu
 4. Under Type of Corporate/Institution -> Select PSU – Public Sector Undertaking -> Go
 5. Under PSU – Public Sector Undertaking Name -> Select BHEL PSSR CHENNAI and Submit
 6. Under Select Payment Category -> SCT Tender EMD & Tender Fees
- iii. Banker's cheque or Pay order or Demand Draft in favour of 'Bharat Heavy Electricals Limited' (along with offer) and payable at Chennai.
- iv. Fixed Deposit Receipt (FDR) issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act (FDR should be in the name of the Contractor, a/c BHEL) along with the offer.
- v. In case EMD amount is more than Rs. Two Lakhs, Tenderer has the option to submit Rs. Two lakhs in the forms described above in clause no. 1.9.1. (i) to (iv) and the remaining amount over and above Rs. Two Lakhs in the form of Bank Guarantee from Scheduled Bank (along with the Offer).

Note:

- a) Proforma of Bank Guarantee (in lieu of Earnest Money)- Form WAM 23 is enclosed with this Tender.
- b) The Bank Guarantee shall be valid for at least six months from the due date of tender submission mentioned in the Notice Inviting Tender.
- c) Date of Expiry of Claim shall be as given in Proforma of Bank Guarantee (in lieu of Earnest Money)-Form WAM 23.

Bank Details for the purpose of Taking EMD BG

Name and Address of Beneficiary:	Bharat Heavy Electricals Ltd. Power Sector Southern Region, Tek Towers, No.11, Old Mahabalipuram Road, Okkiyam Thoraiakkam, Chennai - 600097.
Name of Bank of Client :	State Bank Of India
Bank Branch Address:	SBI Saidapet Branch, EVR Periyar Building, Nandanam, Anna Salai, Chennai – 600035

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IFSC Code :	SBIN0000912
Account No. :	10610819499

Details for SFMS (Structured Financial Messaging System) transmission of BG

Bank and Branch	SBI TFCPC Branch
Branch Code	5056
IFSC Code	SBIN0005056

- 1.9.2 EMD shall not carry any interest.
- 1.9.3 EMD by the Tenderer will be forfeited as per NIT Conditions, if:
- i. After opening the tender and within the offer validity period, the Tenderer revokes his tender or makes any modification in his tender which is not acceptable to BHEL.
 - ii. The Contractor fails to deposit the required Security deposit or commence the work within the period as per LOI/Contract
- 1.9.4 EMD given by all unsuccessful tenderers will be refunded normally within 15 days of award of work.
- 1.9.5 EMD of successful tenderer will be retained as part of Security Deposit.
- 1.9.6 EMD by the tenderer shall be withheld in case any action on the tenderer is envisaged under the provisions of extant" Guidelines on Suspension of Business dealings with suppliers/contactors" and forfeited / released based on the action determined under these guidelines.

SI No: 5

SECURITY DEPOSIT: The SECURITY DEPOSIT (SD) clause 1.10 published in General Conditions of Contract (Volume I Book-II) is revised as under.

1.10 Security Deposit:

- 1.10.1 Upon acceptance of Tender, the successful Tenderer should deposit the required amount of Security Deposit for satisfactory completion of work, as given below:
- 1.10.2 The total amount of Security Deposit will be 5% of the contract value. EMD of the successful tenderer shall be converted and adjusted towards the required amount of Security Deposit.
- 1.10.3 The security Deposit should be furnished before start of the work by the contractor.

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1.10.4 Modes of deposit:

- 1.10.4.1 The balance amount to make up the required Security Deposit of 5% of the contract value may be furnished in any one of the following forms
- Cash (as permissible under the extant Income Tax Act)
 - Local cheques of Scheduled Banks (subject to realization)/ Pay Order/ Demand Draft/ Electronic Fund Transfer in favour of BHEL
 - Bank Guarantee from Scheduled Banks / Public Financial Institutions as defined in the Companies Act. The Bank Guarantee format for Security Deposit shall be in the prescribed formats.
 - Fixed Deposit Receipt issued by Scheduled Banks/ Public Financial Institutions as defined in the Companies Act. The FDR should be in the name of the contractor, A/C BHEL, duly discharged on the back.
 - Securities available from Indian Post offices such as National Savings Certificates, Kisan Vikas Patras etc. (Certificates should be held in the name of Contractor furnishing the security and duly endorsed/ hypothecated/ pledged, as applicable, in favour of BHEL and discharged on the back)

(Note: BHEL will not be liable or responsible in any manner for the collection of interest or renewal of the documents or in any other matter connected therewith)

- 1.10.5 At least 50% of the Security Deposit including the EMD should be deposited in any form as prescribed before start of the work and the balance 50% of the Security Deposit will be recovered by deducting 10% of the gross amount progressively from each running bills of the contractor till the total amount of the required Security Deposit is collected.
- 1.10.6 The recoveries made from running bills (cash deduction towards balance SD amount) will be released against submission of equivalent Bank Guarantee in the prescribed formats, but only once, before completion of work.
- 1.10.7 The Security Deposit shall not carry any interest.
- 1.10.8 If the value of work done at any time exceeds the contract value, the amount of Security Deposit shall be correspondingly enhanced and the excess Security Deposit due the enhancement shall be immediately deposited by the Contractor or recovered from payment/s due to the Contractor.
- 1.10.9 The validity of Bank Guarantees towards Security Deposit shall be initially upto the completion period as stipulated in the Letter of Intent/Award + 3 months, and the same

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shall be kept valid by proper renewal till the acceptance of Final Bills of the Contractor, by BHEL.

Date of Expiry of Claim shall be as given in the prescribed formats for Bank Guarantee towards Security Deposit.

- 1.10.10 BHEL reserves the right of forfeiture of Security Deposit in addition to other claims and penalties in the event of the Contractor's failure to fulfill any of the contractual obligations or in the event of termination of contract as per terms and conditions of contract. BHEL reserves the right to set off the Security Deposit against any claims of other contracts with BHEL.

1.10.11 Penalty for Delayed Remittance of Security Deposit

If the contractor fails to furnish SD before start of work, in line with 1.10.3 above, Simple Interest against delayed remittance of the Security Deposit shall be deducted from the sub-contractor at the rate of SBI PLR + 2% on the value of 50% SD of the contract, for the delayed period (i.e., period between start of work and date of remittance of Initial SD, i.e., atleast 50% of SD). In case, the delayed period has different SBI PLR rates, Simple Interest shall be calculated based on different rates by considering the corresponding time period. On similar lines Penalty shall be levied for delayed remittance of Additional Security Deposit (if applicable).

Note: - Bank details & SFMS details provided above in Sl. No. 04 Earnest Money Deposit) may be used for the purpose of arranging Bank Guarantees towards Security Deposit / Additional Security Deposit also.

SI No: 6

Clause 2.7.1, 2.7.2 and 2.7.3 in GCC regarding Rights of BHEL is revised as under:

- 2.7.1 To withdraw any portion of work and / or to restrict / alter quantum of work as indicated in the contract during the progress of work and get it done through other agencies to suit BHEL's commitment to its customer or in case BHEL decides to advance the date of completion due to other emergent reasons / BHEL's obligation to its customer.

In case of inadequate manpower deployed by the contractor, BHEL reserves the right to deploy additional manpower through any other agency for expediting activities in the interest of the project. Supplied manpower shall be put on job by the contractor and payments and other statutory compliances related to manpower

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shall be the contractor's responsibility. In case of contractor's failure to fulfill his obligations in respect of such manpower, BHEL reserves the right to take necessary action as per contract conditions.

2.7.2.

2.7.2.1 To terminate the contract or withdraw portion of work and get it done through other agency, at the risk and cost of the contractor after due notice of a period of 14 days' by BHEL in any of the following cases:

1. Contractor's poor progress of the work vis-à-vis execution timeline as stipulated in the Contract, backlog attributable to contractor including unexecuted portion of work does not appear to be executable within balance available period considering its performance of execution.
2. Withdrawal from or abandonment of the work by contractor before completion of the work as per contract.
3. Non-completion of work by the Contractor within scheduled completion period as per Contract or as extended from time to time, for the reasons attributable to the contractor.
4. Termination of Contract on account of any other reason (s) attributable to Contractor.
5. Assignment, transfer, subletting of Contract without BHEL's written permission.
6. Non-compliance to any contractual condition or any other default attributable to Contractor.

Risk & Cost Amount against Balance Work:

Risk & Cost amount against balance work shall be calculated as follows:

$$\text{Risk \& Cost Amount} = [(A-B) + (A \times H/100)]$$

Where,

A= Value of Balance scope of Work (*) as per rates of new contract

B= Value of Balance scope of Work (*) as per rates of old contract being paid to the contractor at the time of termination of contract i.e. inclusive of PVC & ORC, if any.

H = Overhead Factor to be taken as 5

In case (A-B) is less than 0 (zero), value of (A-B) shall be taken as 0 (zero).

* Balance scope of work (in case of termination of contract):

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Difference of Contract Quantities and Executed Quantities as on the date of issue of Letter for

‘Termination of Contract’, shall be taken as balance scope of Work for calculating risk & cost amount. Contract quantities are the quantities as per original contract.

If, Contract has been amended,

quantities as per amended Contract shall be considered as Contract Quantities.

Items for which total quantities to be executed have exceeded the Contract Quantities based on drawings issued to contractor from time to time till issue of Termination letter, then for these items

total Quantities as per issued drawings would be deemed to be contract quantities.

Substitute/ extra items whose rates have already been approved would form part of contract quantities for this purpose. Substitute/ extra items which have been executed but rates have not been approved, would also form part of contract quantities for this purpose and rates of such items shall be determined in line with contractual provisions.

However, increase in quantities on account of additional scope in new tender shall not be considered for this purpose.

NOTE: Incase portion of work is being withdrawn at risk & cost of contractor instead of termination of contract, contract quantities pertaining to portion of work withdrawn shall be considered as ‘Balance scope of work’ for calculating Risk & Cost amount.

LD against delay in executed work in case of Termination of Contract:

LD against delay in executed work shall be calculated in line with LD clause no. 2.7.9 of GCC, for the delay attributable to contractor. For limiting the maximum value of LD, contract value shall be taken as Executed Value of work till termination of contract.

Method for calculation of “LD against delay in executed work in case of termination of contract” is given below.

- i). Let the time period from scheduled date of start of work till termination of contract excluding the period of Hold (if any) not attributable to contractor = T1
- ii). Let the value of executed work till the time of termination of contract= X
- iii). Let the Total Executable Value of work for which inputs/fronts were made available to contractor and were planned for execution till termination of contract = Y

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- iv). Delay in executed work attributable to contractor i.e. $T2 = [1 - (X/Y)] \times T1$
- v). LD shall be calculated in line with LD clause (clause 2.7.9) of the Contract for the delay attributable to contractor taking "X" as Contract Value and "T2" as period of delay attributable to contractor.

2.7.2.2 In case Contractor fails to deploy the resources as per requirement, BHEL can deploy own/hired/otherwise arranged resources at the risk and cost of the contractor and recover the expenses incurred from the dues payable to contractor. Recoveries shall be actual expenses incurred plus 5% overheads or as defined in TCC.

2.7.3 **Recoveries arising out of Risk & Cost and LD or any other recoveries due from Contractor**

Following sequence shall be applicable for recoveries from contractor:

- a) Dues available in the form of Bills payable to contractor, SD, BGs against the same contract.
- b) Demand notice for deposit of balance recovery amount shall be sent to contractor, if funds are insufficient to effect complete recovery against dues indicated in (a) above.
- c) If contractor fails to deposit the balance amount to be recovered within the period as prescribed in demand notice, following action shall be taken for balance recovery:
 - i) Dues payable to contractor against other contracts in the same Region shall be considered for recovery.
 - ii) If recovery cannot be made out of dues payable to the contractor as above, balance amount to be recovered, shall be informed to other Regions/Units for making recovery from the Unpaid Bills/Running Bills/SD/BGs/Final Bills of contractor.
 - iii) In-case recoveries are not possible with any of the above available options, Legal action shall be initiated for recovery against contractor.

SL No: 7

Void

SL No: 8:

The OVERRUN COMPENSATION (ORC) clause 2.12 published in General Conditions of Contract (Volume I Book II) is revised as under.

TECHNICAL CONDITIONS OF CONTRACT (TCC)

2.12 OVERRUN COMPENSATION (ORC)

Void. (Explanation: Over Run Compensation is not applicable for this tender.)

SI No: 9

Clauses 2.13.1, 2.13.6 & 2.13.7 in GCC on Interest Bearing Recoverable Advances.

Clauses 2.13.1, 2.13.6 & 2.13.7 in GCC is revised as under:

- Clause 2.13.1 in GCC is revised as “Normally no advance payment shall be payable to the contractor. Mobilization advance payment in exceptional circumstances shall be interest bearing and secured through a Bank Guarantee and shall be limited to a maximum of 5% of contract value. This ‘Interest Bearing Recoverable Advance’ shall be payable in not less than two installments with any of the installment not exceeding 60% of the total eligible advance”.
- Clause 2.13.6 in GCC is revised as “The rate of interest applicable for the above advances shall be the Base rate of State Bank of India prevailing at the time of disbursement of the advance + 6%, and such rate will remain fixed till the total advance amount is recovered”.
- Clause 2.13.7 in GCC is revised as “Unadjusted amount of advances paid shall not exceed 5% of the total contract value at any point of time. Recovery of advances shall be made progressively from each Running Bill such that the advance amounts paid along with the interest is fully recovered by the time the contractor’s billing reaches 90% of contract value.”

SI. No: 10:

Clause 2.14.1 on Quantity Variation in General Conditions of Contract (GCC), Volume-IC, Book- II is revised as under:

- 2.14.1 “The quantities given in the contract are tentative and may change to any extent (both in plus side and minus side). The derived item rates (as mentioned above) for individual items shall remain firm irrespective of any variations in the individual quantities. No compensation becomes payable in case the variation of the final executed contract value is within the limit of Minus (-) 25% of awarded contract value.”

SI No: 11 :

The PRICE VARIATION COMPENSATION (PVC) clause 2.17 published in General Conditions of Contract (Volume IC Book-II) is revised as under.

2.17 PRICE VARIATION COMPENSATION

Void. (Explanation: Price Variation Compensation is not applicable for this tender.)

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SI No: 12: Clauses 2.21 in GCC regarding Arbitration is amended as below

2.21 ARBITRATION & CONCILIATION

2.21.1 ARBITRATION:

2.21.1.1 Except as provided elsewhere in this Contract, in case Parties are unable to reach amicable settlement (whether by Conciliation to be conducted as provided in Clause 2.21.2 herein below or otherwise) in respect of any dispute or difference; arising out of the formation, breach, termination, validity or execution of the Contract; or, the respective rights and liabilities of the Parties; or, in relation to interpretation of any provision of the Contract; or, in any manner touching upon the Contract (hereinafter referred to as the 'Dispute'), then, either Party may, commence arbitration in respect of such Dispute by issuance of a notice in terms of section 21 of the Arbitration & Conciliation Act, 1996 (hereinafter referred to as the 'Notice'). The Notice shall contain the particulars of all claims to be referred to arbitration in sufficient detail and shall also indicate the monetary amount of such claim. The arbitration shall be conducted by a sole arbitrator to be appointed by the Head of the BHEL Power Sector Region issuing the Contract within 60 days of receipt of the complete Notice. The language of arbitration shall be English.

The Arbitrator shall pass a reasoned award.

Subject as aforesaid, the provisions of Arbitration and Conciliation Act 1996 (India) or statutory modifications or re-enactments thereof and the rules made thereunder as in force from time to time shall apply to the arbitration proceedings under this clause. The seat of arbitration shall be **Chennai** (the place from where the contract is Issued). The Contract shall be governed by and be construed as per provisions of the laws of India. Subject to this provision 2.21.1.1 regarding ARBITRATION, the principal civil court exercising ordinary civil jurisdiction over the area where the seat of arbitration is located shall have exclusive jurisdiction over any DISPUTE to the exclusion of any other court.

2.21.1.2 In case of Contract with Public Sector Enterprise (PSE) or a Government Department, the following shall be applicable:

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises

TECHNICAL CONDITIONS OF CONTRACT (TCC)

(CPSEs)/ Port Trusts inter se and also between CPSEs and Government Departments/Organizations (excluding disputes concerning Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through AMRCD (Administrative Mechanism for Resolution of CPSEs Disputes) as mentioned in DPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018 as amended from time to time.

2.21.1.3 The cost of arbitration shall initially be borne equally by the Parties subject to the final allocation thereof as per the award/order passed by the Arbitrator.

2.21.1.4 Notwithstanding the existence of any dispute or differences and/or reference for the arbitration, the Contractor shall proceed with and continue without hindrance the performance of its obligations under this Contract with due diligence and expedition in a professional manner unless the dispute inter-alia relates to cancellation, termination or short-closure of the Contract by BHEL.

2.21.2 **CONCILIATION:**

If at any time (whether before, during or after the arbitral or judicial proceedings), any Disputes (which term shall mean and include any dispute, difference, question or disagreement arising in connection with construction, meaning, operation, effect, interpretation or breach of the agreement, contract), which the Parties are unable to settle mutually, arise inter-se the Parties, the same may, be referred by either party to Conciliation to be conducted through Independent Experts Committee (IEC) to be appointed by competent authority of BHEL from the BHEL Panel of Conciliators.

Notes:

1. No serving or a retired employee of BHEL/Administrative Ministry of BHEL shall be included in the BHEL Panel of Conciliators.
2. Any other person(s) can be appointed as Conciliator(s) who is/are mutually agreeable to both the parties from outside the BHEL Panel of Conciliators.

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 in Procedure 2.3 enclosed in Vol 1A Part II. The Procedure 2.3 together with its Formats will be treated as if the same is part and parcel hereof and shall be as effectual as if set out herein in this GCC.

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The Contractor hereby agrees that BHEL may make any amendments or modifications to the provisions stipulated in the Procedure 2.3 enclosed in Vol IA Part II of TCC from time to time and confirms that it shall be bound by such amended or modified provisions of the Procedure 2.3 with effect from the date as intimated by BHEL to it.

2.21.3 No Interest payable to Contractor

Notwithstanding anything to the contrary contained in any other document comprising in the Contract, no interest shall be payable by BHEL to Contractor on any moneys or balances including but not limited to the Security Deposit, EMD, Retention Money, RA Bills or the Final Bill, or any amount withheld and/or appropriated by BHEL etc., which becomes or as the case may be, is adjudged to be due from BHEL to Contractor whether under the Contract or otherwise.

SI No: 13:

The chapter Reverse auction procedure published in 'Forms and Procedures' of Volume I Book II stands deleted. 'Guidelines for Reverse Auction-2021' available in the website <http://www.bhel.com> -> Supplier Registration, shall be applicable.

SI No: 14:

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: 15:

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 02) is enclosed.

SI No:16 :

Clause 2.22 in GCC regarding Retention Amount is revised as under:

2.22 Performance Security Deposit

2.22.1 After award of work, Vendor shall submit 5% of the contract value towards Performance Security Deposit, in the form of (a) or (b) below.

(a) CASH (DD/ Online payment), 5% of the contract Value towards Performance Security Deposit, before commencing the contract

(or)

(b) Recovery 5% from Each Running Bill towards Performance security deposit.

(Note: Subcontractor has to choose either Option (a) or (b) before issue of Detailed LOI).

(c) However, Performance Security Deposit on part of PVC will be recovered at the rate of 5% from every running bill towards performance security deposit.

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2.22.2 Refund of Performance Security Deposit:

- a) 50% of Performance Security Deposit shall be released along with the final bill.
- b) Balance 50% will be released after completion of Performance Guarantee Period (i.e., after expiry of Guarantee period), provided all the defects noticed during the guarantee period have been rectified to the satisfaction of BHEL Site Engineer/ BHEL Construction Manager, and after deducting all expenses/ other amounts due to BHEL under the contract/ other contracts entered into by BHEL with them. This portion of Performance Security Deposit, amount can be released on commencement of the Guarantee Period, on submission of equivalent Bank Guarantee.

The performance security deposit mentioned herein above, is in addition to Security Deposit as per SI No. 5 above.

SI No: 17:

Void

SI No: 18:

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 Chapter-12, Part-II of Volume-IA Technical Conditions of Contract.

SI No: 19:

Clause 2.15.5 of GCC in Extra Works is revised as under:

2.15.5: After eligibility of extra works is established and finally accepted by BHEL engineer / designer, payment will be released on competent authority's approval at the following rate.

MAN-HOUR RATE FOR ELIGIBLE EXTRA WORKS:

Single composite average labour man-hour rate, including overtime if any, supervision, use of tools and tackles and other site expenses and incidentals, consumables for carrying out any major rework / repairs / rectification / modification / fabrication as certified by site as may arise during the course of erection, testing, commissioning or extra works arising out of transit, storage and erection damages, payment, if found due will be at Rs 108/- per man hour.

