ENGINEERING DEPARTMENT

Rev. No	Specification No.	Sheet No.
01	**PC : TSP : EHT : NEW PARLI-8**	1 of 15

TECHNICAL SPECIFICATION FOR ELECTRCAL HEAT TRACING SYSTEM

REV.	DATE	ALTERATION	PREPARED	CHECKED	APPROVED
05					
04					
03					
02					
01	04.05.12	Revised based on DESEIN mail dtd 25.01.12 & MAHAGENCO mail dtd 12.04.12	B.Sumith	B.Sumith	R.Prabha
00	20.04.11	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.

01 5.4.3 Heat Tracer shall have cut-to-length features in order to facilitate the modification and rerouting of pipe lines.

01 5.4.4 Self limiting type tracer having monolithic core shall be offered since bus wires are separated by matrix. Such configuration is free from short circuits associated with fibre core self limiting heat tracer.

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.

01 5.6.1 Heat tracer inner and outer jacket material shall be high temperature fluoropolymer having minimum continuous temperature rating **250** Deg. C. Vendor to confirm type of fluoropolymer of tracer meeting this requirement and provide published data from the manufacturer of fluoropolymer.

01 5.6.2 Heat tracer shall have a nickel plated copper braiding which has excellent corrosion resistance. Tinned copper braid does not meet this requirement and shall not be offered. Nickel plated braid also provides an effective ground path for fault current.

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

1`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.

01 5.26 Heat Tracer shall have unconditional **T3C** 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% (Absolute)
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 is 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:NEW PARLI – 8.**

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.

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% (includes tracers and accessories) 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 : **NEW PARLI, EXTN.3, UNIT-8, 1x 250 MW**
Customer No. : **7044**

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): 50

2 EHT SERVICE : LSHS – FUEL OIL LINES

APPLICATION	LINE SIZE	F.O PIPE LENGTH in m	INSULATION THICKNESS In mm	MAINTENANCE TEMPERATURE In °C
DAYTANK TO PUMP HOUSE	NB 80	50	45	85
PUMP HOUSE TO COMMON POINT	NB 80	650	45	85
COMMON POINT TO BOILER-8	NB 80	800	45	85
BOILER UNIT-8 TO COMMON POINT	NB 50	800	30	85
COMMON POINT TO PUMP HOUSE	NB 50	650	30	85
PUMP HOUSE TO DAYTANK	NB 50	50	30	85
HFO DRAIN	NB 25	150	25	85
NO OF VALVES	**30** Nos (Consider 3.0 m per valve)			
NO OF SUPPORTS	**300** Nos (Consider 0.3 m per support)			

TECHNICAL SPECIFICATION FOR ELECTRCAL HEAT TRACING SYSTEM

3	Maximum Process Temperature	(°C)	:	140
4	**Exposure Temp.Rating**			
4.1	Continous power on temperature	(°C)	:	140
01 4.2	Intermittent power ON temperature	(°C)	:	**232**
01 4.3	Intermittent power OFF temperature	(°C)	:	**285**
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% (Absolute)
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

1	SLSR tracer (33 W/m at 85 Deg.C) in line with specification PC:TSP:EHT:NEW PARLI-8	: 925 m
2	Power Connector with accessories	: 22 Nos
3	Tee Connector with accessories	: 38 Nos
4	Splice Connector with accessories	: 29 Nos
5	End Connector with accessories	: 60 Nos
6	High Temp. Glass adhesive tape (20 m/roll)	: 14 Nos
7	Aluminium adhesive tape (20 m/roll)	: 80 Nos
8	Caution labels	: 100 Nos
9	3" Pipe strap	: 17 Nos
01 10	2" Pipe strap	: **35 Nos**
11	1.5" Pipe strap	: 42 Nos
12	1" Pipe strap	: 120 Nos
13	6" Pipe strap	: 10 Nos
14	Thermostats	: 22 Nos
15	4" Pipe strap	: 22 Nos

Note:

Refer Annexure-A - Special requirements for BHEL-Trichy's EHT portion

Special requirement for BHEL-Trichy portion EHT indent

Documents to be submitted:

Along with offer

a. Detailed calculation sheet giving basis for selection, supplemented by catalogs, graphs etc for heater
b. Filled in data sheet in the format attached
c. Recommended panel wiring diagram (power and control)
d. Details of all accessories offered
e. Detailed BOM
f. Point wise confirmation of conformance to specification.

After placement of order

a. Installation drawing of heater showing orientation of heaters, thermostats, power connectors etc (1 reproducible print + 3 copies)
b. Three copies of installation instructions.
c. Three copies of O&M manuals for heater and accessories.

