BHARAT HEAVY ELECTRICALS LIMITED
TIRUCHIRAPPALLI

CONTROLS AND INSTRUMENTATION / FB
QUALITY ASSURANCE

STANDARD PACKING PROCEDURE
FOR
ELECTRICAL AND ELECTRONIC PANELS
(INCLUDING BOXES, CABINETS, CUBICLES, SYSTEMS AND CHASSIS)

Rev	Date	Prepared	Checked	Approved	Revision History
00	01.01.96	Sd/-	Sd/-	Sd/-	Initial History
01	28.03.02	A.J.OMPRAKASH Sd/-	R.VARADARAJAN Sd/-	G.MATHIYALAGAN Sd/-	Department name changed
02	26.02.07	RM.VAIRAVAN	N.SRIDHAR	S.SOMASUNDARAM	Revised after discussion with Shipping Dept.

1.0 SCOPE

1.1 This procedure gives minimum guidelines to be complied with for packing of Electrical, Electronics and Instrumentation panels. This packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage for periods more than one year.

2.0 WOOD SPECIFICATION FOR PACKING

2.1 Rubber wood as per manufacturer standard.
2.2 Silver Oak as per procedure PR: CHEM:017 or as per relevant International Standards.

3.0 PACKING

3.1 For Inland packing, rubber wood and export packing Silver Oak wood shall be used. The wood used shall be seasoned and treated. It shall be free from knots, etc. and any kind of decay caused by insects and fungus.
3.2 The required wood case for the equipment to be packed shall be made out of individual planks of single length and no joint is permissible. Using such planks, the required wood case for the panel shall be made,
3.3 Sufficient number horizontal, vertical and diagonal planks (dimension depending upon case size) shall be used for binding and strengthening. Runners have to be provided with metallic sling plates for handling.
3.4 Support planks are to be provided such that, no force is acting on the parts of equipment or its parts.
3.5 Panels above 1.5 metre shall be bolted at the bottom.
3.6 The equipments covered with a polythene sheet shall be kept inside the box, followed by coir, wooden bottoms, thermo coal, etc to prevent vibration effect during loading, transportation, etc.
3.7 The gap between job and the box shall be filled with suitable material like jute, coir, thermo coal, etc.
3.8 On all sides of the inner case, black polythene sheet shall be nailed.
3.9 Loose items of the equipment, if any, shall be packed separately.
3.10 Delicate components likely to be damaged, example PCB – Electronic modules, instrument, etc are to be covered individually in anti-static bags and packed in cartons and filled with fillers like thermo coal, paper cuttings, etc.
3.11 Such cartons shall be packed with overall polythene rapping and packed in wooden cases. Mark prominently as "ELECTRONIC COMPONENTS".
3.12 Each case must have sufficient quantity of silica gel, packed in cotton cloth bags, shall be kept at different places as required.
The bags used shall have the following information marked on it.

Silica Gel activator type:
Blue: Active
Rose: Reduced active
White: No activity. To be replaced with fresh Silica gel.

4.0 MARKING

4.1 After completing the packing, Stencil marking, as per dispatch instructions and symbol marking as per Annexure – I shall be made. Please ensure the box is stenciled with "FRAGILE ITEM", "HANDLE WITH CARE"

5.0 PACKING SLIP

5.1 A copy of the packing slip, kept in a polythene cover shall be kept inside the box. Another copy of the packing slip, kept in a polythene cover shall be kept out side the box and covered with a metallic plate to the case.

6.0 CAUTION

Do not pack any other Mechanical items with this case.

7.0 GENERAL

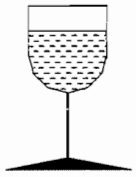
7.1 These packing procedures are the minimum requirements in addition to the standard instructions mentioned in the Purchase Order and Specification.

7.2 Deviation to meet the packing procedure requirements / non-clarity in packing approach in any quotation will be liable for rejection of offer.

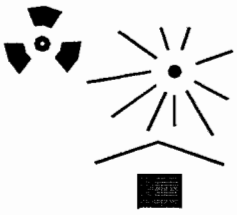
ANNEXURE – 1

TO

PROCEDURE NO:CI:QAC:PR:02/00 ; PR:03/00 ; PR:04/00



FRAGILE, HANDLE WITH CARE



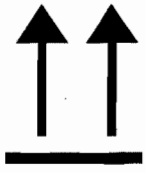
PROTECT FROM HEAT AND RADIOACTIVE SOURCES

USE NO HOOKS

NOTE: The design of heavy goods packages cannot always resist top lifting by grabhooks.

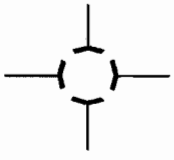
KEEP DRY

NOTE: Not all cases have waterproof internal linears: plywood used in the construction may not have a waterproof glueline.



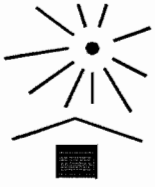
THIS WAY UP

NOTE: Certain designs of small cases make it difficult to distinguish top from bottom.



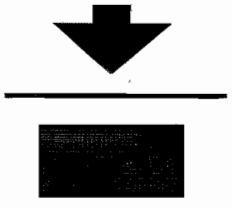
CENTRE OF GRAVITY

NOTE: This should be stancilled as a minimum on the two longest case sides (this information will normally be supplied by the manufacturer of the item(s) packed).



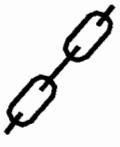
KEEP AWAY FROM HEAT

... kg max



STACKING LIMITATION

NOTE: The maximum load in kilograms should be marked above the arrow.



INTERNATIONAL "SLING HERE" SYMBOL

BHARAT HEAVY ELECTRICALS LIMITED / TIRUCHIRAPPALLI
CONTROLS AND INSTRUMENTATION/QA/FB

STANDARD QUALITY PLAN FOR

ELECTRICAL PANELS

(SB MCC, AC CSP, DC CSP, LUB.OIL PANEL, MILL PANEL ETC..),

REV	DATE	PREPARED	REVIEWED	APPROVED	REVISION HISTORY
00	03.11.92	--- Sd ---	--- Sd ---	--- Sd ---	Initial release.
01	31.07.97	--- Sd ---	--- Sd ---	--- Sd ---	Reference Standards included.
02	16.06.97	--- Sd ---	--- Sd ---	--- Sd ---	Format revised.
03	21.03.02	--- Sd ---	--- Sd ---	--- Sd ---	Department name changed, Inspection details included, CTQ requirements added & General revision.
04	07.12.07	RM.VAIRAVAN	N.SRIDHAR	S.SOMASUNDARAM	Revised to include the comments /Feedback of internal discussion / Vendors meet.