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VOLUME-IA PART-II

CHAPTERS 2-12

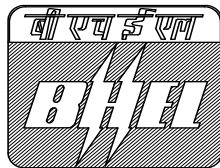
In the next 177 pages as below:

CHAPTER	DETAILS	NO. OF PAGES
CHAPTER 2	Standard Specification for Geotechnical Investigation	51
CHAPTER 3	Technical Specification for Topographical Survey	12
CHAPTER 4	Drawing of Geotechnical Investigation and Survey Layout for FGD Area (For Tender Purpose only)	01
CHAPTER 5	Plot Plan Drawing	01
CHAPTER 6	Plant Layout fo FGD System	02
CHAPTER 7	HSE Plan For Site Operations By Subcontractor (Document No. HSEP: 14 Rev01)	82
CHAPTER 8	Form No.: F-15 (Rev 02) Monthly Performance Evaluation of Contractor	06
CHAPTER 9	Form 14 Rev 01 (Rev 01); Monthly Plan and Review with Contractors	05
CHAPTER 10	Procedure For Conduct Of Conciliation Proceedings	11
CHAPTER 11	Proforma Of Bank Guarantee (In lieu of Earnest Money)-Form WAM 23	03
CHAPTER 12	Proforma Of Bank Guarantee (In lieu of Security Deposit)-Form WAM 22	03

BHARAT HEAVY ELECTRICALS LTD

**STANDARD SPECIFICATION
FOR
GEOTECHNICAL INVESTIGATION**

SPECIFICATION NO. PE-TS-999-603-002



JUNE, 2009

**POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
PPEI BUILDING, PLOT NO. 25
SECTOR-16A
NOIDA (U.P.)-201301**



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**STANDARD SPECIFICATION
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1.0 GENERAL

- 1.1 This specification covers the technical requirements for a detailed “geotechnical investigation and submission of a detailed geotechnical report”. The detailed geotechnical investigation shall be carried out onshore to provide the designer with sufficiently accurate information both general and specific about the sub-strata profile and relevant soil and rock parameters at site on the basis of which the foundation for various structures and equipments of the power station can be designed rationally. Such structures would include main power house, chimney, boiler foundation, turbo-generator foundation, foundation for vibratory equipments, deep pits, reservoir, ash pond, pipe supports and all other related structures of the power station etc. The above list is indicative and not exhaustive. The range of load intensities from the various structures are expected to be between 50 kN/sqm and 500 kN/sqm.

2.0 SCOPE

- 2.1 The work shall include mobilization of all necessary equipments, providing necessary engineering supervision and technical personnel, skilled and unskilled labours, arranging water for drilling etc as required to carry out the entire field as well as laboratory investigation, analysis and interpretation of test data collected and preparation of a geotechnical report. The entire field as well as laboratory investigation work shall be supervised by a graduate/post graduate in civil engineering with atleast 5 years of site experience in respective areas of geotechnical investigation work. A geologist shall also be deputed at site during investigation whenever rock drilling is undertaken. The scheduling of laboratory tests, analysis and interpretation of test results, drafting of report and recommendations shall be carried out by a post graduate in geotechnical engineering with atleast 5 years of experience.



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- 2.2 The contractor shall make his own arrangements for locating the co-ordinates and position of bore holes, trial pits and other field tests as per the drawings/sketches supplied to him and for determining the reduced levels at these locations with respect to a single bench mark indicated by the engineer-in-charge. Two established reference lines will be indicated to him. The contractor has to provide at the site all the required survey instruments to the satisfaction of the engineer-in-charge so that the work can be carried out accurately according to the specification and drawings.
- 2.3 All the field data shall be recorded in the proforma recommended in Indian Standard Codes and the field records shall be countersigned by the engineer-in-charge. The contractor shall submit two copies of the field borelogs to the engineer-in-charge soon after the completion of each bore hole. All the investigations are to be carried out by the contractor as per the priority requirements of the engineer-in-charge.
- 2.4 The contractor shall intimate the engineer-in-charge giving reasons if any additional specific tests he consider necessary to be carried out duly considering local sub-soil conditions. In case the proposal for conducting additional specific tests is approved by the engineer-in-charge then same shall also be carried out.
- 2.5 Whenever the contractor is unable to extract undisturbed samples he should immediately inform the engineer-in-charge. In such a case payment for boring charges shall be subject to the engineer-in-charge being satisfied that adequate effort has been made to extract undisturbed samples.
- 2.6 All the laboratory test data shall be recorded in the proforma recommended in the Indian Standard Codes and a copy of these shall be sent to the engineer-in-charge every week during the progress of laboratory testing. Whenever desired during the progress of work the owner/engineer-in-charge may be present at the laboratory where the contractor is arranging for execution of the laboratory tests.
- 2.7 The contractor shall interact with the engineer-in-charge to get acquainted with the different type of structures envisaged and in assessing the load intensities on the foundation for the various structures of the power project in order to enable him/her to make



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specific recommendation for the depth & type of foundation and the allowable bearing pressure. The contractor shall submit detailed geotechnical report after incorporating the comments (if any) on the draft report.

- 2.8 The “Standard Specification for Geotechnical Investigation” shall be read in conjunction with the document titled “Schedule of Quantities for Geotechnical Investigation” and amendments (if any) which shall be furnished specific project wise separately.

3.0 TENDER DRAWING

- 3.1 A tender drawing titled “Vicinity Map” or “Plot Plan” or “Geotechnical Investigation Layout” indicating the study area/tentative location of the bore holes and field tests/areas to be investigated for locating the project shall be furnished specific project wise separately. The location, extent and depth of bore holes and field tests/area(s) indicated in the drawing are subject to change that may be necessary during actual execution of the work. No claim whatsoever shall be entertained for differences between the location, extent and depth/area(s) etc of tests indicated on the construction drawings and those shown on the tender drawings. The work shall be carried out as per the instructions of the engineer-in-charge.

- 3.2 The bidder must visit the site prior to submitting his/her quotations to acquaint himself/herself fully with the nature, type, scope of work and involvement therein. The rates quoted shall remain firm during the entire period of execution till completion of the work and any additional claim for lack of knowledge shall not be entertained.

4.0 GENERAL REQUIREMENTS

- 4.1 In areas which have already been developed, the contractor shall take advantage of existing local knowledge, record of trial pits, bore holes etc in the vicinity and the type of foundations adopted and behaviour of existing structures particularly those of similar nature to the ones proposed for this project.
- 4.2 The contractor shall make use of information gathered from quarries, unlined wells, cuttings from nearby areas etc. The general



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topography of the near by areas will often give some indication about the variation of the soil conditions which are likely to exist.

4.3 The contractor shall gather data regarding the removal of overburden by excavation, erosion or land slides in the areas which may give an idea of the amount of reconsolidation that the soil strata has undergone. Similarly data regarding recent fills shall also be studied to determine the characteristics of the fill as well as the original strata.

4.4 The water level in streams and water courses if any in the neighbourhood shall be noted. Reliable information regarding ground water level shall also be gathered from water level in the near by wells.

4.5 The contractor shall make enquiries and verify regarding earlier use of the site which can have important bearing on its suitability for the proposed structures. This is important particularly in areas where there have been underground works e.g. worked out ballast pits, quarries, old brick fields, mines, mineral workings etc. The possibility of damage to the structures, sewers, conduits and drainage system by subsidence shall also be investigated.

4.6 It is essential that the equipments/instruments are properly calibrated at the commencement of the work so that they represent true values and submit the test reports to the engineer-in-charge. If the engineer-in-charge so desires, the contractor shall arrange for having the instruments tested in presence of the engineer at an approved laboratory at the contractor's cost and the test reports shall be submitted to the engineer-in-charge.

4.7 When blasting with explosives is involved, agency/contractor shall arrange statutory clearances and also the portable magazine for storing/carrying the explosives.

5.0 CODES AND STANDARDS

5.1 All standards, specification and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions.



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5.2 In case of conflict between this specification and those (IS codes and standards etc) referred to herein, the former shall prevail.

5.3 All work shall be carried out as per the specification and the following standards and codes.

IS: 1080 Code of practice for design and construction of simple spread foundations

IS: 1498 Classification and identification of soils for general engineering purposes

IS: 1888 Method of load test on soils

IS: 1892 Code of practice for subsurface Investigation for foundation

IS: 1904 Code of practice for design and construction of foundations in soils: General requirements

IS: 2131 Method of standard penetration test for soils

IS: 2132 Code of practice for thin walled tube sampling of soils

IS: 2470 Code of practice for design and construction of septic tanks Part-I

IS: 2720 Method of test for soils (Relevant parts)

IS: 2809 Glossary of terms and symbols relating to soil engineering

IS: 2810 Glossary of terms relating to soil dynamics

IS: 2911 Code of practice for design and construction of pile foundations (Relevant parts)

IS: 2950 Code of practice for design and construction of raft foundation Part- I



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- IS: 3025 Methods of sampling and testing (Physical and chemical) for water used in Industry
- IS: 3043 Code of practice for earthing
- IS: 4078 Code of practice for indexing and storage of drill cores
- IS: 4434 Code of practice for in-situ vane shear test for soils
- IS: 4453 Code of practice for exploration by pits, trenches, drifts and shafts
- IS: 4464 Code of practice for presentation of drilling information and core description in foundation investigation
- IS: 4968 Method for subsurface sounding for soils- Dynamic Part -II method using cone and bentonite slurry
- IS: 4968 Method for subsurface sounding for soils-Static cone Part-III penetration test
- IS: 5249 Method of test for determination of in-situ dynamic properties of soil
- IS: 5313 Guide for core drilling observations
- IS: 5529 Code of practice for in-situ permeability test – Test in Part-I overburden
- IS: 5529 Code of practice for in-situ permeability test - Test in bed Part-II rock
- IS: 6065 Recommendation for the preparation of geological and geotechnical maps for river valley project
- IS: 6403 Code of practice for determination of allowable bearing pressure on shallow foundation
- IS: 6926 Code of practice for diamond core drilling for site investigation of river valley projects



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- IS: 6935 Method of determination of water level in a bore hole
- IS: 6955 Code of practice of subsurface exploration for earth and rockfill dams
- IS: 7422 Symbols and abbreviations for use in geological maps, sections and subsurface exploratory logs (Relevant parts)
- IS: 8009 Code of practice for calculation of settlement of
Part-I foundation subjected to symmetrical vertical loads -
Shallow foundations
- IS: 8009 Code of practice for calculation of settlement of
Part-II foundation subjected to symmetrical vertical loads –
Deep foundations
- IS: 8763 Guide for undisturbed sampling of sands
- IS: 8764 Method for determination of point load strength index of rocks
- IS: 9143 Method for the determination of unconfined compressive strength of rock materials
- IS: 9179 Method for preparation of rock specimen for laboratory testing
- IS: 9198 Compaction rammer for soil testing
- IS: 9214 Determination of modulus of sub-grade reaction in field
- IS: 9259 Specifications for liquid limit apparatus
- IS: 9640 Specifications for split spoon sampler
- IS: 9669 Specifications for CBR mould and its accessories
- IS: 10050 Method for determination of slake durability index of rocks



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IS: 10060 Code of practice for subsurface investigation for power house sites

IS: 10074 Specification for compaction mould assembly for light and heavy compaction

IS: 10108 Code of practice for sampling by thin wall sampler with stationary piston

IS: 10589 Equipment for determination of subsurface sounding of soils

IS: 10837 Specifications of moulds for determination of relative density and its accessories

IS: 11229 Specifications for shear box testing of soils

IS: 11315 Description of discontinuities in rock mass - Core Part-II recovery and rock quality

IS: 12070 Code of practice for design and construction of shallow foundations on rocks

IS:13372 Seismic testing of rock mass – Code of practice (Part I & II)

6.0 FIELD INVESTIGATION - SOIL

6.1 Boring

6.1.1 General Requirements

a) Bore holes shall be drilled at specified locations to obtain information about the sub-soil profile, its nature, strength and to collect soil samples for strata identification and conducting laboratory tests. The minimum diameter of the bore hole shall be 150 mm and boring shall be carried out in accordance with the provisions of IS: 1892 and as per this specification.



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b) All bore holes shall extend up to the depths shown on the construction drawings or as directed by the engineer-in-charge. If the strata with standard penetration test (SPT) 'N' value greater than 100 with characteristics of rock is met with earlier, the bore hole shall be advanced further by chiselling. Chiselling shall be continued for a maximum depth of 20cm or upto 2 hours whichever is earlier. During chiselling rock fragments/rock cores shall be collected. Identification of rock strata shall be on the basis of visual examination of SPT sample and rock fragments. After it is established that rock is met with, the borehole shall be advanced further by drilling in rock as specified in Clause-7.0 and cores shall be collected. When the bore hole is terminated in soil strata, an additional standard penetration test shall be carried out at the termination depth.

c) Casing pipe shall be used in the borehole to support its sides when side fall is suspected to occur inside the borehole. When casing pipe is used, it shall be ensured that its bottom end is at all times 15 cm above the bottom of the bore hole. In case of cohesionless soils the advancement of the casing pipe shall be such that it does not disturb the soil to be tested or sampled. The casing shall be advanced by slowly turning the casing pipe and not by driving.

d) In-situ tests and collection of undisturbed samples (UDS) shall be carried out at regular intervals and at change of strata or as decided by the engineer-in-charge. Representative disturbed and undisturbed samples shall be preserved for conducting various tests in the laboratory. Water table in the borehole shall be carefully recorded and reported. No water/drilling mud shall be added while boring above ground water table. For cohesionless soil below water table, the water level in the borehole shall all times be maintained at slightly above the water table.

e) The bore hole shall be cleaned using suitable tools up to the depth of testing or sampling ensuring that there is minimum disturbance of soil at the bottom of the bore hole. The process of jetting through an open tube sampler shall not be permitted. In cohesive soils, the borehole may be cleaned using a bailer with a flap valve. Gentle circulation of drilling fluid shall be done when rotary mud circulation boring is adopted.



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f) On completion of the borehole, the portion drilled in soil shall be backfilled with sand unless otherwise specified and as directed by the engineer-in-charge.

g) Wash boring shall not be adopted.

6.1.2 Auger Boring

Auger boring can be adopted in soft to stiff cohesive soils above water table. Augers shall be of helical or post hole type which may be manually or power operated. While boring care shall be taken to minimise the disturbance to the deposits below the bottom of the borehole. The cuttings brought up by the auger shall be carefully examined in the field and the description of all the strata shall be duly recorded in the field borelog as per IS:1498. No water shall be used while auger boring.

6.1.3 Shell and Auger Boring

Shell and Auger boring can be used in all types of soil free from boulders. For cohesionless soil below ground water table, the water level in the bore hole shall always be maintained at or above the ground water level. The use of chisel bit shall be permitted in hard strata with SPT 'N' value greater than 100. Chisel bits may also be used to extend the borehole through local obstruction such as old construction, boulders, rocky formations etc. All other requirements in clause 6.1.2 shall apply for this type of boring also.

6.1.4 Percussion Drilling

This method can be adopted in soil with gravel and boulders when the boring has to be done at a faster rate. This method consists of breaking of the strata by repeated blows from a chisel or drilling bit and bailing out the debris at intervals by adding water into the bore hole. This method is not suitable for careful and very reliable sampling operation because of the disturbance caused during boring. This method shall not be adopted unless otherwise specified or permitted by the engineer-in-charge.



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6.1.5 Rotary Mud Circulation Drilling

This method can be used in all types of soil below water table. In this method boring shall be done by rotating the bit fixed at the bottom of the drill rod. Proper care shall be taken to keep a firm contact between the bit and the bottom of the borehole. Bentonite or mud laden fluids shall be used as the drilling fluid to serve as the protective surface inside the borehole.

6.2 Standard Penetration Test (SPT)

This test shall be conducted in all types of soil deposits met within the bore hole to find the variation in the soil stratification by correlating with the number of blows required for unit penetration of a standard penetrometer. This test shall be conducted at every 1m interval alternate to collection of UDS upto 10m depth below ground level and at every 1.5m interval alternate to collection of UDS beyond 10m depth, at every change of strata, at depths wherever undisturbed soil samples could not be collected and as per the directions of the engineer-in-charge. The starting depth of performing SPT shall be 1m below ground level unless otherwise specified. The depth interval between the top level of standard penetration test and to that of (next) undisturbed sampling shall not be less than 1m. The specification for equipments and other accessories, procedure for conducting the test, presentation of test results and collection of disturbed soil samples etc shall conform to IS: 2131.

This test shall be carried out by driving a standard split spoon sampler in the borehole by means of a 63.5 kg hammer having a free fall of 0.75m. The sampler shall be driven using the hammer for 450 mm penetration. While driving, the number of blows for every 150 mm penetration and the penetration for every 50 blows shall be recorded. The number of blows for the last 300 mm drive shall be reported as 'N' value. This test shall be discontinued when the blow count is equal to 100 and the penetration shall be recorded. Refusal shall be considered to be met with when the blow count is equal to 100. At the location where the test is discontinued, the penetration and the corresponding number of blows shall be reported. Sufficient quantity of disturbed soil samples shall be collected from the split spoon



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sampler for identification and laboratory testing. The samples shall be visually classified & recorded at the site and shall be properly preserved and labelled for future identification & testing.

6.3 Sampling

6.3.1 General

a) Sufficient number of soil samples shall be collected for reliable estimation of soil properties. The samples collected shall be either disturbed or undisturbed. Disturbed soil samples shall be collected for field identification and conducting laboratory tests such as sieve analysis, index properties, specific gravity, chemical analysis etc. Undisturbed samples shall be collected to estimate physical, strength and settlement properties of the soil.

b) All the accessories required for sampling and the method of sampling shall conform to IS:2132. All disturbed and undisturbed samples collected in the field shall be classified at site as per IS: 1498.

c) All the samples shall be identified with date, bore hole or trial pit number, depth of sampling etc. It is also essential to mark an arrow pointing towards the top surface of the undisturbed sample as the soil was in-situ. Care shall be taken to keep the undisturbed soil samples and box samples vertically with the arrow directing upwards. The tube samples shall be properly trimmed at both ends and suitably sealed with molten paraffin wax at both ends immediately after extracting the samples from the bore hole/trial pit and suitably capped on both sides.

d) When the contractor fails to collect undisturbed soil sample at a specified depth, the borehole shall be advanced by 0.50m and shall be performed with a standard penetration test. The reason for not obtaining the undisturbed soil sample shall be indicated in the borelog.

e) Precaution shall be taken to ensure that there shall not be any change in moisture content and disturbance of the soil samples and they shall be placed in a temporary store at the end of the day's work.



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All the samples shall be kept over a bed of sand, jute bags, saw dust etc and covered over the top with similar material. The bed and top cover shall be kept moist till they are properly packed in wooden boxes. The contractor shall be responsible for packing and transporting of all the samples from site to the laboratory within seven days after sampling with proper protection against loss and damage.

f) All the samples shall be suitably packed in wooden boxes using sand, saw dust etc all around the samples before transporting to the laboratory for testing.

6.3.2 Disturbed Samples

a) Disturbed soil samples shall be collected from cuttings and from split spoon sampler in boreholes at regular intervals to provide complete description of soil profile and its variation. The samples shall be immediately stored in airtight jars or polythene bags and labelled with borehole/trial pit number and depth.

b) In elevated areas, if superficial material is available in plenty, then bulk samples from a depth of about 0.5m below ground level shall be collected to establish all required properties to use it as a fill material. Disturbed samples weighing about 250N shall be collected at shallow depths and immediately stored in polythene bags as per IS: 1892. The bags shall be sealed properly and shall be kept in wooden boxes.

6.3.3 Undisturbed Samples

In each borehole UDS shall be collected at regular interval of 1m alternate to conducting SPT upto 10m depth below ground level and at every 1.5m interval alternate to conducting SPT beyond 10m depth and as directed by the engineer-in-charge. The starting depth of collecting UDS shall be 2m below ground level unless otherwise specified and as directed by the engineer-in-charge. Undisturbed samples shall be of 100mm diameter and 450mm length. Samples shall be collected in such a manner that the structure of soil and its moisture content do not get altered. The specification for the accessories required for sampling and the sampling procedure shall



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conform to IS:1892 and IS:2132. Undisturbed sampling in sand shall be done using compressed air technique as mentioned in IS:8763. Thin walled sampler shall be used to collect undisturbed samples by pushing the tube into the soil. The sampling tube shall have a smooth finish on both surfaces and minimum effective length of 450mm. The area ratio of sampling tubes shall be less than 12.5%. However in case of very stiff soils area ratio upto 20% shall be permitted.

a) Undisturbed Sampling in Cohesive Soil

Undisturbed samples in soft to stiff cohesive soils shall be obtained using a thin walled sampler. In order to reduce wall friction, suitable precautions such as oiling the surfaces shall be taken. The bore hole shall be cleaned and the depth of sampling below ground level shall be noted. The sampler shall then be attached to the bottom of boring rods and lowered into the borehole. The sampler shall be pushed into the clay layer by hand or by jacking and soil sample of specified length shall be collected without disturbing the soil. The distance by which the sampler penetrates into the soil strata shall be checked. Care shall be taken to ensure that the sampler is not driven too far as this will compress the soil. The sampler shall be rotated to break the core at bottom of the sampler and then steadily drawn up.

b) Undisturbed Sampling using Piston Sampler

Undisturbed samples in very loose saturated sandy & silty soils and very soft clays shall be obtained by using a piston sampler consisting of a sampling cylinder and piston system. In soft clays and silty clays with water standing in the casing pipe, piston sampler shall be used to collect undisturbed samples. During this method of sampling expert supervision is called for.