FUEL FIRING/PE(B)
BHEL,TIRUCIRAPALLI

HEAT TRACER DATA SHEET

1306 285

PROJECT:

1 APPLICABLE STANDARDS
- BS 6351 : 1983

2 OPERATING DATA
- Fluid - HFO/LSHS
- Ambient Temperature - 5 to 50 °C
- Pipe Maintenance Temperature - 85 °C
- Max Fluid Temperature - 140 ° C
- Size of Pipes/Fittings - 1/2" to 8"
- Power Supply - 240 V 1Ph AC
- 415 V 3Ph AC
- Insulation : Material-Mineral Wool
- : Thickness-50 mm
- : K-0.039 KCal/m-hr°C
- (Note: 1. K - Thermal Conductivity at a Mean Temp. of 50°C)

3 TYPE OF HEATER :
- SLSR/Constant Wattage Parallel Circuitry
- Cut to Length/Factory Terminated
- Burnout Proof : Yes/No
- Weather Proof : Yes/No

4 HEATER DATA :
- Watt Density - W/m at $T_{MAINTENANCE}$
- Heater Insulation :
- Material -
- Max Withstand Temp - °C
- Heater Core :
- Material -
- Max Withstand Temp - °C
- Max Sheath Temp (Clause 3.13)- °C
- Calculation Attached- Yes/No
- Heater T Rating -
- Unconditional - Yes/No
- If Conditional attach conditions
- Tolerance on Output - + % - %
- Max Circuit Length - m
- Min Radius of Bend - mm
- Overlapping: Permitted/Not Permitted
- Predicted Heater Life : Yrs
- Basis:Graph/Calculation Attached Y/N
- Aluminium Tape : Provided/Not Provided

5 ELECTRICAL DATA :
- Operating Voltage : V
- Inrush Current :
- Circuit Breaker Data Attached Y/N
- Wiring Diagram: Power Attached Y/N
- Wiring Diagram: Control Attached Y/N

6 TESTS :
- Type Tests :
- Impact Test - Y/N
- Cold Bend - Y/N
- High Temperature Exposure - Y/N
- Repeated Electrical Cycling - Y/N
- Repeated Mechanical Flexing - Y/N
- Repeated Abrasion - Y/N

Routine Tests :
- Dielectric Withstand Test - Y/N
- Output Vs Temperature - Y/N
- Visual Examination - Y/N

7 APPROVALS
- Approvals for model chosen:
- (Note:Enclose Copies of Approval Doc)

8 DOCUMENTS
- Documents with Offer Attached Y/N
- Documents after PO Y/N
- List of Similar Installations : Y/N

Thermostats/Temp Switch/RTD Provided

BHARAT HEAVY ELECTRICALS LIMITED
4-42-823-03192 REV 01

4th MARCH,1992

Annexure – III

GENERAL DESIGN FEATURES

i. Heat Tracer shall be Self Limiting and Self Regulating type having positive temperature co-efficient (PTC) characteristic.

ii. Heat Tracer shall be low Watt density type. This is required to achieve increased life of the tracer.

iii. Heat Tracer inner and outer jacket material shall be high temperature fluoro polymer having minimum continuous temperature rating 250 Deg. C. Vendor to confirm type of fluoro polymer of tracer meeting this requirement and provide published data from the manufacturer of flouro polymer.

iv. Self Limiting type tracer having monolithic core shall be offered since bus wires are separated by matrix. Such configuration is free from short circuits associated with fibre core self limiting heat tracers.

v. Heat tracer shall withstand the highest equilibrium pipe temperature that occurs when heat tracer is continuously energized at the maximum ambient temperature and at the maximum operating voltage. Maximum expected pipe temperature is 140 Deg. C.

vi. The Heat tracer shall be capable of withstanding maximum intermittent exposure temperature of 232 Deg. C. and 285 Deg. C. under " power on" and "power off" respectively. This is required to take care of Steam flushing of pipe lines and process upsets. This will be supported by certification from statutory authorities of the country of origin.

vii. Heat Tracer shall have a nickel plated copper braiding which has excellent corrosion resistance. Tinned copper braid does not meet this requirement and shall not be offered. Nickel plated braid also provides an effective ground path for fault currents.

viii. The design of Heat Tracer shall comply with IEEE:515-1997. Heat tracer shall have passed service life performance bench mark test specified in IEEE:515-1997. This shall be supported by test report.

ix. Heat Tracers shall have cut-to-length features in order to facilitate the modification and re-routing of pipelines.

x. Heat tracer shall have unconditional T3 rating. This will be supported by certification from statutory authorities of country of origin.

xi. Heat tracer offered shall have approval from Factory Mutual of USA and CCE of India for use in hazardous area classification.

xii. Though Thermostats are not mandatory using Self Limiting and Self Regulating tracers, at least one thermostat per circuit shall be provided for energy savings.