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK	REF.DOC. & ACCEPTANCE STANDARD	FORMAT OF RECORD	AGENCY			REMARKS
							M	B	C	
A)	**RAW MATERIALS BOUGHT OUT ITEMS INSPECTION**									
01	Sheet steel	a) Dimensions	MEAS	1 sample of each type & size per lot	Purchase Spec, Drgs, IS 513 & 1S 1079	LGB	P			
		b) Surface finish & check for waviness/flatness	VISU	-DO-	-DO-	LGB	P			
		c) Tensile & Bending test	MECH	-DO-	-DO-	Supplier TC	V			
02	Air Circuit Breaker	a) Make, Type & Rating	VISU	100%	IS 13947 Pt 2 , Purchase Spec, Drgs,	LGB	P			
		b) All routine tests including calibration of releases	TESTS	100%	-DO-	Supplier TC	V	V		
03	Moulded case circuit breaker/Miniature circuit breaker	a) Make, Type & Rating	VISU	100%	Purchase Spec, Drgs,	LGB	P			
04	Air break Switches/ Fuse switch units	a) Make, Type & Rating	VISU	100%	IS 13947 Pt 3 , Purchase Spec, Drgs,	LGB	P			
		b) Operation check	MECH	100%	Mfr. Standard	Mfr. Standard	P			
05	HRC Fuses	a) Make, Type & Rating	VISU	100%	IS 13703 , Purchase Spec, Drgs,	LGB	P			
		b) Continuity	ELEC	100%	Mfr. Standard	Mfr. Standard	P			
06	AC/DC Power & aux. contactors	a) Make, Type & Rating	VISU	100%	IS 13947, Pt 4 , Purchase Spec, Drgs,	LGB	P			
		b) Operation check	ELEC	100%	Mfr. Standard	Mfr.	P			

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK	REF.DOC. & ACCEPTANCE STANDARD	FORMAT OF RECORD	AGENCY			REMARKS
							M	B	C	
07	Protective Relays & Thermal O/L Relay	a) Make, Type & Rating	VISU	100%	Purchase Spec, Drgs,	Standard LGB	P			
		b) Routine test certificate	ELEC	100 %	IS 3231/IS 8686, Mfr. Specifications	Supplier's TC	V	V		For protection relay
08	Current Transformer	a) Make, Type & Rating	VISU	100%	Purchase Spec, Drgs, IS 2705	LGB	P			
		b) Overall dimension & mounting arrangement	MEAS	100 %	Mfr. drg	LGB	P			
		c) IR,HV,Ratio & polarity check	ELEC	100%	Purchase Spec, Drgs, IS 2705	LGB	P			
		d) All routine tests as per IS 2705	ELEC	10%	-DO-	Supplier TC	V			
09	Control Supply Transformer	a) Make, Type & Rating	VISU	100%	Purchase Spec, Drgs,	LGB	P			
		b) Voltage ration	ELEC	100%	Purchase Spec, Drgs,	LGB	P			
		d) All routine tests as per IS 12021	ELEC	10%	-DO-	Supplier TC	V	V		
10.	Indicating Instruments	a) Make, Type & Rating	VISU		Purchase Spec, Drgs, IS 1248	LGB	P			
		b) Routine tests including calibration & accuracy test reports	ELEC	100%	Supplier TC		V	V		
11.	Push button & Indicating lamp	Make, Type & Rating	VISU	100%	Purchase Spec, Drgs, IS 13947,Pt 5	---	P			

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK	REF.DOC. & ACCEPTANCE STANDARD	FORMAT OF RECORD	AGENCY			REMARKS
							M	B	C	
12.	Terminal block	Make, Type & Rating	VISU	100%	Purchase Spec, Drgs	---	P			
13	PVC Wires	Size, Colour & BIS marking	VISU	1 sample of each type & rating per lot	IS 694, Purchase Spec & Drg	LGB	P			
14	Heater and Thermostat	a) Make, Type & Rating	VISU	100%	Purchase Spec, Drgs	---	P			
		b) Functional test	ELEC	100%	Mfr. standard	---	P			
15	Anti Vibration pad & Gasket	Matl. Size, Shore Hardness and Flame Test	VISU & MEAS	On two samples	Purchase Spec, Drgs	---	P			
16	Support Insulators	Dimension & Material	PHYS	On two samples	Mfr's Std	TC	P			
17	Bus-Bar (Power, Control & Earth)	a) Dimension	MEAS	One sample/Lot	Purchase spec , drg & IS 5082	Supplier TC	P			
		b) Mech. Properties	MEAS	-DO-	Purchase spec , drg & IS 5082	Supplier TC	V			
		c) Surface finish	VISU	-DO-	Purchase spec , drg & IS 5082	Supplier TC	P			
		d) Conductivity	ELEC	-DO-	Purchase spec , drg & IS 5082	Supplier TC	V			
18.	Cable Gland	Make, Type & Rating	VISU	100%	Purchase Spec, Drgs	LGB	P			
19.	Timer	a) Make, Type & Rating	VISU	100%	Purchase Spec, Drgs	LGB	P			
		b) Contact configuration	ELEC	100%	Purchase Spec, Drgs	LGB	P			
		c) Functional check	ELEC	100%	Mfr. Standard	LGB	P			

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK	REF.DOC. & ACCEPTANCE STANDARD	FORMAT OF RECORD	AGENCY			REMARKS
							M	B	C	
B)	**IN-PROCESS INSPECTION**									
20.	Fabrication	a) Cutting, Punching, Shearing & Bending	MEAS	Mfr. practice	Mfr.drg	LGB	P			
		b) Panel front door cut-outs punching	MEAS	Mfr. practice	Mfr.drg	LGB	P			
21.	Pretreatment & (by 7 tank process)	Chemical concentration check of all tanks for pretreatment of sheet steel	CHEM	Mfr. practice	Mfr's Std & IS 6005	LGB	P	V		
22	Painting	a) Paint shade	VISU	1 sample/lot	Purchase Spec, Drgs, IS 5 & RAL shade card	LGB	P			
		b) Paint thickness & adhesion	MEAS/ TEST	Mfr. practice	Purchase Spec, Drgs	LGB	P			Cross hatch method for paint adhesion check
23.	Assy of electrical components	a) Location of components & accessibility for attending / wire tightening	VISU	100%	Purchase Spec, Drg & IS 8623	LGB	P			
		b) Clearance of bus bars of different phases & earth	MEAS	100%	Purchase Spec, Drg & IS 8623	LGB	P			
		c) Shrouding of power terminals	VISU	100%	Purchase Spec, Drg & IS 8623	LGB	P			
C)	**FINAL INSPECTION**									
24.	Routine Tests	a) Overall dimension including sheet steel thickness.	MEAS	100%	Purchase Spec, Drg	LGB	P	W		
		b) Door locking, Interlocking and pad locking arrangement	MECH	100%	Purchase Spec, Drg	LGB	P	W		
		c) Usage of plated fasteners	VISU	10%	Purchase Spec, Drg	LGB	P	W		
		d) Mounting arrangement of components & Component identification for make, type, rating	VISU	100%	Purchase Spec, Drg	LGB	P	W		