The interior surface of the sampler shall be smooth, clean and corrosion resistant. Its cutting edge and the ring seals shall be inspected for wear and rejected if worn. Check shall be done to ensure that the moving parts of the sampler function freely before the sampler is lowered into the borehole. While pushing the system into the soil and till the beginning of the sampling operations, the bottom of the piston shall be flushed with the cutting edge of the sampler. At the depth of sampling, the piston should be fixed relative to the



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ground and the sampler cylinder shall be independently pressed down smoothly and continuously into the ground. If an obstruction is met, the sampler shall be withdrawn and another sample be taken after the obstruction is removed.

Accurate measurements of the depth of sampling, height of sampler, stroke and length of sample recovery shall be noted and recorded. After the sampler is pushed to the required depth, both the sampler cylinder and the piston system shall be drawn up together ensuring that there shall not be any disturbance to the sample which shall then be protected from changes in moisture content.

c) Undisturbed Sampling in Cohesionless Soils

Undisturbed samples in cohesionless soils shall be obtained as per the procedure given in IS:8763. Compressed air sampler shall be used to take the samples of cohesionless soil below water table. Precautions shall be taken to clean the borehole before sampling. Thin walled tube samplers of 60mm internal diameter shall be used. The height and other dimensions of the sampler shall be recorded before use. Proper care shall be taken to maintain the water level in the bore hole slightly above the ground water table before and during sampling operations. Immediately after the sample is obtained, the ends of the sample shall be waxed and capped to avoid moisture content changes.

6.3.4 Relaxation During Sampling

a) The sampler shall be pushed into the soil and driving of sampler shall be resorted to only when it cannot be pushed into the soil. This shall be done only with the permission of the engineer-in-charge and all the details about the same shall be recorded in the bore logs.

b) In clays when 'N' value is greater than 50, the undisturbed sampling may be replaced by standard penetration test.



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6.4 Ground Water

6.4.1 One of the following methods shall be adopted for determining the ground water table in bore holes as per IS:6935 and as per the instructions of the engineer-in-charge.

a) In permeable soils, the water level in borehole shall be allowed to stabilize after lowering it adequately by bailing. When water level inside the borehole is found to be stable, the depth of water level below ground level shall be measured. Stability of sides and bottom of the borehole shall be ensured at all times.

b) For both permeable and impermeable soils, the following method shall be suitable. The borehole shall be filled with water and then bailed out to various depths. Observation on the rise or fall of water level shall be made at each depth. The level at which neither a fall nor a rise is observed shall be considered as the water table elevation. This shall be established by three successive readings of water level taken at an interval of two hours.

6.4.2 In case any variation in the ground water level is observed in any specific boreholes then the water level in these bore holes shall be recorded daily during the course of field investigation. Levels in nearby wells, streams etc if any shall also be noted whenever these readings are taken. If so called for, observation wells shall be drilled for the purpose of long term studies on the fluctuation in ground water levels and pressure. Either stand pipe or piezometer shall be installed at the specified depths in the selected previously drilled bore holes or specially drilled bore holes for this purpose as per the specification and instructions of the engineer-in-charge. Daily water level readings shall be recorded immediately following the installation upto the time of leaving the site. At the end of field work, these installations shall be handed over in satisfactory working condition to the engineer-in-charge without disturbing their position so that the owner can continue further observations.

6.4.3 Stand pipes and piezometers shall consist of 19mm internal diameter rigid unplasticised (UPVC) tubing. All the joints in the tubing shall be made of coupling sleeves. The top of UPVC tubing shall be enclosed in a 75mm diameter galvanised steel pipe of 1.5m length



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having a galvanised steel screw cap with well greased threads and the caps shall be tightened such that it would be impossible to loosen by hand. The lower end of the pipe shall have four legs of 6mm thick and 100mm long and welded to have projection of 25mm. The pipe shall be sealed into the ground with cement grout so that it does not rotate. The top end of the pipe shall project about 300mm above ground level unless otherwise specified by the engineer-in-charge. The perforated tubing for the porous element shall be surrounded by a response zone of well graded sand from 500mm below to 150mm above the lower end of the stand pipe or piezometer and the bore hole above the response zone shall be back filled with natural soil or well graded sand.

a) Stand pipe

Stand pipes shall be installed to measure the water level in soils with high permeability such as sand and gravel. The stand pipe shall consist of a perforated tubing attached to the bottom of the UPVC tubing. The perforated tube shall be 150mm long having perforations of diameter not greater than 1mm.

b) Piezometers

Piezometers shall be installed to measure the pore pressures in soil with medium to low permeability. Piezometer shall consist of a porous filter attached to the bottom of the UPVC tubing. The filter shall be 300mm in length and shall be placed in the bore hole and sealed at top and bottom by grouting. Hydraulic piezometers with double line are to be used to remove the air trapped in the system.

6.4.4 Sub-Soil Water Samples

a) Sub-soil water samples shall be collected for carrying out chemical analysis. Representative samples of ground water shall be collected when it is first encountered in boreholes before the addition of water to aid boring or drilling. Water samples shall not be collected when bentonite slurry or mud has been used for drilling operations. If water has been added for drilling purposes or if ground water has been diluted by surface rain water then the bore hole shall be



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dewatered and water be allowed to rise from which the sample may be taken.

b) The sampling apparatus shall be such that the water at the desired depth can be collected directly without any disturbance and any change in concentration of constituents like dissolved gases etc. Undue agitation shall be avoided. An ordinary suction pump with its suction end inserted upto the required depth in the borehole shall be used for this purpose.

c) The sample shall be collected in a clean vessel and allowed to settle so that the supernatant liquid can be poured into a clean well rinsed glass or polythene bottle. Sufficient quantity and number of samples shall be collected to carry out the chemical analysis and sent to a laboratory in airtight bottles with proper labelling. Chemical analysis of water samples shall include determination of pH value, turbidity, sulphate, carbonate, nitrate & chloride contents, presence of organic matter and suspended solids etc.

d) In some cases constituents may be mixed and analysed later as specified in the specific test methods. Chemical preservatives may be added to the sample for cases as specified in the test method/IS codes. This shall only be done if analysis cannot be conducted within an hour of collection and shall have the prior written permission and approval of the engineer-in-charge.

6.5 In-situ Permeability Test

6.5.1 In-situ permeability test shall be conducted to determine the water percolation capacity of overburden soil. This test shall be performed inside the bore hole/trial pit at specified depths or in each layer or as per the directions of the engineer-in-charge. The type of test shall be either pump-in or pump-out test depending on the subsoil and ground water conditions. Pump-in test shall be conducted whether ground water in borehole exists or not. Pump-out test shall be conducted to obtain data for dewatering purposes when ground water is met in the borehole. The specification for equipments required for the test and the procedure of testing shall be in accordance with IS: 5529, Part-1. When it is required to carry out the permeability test for a particular section of the soil strata above ground water table, bentonite slurry shall not be used while boring.



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6.5.2 Pump-in-Test

Pump-in test shall be conducted in the bore hole/trial pit by allowing water to percolate into the soil. Choice of the method of testing shall depend on the soil permeability and prevailing ground water level.

Only clear water shall be used for conducting the test. Before conducting the test, the borehole shall be cleaned as specified in clause 6.1.1 (e). Water shall be allowed to percolate through the test section for sufficient period of time to saturate the soil before starting the observation.

a) Constant Head Method (In Bore Hole)

This test shall be conducted in boreholes where soil has a high permeability. Water shall be allowed into the borehole through a metering system ensuring gravity flow at constant head so as to maintain a steady water level in the borehole. A reference mark shall be made at a convenient level which can be easily seen in the casing pipe to note down the fluctuations of water level. The fluctuations shall be counteracted by varying the quantity of water flowing into the borehole. The elevation of water shall be observed at every 5 minute interval. When three consecutive readings show constant value, the necessary observations such as flow rate, elevation of water surface above test depth, diameter of casing pipe etc shall be made and recorded as per the proforma recommended in IS: 5529, Part-1, Appendix-A.

b) Falling Head Method (In Bore Hole)

This method shall be adopted for soils of low permeability and which can stand without casing. The test section shall be sealed at the bottom of the borehole and a packer at the top of the test section. If the test has to be conducted at an intermediate section of a pre-bored hole then double packers shall be used. Access to the test section through the packer shall be by means of a pipe which shall extend above the ground level. Water shall be filled into the pipe upto the level marked just below the top of the pipe and water be allowed to drain into the test section. The water level in the pipe shall be



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recorded at regular intervals as mentioned in IS: 5529, Part-1, Appendix-B. The test shall be repeated till constant records of water level are achieved.

c) Percolation Test (In Trial Pit)

Percolation test shall be conducted in trial pit in areas where water/effluent is stored/discharged in ground level tanks. The loss of water due to percolation into the soil shall be estimated by the soil absorption capacity.

6.5.3 Pump-Out Test

This test shall be carried out at site to determine the co-efficient of permeability of soil below water table. This test shall be conducted by continuous pumping out of water from a well so as to maintain a steady water level at the desired depth in the well. The fluctuations in the water level shall be counteracted by varying the quantity of water pumped out of the well. The specification for the equipments & accessories required for performing the test, the procedure of testing, field observations and reporting of results shall conform to IS: 5529, Part-1. The well shall be of 400mm in diameter to be installed with a 250mm diameter perforated GI/MS pipe. Observation pipes of 50mm diameter shall be installed at regular intervals along three radial lines extending from the well at 120 degrees to each other. Length of these pipes shall depend upon the ground level, estimated depth of lowering the ground water and the distance from the well. Sufficient number of observation pipes shall be installed along each of the radial lines so as to assess the zones of influence due to dewatering. Draw down depth in the well shall be as specified in the drawing.

6.6 TRIAL PIT

6.6.1 Trial pits shall be of 3m x 3m size so as to permit easy access for visual examination of walls of the pit and to facilitate sampling and in-situ testing operations. Pits shall be excavated upto a maximum depth of 4m below ground level or as per the directions of the engineer-in-charge. Precautions shall be taken to ensure the stability of pit walls including provision of shoring if necessary as per IS:



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4453. Precautions shall be taken to prevent surface water draining into the pit. Arrangements shall be made for dewatering if the pit is extended below water table. Trial pits shall be kept dry and a ladder shall be provided for easy access to the bottom of the pit. In-situ tests shall be conducted and undisturbed samples shall be collected immediately on reaching the specified depth so as to avoid substantial changes in moisture content of the subsoil. Arrangements shall be made for barriers, protective measures and lighting necessary for the period the pits remain open.

6.6.2 A note on the visual examination of soil strata shall be prepared. This should include the nature, colour, consistency and visual classification of the soil, thickness of soil strata, thickness of expansive soil & ground water table if any etc.

6.6.3 Undisturbed samples shall be collected at 1m, 2m, 3m depth and at the termination depth in all the pits.

a) Chunk Samples

In cohesive soils, undisturbed samples of regular shapes shall be collected. The samples shall be cut and trimmed to a size of 0.3m x 0.3m x 0.3m. A square area of 0.35m x 0.35m shall be marked at the centre of the levelled surface at the bottom of the pit. Without disturbing the soil inside the marked area, the soil around this marking shall be carefully removed upto a depth of 0.35m. The four vertical faces of the soil block protruding at the centre shall be trimmed slowly so that its size reduces to 0.3m x 0.3m. Wax paper cut to suitable size shall be wrapped uniformly and covered with two layers of thin cloth over all the five exposed surfaces of the soil block and sealed properly using molten wax. A firmly constructed wooden box of size 0.35m x 0.35m x 0.35m (internal dimensions) with the top and bottom open shall be placed around the soil block and held such that its top edge protrudes just above the surface of the block. The space between the soil block and the box shall be filled uniformly and tightly with moist saw dust. The top surface shall also be covered with saw dust before nailing the wooden lid to cover the box firmly taking care that the soil block is not disturbed. The area of contact between the bottom portion of the block and the ground shall be reduced slowly by removing soil in small quantities using



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small rods so that the block can be separated from the ground slowly without disturbance. After inverting the wooden box along with the soil block, the bottom portion shall be trimmed and covered with wax paper, cloth and to be sealed with molten wax. A wooden lid shall be nailed to the box after providing proper saw dust cushion below it. An arrow mark shall be made on the vertical face of the wooden box to indicate the top surface of the sample along with the location, date and depth of sampling.

b) Tube Samples

Undisturbed tube samples may also be obtained by means of 100mm diameter sampling tubes with a cutting edge. The sampler shall be slightly oiled or greased inside and outside to reduce friction. The sampler shall be pushed into the soil and while doing so soil around the tube shall be carefully removed. In case it is not possible to push the sampler it may be driven by light blows from a "monkey".

6.6.4 In case it is not possible to collect undisturbed samples in the pit, in-situ density of soil shall be determined by sand replacement method. The specification, equipments, accessories etc required for the test and the procedure of testing shall be in accordance with IS: 2720, Part-XXVIII. No separate payment shall be made for this test.

6.6.5 After the completion of the test, sampling and visual examination, the pit shall be suitably backfilled as directed by the engineer-in-charge. Unless otherwise specified excavated soil shall be used for this purpose.

6.7 Vane Shear Test

Field vane shear test shall be performed inside the borehole to determine the shear strength of cohesive soils, especially of soft and sensitive clays which are highly susceptible to sampling disturbance. This test shall be conducted by advancing a four winged vane of suitable size (75mm or 100mm diameter as per the soil condition) into the soil upto desired depth and measuring the torque required to rotate the vane. The specification for equipments & accessories required, the test procedure and field observations etc shall be as per IS: 4434. This test may also be conducted by direct penetration from



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the ground surface. If the cuttings at the test depth in the bore hole show any presence of gravel, sand, shells, decomposed wood etc which are likely to influence the test results substantially, the test at that particular depth may be omitted with the permission of the engineer-in-charge. However the test shall be conducted at a depth where these obstructions cease to occur. On completion of the test the results shall be reported in an approved proforma as specified in IS: 4434, Appendix-A.

6.8 Static Cone Penetration Test

Static cone penetration test shall be conducted to know the soil stratification and to estimate the various physical and engineering properties of soil. The cone penetrometer shall be advanced by pushing and the static force required for unit penetration shall be determined. The test shall be conducted using a 200kN capacity mechanically operated equipment upto the specified depth or refusal whichever is earlier. For this test, 'refusal' means meeting a very hard strata which cannot be penetrated at the rate of at least 0.3cm/sec even when the equipment is loaded to its full capacity. The specification for the equipment and accessories required for performing the test, test procedure, field observation and reporting of results shall conform to IS : 4968, Part-III. At the ground level, preboring upto 0.5m depth shall be permitted if the overlying strata is very hard. No extra payment shall be made on account of this preboring. Continuous record of the penetration resistance shall be maintained.

6.9 Dynamic Cone Penetration Test

Dynamic cone penetration test shall be conducted using bentonite slurry by driving a standard size cone attached to the bottom of a string of drill rods. The test shall be conducted upto the specified depth or refusal whichever is earlier. Refusal shall be considered when the blow count exceeds 150 for 300mm penetration. The specification for the equipment and accessories required for performing the test, test procedure, field observations and reporting of results shall conform to IS:4968, Part-II. The driving system shall comprise of a 65 kg weight having a free fall of 0.75m. The cone



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shall be of 65mm diameter provided with vents for continuous flow of bentonite slurry through the cone and rods in order to avoid friction between the rods and soil. On completion of the test, the results shall be presented as a continuous record of number of blows required for every 300mm penetration of the cone into the soil in a suitable chart supplemented by a graphical plot.

6.10 Plate Load Test

- 6.10.1 Plate load test shall be conducted to determine the bearing capacity and load/settlement characteristics of soil at shallow depth by loading a plane and levelled steel plate kept at the desired depth and measuring the settlement under different loads until a desired settlement takes place or failure occurs. The specification for equipment and accessories required for conducting the test, the test procedure, field observations and reporting of results etc shall conform to IS: 1888. The location and depth of the test shall be as given in the drawing or as indicated by the engineer-in-charge. Undisturbed tube samples as specified in clause 6.6.3 (b) shall be collected at 1m and 2.5m depths from the ground level for carrying out laboratory tests.
- 6.10.2 The size of pit shall not be less than five times the plate size and the depth shall be as specified. All provisions regarding excavation and visual examination of pit under clause 6.6.1 and 6.6.2 shall apply here also.
- 6.10.3 If the ground water table is at a depth higher than the specified test depth, the ground water table shall be lowered and maintained at the test depth for the entire duration of the test. Dewatering shall be at the cost of the contractor.
- 6.10.4 Unless otherwise specified the reaction method of loading shall be adopted. Settlement shall be recorded from dial gauges placed at four diametrically opposite ends of the test plate. The test plate shall be of 600mm x 600mm size and atleast 25mm thick. The bottom of the pit shall be levelled before placing the plate in position for conducting the test.



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- 6.10.5 A seating load of 7kN/sqm shall be applied and after the dial gauge readings are stabilized, the load shall be released and the initial readings of the dial gauges be recorded after they indicate constant reading. The load shall be increased in stages. These stages shall be 20, 40, 70, 100, 150, 200, 250, 300, 400, 500, 600 and 800kN per sqm or as directed by the engineer-in-charge. Under each loading stage, record of 'time vs settlement' shall be kept as specified in IS:1888.
- 6.10.6 In case of cohesive soils, each load increment shall be maintained until the settlement is less than 0.02mm/minute or 6 hours whichever is later. Dial gauge readings for settlement shall generally be taken at 1, 2.25, 4, 6.25, 9, 16, 25, 60, 90 and 120 minutes from the start of each stage of loading. Thereafter the readings shall be taken at hourly interval upto a further 4 hours and at two hours interval thereafter for another 6 hours.
- 6.10.7 Other than cohesive soils (for all other type of soils), each stage loading shall be maintained for a minimum duration of one hour or till the settlement rate reduces to 0.02mm/minute whichever is later. No extrapolation of settlement rate from periods less than one hour shall be permitted. The final loading shall be maintained for 24 hours. During unloading, reading of dial gauge shall be recorded for each stage of unloading.
- 6.10.8 Loading shall be carried out in stages as specified above till one of the following conditions occur.
- a) Failure of soil under the plate i.e. the settlement of the plate at constant load becomes progressive and reaches a value of 40 mm or more.
- b) Load intensity of 800 kN/sqm is reached without failure of the soil.
- 6.10.9 Backfilling of the pit shall be carried out as per the directions of the engineer-in-charge. Unless otherwise specified the excavated soil shall be used for this purpose.



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6.11 Cyclic Plate Load Test

This test shall be carried out to determine the dynamic soil properties required for the analysis of foundation subjected to dynamic loads. This test shall be conducted on similar lines as the ordinary plate load test with an addition that unloading shall also be done before each stage of loading. Test set up, load increment and maximum load intensity etc shall be as per Clause- 6.10.

- 6.11.1 After each stage of loading, the load shall be removed in a minimum of two stages and as directed by the engineer-in-charge. After each stage of reduction of load, dial gauge readings and settlements shall be taken for atleast one hour until the readings stabilize. Thereafter the next loading stage shall commence. Recording and analysis of test data shall be as per IS: 5249.

6.12 Field California Bearing Ratio Test

This test shall be carried out to obtain the properties of soil required for the design of roads. The equipments and accessories required for carrying out the test, test procedure, recording of observations and presentation of results shall conform to IS: 2720 part XXXI. The test locations and depth shall be as specified in the drawings or as directed by the engineer-in-charge.

6.13 Electrical Resistivity Test

This test shall be conducted to determine the electrical resistivity of soil required for designing safety grounding system for the entire power plant area. The specification for the equipments and other accessories required for performing the test, test procedure and reporting of field observations shall conform to IS:3043. The test shall be conducted using Wenner's four electrode method as specified in IS:1892, Appendix-B2. Unless otherwise specified, at each test location the test shall be conducted along two perpendicular lines parallel to the co-ordinate axes. On each line, the spacing of electrodes shall be kept at 1m, 2m, 5m and 10m. Testing shall be done during the driest season prevalent in the area to the extent possible. In no circumstances shall the testing be done during or



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immediately after the rainy season or persistent rains or in the vicinity of any existing water body such as ponds, streams etc.