TEST REQUIREMENT

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

a) dielectric withstand

b) insulation resistance
c) resistance of metallic braid
d) thermal output
e) self-regulating index
f) start-up current
g) maximum self-generated temperature
h) thermal stability
i) jacket tensile and elongation
j) room temperature bend
k) cold bend
l) impact resistance
m) deformation under load
n) jacket ageing
o) voltage withstand at elevated temperature

HEATER INSTALLATION

a) Vender shall supply all conduits, junction boxes, fittings and any other equipment or material necessary to supply power to tracers.

b) Vender shall supply all necessary accessories for fixing and installing the heater strip and cost for this is deemed to be included in his offer.

c) All connectors and end seals shall be flame-proof type.

d) Heat tracing system have to be installed as per local electrical codes and practices.

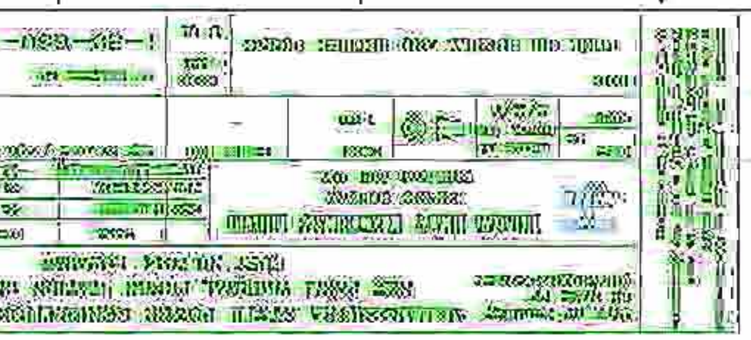
All related electrical data for heaters, such as KW rating, operating voltage etc, shall be furnished in the bid itself so that suitable inputs can be arranged by the owner.

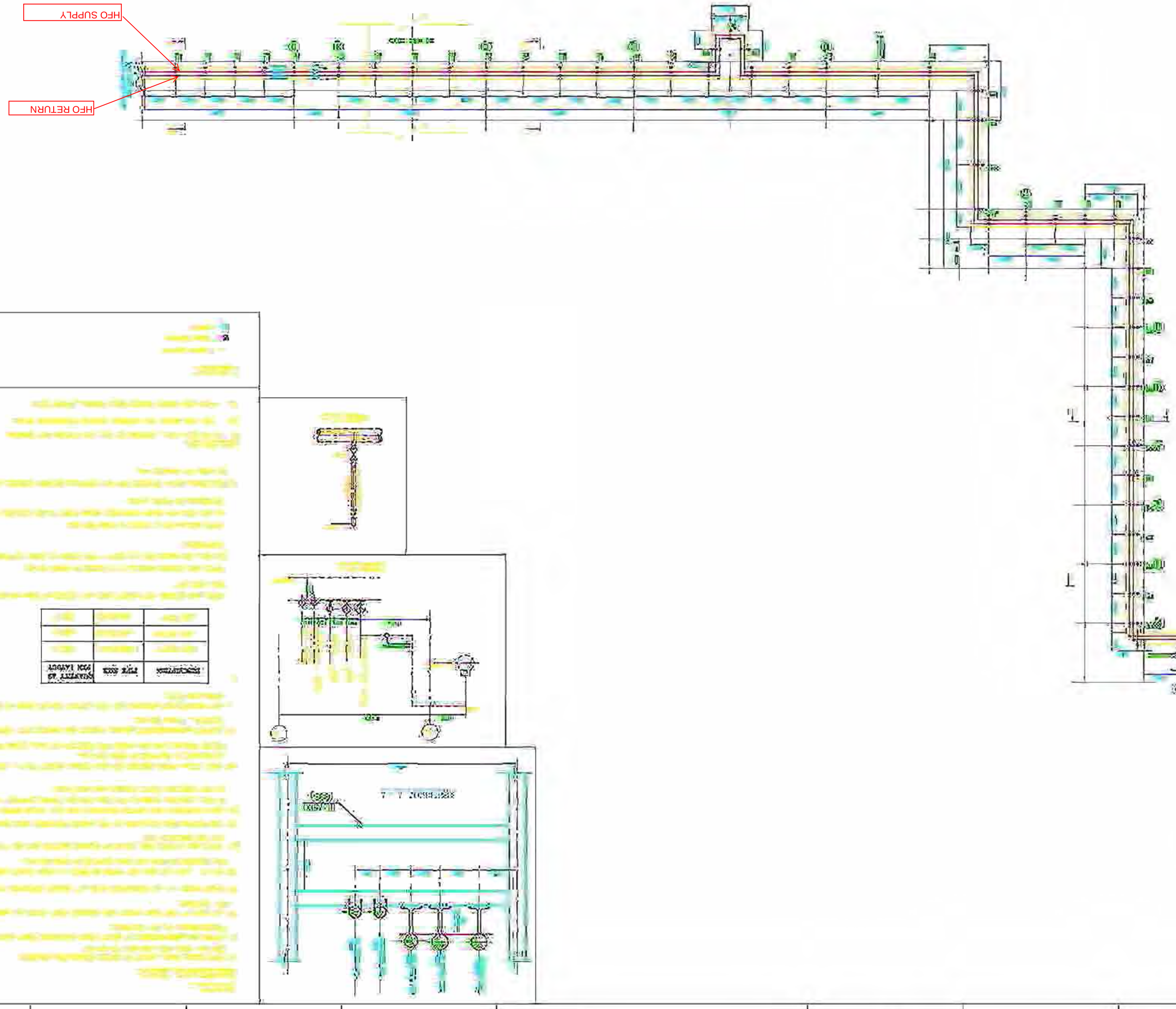
Automatic monitoring system within plant:-