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK	REF.DOC. & ACCEPTANCE STANDARD	FORMAT OF RECORD	AGENCY			REMARKS
							M	B	C	
		& layout								
		e) Kick plate Material, size & finish(if provided)	MEAS/ VISU	100%	Purchase Spec, Drg	LGB	P	W		
		f) Provision of gaskets at mating surfaces and rubberised neoprene gasket between shipping sections	VISU	100%	Purchase Spec, Drg	LGB	P	W		
		g) Painting shade, finish and thickness	VISU /MEAS	Minimum 5 places on each side	Purchase Spec, Drg	LGB	P	W		
		h) Busbar size(Main, Control, Aux. & Earth), clearances, colour coding/sleeving, phase sequence identification	MEAS/ VISU	100%	Purchase Spec, Drg	LGB	P	W		
		i) Provision of additional tapped holes and fasteners for earth connection and earth symbol	VISU	100%	Purchase Spec, Drg	LGB	P	W		
		j) CT secondary shorting & earthing(where applicable)	VISU	100%	Purchase Spec, Drg	LGB	P	W		
		k) Provision of labels/Name plates with pan head screws	VISU	100%	Purchase Spec, Drg	LGB	P	W		
		l) Power/Control wiring sizes,Colour, Ferruling and termination with insulated lugs and proper crimping	VISU	100%	Purchase Spec, Drg	LGB	P	W		
		m) Power & Control drawout contacts alignment check	ELEC	100%	Purchase Spec, Drg	LGB	P	W		10% random sample by BHEL for D/O MCC
		n) Provision of spare terminals, Shrouding of power terminals(above 110V0 and warning stickers for 415 V	PHYS	100%	Purchase Spec, Drg	LGB	P	W		
		o) Functional check for logic verification and annunciation	ELEC	100%	Purchase Spec, Drg	LGB	P	W		10% random sample by

SL. NO.	COMPONENT & OPERATION	CHARACTERISTICS	TYPE OF CHECK	QUANTUM OF CHECK	REF.DOC. & ACCEPTANCE STANDARD	FORMAT OF RECORD	AGENCY			REMARKS
							M	B	C	
		p) Interchangeability check for drawout modules	ELEC	100%	Purchase Spec, Drg	LGB	P	W		BHEL 10% random sample by BHEL
		q) IR test before & after HV test with 500 V Megger	ELEC	100%	IS 8623	LGB	P	W		Shall be >1 Mega ohm
		r) HV test on power & control circuit	ELEC	100%	IS 8623	LGB	P	W		Shall withstand 2 KV for 1 minute
25.	Type Test	a) Degree Of Enclosure Protection	ENVI	one of design	Purchase Spec, Drg, IS 13947 Pt 1& IS 8623	TR	V	V		
		b) Temperature rise test	ELEC	one of design	Purchase Spec, Drg, IS 13947 Pt 1& IS 8623	TR	V	V		Applicable for SB MCC
		c) Short circuit test	ELEC	one of design	Purchase Spec, Drg, IS 13947 Pt 1& IS 8623	TR	V	V		Applicable for SB MCC

D) NOTES:

1.Legend

MECH	: Mechanical;	VISU	: Visual;
ENVI	: Environmental;	PHYS	: Physical
T.C.	: Test certificate;	LGB	: Log Book;
ELEC	: Electrical;	MEAS	: Measurment;
TR	: Test Report;	CHEM	: Chemical

2. All testing facilities shall be arranged by the vendor at their works. Tests for which facilities are not available are to be carried out at recognised National test houses like ETDC / CIL / NPL / ERTL etc.., at vendor's cost.

3. Through logbooks / any other documents available at the vendor's works, it shall be possible to correlate the finished product with raw material and in process stage checks / inspection carried out.

4. All measuring and testing instruments shall be periodically calibrated from recognised test houses and certificates made available during inspection.

5. Test certificates for routine and type test to be furnished by the vendor.

6.Vendor to give tentative inspection programme in advance and confirm exact date three weeks in advance for arranging BHEL inspection.

7. Type test certificates shall not be earlier than 5 years from the date of enquiry.

8. Packing shall be as per the 'PACKING PROCEDURE indicated in the Specification.

E) REFERENCE STANDARDS: (for indicated standards refer the latest version)

IS 5	Colours for ready mixed paints and enamels
IS 513	Cold rolled low carbon steel sheet and strips.
IS 694	P.V.C insulated cables for working voltages upto and including 1100 V.
IS 1079	Hot rolled carbon steel sheet and strips
IS 1248	Direct acting electrical indicating instruments
IS 2026	Power transformers
IS 2705	Current transformers
IS 3231	Electricals relays for power system protection.
IS 5082	Wrought aluminium and aluminium alloy bars,rods,tubes and Sections for electric purpose.
IS 6005	Code of practice for phosphating of iron and steel.
IS 8623	Low voltage switchgear and control gear Factory built assemblies of swithchgear and controlgear assemblies
IS 13703	LV fuses for voltages not exceeding 1000 V ac or 1500 V dc
BS 6121	Cable glands.
IS 13947 Pt 1	Specification on Enclosure Protection.
Pt 2	Specification on Circuit Breakers.
Pt 3	Specification on Switches.
Pt 4	Specification on Contactors & Starters.

LIST OF EHT SYSTEM FEEDERS PROVIDED IN BOILER FRONT
PROJECT: GVK GOINDWAL TPS—2X270 MW. – Cust.no.1204&1205

Drawing no. : CI-EHT-1204-0001 / 00

Ref.drg. –Scheme of Fuel Oil System-KEY DIAGRAM--Drg. No. – 0-00-056-10774/01

Sl.No.	Feeder Ref.	Capacity of feeder in KW	Remarks
01	CKT-1	1.0 KW	1)Power for CKT-1 TO 24 including spare circuits are of 1 Phase , 240 V, 50 HZ. 2)Total Power is to be provided from 3 PHASE , 3 Wire , 415 V , 43 KW. Approximate. Total Power Requirement = 45 KW. 3) 3 Ph , 4 Wire BUS is to be derived from DELTA / STAR Transformer
02	CKT-2	1.0 KW	
03	CKT-3	1.0 KW	
04	CKT-4	1.0 KW	
05	CKT-5	1.0 KW	
06	CKT-6	1.0 KW	
07	CKT-7	1.0 KW	
08	CKT-8	1.0 KW	
09	CKT-9	1.0 KW	
10	CKT-10	1.0 KW	
11	CKT-11	1.0 KW	
12	CKT-12	1.0 KW	
13	CKT-13	3.0 KW	
14	CKT-14	2.0 KW	
15	CKT-15	5.0 KW	
16	CKT-16	5.0 KW	
17	CKT-17	1.7 KW	
Spare	CKT-18	1.0 KW	
Spare	CKT-19	1.0 KW	
Spare	CKT-20	1.0 KW	
Spare	CKT-21	2.0 KW	
Spare	CKT-22	5.0 KW	
Spare	CKT-23	1.7 KW	
Panel Lighting & Heater ckt	CKT-24	1.0 KW	
TOTAL POWER		41.40 KW	