6.14 Seismic Refraction Test

6.14.1 This test shall be carried out to establish the rock and soil profiles of varying density. The dynamic shear modulus of the soil shall also be obtained from the results of this test. The specification for the equipments and other accessories, procedure for carrying out the test, recording and analysis of results and their presentation shall conform to IS: 1892.

6.14.2 This test shall be carried out by inducing shock waves into the soil by striking a plate placed on the ground surface with a hammer. The shock waves shall be picked up through geophones placed on the ground surface at regular intervals in line with the plate along a straight line. The time elapsed before the waves reach the geophones shall be recorded to an accuracy of one millisecond or better.

6.14.3 The distance between the shock point and the geophones shall be increased to cover a wider area. Alternatively, multiple geophones shall be used simultaneously using multiple channel seismograph to record the arrival time and intensity of waves reaching the geophones. The spacing of geophones shall be 5m. As the distance between geophones and the shock producing point are increased, the time lapse for the waves passing through different underlying strata and reaching the geophone shall be recorded. The wave forms shall be recorded for each test using multiple channel seismograph.

6.14.4 The test shall be conducted along traverses in two orthogonal directions as specified in the drawing or as directed by the engineer-in-charge. During testing, proper care shall be taken to avoid disturbance caused due to the movement of vehicles or other working operations around the test location. The type of wave (compression or shear) shall be analysed properly using the data recorded during the test.



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6.15 Cross Hole Shear Test

This test shall be generally carried out in accordance with IS: 13372 to establish the dynamic elastic properties of soil and rock. In this test, the seismic waves are to be picked up in two adjacent receiver boreholes. The spacing of boreholes shall be determined so as to obtain good results. The boreholes shall be uncased in the portion carrying the geophones. However it should be kept filled with water or drilling mud in order to ensure perfect contact between the borehole wall and the geophone. In case of cased hole preferably a low velocity material such as a high impact PVC should be used for casing and it is essential that it should be well grouted behind in order to make an intimate contact with the soil. The charge shall be installed within the depth as specified and the waves shall be picked up from the geophones installed at required depths in receiver boreholes. Knowing the travel time from shot hole to receiver hole and corresponding distance, the velocity of the waves is determined which enables to estimate dynamic elastic modulus, shear modulus and Poisson's ratio. In each receiver borehole multiple geophones shall be provided at 2m interval (with starting depth as 3m below ground level) to cover the depth and various strata as specified. Intensity of the waves shall be recorded by multiple channel seismograph.

6.16 Pressuremeter Test

6.16.1 This test shall be conducted in bore holes at desired depth to obtain the in-situ stress-strain characteristics and strength parameters of soil/rock layer by measuring the deformation of the probe at different pressures of the volumeter. The location and depth of the test shall be as given in the drawing or as per the directions of the engineer-in-charge.

6.16.2 All precautions shall be taken to ensure a smooth bore hole of required diameter with minimum disturbance to the surrounding soil. In soft, loose and sensitive soils, the bore hole shall be predrilled deeper than the testing depth for enough so that the cuttings settling at the bottom of the bore hole shall not interfere with the test.



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6.16.3 The equipment shall be calibrated for pressure losses (membrane correction/air calibration) and volume or radius changes (line calibration/thick wall rigid steel cylinder test) before starting of test and at regular intervals as per the manufacturer's specification.

6.16.4 Maximum value of pressure correction shall not be more than 50% of limit pressure. The total volume losses in the system shall not exceed 0.5% of the static probe volume per 100kPa. Volume correction may be neglected in soil if it is less than 0.1% of probe volume per 100 kPa.

6.16.5 The test shall be performed by expanding a cylindrical probe to obtain a pressure vs volume or pressure vs radius curve as specified in IS:1892. The probe may be of Ax, Bx or Nx size. However the size of the borehole shall be compatible to the size of pressuremeter probe. Hose pipe connecting the probe with the surface unit shall be of flexible tubing of single or coaxial type. The equipment should be able to reach a maximum pressure of 5000kPa for testing in soil and 8000kPa for testing in rock. The accuracy of measuring device shall be such that a change of 0.2% of static probe volume or 0.1% of probe radius is measurable as specified in IS:1892.

6.16.6 The probe shall be lowered down to the required depth as soon as the boring is completed so as to limit the expansion of soil due to release of stresses. The probe shall be held by a clamping device ensuring that it is not located at the interface of two different soil/rock layers.

6.16.7 The pressure shall be increased in at least 20 equal stages as directed by the engineer-in-charge. At each stage the pressure shall be maintained for a period of at least 60 seconds and volume reading shall be taken for 7 to 14 minutes. The volume of water sent into the probe during this period shall be measured upto an accuracy of 0.01cum. In case the water level in the volumeter drops rapidly, it is necessary to close the volumeter valve quickly so that the reservoir does not empty and allow air or gas into the tubing.

6.16.8 The test shall be carried out in stages till one of the following conditions occur.



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- a) The volume of the probe is doubled
- b) Ultimate failure of soil/rock occurs
- c) Load intensity of 5000kPa for soil and 8000kPa for rock is reached without failure.

6.16.9 If the shape of uncorrected pressure vs volume curve drastically varies from the ideal test curve, the test shall be repeated at no extra cost to the owner/BHEL at a different depth as decided by the engineer-in-charge.

6.16.9 On completion of the test, all results mentioned in Clause- 9.2 shall be reported.

7.0 FIELD INVESTIGATION - ROCK

7.1 Rock Drilling

Drilling in rock shall be done at specified locations or as per the directions of the engineer-in-charge. Before commencing drilling, it shall be proved that characteristics of rock has been met with as mentioned in clause 6.1.1(b). The starting depth of drilling in rock as mentioned in clause 6.1.1(b) shall be certified by the engineer-in-charge. The portion drilled in rock shall be backfilled with 1part of cement : 3 part of sand (1:3) grout unless otherwise specified and as directed by the engineer-in-charge.

7.1.1 Equipment

a) Core drilling shall be done by rotary motion using diamond bit. The feed or thrust to the drilling bit shall be actuated by hydraulic system. The rotary core drilling equipment and procedure for drilling shall conform to IS: 6926. The equipment shall be provided with necessary facilities to regulate the spindle speed, bit pressure and water pressure during core drilling to get a good core recovery.

b) Drilling shall be carried out with Nx size diamond tipped drill bits or impregnated diamond bits depending on the type of rock encountered. Double tube swivel core barrel of Type B conforming to IS: 6926 shall be used to ensure a good core recovery and to pick



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up cores from all layers of rock. Suitable core catchers shall be used to ensure continuous and good core recovery.

7.1.2 Procedure

a) The drilling fluid shall be clean water. Circulation of drilling fluid shall be started before the core barrel reaches the bottom of the hole to prevent cuttings or sludge from entering the core barrel at the start of coring. Drilling fluid shall be circulated continuously down the hollow rods and the sludge conveying the rock cuttings to the surface shall be collected.

b) When drilling through soft/weathered/fractured rock, water circulation must be reduced so as to avoid shattering/breaking of core.

c) The rotational speed of the bit (spindle speed), the amount of downward pressure applied on the bit (bit pressure) and water pressure shall be suitably adjusted and properly monitored so that the core is collected with least disturbance and to avoid shearing of the core from its base. Bit speed, bit pressure, water pressure for the type of bit for various rock types shall be as per Appendix A of IS:6926.

d) No drill run shall exceed 0.75m in length. This can be increased to 1.5m provided the core recovery observed is more than 80% in two successive 0.75m drill runs and on approval from the engineer-in-charge. If the core recovery is less than 20% then SPT shall be performed before commencing the next drill run as explained in Clause- 6.2.

e) If at any time blocking of the bit or grinding of the core is observed, the core barrel shall be immediately withdrawn from the borehole regardless of the length of drill run completed.

7.1.3 Observations

a) The colour of return water at regular intervals, the depth at which any change of colour of return water is observed, the depth of



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occurrence and amount of flow of hot water if encountered shall be recorded.

b) The depths through which a uniform rate of penetration was maintained, the depth at which a marked change in rate of penetration or sudden fall of drill rod occurs, the depth at which any blockage of drill bit causing core loss if any etc shall be recorded.

c) Any heavy vibration or torque noticed during drilling should be recorded together with the depth of occurrence.

d) Special conditions like the depth at which grouting was done during drilling, presence of artesian conditions, loss of drilling fluid, observation of gas discharge with return water etc shall also be observed and recorded.

e) During drilling operation, observation on return water, rate of penetration etc shall be recorded in a proforma as given in IS: 5313, Appendix-A.

7.1.4 Core Samples

a) Core samples shall be extracted by the application of a continuous pressure at one end of the core with the barrel held horizontally without vibration. Friable cores shall be extracted from the barrel directly into a suitable sized half round plastic channel section. Care shall be taken to maintain the direction of extrusion of sample same as that while coring to avoid stress reversal.

b) Immediately after withdrawal from the core barrel, the cores shall be placed in a tray and transferred into boxes specially prepared for the purpose. The boxes shall be made from seasoned timber or any other durable material and shall be indexed on top of the lid as per IS:4078. The cores shall be numbered serially and arranged in the boxes in a sequential order. The description of the core samples shall be recorded as per IS: 4464. Where no core is recovered, it shall be recorded as specified in the continuous record of core recovery and RQD in the corelog as per IS:11315, Part-II.



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c) The basic information for the description of rocks shall cover
i) degree of weathering ii) discontinuity spacing iii) strength iv)
colour v) grain size vi) structural condition, the mineralogy of the
grains and cementing material vii) rock name, special features like
major joint planes, features/laminations, faults etc.

7.2 Standard Penetration Test

The relevant hardness of rocks shall be tested in boreholes after every drill run of 0.75m in rock if core recovery observed is less than 20% or as directed by the engineer-in-charge. The testing equipment and arrangement shall be conforming to IS: 2131. The number of blows for each 75mm penetration to a total penetration of 450mm shall be recorded. Penetration for every 50 blows shall be recorded and the test shall be stopped at a total of 100 blows.

7.3 Plate Load Test

The test shall be conducted as described under Clause- 6.10 for soil subject to the following changes.

The test plate shall be of size 45cm x 45cm and at least 25mm thick. The maximum load shall be 1500 kN/sqm to be applied in stages of 25, 50, 100, 150, 200, 300, 400, 600, 800, 1000, 1200, 1400 and 1500 kN per sqm. Under each load the time Vs settlement shall be recorded and plotted.

7.4 Pressuremeter Test

This test shall be conducted as described under Clause- 6.16 for soil subject to the following changes. The test shall be carried out till one of the following condition occurs.

- a) The volume of the probe is doubled
- b) Ultimate failure of rock
- c) Load intensity of 8000 kN/sqm is reached without failure.

7.5 Cross Hole Shear Test

This test shall be conducted as described under Clause- 6.15 for soil.



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7.6 Permeability Test

Permeability test shall be conducted in bed rock inside the bore hole by pumping in water under pressure to determine the percolation capacity of the rock strata. This test shall be conducted in uncased and ungrouted sections of the drill hole. Clear and clean water shall be used for the purpose of both drilling and testing. The specification for the equipments and other accessories, test procedure etc shall conform to IS: 5529, Part-II. The length of the test section shall be either 1.5m or 3m as per field conditions and as per the directions of the engineer-in-charge. The level of water table (if any) in the bore hole shall be recorded and the drill hole shall be cleaned before the start of the test. Depending upon the depth of the test section, single or double packer method shall be adopted. Care shall be taken to maintain water tightness of all the joints and connections during testing.

a) Single Packer method

This method shall be adopted when the bottom elevation of the test section is the same as the bottom of the drill hole. The packer shall be fixed at the top level of test section such that only the test section lies below the packer. Water shall then be pumped through a pipe into the test section under a required pressure and maintaining it till a constant quantity of water intake is observed. The amount of water percolating through the hole shall be recorded at every 5 minute interval. The test shall be repeated by increasing the pressure at regular intervals upto a pressure limit as specified in IS: 5529, Part-II. The details and observations shall be recorded in a proforma as recommended in IS: 5529, Part-II, Appendix-B.

b) Double Packer method

This method shall be adopted when the permeability of an isolated section inside a drill hole is to be determined. Packers shall be fixed both at the top and bottom of the test section such that their spacing is exactly equal to the length of the test section. The test shall then be conducted as specified in Clause- 7.6(a).



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8.0 LABORATORY INVESTIGATION

8.1 Essential Requirements

a) All laboratory tests shall be conducted in an approved laboratory using approved apparatus complying with the requirements and specifications of Indian standards or other approved standards for this class of work. It shall be checked that the apparatus are in good working condition before starting the laboratory tests. Calibration of all the instruments and their accessories shall be done carefully and precisely.

b) Depending on the type of sub strata encountered, appropriate laboratory tests shall be conducted on soil and rock samples collected in the field. Laboratory tests shall be scheduled and performed by a qualified and experienced personnel who are thoroughly conversant with the work. Tests indicated in the schedule of items shall be performed on soil, rock and water samples as per relevant IS codes. One copy of all the laboratory test data records shall be submitted to the owner progressively every week. Laboratory tests shall be carried out concurrently with field investigation since initial laboratory test results could be useful in planning the later part of field work. **A schedule of laboratory tests shall be established by the contractor and the same shall be submitted and got approved by the engineer-in-charge before starting of laboratory tests.**

c) All samples whether undisturbed or disturbed shall be extracted, prepared and examined by a competent personnel properly trained and experienced in soil sampling, examination, testing and in using the apparatus as per the specified standards.

d) Undisturbed soil samples retained in liners or seamless tube samplers shall be taken out without causing any disturbance to the samples using suitably designed extruder just prior to actual testing. If the extruder is horizontal, proper support shall be provided to prevent the sample from breaking. For screw type extruders the pushing head shall be free from the screw shaft so that no torque is applied to the soil sample in contact with the pushing head. For soft clay samples, the sample tube shall be cut by means of a high speed



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hacksaw to specified test length and placed over the mould before pushing the sample into it with a suitable piston.

e) While extracting a sample from a liner or tube care shall be taken to see that its direction of movement is the same as that during sampling to avoid stress reversal.

f) On all undisturbed soil samples tested for bulk density, water content, grain size distribution, liquid limit and plastic limit tests shall also be performed.

g) On all rock samples tested for unconfined compression test, bulk density and water content tests shall also be performed.

h) After completion of all tests, a summary of test results for each soil and rock sample shall be presented in a proforma as enclosed in **Annexure-A & B** respectively. Chemical test results on soil and water samples shall be furnished in a tabular form separately.

8.2 Tests

Tests as indicated in this specification and as called for by the engineer-in-charge shall be conducted. The tests shall include the following.

a) Tests on Undisturbed and Disturbed Soil Samples

- Visual and engineering classification
- Sieve analysis and hydrometer analysis
- Liquid, plastic and shrinkage limits
- Specific gravity
- Chemical analysis
- Swell pressure and free swell index determination
- Proctor compaction
- California bearing ratio



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b) Test on Undisturbed Soil Samples

- Bulk density and moisture content
- Relative density (for sand)
- Unconfined compression test
- Box shear test
- Triaxial shear tests (depending on the type of soil and field conditions on undisturbed or remoulded samples)
 - i) Unconsolidated undrained
 - ii) Consolidated undrained test with the measurement of pore water pressure
 - iii) Consolidated drained
- One dimensional consolidation test

c) Test on Rock Samples

- Visual classification
- Water absorption, porosity and density
- Specific gravity
- Hardness
- Slake durability
- Unconfined compression test (both at saturated and at in-situ water content)
- Point load strength index
- Deformability test (both on saturated and dry samples)



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c) Chemical Analysis of Sub-soil and Ground Water

8.3 Salient Test Requirements

a) Remoulded soil specimen whenever desired shall be fully reworked at field density and natural moisture content. For conducting CBR test and triaxial test for dyke/road material the sample shall be remoulded to 95% of standard proctor density.

b) Triaxial shear test shall be conducted on undisturbed soil samples saturated by the application of backpressure. Only if the water table is at sufficient depth such that chances of its rising to the base of the footing are meagre or nil, the triaxial tests shall be performed on the specimens at natural moisture content. Each test shall be carried out on a set of three test specimens from one sample at cell pressures equal to 100, 200 and 300 kN/sqm or as required depending on the soil conditions.

c) Effective stress triaxial shear test shall be consolidated undrained with pore water pressure measurement. The test shall be conducted at cell pressures of 100, 200 and 300 kN/sqm ensuring complete consolidation at each stage.

d) Direct shear test shall be conducted on undisturbed soil samples. The three normal vertical stresses for each test shall be 100, 200 and 300 kN/sqm or as required depending on the soil conditions.

e) Consolidation test shall have loading stages of 10, 25, 50, 75, 100, 200, 400 and 800 kN/sqm. Rebound curve shall be recorded for all the samples by unloading the specimen at the in-situ stress of the specimen. Additional rebound curves shall also be recorded whenever desired by the engineer-in-charge.

f) Chemical analysis of sub-soil shall include determination of pH value, carbonate, sulphate (both SO_3 and SO_4), chloride and nitrate contents, organic matter, salinity and any other chemicals harmful to the foundation material. The contents in soil shall be indicated as percentage.



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g) Chemical analysis of sub-soil water sample shall include the determination of the properties such as colour, odour, turbidity, pH value and chemical contents such as carbonate, sulphate (both SO_3 and SO_4), chloride, nitrate, organic matter and any other chemicals harmful to the foundation material. The contents such as sulphate etc shall be indicated as ppm by weight.

h) The laboratory CBR test shall be performed on undisturbed or on remoulded sample as per the drawing or as directed by the engineer-in-charge in soaked and unsoaked conditions.

9.0 REPORT

9.1 General

a) On completion of all the field and laboratory works, the contractor shall submit a draft report containing geological information of the region, procedure adopted for investigation, field observations, summarised test data, conclusion and recommendations. The report shall include detailed borelogs, sub-soil sections, field test results, laboratory observations and test results in both tabular as well as graphical forms, practical and theoretical considerations for the interpretation of test results, the supporting calculations for the conclusions drawn etc. Initially, the contractor shall submit three copies of the report in draft form for the owner/BHEL's review.

b) After review of the draft report, the employer's comments will be intimated to the contractor. The contractor shall incorporate the comments and after getting the amended draft report approved, five copies of the detailed final report shall be submitted alongwith one set of reproducible of the graphs, tables etc. Any expenditure on account of redrafting, finalising the report etc shall be deemed to have been included in the quoted rates.

c) The detailed final report based on field observations, in-situ and laboratory tests shall encompass theoretical as well as practical considerations for foundation of different type of structures envisaged in the area under investigation. The contractor shall acquaint himself about the type of structures, foundation loads and other information required from the engineer-in-charge.



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9.2 Data to be Furnished

The report shall also include but not be limited to the following.

- a) A Plot Plan/Geotechnical Investigation Layout showing the location and reduced levels of all field tests e.g. bore holes, trial pits, plate load tests etc properly drawn to scale and dimensioned with reference to the established grid lines.
- b) Geological information of the area such as geomorphology, geological structure, lithology, stratigraphy and tectonic faults, seismicity of the region and site, core recovery and rock quality designation etc.
- c) Past observations and historical data if available for the area or for other areas with similar soil profile for similar structures in the surrounding areas.
- d) A true cross section of all individual boreholes and trial pits with reduced levels and co-ordinates showing the classification and thickness of individual stratum, position of ground water table, various in-situ tests conducted and samples collected at different depths and the rock stratum if met with.
- e) A set of longitudinal and transverse soil/rock profiles connecting various bore holes in order to give a clear picture of the variation of the subsoil strata as per IS: 6065.
- f) Water level contours and rock level contours
- g) Plot of standard penetration test 'N' values (both uncorrected and corrected) with depth for identified areas.
- h) Results of all field tests in tabular as well as in graphical forms.
- i) Results of all laboratory tests summarised (i) for each sample as well as (ii) a consolidated table giving the layer-wise soil and rock properties . All the relevant charts, tables, graphs, figures, supporting



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calculations, conclusions and photographs of representative rock cores and trial pits shall be furnished.

j) For all triaxial shear tests, stress vs strain diagrams as well as Mohr's circle envelopes shall be furnished. If back pressure is applied for saturation, the magnitude of the same shall be indicated. The value of modulus of elasticity 'E' shall be furnished for all tests along with relevant calculations.

k) For all consolidation tests the following curves shall be furnished.

e vs log P

e vs P and

Compression vs log t or square root of t (depending upon shape of the plot for proper determination of coefficient of consolidation)

The point showing initial condition (e_0 , P_0) of the soil shall be marked on the curves.

l) Values of compression index, coefficient of volume compressibility etc shall be furnished. The procedure adopted for calculating the compression index from the field curve and settlement of soil strata shall be clearly specified. The time required for 50% and 90% primary consolidation along with secondary settlement if significant shall also be calculated.

m) For pressuremeter tests, the following shall be furnished.