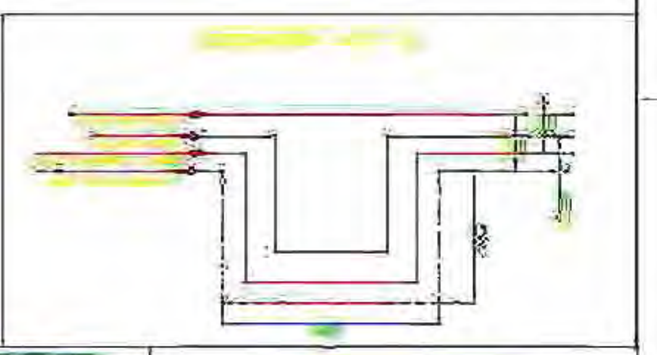
In order to have effective and efficient control over plant operation and to promote the ease of operation, close circuit TVs are provided within the main plant at strategic locations. This is to have on-line monitoring of the equipment on continuous basis and display in screen located at control room. The purpose is to ensure that the equipment is performing the duty assigned to it.
The bidder will select the strategic locations where the CCTVs are to be positioned;
The suggestive locations are: -

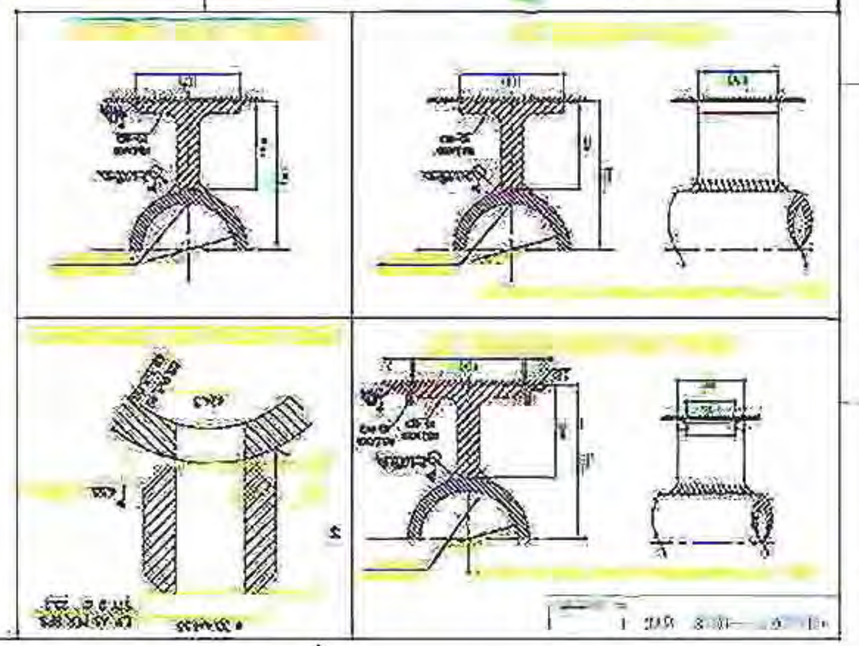
- Outlet of flue gas from chimney.
- Outlet of bottom ash from chimney.
- Reject gate of bowl mills
- Others.