Bharat Heavy Electricals Limited
Piping Centre Chennai-17

ENGINEERING DEPARTMENT

Rev. No	Specification No.	Sheet No.
00	**PC : TSP : EHT : GVK POWER**	1 of 15

TECHNICAL SPECIFICATION FOR ELECTRCAL HEAT TRACING SYSTEM

REV.	DATE	ALTERATION	PREPARED	CHECKED	APPROVED
05					
04					
03					
02					
01					
00	15.04.11	Fresh issue	B.Sumith	E.Loganathan	R.Prabha

TECHNICAL SPECIFICATION FOR ELECTRCAL HEAT TRACING SYSTEM

1.0 SCOPE

1.1 This standard specifies the requirement of Electrical Heat Tracing System in Utility/ Captive Power Plants.

1.2 This specification covers the general requirements for the design, selection and supply of "Electric Heat Tracing (EHT) System" for the pipelines (including valves and fitting), equipment (eg. pumps, strainers etc) and tanks/vessels to maintain the specified operating temperature of the process. Depending on system offered whether a total package, or tracers alone, etc. other specifications (referred elsewhere), shall also be deemed to constitute within the scope of this specification.

2.0 GENERAL

2.1 It is the responsibility of the vendor to supply all items that are incidental for completion of the installation whether specifically mentioned or not, so that the installation complies with the relevant standards and specifications, at no extra cost to the purchaser.

2.2 Responsibility of obtaining necessary approvals from statutory authorities rests entirely with the vendor. Vendor shall submit all necessary drawings, detail proforma etc. to the concerned authorities and get their approval.

3.0 CODES AND STANDARDS

The design, material, construction, manufacture, inspection, testing and performance of the EHT system shall essentially comply with Standards BS 6351, 1983 (or latest), IEEE:515 - 1997 regulations and safety codes as applicable to the locality where it is to be used. Nothing in this specification shall relieve the vendor of meeting the above responsibilities.

4.0 DATA SHEET

4.1 Enclosed Data Sheet, gives specific project information, requirement and the same constitutes a particular requirement in addition to general technical requirement specified in this specification.

5.0 GENERAL TECHNICAL REQUIREMENTS

5.1 For heat tracing requirements, low watt density heaters shall be used. (Rating shall be limited and optimised).

5.2 Heaters shall have self burn-out proof feature or design.

5.3 For easy installation and efficient heat transfer, the heater strip shall be flexible and with flat configuration. Semi-rigid, round configuration type of heaters is not acceptable. Also heaters requiring incorporation of resistors are not acceptable.

5.4 Heaters shall be of self-limiting and self-regulating type of parallel circuit flat cable, with positive temperature coefficient.Minimum Output Shall be 33 Watts per Meter.

NOTE: Constant wattage parallel and constant wattage series type of EHT are not acceptable.

5.4.1 The bidder shall include power supply distribution panel, all accessories for EHT installation like fixing tapes, end / power / special connections etc. in scope of supply to make the system complete, in all aspects. Supply of ordinary power and control cables are included in scope. The recommended cable sizes (power and control) shall be furnished.

5.4.2 It is to be noted that controls required for the EHT chosen shall also be housed in power supply distribution panel itself. Each circuit shall be provided with dedicated thermostat, to effect energy savings.

5.5 General Requirements

5.5.1 The design shall be based on continuous and reliable service, safety to personnel and equipment, ease of maintenance and interchange ability of equipment.

5.5.2 The system shall be complete in every detail with all equipment, accessories and material required to provide a total heating system to meet the requirements in this specification. Consideration shall be given, but not to be limited, to climatic conditions, pipe material, pipe size and length, fittings, type and thickness of insulation, fluid flow conditions, voltage levels and power supplies available. The design shall take into account heat losses at the pipe supports, tank foundations etc. Actual pipe layout drawings will be made available after purchase order during execution of the contract. The number of circuits, connectors and accessories shall be decided based on pipe length indicated vide data sheets. Number of feeders and rating of feeders at the time of bid shall be liberally selected/sized so that the same can be utilized during contracts execution based on actual pipe layout drawings (Refer clause No. 5.28.6)

5.5.3 Entire surface area has to be considered for tanks (if applicable), for computing the heat loss. A 10% design margin shall be considered on the rate of heat loss calculated this way.

5.5.4 Extra heater length shall be provided for valves, flanges, pipe supports etc.,(one support to be mounted at every 3 meters. Pipe to pipe connections are welded type). The electric heat tracing for these shall be done in such a way that the servicing and operation of the same shall be easily possible, without disconnecting the wiring.

5.5.5 Vendor shall supply all necessary accessories for fixing and installing the heater strip.

5.5.6 Glass adhesive tape shall be used for fixing the heat tracer on pipe lines and aluminium adhesive tape shall be used for fixing on the tanks. The tapes shall be offered and quantity to be indicated in BOM.

5.5.7 The rating of tracer selected shall be such that pitch factor is always <1. A pitch factor >1 shall be generally avoided.

5.6.1 Heat tracer inner and outer jacket material shall be high temperature fluoropolymer having minimum continuous temperature rating 210 Deg. C. vendor to confirm type of fluoropolymer of tracer meeting this requirement and provide published data from the manufacturer of fluoropolymer.

5.6.2 Heat tracer shall have a metallic braiding.

5.7 Heater strip shall be such as to permit easy and quick replacement of damaged portions, if accidentally damaged

5.8 Heater shall not be affected by water in the event of flood, rain and/or fire fighting operations.

5.9 Design, manufacture, guarantee shall cover an operating life of 30 years. Vendors shall furnish details on accelerated ageing tests carried out and the basis of their claim.

5.10 Heaters (EHT) shall operate on Purchaser's 240V, 1 phase, two wire. For this purpose, 415V, 3 phases, 3 wires, 50 Hz AC supply system, will be provided by the Purchaser. Necessary power distribution for distributing power to each segment of tracer from this power rating shall be properly engineered and supplied.

5.11 Heaters shall be of weather proof, water proof and shock proof type and shall be suitable for outdoor installation.

5.12 The construction shall be such that the jacket over the element is thermally conductive, electrically insulative polymer material of the flexible type, with metallic braid plus over sheath.

5.13 Heat tracers offered shall not require the use of heat transfer cement.

5.14 The heater having self-regulating characteristics shall ensure auto-reduction in heat output in response to increase in process temperature or ambient temperature and this process shall also be reversible. Inrush current, of such self-limiting, self-regulating type of tracers, shall be clearly indicated in the offer.