Calibration record including description of membrane and sheath on probes, dimensions of thick walled cylinder, length of flexible tubing, calibration curves and temperature etc.

Drilling record including borehole number, method of making borehole, log with soil type and condition, depth of water table in the borehole, weather and temperature etc.

Test record including type of test, date and time, depth of centre point of probe, volume readings at 30 and 60 second elapsed time and corresponding pressure readings and notes on any deviation from standard test procedure etc.



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Field pressuremeter, creep and air calibration curves indicating P_o , P_f and P_l . Corrected pressuremeter and creep curves indicating P_o , P_f , P_l along with calculation for the corrections.

n) Values of cohesion, angle of internal friction, pressuremeter modulus, shear modulus and co-efficient of sub-grade reaction along with sample calculations. Calculation for allowable bearing pressures and corresponding total settlements for shallow foundations and load carrying capacity calculation of piles in various modes etc.

o) Analysis and discussion of test results.

9.3

Recommendations

Recommendations shall be given areawise duly considering the type of soil/rock, structure, foundation type and ground water table etc in the area. The recommendations shall include but not be limited to the following.

a) Type of foundation to be adopted for various structures duly considering the sub strata characteristics, water table, total settlement permissible for the structures and equipments, minimum depth and width of foundation etc.

b) For shallow foundations the following shall be furnished with comprehensive supporting calculations.

i) Net safe bearing pressure for isolated square/rectangular footings and continuous strip footings of sizes 1, 2, 3, 4 & 5m at different founding depths of 1, 2, 3, 4 & 5m below ground level considering both shear failure and settlement criteria giving reasons for the type of shear failure adopted in the calculation.

ii) Net safe bearing pressure for raft foundation of widths greater than 6m at 2, 3, 4 & 5m below ground level considering both shear failure and settlement criteria.



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iii) Modulus of sub-grade reaction and modulus of elasticity from plate load test results along with time-settlement curves and load-settlement curves in both natural and log-log graph.

c) If piling is envisaged the following shall be furnished with comprehensive supporting calculations.

i) Type of pile and reasons for recommending the same duly considering the sub strata characteristics.

ii) Suitable founding strata for the pile.

iii) Estimated length of pile for 800kN (450mm dia.), 1050kN (500mm dia.), 1500kN (600mm dia.) and 4500kN (1070mm dia.) capacities. End bearing and frictional resistance shall be indicated separately. Safe lateral and tensile load carrying capacities of pile with supporting calculations.

iv) Magnitude of negative skin friction if any.

d) Coefficient of permeability of various sub-soil and rock strata based on in-situ permeability tests.

e) Cone resistance, frictional resistance, total resistance and settlement analysis for different size of foundations.

f) Electrical resistivity of sub-soil based on electrical resistivity tests including electrode spacing vs cumulative resistivity curves.

g) Dynamic soil properties such as dynamic shear modulus and Poisson's ratio etc from cross-hole shear and seismic refraction tests and coefficient of elastic uniform compression from cyclic plate load tests.

h) Suitability of the soil for construction of roads and embankments, their stable slopes for shallow and deep excavations, active and passive earth pressures, earth pressure at rest and modulus of elasticity as a function of depths for the design of underground structures etc.



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i) Suitability of locally available soils at site for filling and back filling purposes.

j) If expansive soil is met with, then recommendation on removal or retainment of the same under the structures/roads etc shall be given. In the latter case, detailed specifications of any special treatment required including specification for materials to be used, construction method, equipments to be deployed etc shall be furnished.

k) Protective measures based on chemical nature of soil and ground water with due regard to the potential deleterious effects on concrete, steel and other building materials etc. Remedial measures for sulphate attack and acidity shall be dealt in detail.

l) Susceptibility of sub soil strata to liquefaction in the event of earthquake. If so, recommendation for remedial measures.

m) Identification of any other potential geotechnical problems and their remedial measures.

n) Description of measures required for erosion control.

o) Identification of corrective measures required for the improvement of sub surface conditions such as removal of poor sub soil/material and in-situ densification etc. If ground improvement is recommended then its detailed specification, specification for the materials to be used, construction method, equipments to be deployed etc shall be furnished.

10.0 RATES & MEASUREMENTS

10.1 RATES

a) The item of work in the schedule of quantities describes the work very briefly. The various items of the schedule of quantities shall be read in conjunction with the corresponding sections in the technical specification including amendments and additions if any. For each item in the schedule of quantities, the bidder's rates shall include all the activities covered in the description of the items as well as for



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all necessary operations in details described in the technical specification.

b) No claims shall be entertained if the details shown on the released for construction drawings differ in any way (e.g. location and depth of tests, number of tests etc) from those shown on the tender drawings.

c) The unit rates quoted shall include minor details which are obviously and fairly intended and which may not have been included in these documents but are essential for the satisfactory completion of the work.

d) The bidders quoted rates shall be inclusive of providing all equipments, men, materials, skilled and unskilled labours, making observations, establishing the ground level and coordinates at location of each bore hole, test pit etc by carrying levels from one established bench mark and distances from one set of grid lines furnished by the engineer-in-charge. Also no extra payments shall be made for conducting the standard penetration tests, collection, packing and transportation of all the samples and cores, recording of all results and submitting them in approved formats etc.

e) The quoted rates for trial pits/plate load tests/ cyclic plate load tests shall be inclusive of dewatering and backfilling etc.

f) The quoted rates for drilling in rock shall satisfy the requirements as furnished in specification.

g) The rates quoted for conducting pump out test shall be inclusive of boring a well of 400mm diameter, providing and installation of perforated GI/MS pipes and observation pipes etc .

h)The rates quoted for conducting cross hole shear test shall be inclusive of necessary boring, providing PVC pipes, grouting, geo-phones, backfilling the holes after completion of testing etc.

i)The rates quoted for laboratory tests shall include preparation of samples, performing tests, recording, analysis and submission of data etc.



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j) The bidder shall submit a scheme showing the arrangement and equipment proposed to be used for conducting the site work along with rates. However the minimum number of staff and equipments to be deployed/mobilised for site works shall be as per **Annexure-C & D** respectively.

10.2 MEASUREMENTS

a) All measurements shall be in SI Units.

b) Length shall be measured in metres (m) correct to two places of decimals. Areas shall be worked out in square meters(Sqm) and volume in cubic meters(Cum) rounded off to two decimals.

c) Certain tests have to be conducted in the bore holes and trial pits etc. Such bore holes and trails pits etc shall be measured once only and not again just because the tests are conducted therein.

d) The depth of penetration due to SPT at the bottom of bore hole shall not be considered for the measurement of bore hole depth.

e) Pits shall be measured in Cum.

f) Coring in rock with diamond bit shall be measured in length(metre) correct to two places of decimal for the actual cored length satisfying the criteria of specification.

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ANNEXURE - A SUMMARY OF LABORATORY TEST RESULTS ON SOIL SAMPLES																													
BORE HOLE/ TRIAL PIT NO.	DEPTH (m)	TYPE OF SAMPLE	DENSITY (kN/Cum)		WATER CONTENT (%)	PARTICLE SIZE (%)				ATTERBERG'S LIMITS				SOIL		STRENGTH TEST		CONSOLIDATION TEST				SWELL TEST		COMPACTION TEST		RELATIVE DENSITY	PERMEABILITY(m/hr)	REMARKS	
			BULK	DRY		GRAVEL	SAND	SILT	CLAY	LL	PL	PI	SL	IS CLASSIFICATION	DESCRIPTION	SPECIFIC GRAVITY	TYPE	C	ϕ	e_o	Pc	Cc	p	m_v	Cv				S.Pr
<u>For type of sample</u> DS Disturbed soil sample UDS Undisturbed soil sample RMS Remoulded soil sample WS Water sample <u>For strength test</u> UCC Unconfined compression test VST Vane shear test Tuu Unconsolidated undrained triaxial test Tcu Consolidated Undrained Triaxial test with pore pressure Tcd Consolidated drained triaxial test (Note: Replace T by D for Direct Shear test)												<u>For others tests</u> LL Liquid Limit (%) PL Plastic Limit (%) PI Plasticity Index (%) SL Shrinkage limit (%) C Cohesion (kN/Sq.m) ϕ Angle of internal friction (degrees) S.Pr Swelling pressure (kN/Sq.m) FSI Free swell index (%) e_o Initial Void ratio Pc Preconsolidation pressure (kN/Sq.m) Cc Compression index												p Pressure range (kN/Sq.m) m_v Coefficient of volume compressibility (Sq.m/kN) Cv Coefficient of consolidation (Sq.m/hr) MDD Maximum Dry Density (kN/Cum) OMC Optimum moisture content (%) CBR California Bearing Ratio (%)					



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ANNEXURE-B

SUMMARY OF LABORATORY TEST RESULTS
ON ROCK CORE SAMPLES

BORE HOLE NO.	
DEPTH	
CORE PIECE NO.	
MOISTURE CONTENT	
SPECIFIC GRAVITY	
HARDNESS	
POROSITY	
DRY DENSITY	
SLAKE DURABILITY	
POINT LOAD STRENGTH INDEX	
DEFORMABILITY (DRY /SATURATED)	
UNCONFINED COMPRESSIVE STRENGTH (INSITU/SATURATED)	
CORE DESCRIPTION	
REMARKS	



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ANNEXURE-C

MINIMUM STAFF TO BE DEPLOYED

<u>S.No.</u>	<u>Description</u>	<u>No. of persons</u>
1.	Geotechnical Engineer	To be filled by respective BHEL Power Sector Region project wise considering the project schedule and actual scope of work
2.	Engineering Geologist	
3.	Supervisor	
4.	Qualified Surveyor	
5.	Rig Operators	
6.	Mechanic	



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ANNEXURE-D

LIST OF EQUIPMENTS TO BE MOBILISED TO SITE (MINIMUM)

<u>S.No.</u>	<u>Description</u>	<u>Quantity</u>
1	Shell and auger boring set	To be filled by respective BHEL Power Sector Region project- wise considering the project schedule and actual scope of work
2.	Rotary core drilling unit (Hydraulic feed)	
3.	Static cone penetration test equipment - 20T capacity	
4.	Dynamic cone penetration test equipment	
5.	Plate load test set up	
6.	Field permeability test set up	
7.	Menard pressuremeter or equivalent set up with limit pressure of 80kg/sq.cm.	
8.	Seismic refraction test set up	
9.	Electrical resistivity test set up	

Note:

Additional equipments shall be mobilized if required as per the directions of the engineer-in-charge to match the work schedule.

**1X800 MW TSGENCO KOTHAGUDAM TPS STAGE-VII,
PALONCHA-FGD SYSTEM**

**TECHNICAL SPECIFICATION FOR
TOPOGRAPHICAL SURVEY**

SPECIFICATION NO PE-DC-K90-601-C001

VOL - IIB



**PROJECT ENGINEERING MANAGEMENT
POWER PROJECT ENGINEERING INSTITUTE,
HRD & ESI COMPLEX,
PLOT NO.: 25, SECTOR-16A,
NODIA, - 201 301, (UP)**



**STANDARD SPECIFICATION FOR
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**STANDARD SPECIFICATION
FOR
TOPOGRAPHICAL SURVEY**

1.0 GENERAL

- 1.1 This specification covers the technical requirements for carrying out **“Topographical Survey and Allied Works”** for the entire area/areas indicated for locating the power plant and its other systems. The work shall be executed in accordance with the specification and good standard of practice necessary to fulfil the objectives of the survey work strictly in accordance with the instruction and satisfaction of the engineer-in-charge.

2.0 SCOPE

- 2.1 The scope of work includes the following.
- 2.1.1 Carrying out topographical survey and preparation of plans (maps) and report of the entire area/areas indicated for locating the power plant and its other systems.
- 2.1.2 Carrying out bench mark (GTS / any other reference bench mark approved by the engineer-in-charge) to site/sites under survey by parallel levelling, establishing and constructing bench mark, grid and reference pillars in the field.
- 2.1.3 Spot level survey of the entire area/areas at specified intervals and development of contours.
- 2.1.4 Carrying out cross-section of canal/nallah as specified in the schedule of quantities by taking spot levels at 5m interval or less depending upon the site conditions and instructions of the engineer-in-charge.
- 2.1.5 Providing survey instruments, construction equipments, tools & plants, materials, labours, qualified surveyors, clearance of jungles, cutting of trees, earth work, scaffoldings, transport, supervision by competent engineers/surveyors, testing of materials, full insurance and all other incidental items as may be necessary for successful completion of the surveying , mapping and construction works etc.



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2.1.6 Furnishing all field data and drawings on floppies apart from hard copies.

2.1.7 Furnishing survey report as described in details in the succeeding paragraphs is also included in the scope of work.

3.0 TENDER DRAWING

3.1 The enclosed Topographical Survey & Geotechnical Investigation Layout (**Drg. No. PE-DG-K90-601-C001**) indicate the tentative location of the area/areas to be surveyed for locating the project. The location/area(s) indicated in the drawing is subject to change that may be necessary during actual execution of the work. The work shall be carried out as per the instructions of the engineer-in-charge.

3.2 The bidder must visit the site prior to submitting his quotations to acquaint himself fully with the nature, type, scope of work and involvement therein. The rates quoted shall remain firm during the entire period of execution till completion of the work and any additional claim for lack of knowledge shall not be entertained.

4.0 SPECIFICATION

4.1 The work shall be executed according to the specification and good standard of practice necessary to fulfil the objectives of the survey work strictly in accordance with the instruction and satisfaction of the engineer-in-charge.

4.2 The specification shall be read in conjunction with the description of items in the schedule of quantities. The bidder shall refer to the employer for any discrepancy which may exist between the drawings, specification and corresponding items of the schedule for clarification before submission of quotation and the employer's decision as to the clarity of the point raised shall be final and binding on the bidder.

4.3 The work at site shall be carried out under the full time supervision by a qualified engineer or a senior surveyor. The engineer or senior surveyor shall be responsible for and capable of co-ordinating the work of the surveying teams, setting out the work accurately, identifying immediately and positively the type of instruments to be deployed and the



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methodology of surveying to achieve speed and accuracy in the work and shall be fully conversant with the theory and techniques of traversing, triangulation, spot levelling survey work etc covered by this contract.

4.4 The contractor shall be responsible for the proper execution of the work to such lines and grades as specified in the specification, drawings or as directed by the engineer-in-charge from time to time.

4.5 After arrival of the instruments to site, these shall not be moved out of the site by the contractor without the prior written permission and approval of the engineer-in-charge. In case the instruments are moved out of the site without the prior written permission and approval, the engineer-in-charge/owner reserves the right to deduct from the contractor's bill(s) the amount as considered reasonable and or to withheld the payments for the work done. The decision of the engineer-in-charge in this regard shall be final and binding on the contractor.

5.0 CARRYING OUT AND SETTING UP OF BENCH MARK & REFERENCE PILLARS

5.1 The contractor shall carry out bench mark by fly-levelling from the nearest GTS bench mark or available source as approved by the engineer-in-charge and establish the same on a permanent bench mark to be constructed as per **Fig.1** at a convenient location(s) at site as per the instructions of the engineer-in-charge. All subsequent transfer of levels shall be carried out with respect to this bench mark.

5.2 The work shall also include constructing permanent reference pillars as per **Fig.2** at suitable locations as approved by the engineer-in-charge. These reference pillars shall be labelled permanently with their respective co-ordinates and reduced levels for future use. The bench mark and reference pillars shall be shown on the survey drawings.

5.3 The fly levelling should be carried out using two good quality levels simultaneously. The levelling instruments should always be kept free of collimation error which should be checked and adjusted before start of the work every day. A record of adjustments should be kept in the field book.



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5.4 While carrying bench mark to the project site, levels shall be established on the permanent objects like culverts etc at least on one object in every 500m along the route with adequate description about the objects and levels to be mentioned in the level book/survey report to facilitate locating these objects later on. The route for transferring levels shall follow the existing roads as far as possible and this route shall require the approval of the engineer-in-charge before the commencement of work.

5.5 Closing error in levelling should be limited to $12 \sqrt{L}$ mm, where L is the length of the route in km.

5.6 Payment shall be made on the basis of shortest length of the said route measured between the original reference bench mark and the bench mark to be established at site.

6.0 TOPOGRAPHICAL SURVEY AND MAPPING

6.1 Positions both in plan and elevation of all natural and artificial features of the area like waterways, railway tracks, trees, cultivation, houses/any structure, fences, pucca and kutcha roads including culverts and crossings, foot tracks, other permanent objects like telephone posts and transmission towers etc are to be established and subsequently be shown on survey maps by means of conventional symbols (preferably symbols of Survey of India maps). All earth deposits, depressions, hills and valleys within the area/areas are to be surveyed and plotted on maps by contours. Necessary levelling work of the entire area/ areas are to be surveyed and plotted on maps by establishing horizontal location so that location and sketching of contours for the area/ areas can be done at specified intervals and in specified scales on maps. In case of steep slopes and dense jungle etc where gridding is not possible, the method of survey, contour intervals etc shall be decided by the engineer-in-charge at site. Any unusual condition or formations on the ground, location of rock outcrops and springs/falls etc shall also be noted and plotted on the maps.

6.2 The field work shall be done with total station equipment in the following steps.

- i) Establishing horizontal and vertical controls and locating reference grids and bench mark in the area.



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ii) Surveying for establishing spot levels and plotting contours.

iii) Surveying for locating natural and man made details as described earlier.

6.3 The grids for the survey work shall be established in N-S & E-W direction corresponding to magnetic north or the plant north as directed by the engineer-in-charge.

7.0 TRAVERSING

7.1 Triangulation or traversing or a combination of both shall be adopted for the purpose of establishing horizontal control and in order to determine the exact relationship between various existing points on the ground so that surveys required under the present scope of work and in future may be co-related and tied together.

7.2 Total intelligent station instruments should be deployed to achieve the specified accuracy of the work. Proper precautions for avoiding graduation errors, instrumental and personal errors should be scrupulously observed.

7.3 From main traverse/triangulation station, subsidiary stations shall be established at suitable interval to cover the entire area. Level of these stations shall be based on the bench mark established in the survey area. Occupying the main & subsidiary stations, all major details shall be surveyed by total station equipment. Further classification of details if necessary shall be carried out by plane table method.

7.4 The closing error in traverse shall not exceed one in twenty five thousand (1 in 25000) in terms of length or $L\sqrt{N}$ seconds (total in angular measurement) whichever is less (where L is the least count of the instrument and N is the number of stations).

8.0 CONTOURING

8.1 Contractor shall carry out spot level surveying at an interval of 10m for contouring the area/areas. Levels shall also be taken on all traverse stations and on salient points located at random over the area (ground points). Contours are to be interpolated at 0.5m intervals after the above



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points are plotted. The contours shall not be just interpolated but properly surveyed on the ground so that features falling between the two successive levels are also picked up. Sufficient points properly distributed over the entire area shall be located and levels taken so that accurate contouring can be done. At places of sharp curvature or abrupt change in direction and elevation, points selected shall be close to each other. Salient points on ridge lines and valley lines shall also be measured.

8.2 Cross-section of canal/nallah if any shall be prepared by taking spot levels at 5m interval or less depending upon the site conditions and instructions of the engineer-in-charge. For contouring within reservoirs /ponds sounding technique shall be adopted.

8.3 Levelling operation shall always start from main/subsidiary stations whose levels are based on the bench mark established in the survey area and end on the same.

8.4 Closing error in levelling shall not exceed the limit mentioned in clause 5.5.

9.0 CONSTRUCTION OF BENCH MARK, REFERENCE & GRID PILLARS

9.1 Bench marks shall be constructed as per the sketch at **Fig - 1** for each isolated area as per the directions of the engineer-in-charge. The reduced level of the top of hemispherical ball and co-ordinates with respect to survey grid shall be engraved clearly on the top of the bench mark pillar. The top surface of MS plate alongwith the hemispherical ball shall be painted with anticorrosive paint.

9.2 There shall be one reference pillar constructed within one meter of each bench mark pillar as per the sketch at **Fig - 2**. The relation of these pillars with respect to the bench mark pillar and survey grids should be established and indicated in the drawings. The reduced levels and co-ordinates should be transferred & punched on the top of the steel plate of reference pillars. The top surface of MS plate shall be painted with anticorrosive paint.



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9.3 Grid pillars as per the enclosed sketch at **Fig - 2** shall be constructed at the intersection of the 200m grid lines which should be established at site in N-S and E-W direction corresponding to magnetic north or plant north or as directed by the engineer-in-charge and their co-ordinates with reference to the survey grids shall be engraved on the top of the pillars. The top surface of MS plate shall be painted with anticorrosive paint. The pillars should be white washed.

9.4 The payment shall be made on the number of bench mark and reference/grid pillars actually constructed at site as per the directions of the engineer-in-charge.