5.15 Heat tracer shall have high self-regulating index (SRI) to meet requirements for rapid start-up and energy efficiency. SRI is a measure of tracer's ability to adjust its heat output in response to changes in pipe temperature and ambient temperature, SRI shall not be less than 0.25 watts at 0°C and value of the same to be guaranteed.

5.16 The heater shall have uniform heat output per unit length, and minimum cut length shall not be less than 100 metres and shall permit site cutting / fabrication.

5.17 Heaters shall not be affected by vibration and twisting.

5.18 Overlaying / criss-crossing of heater during installation shall not affect the performance, or life of the tracing system.

5.19 Design shall be such that failure of controls, under heater energised condition, shall not raise the temperature sufficient enough to cause heater failure.

5.20 Heater sheath shall not reach auto-ignition temperature of the surrounding atmosphere, if used in hazardous areas.

5.21 All EHT shall meet Factory Mutual to IEEE 515/2007, BASFEFA to BS 6351/83, from safety point of view and shall be certified by the Chief Controller of Explosives, India and CMRS, India. In this regard, the product actually supplied shall be either FM / BASEFFA approved. The manufacturing facility shall be licensed to issue FM / BASFEFA /Country of origin certification. Documentary evidence for the above to be furnished.

5.22 EHT shall meet at least Grade 22 of BS 6351 with respect to mechanical, water resistance properties.

5.23 Heater shall be selected based on the maximum temperature differential (Refer enclosed Data Sheet).

5.24 Heaters shall be selected after considering its heat output and taking into account the value of the temperature to be maintained for the fluid and the maximum temperature to be withstood by the heater. In this regard, power-on and power-off temperature requirements spelt vide data sheet shall be met. This should be supported by certification from statutory authority of the country of origin.

5.25 Heat tracers requiring incorporation of special transformers or resistors are not acceptable.

5.26 Heat Tracer shall have unconditional T-2C rating. This should be supported by certification from statutory authority of the country of origin.

5.27 Design shall account for following variances also:

5.27.1	Voltage	:	± 10%
5.27.2	Frequency	:	± 5%
5.28.3	Combination of voltage & frequency	:	± 10%
5.27.4	Design margin	:	± 10%

5.28 Controls:
Each circuit shall be provided with surface mounted thermostat to effect energy savings (i.e. power off at temperature >90 Deg. C).

5.28.1 Suitable space shall be provided in power distribution panel and the controls shall be housed in the same.

5.28.2 Annunciation for following fault condition to be provided.

5.28.2.1 Heater failure - circuit wise

5.28.2.2 Power distribution transformer temp. very high - zone wise
Necessary sensors for the same to be provided.

5.28.3 2 no.(1 for supply and 1 for return at convenient location). Temperature indication should be made available in the panel.

5.28.4 Constant monitoring of the circuit by detecting the current drawn in the circuit shall be provided (Ammeter to be provided).

5.28.5 Powering of circuit zone-wise shall be as per enclosed powering scheme.

5.28.6 Circuit Selection:
Circuit selection shall be done based on product flow and temperature maintenance conditions as recommended by IEEE. However, use of artificial dead legs should not be resorted to. The circuit length shall be limited so as to limit the end to end heat tracer output drop. Variations allowed + 5%. Ease of monitoring and fault finding shall be kept in view while deciding the number of circuits wherever power connector / power splice connector, are employed. The number of circuits shall be such that number of feeders are kept minimum 20% spare feeders to be made available in the panel.

Circuit Selection for Trichy portion:
Heater shall be selected to maintain the temperature indicated in the attached data sheet under minimum ambient temperature and with negative heater out put and voltage tolerances under continuous power on condition and fluid at maximum temperature.
Failure of controls under heater energise conditions shall not raise the temperature sufficient enough to cause heater failure.

Vendor shall furnish calculation for heater sheath temperature for 1" sch40 pipe with 50mm mineral wool insulation, maximum ambient temperature and maximum fluid temperature.
Heater sheath temperature shall not reach auto ignition temperature of the surrounding atmosphere and shall be with in T3 limits.
Overlaying / criss-crossing of the heater during installation shall not affect the performance or life of the heater system.
Field cutting of the heater shall not affect heat out put at either ends.
For other details attached data sheet as well as relevant spec. Clause is to be complied.

5.28.7 All earth points shall be connected to an established earth terminal. Each zone shall have established earth points at an interval of 250m. Copper bus to effect the same (details of which to be furnished in offer) shall be included in the offer.

5.29 Power distribution panel shall generally comply with enclosed Specification **PC:TSP:PDP:UKAI.**

5.29.1 Each outgoing circuit shall have DP MCB, Taut band ammeter, contactor, indicating lamps etc. There shall be two incomers for each panel & manual selection through switch shall be possible. The incomer shall contain:

5.29.1.1 MCCB
5.29.1.2 Power distribution transformer
5.29.1.3 Back up fuse
5.29.1.4 Taut band voltmeter
5.29.1.5 Taut band ammeter

5.29.2 One main incoming feeder will be standby and selection of the feeder through manual switch shall be available on the panel.

5.29.3 PDP shall be single front, sheet steel mounting, free standing, completely draw out, totally enclosed dust and vermin proof modular construction, fully compartmentalized. No hinges, rivets shall be apparent from outside.

5.30 Field junction boxes to terminate Thermostat shall be provided. Intermediate field JB shall be used wherever (i) the power connector (PC) cannot accept required power cable, (ii) access to PC is a problem. In such case, cable connecting JB and PC / PSC (Power Splice Connectors) shall also be supplied (5 Met/point).

5.30.1 All PC(Power Connectors), PSC(Power Splice Connectors), TC(Tee Connectors), EC(End Connectors) shall be complete with cable glands for incomer and outgoing feeders. The same shall be flame-proof type. Necessary certification to be provided.

5.31 Field sensors (Thermostat), shall be provided.(1 Per Circuit)

5.32 Each suitable power distribution transformer to cater to the total heat tracer burden shall be provided with suitable voltmeter / ammeter and protective elements. The entire load shall be properly distributed in each phase, with protection and indicators like ammeters, etc. The load shall be decided considering the start-up requirements. The transformer shall comply with relevant IS code. The % impedance shall be minimum 4% and shall be properly co-ordinated for total fault load reduction with reference to withstandability. Supporting calculations to be furnished. The transformer shall be dry type.

5.33 All accessories and erection consumables like fixing tape, end terminations, power connectors, splicer kits, cable trays, lugs, etc. as required for the system shall be offered. All terminators, connectors and seal kits, etc. shall be flame proof and weather proof to IP-65.

6 INSPECTION & TESTING

Vendor to furnish QP ensuring the following minimum test requirements are covered

a) Service life performance benchmark test specified in IEEE: 515-1997. this shall be supported by test report.

b) TEST REQUIREMENTS

The tests for heat tracers shall include, but not be limited to following:

i) Dielectric withstand
ii) Insulation resistance
iii) Resistance of metallic braid
iv) Thermal output
v) Self-regulating index
vi) Start-up current
vii) Maximum self-generated temperature
viii) Thermal stability
ix) Jacket tensile and elongation
x) Room temperature bend
xi) Cold bend
xii) Impact resistance
xiii) Deformation under load
xiv) Jacket ageing
xv) Voltage withstand at elevated temperature

7 INSTALLATION REQUIREMENTS

(Important: Installation is not in scope).

7.1 All fittings and material required to install and supply power to EHT shall be supplied.

7.2 All installation connections, joints, etc. shall be weather proof, waterproof and flame proof.

7.3 Supervisory assistance during erection & commissioning of EHT (as a total package) to be quoted separately.

7.4 Heating cables shall be spiralled or shall be axially installed preferably more than 60° below the horizontal centre line of pipe to allow for the best heat transfer upward from the tracer and to utilise the pipe for mechanical protection of the tracer. Tracer selected shall be suitable for the same.

7.5 Self-illuminated signs shall be permanently fixed to the outside of the finished external thermal insulation which shall be visible from the ground level. The sign shall read "DANGER / ELECTRICALLY TRACED". The sign plate shall be of size 200x60mm and shall be spaced at an interval of 6M maximum. These labels/name plates shall be supplied in adequate quantity.

8.0 DOCUMENTS

8.1 The following documents in TRIPLICATE shall be furnished in ENGLISH along with the bid.

8.1.1 Detailed calculation sheets with basis of design, supplemented by catalogues, graphs, etc. for EHT. Detailed panel-sizing, transformer sizing calculations to be furnished.

8.1.2 Installation drawing of EHT showing orientation of heaters, thermostats, power connectors, etc. EHT superimposed on pipe isometrics to be given. (After placement of order).

8.1.3 Single line power distribution diagram.

8.1.4 Recommended interconnecting cable (power and control along with back-up selection calculation), clearly indicating terminal disposition and ferruling details.

8.1.5 Details of all accessories offered (along with BOM).

8.1.6 Quality control procedures & Quality assurance program.

8.1.7 Detailed BOM.

8.1.8 Details of Licence Number / Certificates for use from safety point of view.

8.1.9 All other documents called under other sub-specification.

8.1.10 "Tender Deviation" or "Point to Point" confirmation to our specification.

8.2 The following documents in ENGLISH shall be furnished in the event of an order.

8.2.1	Catalogues	5 sets
8.2.2	Operation, Maintenance, Erection and Commissioning Instruction	10 sets
8.2.3	Detailed BOM	5 sets
8.2.4	Panel G.A. drawing & Wiring Diagram, EHT superimposed piping isometrics, circuit schedule	10 sets + 1 reproducible
8.2.5	Recommended interconnection Cable Schedule	10 sets
8.2.6	Test Reports as called for in Q.C.P. and Specification	1 reproducible + 5 sets
8.2.7	Filled in data sheet in the format attached for TRICHY portion.	

9.0 PACKING & DELIVERY CONDITIONS

9.1 All packing will be to international standards, capable of withstanding transit risks. Number of despatch able unit (DU) clearly indicating the weight of each such unit shall be brought out in the offer itself. An unique material code for each item shall be furnished and marked on top of the packing/equipment for easy identification at site.

9.2 Minimum roll size of tracers shall be such that uncut length of tape shall be at least 100 metres, to minimise site joints.

10.0 Erection, Commissioning & Extended Warrantee Requirements

10.1 Alternatively supervisory assistance during erection and commissioning (E&C) of the system shall be quoted separately. Under such circumstances, special kits, if any, for E&C shall be quoted.

10.2 Extended guarantee for a period of 3 years over and above normal 2 years from the date of commissioning for the total EHT system to be provided. This shall cover, but not limited to, free replacement of defective component plus services.

NOTE (IMPORTANT)

(1) Actual requirement of tracer quantity, control system components, erection materials, etc. may vary at the time of execution at Site and the variation to the tune of +10% shall be accommodated without any commercial implication.

(2) It is not the intent to completely specify herein all aspects of design and construction of equipment. Nevertheless the equipment shall confirm in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to the owner who will interpret the meaning of the specification for the purpose of which the owner reserves the right to alter the specification even during the contract execution stage for which commercial implications will not be entertained.

TECHNICAL SPECIFICATION FOR ELECTRCAL HEAT TRACING SYSTEM

PART-1 DATA SHEET (FOR BHEL/PC's PORTION)

Project : **G V K POWER – 2 x 270 MW**
Customer No. : **1204 & 1205**

1 Ambient Conditions

1.1 Max. Dry Bulb Temp (°C) : 35

1.2 Min. Dry Bulb Temp (°C) : 5

1.3 Relative Humidity : 100%

1.4 Design Ambient Min. Temp. (°C) : 0

1.5 Design Temp. for Electrical Equipement / Device (°C) : 45

2 EHT SERVICE : LSHS – FUEL OIL LINES

APPLICATION	LINE SIZE	F.O PIPE LENGTH in m	INSULATION THICKNESS In mm	MAINTENANCE TEMPERATURE In °C
FUEL OIL COMMON SUPPLY	NB 100	585	60	85
FUEL OIL SUPPLY TO BOILER-1	NB 80	20	45	85
FUEL OIL SUPPLY TO BOILER-2	NB 80	115	45	85
FUEL OIL COMMON RETURN	NB 100	585	60	85
FUEL OIL RETURN FROM BOILER-1	NB 80	20	45	85
FUEL OIL RETURN FROM BOILER-2	NB 80	115	45	85
HFO DRAIN	NB 25	75	25	85
NO OF VALVES	**30** Nos (Consider 3.0 m per valve)			
NO OF SUPPORTS	**550** Nos (Consider 0.3 m per support)			

3	Maximum Process Temperature	(°C)	:	140
4	**Exposure Temp.Rating**			
4.1	Continous power on temperature	(°C)	:	140
4.2	Intermittent power ON temperature	(°C)	:	210
4.3	Intermittent power OFF temperature	(°C)	:	210
5	Maximum withstandable outside temperature (Insulation rating)	(°C)	:	210
6	Power supply available at Site		:	415V 3 phase, 3 wire with 50 kA fault level. Bidder to specify kVA rating of total load.
7	**Supply variations**			
7.1	Voltage		:	± 10%
7.2	Frequency		:	± 5%
7.3	Combined		:	± 10%
8	**Insulation Data**			
8.1	Type		:	LBM
8.2	Density		:	100 kg/m³
8.3	Thermal Conductivity (W/m°C)		:	0.040 at 50°C mean 0.052 at 150°C mean
9	Design EHT Load		:	Each tracer circuit shall be Single phase load
10	Spare EHT		:	10% of each type

TECHNICAL SPECIFICATION FOR ELECTRCAL HEAT TRACING SYSTEM

NOTES

1 **Only SLSR tracers are acceptable.**

2 FOS and FOR lines are a combination of yard piping in racks plus piping inside boiler area.

3 The total portion shall be apportioned into segments depending on tracer limitations. Each segment shall be provided with power supply module and controls. Loading and segregation shall ensure proper balancing of all 3 phases.