10.0 Route Survey

10.1 Route Survey shall be conducted along a narrow strip/belt of the terrain selected after field reconnaissance or as directed by Owner/Engineer at Site. Topographical survey for existing storm drainage lines as well as for routing pipe lines, transportation and communication lines, etc. shall be conducted. Longitudinal profiles as well as cross-sections shall be taken at 50 m intervals or less in nearly flat/undulating terrains and at 20 m intervals in hilly terrains, as per direction of the Owner/Engineer. All cross-sections shall be with reference to centre line of corridor showing levels at every 2 - 5 metre intervals and all breaks in the profile. The width of strip/corridor shall be as specified in the drawing or as directed by Owner/Engineer.

11.0 PROGRESS REPORT

11.1 The contractor shall prepare and submit progress report in three copies every week to the engineer-in-charge without fail indicating status of setting out of the grids, total area surveyed, grid pillars constructed, methodology adopted for surveying and instruments deployed including staff working on the site and difficulties encountered during execution of the work etc.

11.2 The submission of such reports and review thereof by the engineer-in-charge shall not be deemed to absolve the contractor of his responsibility of timely completion of the assignment as per the time schedule indicated.



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12.0 PREPARATION & SUBMISSION OF SURVEY MAPS

- 12.1 The contractor shall submit survey maps of the site in 1:1000 scale indicating grid lines and contour lines, demarcating all permanent features like roads, railways, waterways, buildings, power lines, natural streams, trees etc. Project area should have two originals, one showing spot levels and contours (with contour line interval of 0.5m) with grid lines and other with grid lines, contour lines and permanent features.
- 12.2 All the maps should be prepared in digitised forms using Inkjet/Pen plotter and standard computer software like Autocad - 12/13/14 or auto civil on standard A-0 size polyester base film. The block of name plate of all the drawings should be as per BHEL standard.
- 12.3 The contractor shall submit three copies of all the maps for review and approval of the engineer-in-charge. After approval, 6(six) prints of all the final maps alongwith a set of the originals on polyester base film and a floppy shall be submitted. Copies of the maps shall be submitted in proper flappers and original polyester base drawings should be handed over in proper card board covers indicating index of drawings.
- 12.4 Payment shall be made on the area actually surveyed as covered by the plan.

13.0 SUBMISSION OF FIELD DATA AND REPORT

- 13.1 Contractor shall submit all data pertaining to the survey in original to the engineer-in-charge.
- 13.2 All field data shall be submitted to the engineer-in-charge from time to time as per progress of the work.
- 13.3 Three copies of draft report shall be submitted on the completion of the field work for review and approval of the engineer-in-charge. The report should give the introduction of the site, methodology adopted for surveying the areas, calculation of errors, transfer of bench mark and any other calculation required for surveying and preparation of the survey maps.



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13.4 Details of trees with their name, numbers and girths shall also form part of the survey report.

13.5 The survey report should also cover the following.

- General site observation such as location of access roads, river and nallah courses, irrigation canals etc.
- Presence of any well and /or tube well in the site and water level in them shall also be indicated.
- Whether there is any rock outcrops in the site.
- Existing drainage pattern of the site, possibility of water logging and high flood level of the area.

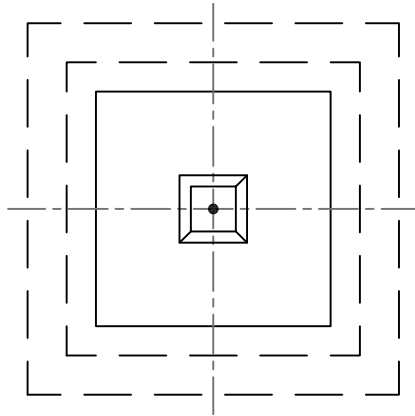
13.6 Final survey report shall be submitted in 6 copies of standard A4 size sheets properly bound and printed using good quality paper and material.

14.0 CLEARANCE OF JUNGLES AND CUTTING OF TREES

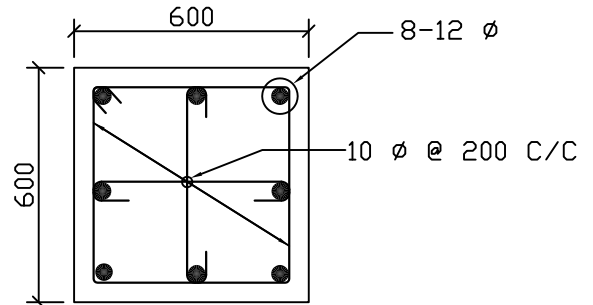
Clearance of jungles and cutting of trees as required to facilitate the survey work also form part of the contract. Necessary permission of concerned public bodies shall be secured by the owner. The contractor shall ensure that minimum amount of jungles are cleared and trees are properly cut under the direction of public bodies. The trees and jungles as cleared shall be stacked and handed over to the engineer-in-charge/owner. No extra payment is admissible under this account.

15.0 INSPECTION

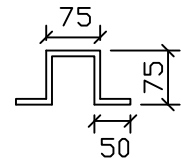
The contractor shall make all arrangements of men, material, instruments, surveyors, necessary records and field data etc at the work site for checking of the work to the satisfaction of the engineer-in-charge or his authorised representative during the progress and on successful completion of the work. The contractor shall intimate well in advance before final decamping from work site so that the final work can be inspected by the engineer-in-charge. This will form a part of acceptance of the work for release of payments.



VIEW 1-1



SECTION 2-2



LUG DETAILS

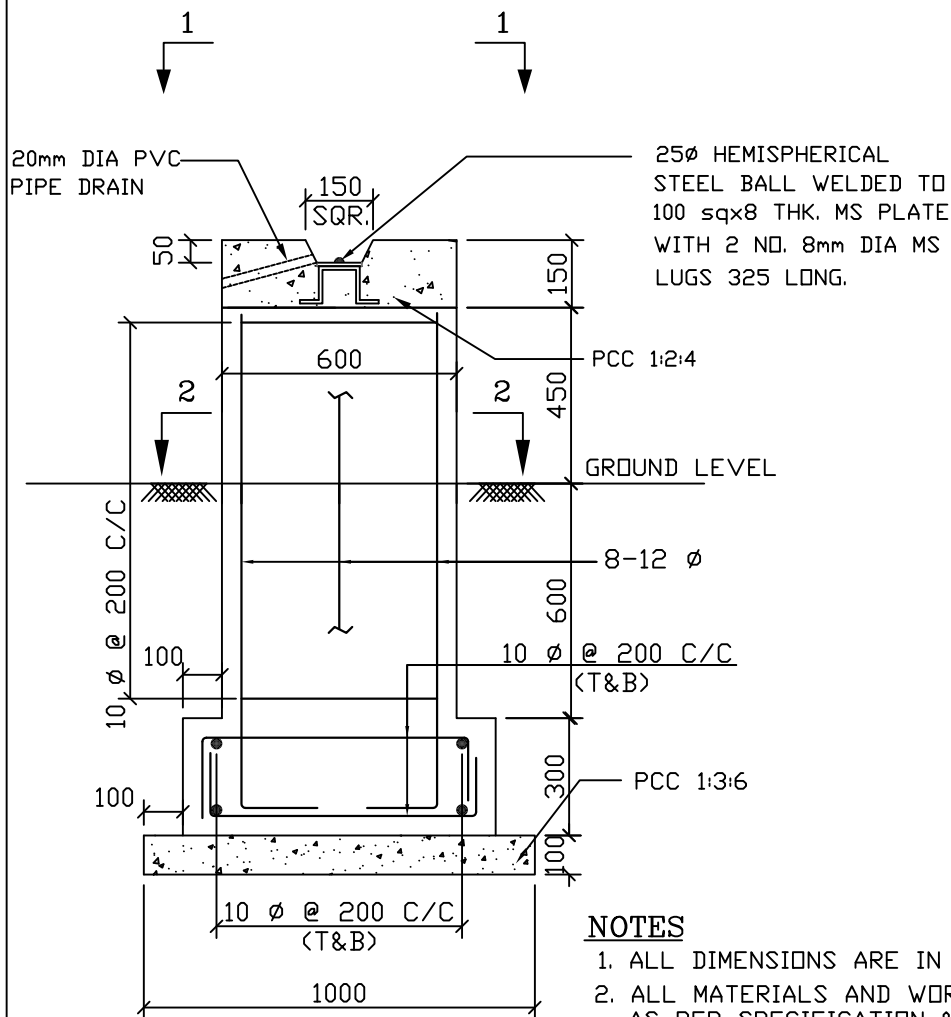
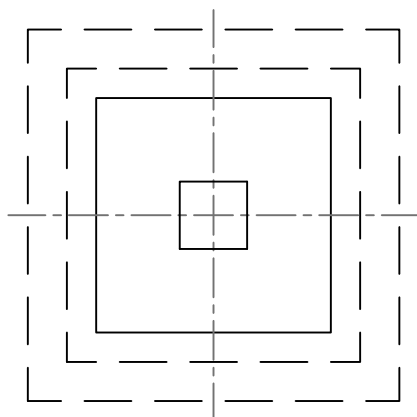


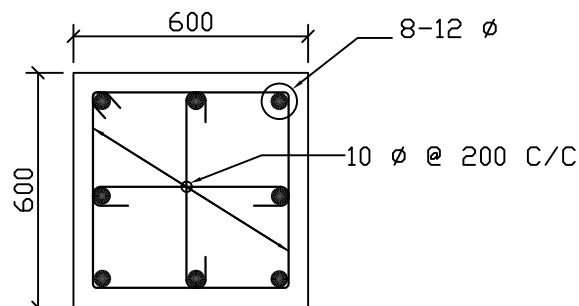
FIG. 1
BENCH MARK PILLAR

NOTES

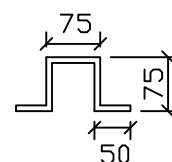
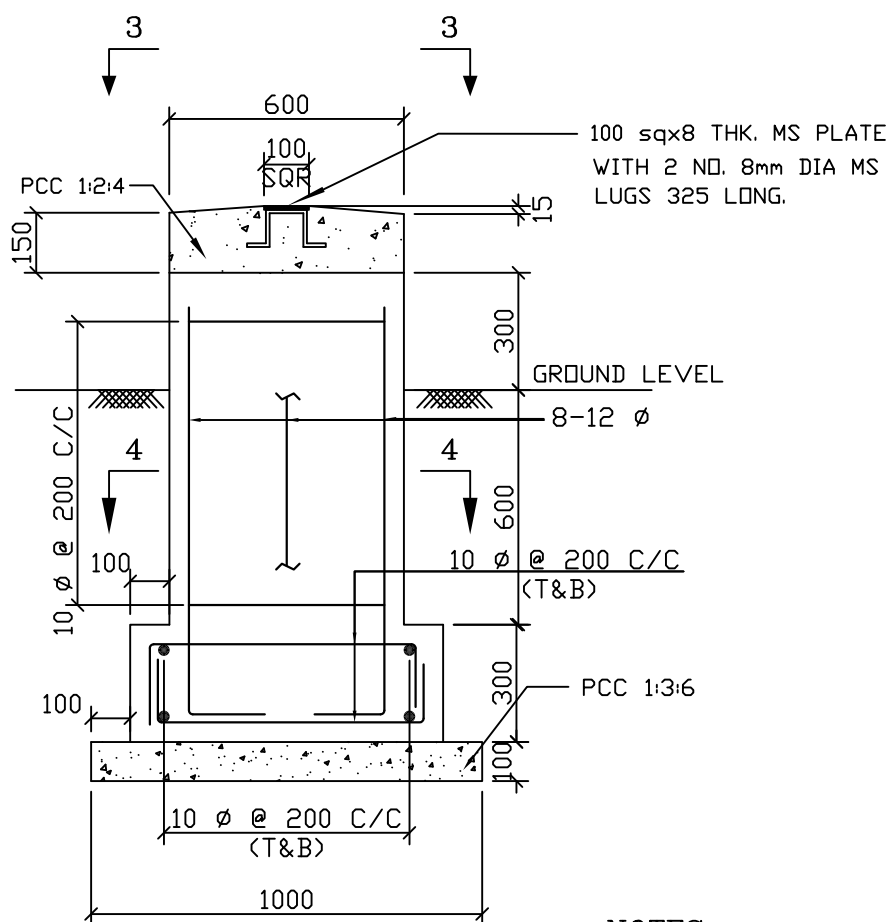
1. ALL DIMENSIONS ARE IN MM
2. ALL MATERIALS AND WORKMANSHIP SHALL BE AS PER SPECIFICATION & RELEVANT IS CODES.
3. GRADE OF CONCRETE SHALL BE M25.
4. REINFORCEMENT STEEL SHALL BE TMT BAR OF Fe500 GRADE.



VIEW 3-3



SECTION 4-4



LUG DETAILS

FIG. 2
GRID PILLAR/REFERENCE PILLAR

NOTES

1. ALL DIMENSIONS ARE IN MM
2. ALL MATERIALS AND WORKMANSHIP SHALL BE AS PER SPECIFICATION & RELEVANT IS CODES.
3. GRADE OF CONCRETE SHALL BE M25.
4. REINFORCEMENT STEEL SHALL BE TMT BAR OF Fe500 GRADE.



IDENTIFICATION NUMBER	DESCRIPTION
1	POWER HOUSE BUILDING INCLUDING ELECTRICAL BAY
2	COAL MILL
3	STEAM GENERATOR
4	ESP
5	CHIMNEY
6	SPACE FOR FGD PLANT
7	TRANSFORMER YARD
8	400 KV SWITCHYARD
9	COMPRESSOR HOUSE
10	MILL RECELS LOADING HOPPERS
11	ASH WATER CUM SLURRY PUMP HOUSE
12	ASH WATER PUMP HOUSE
13	FLY ASH SLOES
14	RAW WATER CUM SLURRY PUMP
15	BOTTOM ASH HOPPER
16	RAW WATER STORAGE RESERVOIR
17	CLARIFIERS
18	DS SET
19	SIDE STREAM FILTRATION AREA
20	ON TREATMENT & CHLORINATION AREA
21	FOAM PUMP HOUSE
22	OW PLANT
23	OW WATER STORAGE TANK
24	BOOSTER PUMP HOUSE
25	CHEMICAL HOUSE
26	OPU REGENERATION AREA
27	NEUTRALISING PIT
28	SWITCH YARD CONTROL ROOM
29	COOLING TOWER
30	COOLING WATER PUMP HOUSE
31	TRACK HOPPER
32	WAGON TIPSER
33	CRUSHER HOUSE
34	STACKER CUM RECLAMER (2 Nos.)
35	CRUSHED COAL PILE
36	CHP CONTROL/ SWITCHGEAR ROOM (MCC-1)
37	AHP COMPRESSOR HOUSE, CUM AHP CONTROL / AHP CONTROL/ SWITCHGEAR ROOM
38	THICKENER
39	SERVICE BUILDING
40	ESP CONTROL ROOMS
41	CONDENSATE STORAGE TANK
41A	MAKE-UP PUMP HOUSE
42	COAL PILE SETTLING BASIN
43	SLO UTILITY BUILDING
44	BRANNING & DRYING ROOM (DELETED)
45	PIPE/CABLE RACK (SSG)
46	RAW WATER PUMP HOUSE
47	CARRIER BOW WINDING SYSTEM
48	MATERIAL ENTRY GATE
49	CLARIFIED WATER STORAGE TANK & PUMP HOUSE
50	CENTRIFUGAL BUILDING
51	SLUDGE PIT
52	HFO & LDO STORAGE TANK DYKE AREA
53A	HFO & LDO UNLOADING PUMP HOUSE
53B	HFO & LDO FORMERING PUMP HOUSE
54	WATCH TOWER
55	BULLDOZER SHED
56	FIRE TANK
57	FIRE WATER STORAGE TANK & PUMP HOUSE
58	WEIGH BRIDGE (SSG)
59	SERVICE WATER OVER HEAD TANK (15.0M DIA)
60	WEIGH BRIDGE FOR INDOOR STORAGE (PEM)
61	PIPE/CABLE RACK (PEM)
62	PURE OIL WATER SEPARATOR PIT
63	C.M.B. WASTE TREATMENT SYSTEM
64	BOILER WASH WATER SLUMP
65	AMBIENT AIR QUALITY MONITORING STATION
66	T.C. WASH WATER SLUMP
67	NOT USED
68	TREATED WATER PIT (SSG SCOPE)
69	ADMINISTRATIVE BUILDING
70	CANTEEN
71	INDOOR STORE
72	MAIN GATE
73	NOT USED
74	NOT USED
75	AHP SLO UTILITY MCC ROOM
76	CHP MCC-2
77	DS PUMP HOUSE-1 (DELETED)
78	CHP PUMP HOUSE
79	WT CONTROL ROOM-1&2
80	AUXILIARY BOILER
81	CHEMICAL LAB
82	CHEMICAL HOUSE (SSG)
83	SECURITY OFFICE FOR MATERIAL ENTRY GATE
84	GAS CYLINDER SHED
85	CHP MCC-3
86	CHP MCC-4
87	ACW/ANCO PUMP HOUSE FOR FGD
88	TRANSFORMER FOR FGD
89	FGD CONTROL ROOM
90	LIME STONE GRINDING BUILDING
91	CEPHEM DEWATERING BUILDING
92	UNLOADING LIMESTONE CHIMNEY
93	LIMESTONE UNLOADING HOPPER
94	CRUSHER HOUSE
95	LIMESTONE SLURRY STORAGE TANK
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97	WASTE WATER TANK
98	SECONDARY HYDROCHLORINE FEED TANK
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100	COH
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102	EXHAUSTION BLOWER
103	WCC PUMP
104	PIPE RACK FOR FGD

NOTES:-

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- THE FINISHED FLOOR LEVEL (F.F.) OF POWER HOUSE BUILDING GROUND FLOOR IS EL. 0.0M WHICH CORRESPONDS TO 0.5M (RL. 99.5M) ABOVE F.F.G.
- THE EXISTING BUILDINGS SHOWN ALONG THE POWER PLANT AREA ETC. AND AS REQUIRED FOR THE CONSTRUCTION OF THE FACILITIES FOR UNIT #12 ARE TO BE DEMOLISHED.
- THE PIPE RACK SHOWN IS INDICATIVE ONLY.
- 400KV OUTGOING LINES ARE TO BE ALIGNED ONLY CLEARING THE RE-ROUTED 220KV LINES RUNNING ALONG THE PLANT BOUNDARY.
- RE-ROUTING OF EXISTING ROAD IN THE NEAR PROPOSED SWITCHYARD AND CHP AREA TO BE SUFFICIENTLY INCORPORATED IN THIS DRAWING BY TIS/ECO.
- CUT & FILL ARE HAVE BEEN CONSIDERED TO PLANT GATES. REFERENCE POINT HAS BEEN INDICATED.
- DUE TO POWER MARSHALLING YARD, RAIL TRACKS ARE COMING OVER RAW WATER PPEL. FENCE, CULVERT TO BE PROVIDED AS INDICATED IN THE PLOT PLAN AND NECESSARY ARRIVAL FROM RITES/ OTHER AGENCIES TO BE ARRANGED BY TIS/ECO.
- MARSHALLING YARD, RAIL TRACKS ARE CONSIDERED AT FOL. 104.5M.
- THE CO-ORDINATES OF APPROACH ROADS NOT SHOWN IN THIS REVISION SHALL BE INDICATED IN FURTHER REVISION OF PLOT PLAN AS PER RESPECTIVE FACILITY REQUIREMENTS.