4 Pipe layout will be finalised during contract execution stage.

5 EHT shall be provided with dedicated thermostat for cutting off power to effect energy savings conditions.

6 Power cables & Control cables in bidder's scope for BHEL (PC) portion of EHT. (Refer Specn. DS:TCI:239:STD & PC:TSP:81052)

7 Two site visits (Each 3 Days) to supervise EHT System erection and commissioning for BHEL-PC & BHEL-T portions to be included in bidder's scope.

TECHNICAL SPECIFICATION FOR ELECTRCAL HEAT TRACING SYSTEM

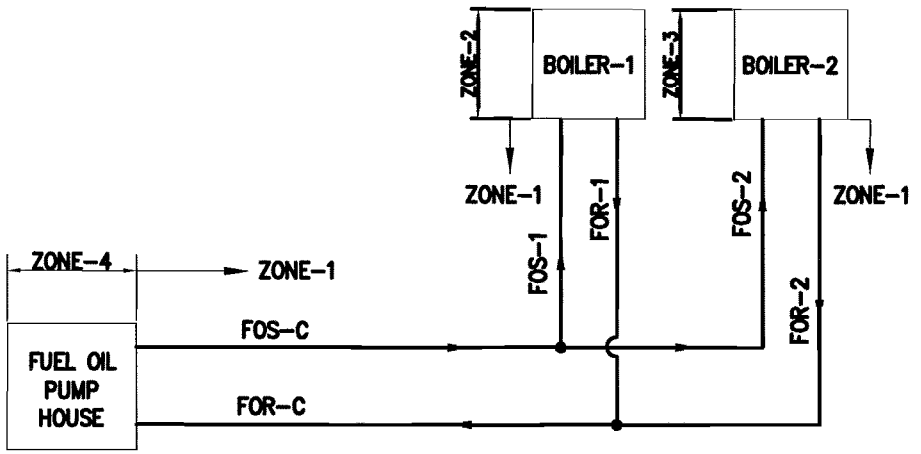
PART-2 BHEL/ TRY's REQUIREMENT

BILL OF QUANTITY

		FOR CUST. NO. **1204**	FOR CUST. NO. **1205**
1	SLSR tracer (33 W/m at 85 Deg.C) in line with specification PC:TSP:EHT:GVK POWER	: 1000 m	600 m
2	Power Connector with accessories	: 23 Nos	18 Nos
3	Tee Connector with accessories	: 30 Nos	20 Nos
4	Splice Connector with accessories	: 23 Nos	18 Nos
5	End Connector with accessories	: 53 Nos	38 Nos
6	High Temp. Glass adhesive tape (20 m/roll)	: 50 Nos	30 Nos
7	Aluminium adhesive tape (20 m/roll)	: 50 Nos	30 Nos
8	Caution labels	: 100 Nos	60 Nos
9	Thermostats	: 46 Nos	36 Nos
10	6" Pipe strap	: 14 Nos	-------
11	3" Pipe strap	: 30 Nos	10 Nos
12	2" Pipe strap	: 40 Nos	25 Nos
13	1.5" Pipe strap	: 40 Nos	10 Nos
14	1" Pipe strap	: 120 Nos	120 Nos
15	Mounting Clamps	: 120 Nos	75 Nos
16	4" Pipe strap	: 14 Nos	-------
17	8" Pipe strap	: 10 Nos	-------

IRST ANGLE PROJECTION(ALL DIMENSIONS IN MILLIMETRES)

DRAWING No **4-81-441-04761**



LEGEND :

FOS-1 : FUEL OIL SUPPLY LINE TO BOILER-1
FOS-2 : FUEL OIL SUPPLY LINE TO BOILER-2
FOS-C : FUEL OIL COMMON SUPPLY LINE
FOR-1 : FUEL OIL RETURN LINE FROM BOILER-1
FOR-2 : FUEL OIL RETURN LINE FROM BOILER-2
FOR-C : FUEL OIL COMMON RETURN LINE

NOTES :

01) ENTIRE E.H.T IS DIVIDED IN TO VARIOUS ZONES FOR POWERING PURPOSE

02) **ZONE-1** E.H.T. AND ACCESSORIES ARE SUPPLIED BY BHEL-PC

03) **ZONE-2** E.H.T. AND ACCESSORIES ARE SUPPLIED BY BHEL-TRICHY

04) **ZONE-3** E.H.T. AND ACCESSORIES ARE SUPPLIED BY BHEL-TRICHY

05) **ZONE-4** E.H.T. AND ACCESSORIES ARE SUPPLIED BY BHEL-TRICHY

06) **POWER DISTRIBUTION PANEL-1 SUPPLIED BY BHEL-PC,**
POWERS THE E.H.Ts IN **ZONE-1 & ZONE-4**
THIS PANEL IS LOCATED IN FUEL OIL PUMP HOUSE

07) **POWER DISTRIBUTION PANEL-2 & PANEL-3 SUPPLIED BY BHEL-TRICHY,**
POWERS THE E.H.Ts IN **ZONE-2 & ZONE-3**
THESE PANELS ARE LOCATED IN RESPECTIVE BOILER OPERATING FLOORS

SL.NO	PANEL DESIGNATION	LOCATION OF PANEL	PANEL SCOPE	MAIN IN COMING POWER SUPPLY	
				RATING	SCOPE
01	**PANEL-1** (ZONE-1 & ZONE-4)	FUEL OIL PUMP HOUSE	BHEL (PC)	**100 kW** 415V, 3Ph, 3 WIRE	BHEL-PEM
02	**PANEL-2** (ZONE-2)	BOILER OPERATING FLOOR	BHEL (T)	**45 kW** 415V, 3Ph, 3 WIRE	BHEL-PEM
03	**PANEL-3** (ZONE-3)	BOILER OPERATING FLOOR	BHEL (T)	**45 kW** 415V, 3Ph, 3 WIRE	BHEL-PEM

SL.NO	SERVICE	LINE SIZE	LENGTH (meters)	INSULATION THICKNESS (mm)	REMARKS
01	FOS-C	100	585	60	
02	FOS-1	80	20	45	
03	FOS-2	80	115	45	
04	FOR-C	80	585	45	
05	FOR-1	50	20	30	
06	FOR-2	50	115	30	
07	DRAINS	25	75	25	

NO. OF VALVES = 30 Nos.
TRACER PER VALVE = 3.0 m
NO. OF SUPPORTS = 550 Nos.
TRACER PER SUPPORT = 0.3m

CUSTOMER NO : 1204 & 1205

GVK POWER (GOINDWAL SAHIB) LIMITED

M/s **TCE CONSULTING ENGINEERS LIMITED**

PROJECT
2x270MW COAL BASED THERMAL POWER PROJECT
GOVINDWAL SAHIB, TARN TARAN DIST., PUNJAB

BHARAT HEAVY ELECTRICALS LIMITED.,
PIPING CENTRE - CHENNAI - 600 017
355-029

	NAME	SIGNATURE	DATE
DRN.	B.SUMITH		07.04.11
CHD.	E.LOGANATHAN		07.04.11
APPD.	R.PRABHA		07.04.11

ALL DIMENSIONS IN MILLIMETRE
PROJECTION
SCALE NTS

TITLE
BASIC SCOPE OF E.H.T FOR FUEL OIL LINES

DRG.No. 4-81-441-04761
REV. 00

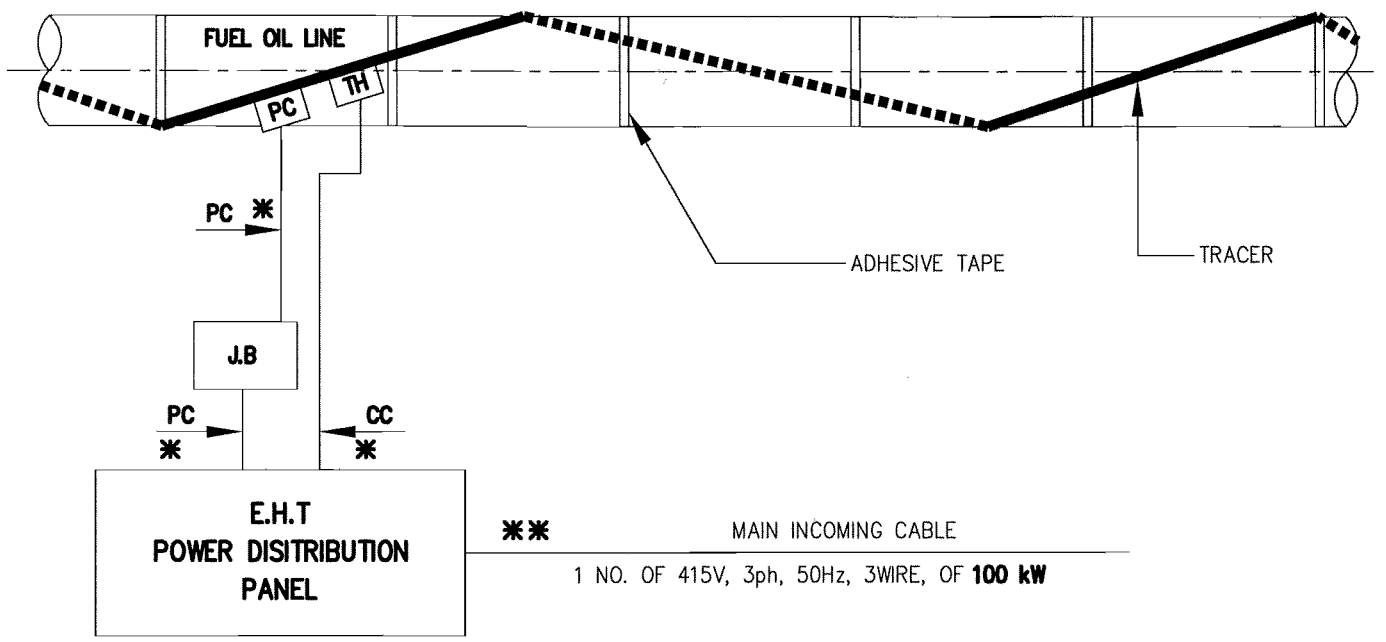
REV	DATE	ALTERED / APPROVED	REV	DATE	ALTERED / APPROVED	REV	DATE	ALTERED / APPROVED
03			02			01		
ZONE			ZONE			ZONE		

FIRST ANGLE PROJECTION(ALL DIMENSIONS IN MILLIMETRES)

DRAWING No 4-81-441-04762

LEGEND : PC : POWER CONNECTOR
JB : JUNCTION BOX
PDP : POWER DISTRIBUTION PANEL
TH : THERMOSTAT

CIRCUIT – 1 (TYPICAL)



PC : POWER CABLE

CC : CONTROL CABLE

NOTES :

01) THIS DRAWING IS APPLICABLE FOR SELF LIMITING, SELF REGULATING TYPE ELECTRICAL TRACER.

02) CABLES MARKED ✱ IS IN BHEL(PC) SCOPE, CABLES MARKED ✱✱ IS IN CUSTOMER SCOPE.

03) FOR RECOMMENDED SIZE OF INTERCONNECTING POWER CABLE BETWEEN PDP AND PC/JB, CIRCUIT SCHEDULE TO BE REFERRED.

04) RECOMMENDED SIZE OF MAIN INCOMER CABLE ———

05) CABLE GLAND AT PC/JB END AND PDP END BY BHEL(PC).

06) CABLE GLAND AND LUGS FOR MAIN INCOMER BY BHEL-PEM.

07) DRAWING INDICATED FOR ONE CIRCUIT. TYPICAL FOR OTHER CIRCUITS.

08) CONTROL CABLES FOR TRACERS IN YARD PIPING ARE IN BHEL-PC SCOPE OF SUPPLY.

09) ONE No. EHT PDP SUPPLIED BY BHEL(PC) WILL BE LOCATED IN F.O.PUMP HOUSE.

10) FOR BASIC SCOPE OF EHT FOR F.O.SYSTEM REFER DRG.No. 4-81-441-04761

11) REQUIREMENT OF JB TO BE DECIDED BY VENDORS

CUSTOMER NO : 1204 & 1205

GVK POWER (GOINDWAL SAHIB) LIMITED

M/s **TCE CONSULTING ENGINEERS LIMITED**

PROJECT **2x270MW COAL BASED THERMAL POWER PROJECT GOVINDWAL SAHIB, TARN TARAN DIST., PUNJAB**

BHARAT HEAVY ELECTRICALS LIMITED.,
PIPING CENTRE - CHENNAI - 600 017
355-029

	NAME	SIGNATURE	DATE
DRN.	B.SUMITH		01.04.11
CHD.	E.LOGANATHAN		07.04.11
APPD.	R.PRABHA		07.04.11

ALL DIMENSIONS IN MILLIMETRE
PROJECTION
SCALE NTS

TITLE **CABLING SCOPE FOR E.H.T SYSTEMS**

DRG.No. 4-81-441-04762

REV. 00

REV	DATE	ALTERED / APPROVED	REV	DATE	ALTERED / APPROVED	REV	DATE	ALTERED / APPROVED
03			02			01		
ZONE			ZONE			ZONE		