REFERENCE DWG. :-

1. PLOT PLAN	PE-DG-410-100-M001-RB
2. DC ROOM LAYOUT PLAN	IS-3-05-694-800-A011
3. GATE COMPLEX	PE-DG-410-441-0024
4. ADMINISTRATIVE BUILDING	PE-DG-410-441-0002
5. TRANSFORMER YARD LAYOUT	PE-DG-410-100-0001
6. TO EQUIPMENT LAYOUT DRAWING	PE-DG-410-100-0003
7. GENERAL ARRANG. OF BOILER	0-00-022-7819
8. GENERAL ARRANG. OF ESP	0-00-111-2708
9. LAYOUT OF D SYSTEM	0-00-020-3876
10. VARIOUS PIPE & TRUSTE LAYOUT	PE-DG-410-100-100-M051 TO M056
11. SWITCHYARD LAYOUT	IS-0-377-010-001
12. ON CHANNEL LAYOUT SIZING	PE-DG-410-100-100-M003

CUSTOMER:
TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA, INDIA
1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12 FGD, PALONCHA

OWNER'S CONSULTANT:
DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA MUMBAI CHENNAI NEW DELHI

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

JOB NO. 439
STATUS CONTRACT
DISTRIBUTION

DEPT. CODE
NAME
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DEPT. SCALE: 1:3000
DRAWING NO. PE-DG-439-100-M001
SHEET 1 OF 1 REV. 00

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11. SWITCHYARD LAYOUT	IS-0-377-010-001
12. ON CHANNEL LAYOUT SIZING	PE-DG-410-100-100-M003

CUSTOMER:
TELANGANA STATE POWER GENERATION CORPORATION LTD
TELANGANA, INDIA
1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12 FGD, PALONCHA

OWNER'S CONSULTANT:
DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA MUMBAI CHENNAI NEW DELHI

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

JOB NO. 439
STATUS CONTRACT
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DATE
18.02.2019
18.02.2019
18.02.2019

00	14.02.19	Fresh Issue	LR	FA	VK
REV	DATE	DESCRIPTION /NOTE	PRD	CHD	APD

REVISIONS

TITLE:

PLANT LAYOUT OF FGD SYSTEM

OWNER/PROJECT:

TSGENCO



KOTHAGUDEM(1X800 MW) THERMAL POWER PLANT
– FGD SYSTEM PACKAGE

CONSULTANT:



DEVELOPMENT CONSULTANTS PRIVATE LIMITED
KOLKATA

EPC CONTRACTOR:



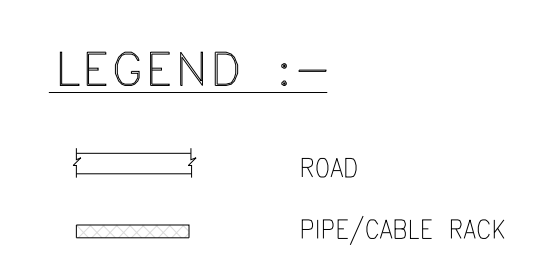
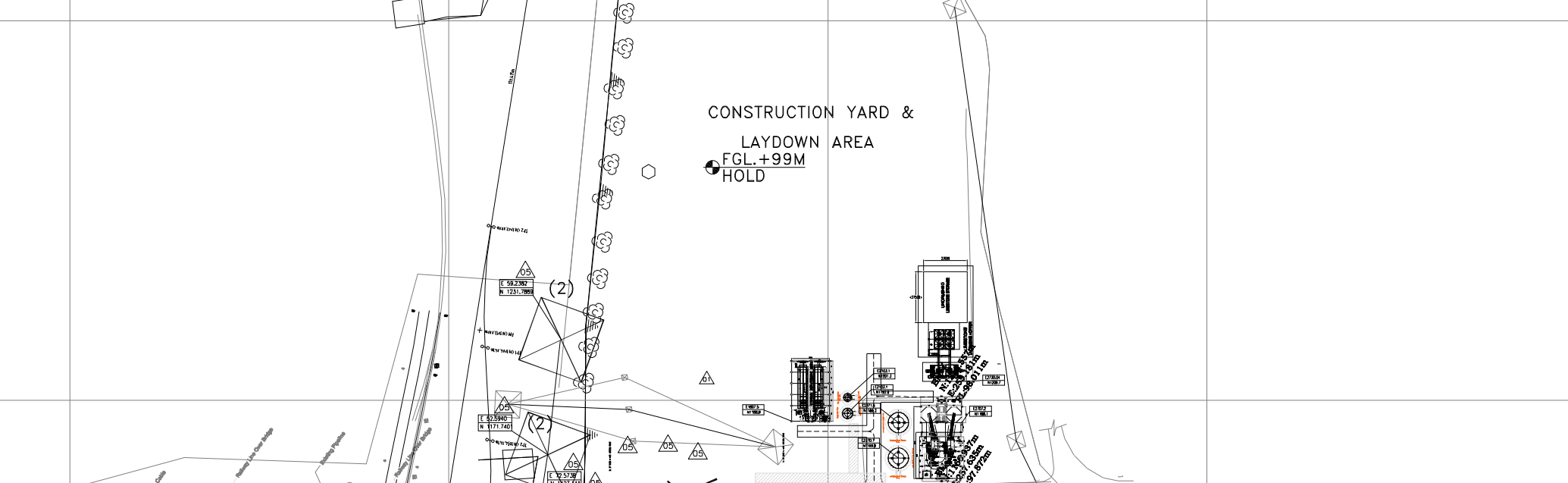
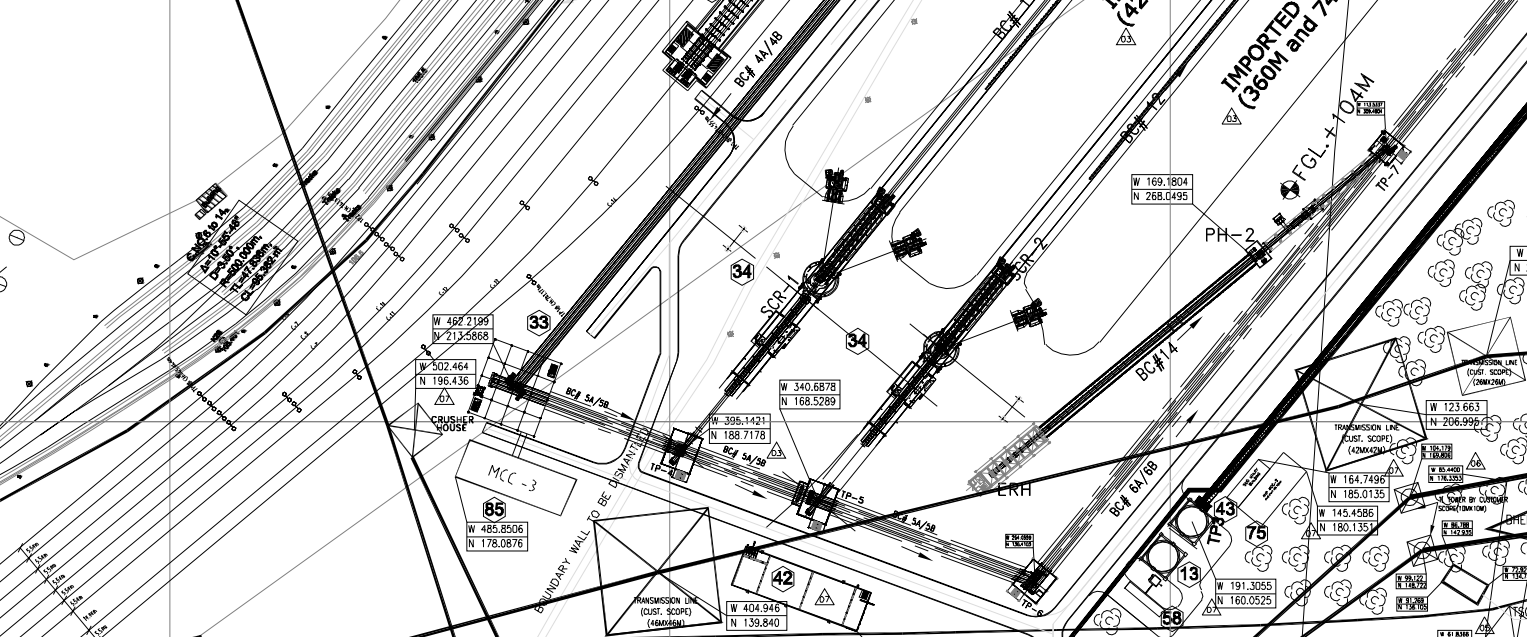
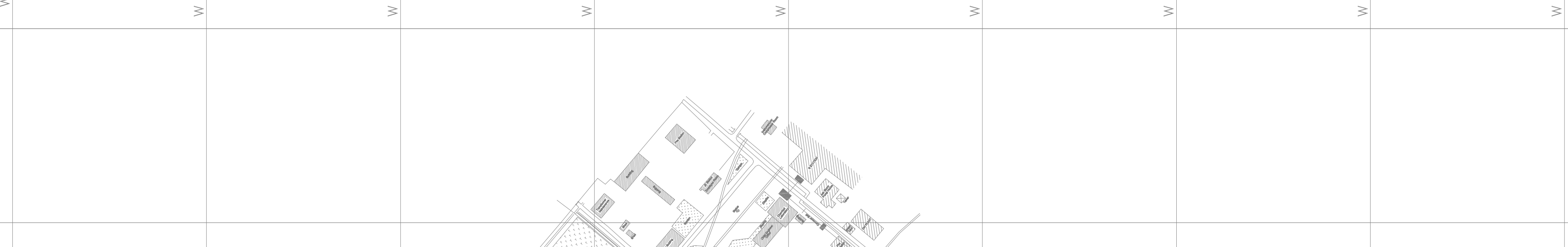
BHARAT HEAVY ELECTRICALS LTD.
BOILER AUXILIARIES PLANT,RANIPET

COLLABORATOR:



mitsubishi hitachi power systems, ltd
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION

	BHEL	Date	
PREPARED BY	Loganathan R	14.02.19	STATUS : <i>FOR APPROVAL</i>
CHECKED BY	Felix Antony	14.02.19	BHEL CUST NO : G801
APPROVED BY	Kesavan .V	14.02.19	BHEL DOC NO: 00-FW-000-00731
			REV :00



FOR AHP AREA
TP1 - 3M AWAY FROM AHP COMPRESSOR HOUSE.
TP2 - 3M AWAY FROM ASH WATER CUM SLURRY P/H
TP3 - 3M AWAY FROM BOUNDARY WALL

REFERENCE DWG. :-	
1. PLOT PLAN	PE-DG-410-100-M001 REV08P
2. D.C. ROOM LAYOUT PLAN	DS-DG-410-694-R00-A01
3. GATE COMPLEX	PE-DG-410-641-C024
4. ADMINISTRATIVE BUILDING	PE-DG-410-641-C002
5. TRANSFORMER HIGH LAYOUT	PE-DG-410-100-1001
6. & TO EQUIPMENT LAYOUT DRAWING	PE-DG-410-100-M003
AT GROUND FLOOR (AT G.L.M)	
7. GENERAL ARRANG. OF BUILDING	0-00-0022-76919
8. GENERAL ARRANG. OF ESP	0-00-0111-25226
9. LAYOUT OF ID SYSTEM	0-00-0020-76876
10. WARD FIVE & DISCIPLE LAYOUT	PE-DG-410-100-M051 TO M056
11. SATCHIYARD LAYOUT	FB-D-377-510-00
12. CN CHANNEL LAYOUT SIZING	PE-DG-410-616-N003

[illegible]

CUSTOMER: 	TELANGANA STATE POWER GENERATION CORPORATION LTD TELANGANA, INDIA 1x800 MW KOTHAGUDAM TPS STAGE-VII UNIT#12, PALONCHA
OWNERS CONSULTANT: 	DEVELOPMENT CONSULTANTS PVT. LTD. CONSULTING ENGINEERS KOLKATA MUMBAI CHENNAI NEW DELHI
	BHARAT HEAVY ELECTRICALS LTD BOILER AUXILIARIES PLANT RANIPET - 632406

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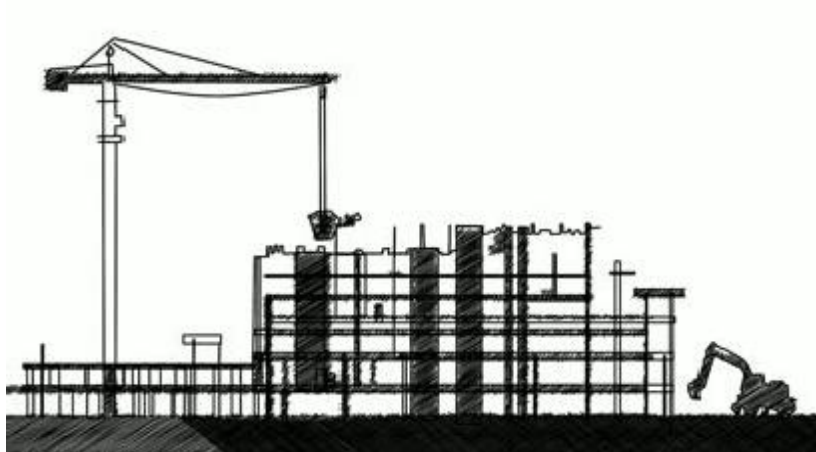
TITLE

PLANT LAYOUT OF FGD SYSTEM

DEPT	NAME	SIGN	DATE
M	DESIGN LOGANATHAN		
	DESIGN LOGANATHAN	-SA-	13.02.19
	CHIEF DESIGNER	-SA-	13.02.19
	APPROV	-SA-	13.02.19

DRAWING NO: **00-FW-000-00731**

SHEET 1	OF 1	REV. 00
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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 Qualification As per Cl. 7.1	HSE Roles and responsibilities - Site In-charge- As per clause 7.2.1 - Safety officer- As per clause 7.2.2
	HSE Planning for Man, Machinery/Equipment/Tools & Tackles	
PROVIDE	HSE 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

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

HOUSE KEEPING

WASTE MANGEMENT

TRAFFIC MANAGEMENT

ENVIRONMENTAL CONTROL

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

CHECKS

HSE AUDITS & INSPECTION

- | | |
|---|--|
| <ul style="list-style-type: none"> • Daily Checks • Inspection of PPEs • Inspection of T& Ps • Inspection of Cranes & Winches | <ul style="list-style-type: none"> • Inspection of Height work • Inspection of Welding and Gas cutting • Inspection of elevators etc. |
|---|--|

HSE PERFORMANCE EVALUATION PARAMETERS

NON CONFORMANCE

PENALTY for NON CONFORMANCE

Refer Clause 16

Incremental penalty

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

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

	HEALTH, SAFETY AND ENVIRONMENT PLAN FOR SITE OPERATION by SUBCONTRACTORS		Doc no.: HSEP: 14
	POWER SECTOR		REV: 01
			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: HSEP:14-F30 – Monthly HSE Planning & Review (Page 11, Clause 8.0 - updated) HSEP:14-F13E-Excavation Inspection Format (part of F30)) HSEP:14-F32B – Job Safety Analysis Format (part of F30) HSEP:14-F31A – Daily HSE Reporting (Page 18, Clause 10.3 – added) HSEP:14-F33 – HSE Performance Evaluation (Page 31, Clause 13 – revised)	IOM No. PSHQHSE/M ONREP/02 Dated 08-Jan-2020	Rohit Kumar	Santosh Nair, GM (MSX & HSE)	



**HEALTH, SAFETY AND ENVIRONMENT
PLAN FOR
SITE OPERATION by SUBCONTRACTORS**

POWER SECTOR

Doc no.: HSEP: 14

REV: 01

Date: 20.01.2020

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**HEALTH, SAFETY AND ENVIRONMENT
PLAN FOR
SITE OPERATION by SUBCONTRACTORS**

POWER SECTOR

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Date: 20.01.2020

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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.



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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:

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

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 worksite.
- 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 selections care and repair of Safety footwear.
IS: 11226 – 1985	Leather Safety footwear having direct molding sole.
IS: 5983 – 1978	Eye protectors.
IS: 9167 – 1979	Ear protectors.
IS: 1179-1967	Eye & Face protection during welding
IS: 3521 – 1983	Industrial Safety Belts and Harness
IS: 8519 -1977	Guide for selection of industrial Safety equipment for body protection
IS: 9473-2002, 14166-1994, 14746-1999	Respiratory Protective Devices

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



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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:

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

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

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

9.0 HSE TRAINING& AWARENESS

9.1 HSE INDUCTION TRAINING

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

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

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



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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 tonRefer 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 and 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 $\frac{1}{4}$ 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 savor, 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 ¼" for each additional foot of length.

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

11.3.14 LIFTING SAFETY

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



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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 on-way system or parking restrictions.
- Safest route shall be provided between places where vehicles have to call or deliver.
- Avoid vulnerable areas/items such as fuel or chemicals tanks or pipes, open or unprotected edges and structures likely to collapse



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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:

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



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



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Other				
WORKING AT HEIGHT				
Safety nets				
Safety belts				
Safety helmets				
Anchoring of safety belt to the life line rope				
ENVIRONMENT				
Lubricant waste/engine oils properly dispose.				
Waste from Canteen, offices, sanitation etc. disposed properly.				
Disposal of surplus earth, stripping materials, expired batteries, oily rags and combustible materials done properly.				
HEALTH CHECKS				
Hygienic conditions at labor camps O.K.				
Availability of first-aid facilities				
Proper sanitation at site, office & labor camps.				
Arrangement of medical facilities.				
Measures for dealing with illness.				
Availability of potable drinking water for workmen & staff.				
Provision of crèches for children.				



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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 2003)	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

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

Number of employees on the site: - _____

Sl.No.	Item	No. Available	Remarks
1	No. of small sterilized dressings		
2	No of medium sized sterilized dressings		
3	No of large sized sterilized dressings.		
4	No of large sized sterilized burn dressings		
5	No of (15 grams) packets sterilized cotton wool		
6	No of pieces of sterilized eye pads in separate sealed packets.		
7	No of roller bandages 10 cm wide.		
8	No of roller bandages 5 cm wide.		
9	Whether tourniquet available		
10	Whether supply of Suitable splints available.		
11	No of packets of safety pins.		
12	Whether kidney tray available		
13	Whether sufficient number of eye wash bottles, filled with distilled water or suitable liquid, clearly indicated by a distinctive sign which shall be visible at all times, available.		
14	Whether 4%-xylocaine eye drops, and boric acid eye drops and soda by carbonate eye drops available.		
15	Whether (60ml) bottle containing a two percent alcoholic solution of iodine available		
16	Whether (two hundred ml) bottle of mercurochrome (2 per cent) solution in water available.		

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

FORMAT NO: HSEP:14-F01

REV NO.: 00

PAGE NO. 02 OF 02

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

REV NO.: 00

PAGE NO. 1 OF 02

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

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

Signature of the examining doctor

**POWER SECTOR****HSE INDUCTION TRAINING**

FORMAT NO: HSEP:14-F03

REV NO.: 00

PAGE NO. 01 OF 01

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

Sl No.	Name	Designation	Organisation	Signature

Signature of Training co-ordinator :

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

Name of Site :	
Sub-Contractors Name :	
Date :	

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

Signature of Site I/C of Subcontractor :

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

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

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

Signature of Site I/C of Subcontractor :

**POWER SECTOR****INSPECTION OF T&Ps**

FORMAT NO: HSEP:14-F07

REV NO.: 00

PAGE NO. 01 OF 01

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

Sl.No.	Description	Remarks
1.0	Name of equipment	
2.0	Basic Information of equipment	
2.1	Specification	
2.2	Sr. No. of equipment	
2.3	Make	
2.4	Year of manufacture	
3.0	Major repairs / overhauls(Furnish details of work carried out)	Date(s) of major repair/overhaul
3.1		
3.2		
3.3	Repairs carried out at site	
4.0	Any performance test conducted	Yes/No
5.0	Document Submitted	Yes/No
6.0	Manufacturer's test / guarantee certificate	Available/ Not available
7.0	Performance test	Done/ Not Done
8.0	Acceptance Norms	
9.0	Committee Observations	
10.0	Date of next review (if accepted)	

Signature-Site Safety Officer (BHEL)

Signature-Subcontractor/ Subcontractor's
Safety Officer

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

Name of Site	
Name of Sub-Contractor	
Date of Inspection	

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

Signature of Site I/C of subcontractor:

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

FORMAT NO: HSEP:14-F09

REV NO.: 00

PAGE NO. 01 OF 03

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

Crane Reg. No (Make/Model)

Name of Driver/Operator

Sl.no.	Description	Observation	Measures
1	Valid Driving license		
2	Hook & Hook Latch		
3	Over Hoist limit switch		
4	Boom limit switch		
5	Boom Angle Indicator		
6	Boom limit cutoff switch		
7	Condition of Boom		
8	Condition of ropes		
9	Number of load lines		
10	Size and condition of the slings		
11	Stability of the cranes		
12	Soil Condition		
13	Swing Break And Lock		
14	Proper Break And Lock		
15	Hoist Break And Lock		
16	Boom Break And Lock		
17	Main Clutch		
18	Leakage in Hydraulic Cylinders		
19	Out riggers 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?				
	Total Number of NO:				
	Total Number of NA:				
	% Compliance :				

Signature of Site I/C of subcontractor :

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

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

Sl. No.	Descriptions	Observation (Yes/No)	Remarks
1	All the workers have been explained safe work method?		
2	An established communication system has been established and explained to the workers.		
3	Adequate illumination has been ensured.		
4	Work area inspected prior to the start of the work.		
5	Area below the work place barricaded, particularly below hot work.		
6	Workers provided with bags /box to carry bolts, nuts and hand tools		
7	Arrangement for fastening hand tools made.		
8	All work platforms ensured to be of adequate strength and ergonomically suitable.		
9	Fabricated makeshift arrangements are checked for quality and type of material welding, anchoring etc.		
10.	Work at more than one elevation at the same segment is restricted.		
	ACCESS/EGRESS		
1	Walkways provided with handrail, mid-rail and toe guard?		
2	All checkered plates, gratings properly welded/ bolted?		
3	Are ladders inspected and they are in good condition?		
4	Are ladders spliced?		
5	Are ladders properly secured to prevent slipping, sliding or falling?		
6	Do side rails extend 36" above top landing?		
7	Are built up ladders constructed of sound materials?		

**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.		
	Housekeeping		
1	Walkways, aisles & all overhead workplaces cleared of loose material.		
2	Flammable materials, if any, are cleared.		
3	All the de shuttering materials are removed after de shuttering is done.		
4	Platforms and walkways free from oil/grease or other slippery material.		
5	Collected scrap are brought down or lowered down and not dropped from height.		
	PPE And Safety Devices		
1	Use of safety helmet, safety belts ensured for all workers		
2	Anchoring points provided at all places of work.		
3	Common lifeline provided wherever linear movement at height is required.		
4	Safety nets are use wherever required.		
5	Proper fall arrest system is deployed at critical workplaces.		
6	Crawler boards/Safety system or works on fragile roof are used.		

Signature of Site I/C of subcontractor :

**POWER SECTOR****INSPECTION OF WELDING AND GAS
CUTTING**

FORMAT NO: HSEP:14-F11
REV NO.: 00
PAGE NO. 1 OF 02

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

Welding				
Sl.no.	Description	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

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

Signature of Site I/C of subcontractor :

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

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

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

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

Signature of Site I/C of subcontractor :

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

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

Sr. No.	Description	Remarks
1.0	Name of equipment	
2.0	Basic Information of equipment	
2.1	Specification	
2.2	Sr. No. of equipment	
2.3	Make	
2.4	Year of manufacture	
3.0	Major repairs/overhauls(Furnish details of work carried out)	Date(s) of major repair/overhaul
3.1		
3.2		
3.3	Repairs carried out at site	
4.0	Any performance test conducted	Yes/No
5.0	Document Submitted	Yes/No
6.0	Manufacturer's test / guarantee certificate	Available/ Not available
7.0	Performance test	Done/ Not Done
8.0	Acceptance Norms	
9.0	Committee Observations	
10.0	Date of next review (if accepted)	
Signature-Subcontractor/ Subcontractor's Safety Officer		Signature-Site Safety Officer (BHEL)

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

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

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

Signature-Subcontractor/ Subcontractor's Safety Officer

Signature-Site Safety Officer (BHEL)

**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 Slings 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.

1 Copy to Site Construction Manager (BHEL)

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

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

1	NAME OF SITE		3	ACTIVITY AREA	
2	SCOPE OF WORK		4	NAME OF CONTRACTOR	
			5	NAME & DESIGNATION OF BHEL ACTIVITY I/C	
6	DATE & TIME OF ACCIDENT		7	DATE RESUMED	
8	NO. OF WORK-DAYS LOST BY VICTIM (If duty not resumed, give estimated figure)				
9	NO. OF MANHOURS LOST BY OTHERS				
10	PERSONAL DETAILS OF INJURED AND / OR DETAILS OF MATERIALS / EQUIPMENT / PROPERTY DAMAGED				
NAME			NAME OF MATERIAL / EQUIPMENT / PROPERTY		
PERIOD OF EMPLOYMENT					
AGE	YRS	SEX	MALE/ FEMALE	ESTIMATED COST	ACTUAL COST
MARITAL STATUS		SINGLE / MARRIED			
OCCUPATION		NATURE OF DAMAGE			
PART OF BODY INJURED					
NATURE OF INJURY					
AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) MOST RESPONSIBLE FOR CAUSING ACCIDENT / INJURY / DAMAGE					
12	PERSON (NAME & DESIGNATION) WITH MOST CONTROL OVER AGENCY (OBJECT / EQUIPMENT / SUBSTANCE) CAUSING ACCIDENT INJURY / DAMAGE				
13	DESCRIBE CLEARLY HOW THE ACCIDENT OCCURRED (USE ADDITIONAL SHEET, IF REQUIRED)				
ANALYSIS					
14	WHAT ACTS AND / OR CONDITIONS CONTRIBUTED MOST DIRECTLY TO THIS ACCIDENT				
15	WHAT ARE THE BASIC REASON FOR THE EXISTENCE OF THESE ACTS AND / OR CONDITION ?				
16	WHAT CORRECTIVE ACTIONS HAVE BEEN TAKEN TO PREVENT ACCIDENT RECURRENCE ?				
	DATE :		SIGNATURE OF SITE HSE COORDINATOR		
17	COMMENTS OF HEAD / SOX				
	DATE:		SIGNATURE OF HEAD/SOX		

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

Note: This is a template and can be modified in consultation with BHEL			
Name of the Site		Name of the Subcontractor	
Scope of Work		Date	
PART- A: PLAN OF HSE ACTIVITIES FOR THE MONTH OF.....			PART-B: REVIEW ON
SN.	Description of HSE Activity & Formats	Plan & Targets for the month	Review
1	Availability of First Aid Box at Required Places and Inspection thereof as per Format: 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: F10	Areas: 1. ...	
10	Inspection of Welding & Gas Cutting operations as per Format: F11	Areas: 1. ...	
11	Inspection of Electrical Installations as per Format: F12	Locations: 1. ...	
12	Inspection of Elevators (as applicable) as per Format: F13	Locations: 1. ...	
13	Inspection of Excavation as per Format: F13E	Locations: 1. ...	



POWER SECTOR

Format for Monthly HSE Planning & Review

FORMAT NO: HSEP:14-F30

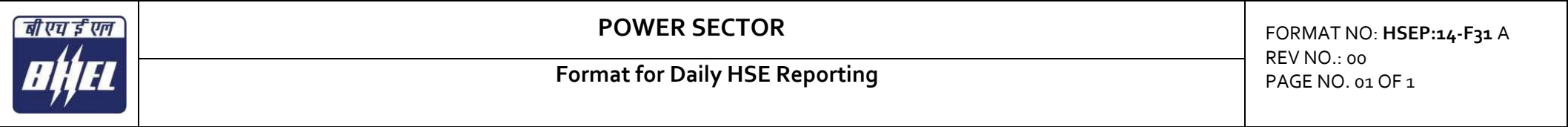
REV NO.: 00

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

	POWER SECTOR		FORMAT NO: HSEP:14-F30 REV NO.: 00 PAGE NO. 03 OF 3
	Format for Monthly HSE Planning & Review		
SN.	Description of HSE Activity & Formats	Plan & Targets for the month	Review
28	Availability of dust/ waste bins at various locations	Locations: 1. ...	
29	Availability of Ambulance (individual/ joint) in each shift	Ambulance No.	
30	Availability of emergency vehicle in each shift	Emergency vehicle	
31	Deployment/ Availability of tested Fire Extinguishers	Locations & Nos. 1. ...	
32	Tree plantation	Locations & Nos. 1. ...	
33	Waste disposal & Scrap Bins	Locations 1. ...	
34	Illumination checks	Locations 1. ...	
35	Safety award function: 1. Display of good practices Award presentation	Minimum 1 per month	
36	Submission of Daily Reports as per Format No.F31A	Daily Reports (Night & Day Shifts)	

PLAN		REVIEW	
<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 NO: HSEP:14-F31 A REV NO.: 00 PAGE NO. 01 OF 1
	Format for Daily HSE Reporting	

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

Night		Day	SHIFT	Year	Site
			Submitted By		
			Work Area(s)		
			Staff		
			Man-Power		
			Safety Officers		
			Safety Stewards		
			Tool Box (Topics and No. of Participants)		
			Induction Training (No. of Participants)		
			Vertigo Test (Numbers Tested)		
			On-the-Job Training (Topic & participants)		
			Work Permits		
			Job Safety Analyses conducted		
			Height Work Inspection		
			Other Hazardous Activities Inspection		
NA			T&P Inspection (Names & Nos. Inspected)		
			Safety Walk (Designation, Areas)		
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	

HAZARDS				PRECAUTIONS	

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

**POWER SECTOR- HQ**

FORMAT NO: HSEP:14-F33

REV NO.: 00

PAGE NO. 01 OF 3

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

**POWER SECTOR- HQ**

FORMAT NO: HSEP:14-F33

REV NO.: 00

PAGE NO. 02 OF 3

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 ₂ fire extinguishers and fire buckets filled with sand?		2	Inspection/ non-conformity records
6b	Availability of Illumination lamp in electric booth?		1	-do-
6c	whether Caution Boards have been displayed?		1	-do-
6d	Usage of Metal Plug top for all hand power tools ?		1	-do-
6e	Usage of Insulated welding cables.		1	-do-
6f	Electrical Booth/Distribution Board to be covered by proper Canopy.		1	-do-
6g	Availability of functional & individual 30mA ELCB / RCCB and MCB for protection and conducting periodical check-up?		1	-do-
6h	Double earthing for panel boards and all machinery & proper earth pit with regular inspection available?		1	-do-
6i	Whether Electrician is qualified and experienced		1	Qualification & Experience records of electrician
6j	Availability and usage of Rubber hand gloves by electrician?		1	Inspection/ non-conformity records

	POWER SECTOR- HQ	FORMAT NO: HSEP:14-F33
	Checklist for Evaluation of HSE Performance	REV NO.: 00 PAGE NO. 03 OF 3

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

Note:

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



SAFETY WORK CLEARANCE

Permit no. _____

Project: _____

Emergency Contact Nos: _____

Subcontractor: _____

BURNING/WELDING /HOT WORK PERMIT

Area : _____ Date: _____ Time: _____

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

Name of Work Performing Contractor: _____

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

Description of Work: _____

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

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

The following precautions are to be taken:

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

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

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

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

Name of BHEL Safety Representative: _____ Sign: _____

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

Name of Work Performing Authority: _____ **Sign:** _____ **Date:** _____ **Time:** _____**Permit Cancellation:**

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

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

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

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

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

Original at BHEL site

Second Copy – BHEL SAFETY

Third Copy : Contractor



SAFETY WORK CLEARANCE

Permit no. _____

Project: _____

Emergency Contact Nos: _____

Subcontractor: _____

LIFTING ACTIVITY PERMIT

Area : _____ Date: _____ Time: _____

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

Performing Contractor: _____

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

Description of Work: _____

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

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

The following precautions are to be taken:

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

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

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

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

Name of BHEL Safety Representative: _____ Sign: _____

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

Name of Work Performing Authority: _____ **Sign:** _____ **Date:** _____ **Time:** _____**Permit Cancellation:**

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

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

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

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

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

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



SAFETY WORK CLEARANCE

Permit no. _____

Project: _____

Emergency Contact Nos: _____

Subcontractor: _____

WORKING AT HEIGHT PERMIT

Area : _____ Date: _____ Time: _____

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

Performing Contractor: _____

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

Description of Work: _____

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

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

The following precautions are to be taken:

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

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

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

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

Name of BHEL Safety Representative: _____ Sign: _____

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

Name of Work Performing Authority: _____ **Sign:** _____ **Date:** _____ **Time:** _____**Permit Cancellation:**

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

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

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

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

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

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



MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Form No.: F-15 (Rev 02)

Page 1 of 6

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 02)

Page 2 of 6

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 02)

Page 3 of 6

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 02)

Page 4 of 6

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
#6.01	Cumulative number of days in a month the nominated Safety Officer was not available	HSE & SA	1		Safety Officer should be available for all the days	Daily Log Book entry/Incident Registers/letter references
#6.02	Shortfall in number of weekly safety meetings in the month conducted or attended by the Safety Officer	HSE & SA	0.5		Safety meetings to be held every week	Copy of Minutes of meeting
#6.03	Level of compliance w.r.t decisions taken in previous Safety meetings	HSE & SA	0.5		Number of consolidated issues discussed in Safety meetings	Copy of Minutes of meeting, Non-compliance intimation documents from BHEL site
#6.04	Delay in submission of monthly report on safety (including electrical safety for equipment & personnel etc.) in the prescribed form	HSE & SA	1		Number of days delayed/Scheduled date is third working day of next month	Daily Log Book entry/Incident Registers/letter references
#6.05	Number of days taken for lodging FIRs from date of occurrence/notice of incident of theft / accident etc.	HSE & SA	0.5		Number of days delayed/Scheduled date is within 24 Hrs of occurrence/notice of incidence	Copy of FIR lodged by Contractor

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Form No.: F-15 (Rev 02)

Page 5 of 6

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
#6.06	Number of times written(email, letters etc.) warning issued for non-availability/ use of improper Fall protection and rescue arrangement as lifeline, fall arrestors, safety net, hand-railings, covered floors, man-basket, rescue basket & kit etc. by the contractor	HSE & SA	2		Total number of non-compliances	Daily Log Book entry/Incident Registers/letter references
#6.07	Number of times punitive fines imposed for unsafe practices as per contract like non-availability/use of PPEs as safety shoes, helmets, goggles, gloves, lifeline, safety belts etc.	HSE & SA	1		Total number of non-compliances	Non-compliance intimation documents from BHEL site
#6.08	Percentage compliance to Emergency preparedness and response plan: Portable Fire-extinguishers, Buckets, Fire-wardens, display of emergency numbers, mock-drills, Hazard Identification and Risk Assessment(HIRA) etc.	HSE & SA	1		Compliance should be 100% as per HSE Plan or as finalized in Safety Meetings	Non-compliance intimation documents from BHEL site
#6.09	Number of times the agency has defaulted on display of safety posters / safety slogans / safety barriers/emergency numbers etc. in identified areas	HSE & SA	0.5		Total number of instances	Non-compliance intimation documents from BHEL site
#6.10	Non compliances observed during HSE and Safety Audit	HSE & SA	0.5		Total number of non-compliances	Non-compliance intimation documents from BHEL site, Audit Reports
#6.11	Cumulative number of days in the month, non-availability of First Aid Kit, First Aider & Emergency Vehicles/Ambulance.	HSE & SA	0.5		Cumulative number of days	Non-compliance intimation documents from BHEL site
#6.12	Number of days taken for submission of Root Cause analysis (RCA) for the accident from the cut-off date intimated by BHEL for submission of RCA	HSE & SA	0.5		Number of days delayed/Scheduled date is cut-off date intimated by BHEL	Daily Log Book entry/Incident Registers/letter references
#6.13	Non conductance of training (induction, job specific, height work etc.), tool box meeting and health check-up as per Contract requirements	HSE & SA	0.5		Number of incidences of non-conductance during the month	Daily Log Book entry/Incident Registers/letter references
Total			100			

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor

MONTHLY PERFORMANCE EVALUATION OF CONTRACTOR

Form No.: F-15 (Rev 02)

Page 6 of 6

Project		Vendor			Package/Unit	
Sl. No.	Parameter for Measurement	Classification	Max Score	Score Obtained	Measurement Key/Scheduled date	Supporting Documents
Less Deduction in Score Due to Major Accidents (Fatal, 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 @ 3 points/ accident						
Less Deduction in Score Due to Minor Accidents attributable to the contractor @ 1 point/ accident						
Less Deduction in Score Due to not Maintaining of Labour Colony (if applicable) as per BHEL HSE policy @2 points in a month on verification any day						
Final Score						

Performance Score Summary for the Month	Total Score	Score Obtained
QUALITY	10	
PERFORMANCE	50	
RESOURCES	20	
SITE INFRASTRUCTURE & SERVICE	5	
SITE FINANCE	5	
HSE & SA	10	
OTHERS (deductions if any)	0	
TOTAL	100	

Note:

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

Name and Signature of BHEL Package In-charge

Name and Signature of Contractor



MONTHLY PLAN REVIEW WITH CONTRACTOR

Form No: F-14 (Rev 01)

PS-

Page 1 of 5

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

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

Date of Plan/ Review

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

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)



MONTHLY PLAN REVIEW WITH CONTRACTOR

Form No: F-14 (Rev 01)

PS-

Page 2 of 5

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

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

CONTRACTOR'S SCOPE:-

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

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:-

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

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)



MONTHLY PLAN REVIEW WITH CONTRACTOR

Form No: F-14 (Rev 01)

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Page 3 of 5

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

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

CONTRACTOR'S SCOPE:-

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

Percentage of Manpower Deployed= $100 \times \Sigma(C \times D) / \Sigma(A \times B)$

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)



MONTHLY PLAN REVIEW WITH CONTRACTOR

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Page 4 of 5

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

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

Date of Plan

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

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

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

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)



MONTHLY PLAN REVIEW WITH CONTRACTOR

Form No: F-14 (Rev 01)

PS-

Page 5 of 5

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

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

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

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 etc.

BHEL
(Sign with name, designation and date)

CONTRACTOR
(Sign with name, designation and date)

PROCEDURE FOR CONDUCT OF CONCILIATION PROCEEDINGS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**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):

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

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

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

FORMAT-7

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

To,

M/s. (Stakeholder's name)

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

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

Dear Sir/Madam,

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

Sl. No.	Claim description	Amount involved

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

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

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

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

Thanking you
Yours faithfully

Representative of BHEL

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

FORMAT-8**FORMAT FOR NOTICE INVOKING CONCILIATION CLAUSE BY A
STAKEHOLDER FOR REFERRING THE DISPUTES TO CONCILIATION
THROUGH IEC**

To,

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

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

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

Dear Sir/Madam,

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

Sl. No.	Claim description	Amount involved

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

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

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

Thanking you

Yours faithfully

Representative of the Stakeholder

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

FORMAT 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.

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

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

To
(Employer's Name and Address)
.....

Dear Sirs,

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

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

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

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

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

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

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

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

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

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

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

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

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

Notwithstanding anything to the contrary contained hereinabove:

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

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

For and on behalf of
(Name of the Bank)

(Signature of Authorised signatory)

Date.....

Place of Issue.....

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

² Name of Tenderer

³ REGISTERED Office Address of the Tenderer

⁴ Details of the Work i.e Tender Description

⁵ EMD Amount as mentioned in Notice Inviting Tender

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

⁷ Validity Date

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

Note:

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

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

PROFORMA OF BANK GUARANTEE (in lieu of SECURITY DEPOSIT)

(On non-Judicial paper of appropriate value)

(Para 4.7.6 of Works Accounts Manual)

Bank Guarantee No.....

Date.....

To

(Employer's Name and Address)

.....

In consideration of Bharat Heavy Electricals Limited (hereinafter referred to as the 'Employer' which expression shall unless repugnant to the context or meaning thereof, include its successors and permitted assigns) incorporated under the Companies Act, 1956 and having its registered office at *BHEL House, Siri Fort, Asiad, New Delhi – 110049* through its unit at *Bharat Heavy Electricals Limited, Power Sector Southern Region, Tek Towers, No.11, Old Mahabalipuram Road, Okkiyam Thoraipakkam, Chennai - 600097* having agreed to exempt _____¹ (Name of the Vendor / Contractor / Supplier) with its registered office at _____² (hereinafter called the said "Contractor" which term includes supplier), from demand under the terms and conditions of the Contract arising vide Letter of Intent (LOI) reference No. _____ dated _____³ valued at Rs. _____⁴ (Rupees _____ only)⁴ (hereinafter called the said Contract), of Security Deposit for the due fulfilment by the said Contractor of the terms and conditions contained in the said Contract, on production of a Bank Guarantee for Rs. _____⁵ (Rupees _____ only),

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

Any such demand made on the bank, shall be conclusive as regards the amount due and payable by the Bank under this guarantee. However, our liability under this guarantee shall be restricted to an amount not exceeding Rs. _____⁵.

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

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

We, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said Contract have been fully paid and its claims satisfied & the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said contractor(s) or acceptance of the final bill or discharge of this guarantee by the Employer, whichever is earlier. This guarantee shall initially remain in force upto and including _____⁶ and shall be extended from time to time for such period as may

be desired by the Employer. Unless a demand or claim under this guarantee is made on us in writing on or before the _____⁷, we shall be discharged from all the liability under this guarantee thereafter.

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

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

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

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

Notwithstanding anything to the contrary contained hereinabove:

- a) The liability of the Bank under this Guarantee shall not exceed.....⁵
- b) This Guarantee shall be valid up to ⁶
- c) Unless the Bank is served a written claim or demand on or before _____⁷ all rights under this guarantee shall be forfeited and the Bank shall be relieved and discharged from all liabilities under this guarantee irrespective of whether or not the original bank guarantee is returned to the Bank.

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

Date _____ Day of _____ for _____ (indicate the name of the Bank)

(Signature of Authorised signatory)

¹ NAME OF VENDOR /CONTRACTOR / SUPPLIER

² REGISTERED OFFICE ADDRESS OF THE VENDOR /CONTRACTOR / SUPPLIER.

³ LETTER OF INTENT(LOI) REFERENCE NO. WITH DATE

⁴ CONTRACT VALUE (AS MENTIONED IN LOI)

⁵ BG AMOUNT IN FIGURES AND WORDS

⁶ VALIDITY DATE

⁷ DATE OF EXPIRY OF CLAIM PERIOD (CLAIM PERIOD SHALL BE MINIMUM OF 3 MONTHS AFTER VALIDITY DATE)

Note:

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