The system shall be complete with necessary hardware, software, and interfaces required for implementing a fully functional system.




HFO SUPPLY
HFO RETURN






NORTH
HFO SUPPLY
HFO RETURN
HFO SUPPLY
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ENGINEERING DEPARTMENT

Rev. No	Specification No.	Sheet No.
01	**PC : TSP : 81052**	1 of 5

TECHNICAL SPECIFICATION FOR FRLS MULTICORE CABLE (IS-1554)

APPLICABLE TO UTILITY AND INDUSTRIAL UNITS

1.0 APPLICATION STANDARDS

1.1 IS-694, IS-1554, IS-5831, IS-6380, IS-8130,

IEC-332, IEC-754, IEEE-383,

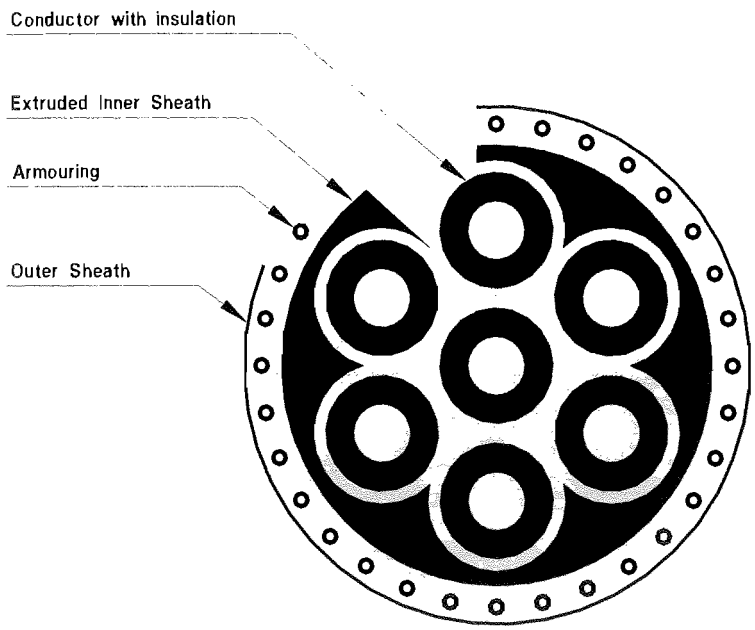
ASTM-D-2843, ASTM-D-2863, SS-4142475

REV.	DATE	ALTERATION	PREPARED	CHECKED	APPROVED
05					
04					
03					
02					
01	25.10.02	Generally revised	E.Loganathan	R.Prabha	GR.Srinivasan
00	10.03.98	Fresh issue	-Sd- M.Devendran	-Sd- R.Prabha	-Sd- GR.Srinivasan

TECHNICAL SPECIFICATION FOR FRLS MULTICORE CABLE (IS-1554)

2.0 CONSTRUCTION OF CABLE

Annealed, tinned, copper conductor, PVC insulated, cores laid up, FRLS PVC fillers may be used to make the cable circular. Extruded FRLS PVC inner sheathed, galvanised steel wire/strip armoured, extruded FRLS PVC outer sheathed cable.



3.0 CONDUCTOR

3.1	Material	:	Annealed tinned copper to IS-8130
3.2	Area of Cross Section	:	1.5 mm^2 / 2.5 mm^2
3.3	Number of Strands	:	7 / 10
3.4	Strand diameter	:	0.52 mm minimum

4.0 INSULATION

4.1	Material	:	HRPVC, Type – C to IS-5831
4.2	Thickness	:	As per IS-1554
4.3	Type	:	Extruded
4.4	Colour Coding & Number Printing	:	As per IS-1554, Number printing at the interval of every 100 mm

5.0 FILLERS

	Material	:	HRPVC, Type ST-2 to IS-5831

6.0 INNER SHEATH

6.1	Material	:	PVC, Type ST-2 to IS-5831
6.2	Thickness	:	As per IS-1554 ; Bidder to specify
6.3	Type	:	Extruded
6.4	Colour	:	Black

7.0 ARMOURING

	Material	:	Single layer, Galvanised Wire/Strip
	Conform to	:	IS-1554, IS-3975

8.0 OUTER SHEATH

	Material	:	FRLS PVC. As per VDE-207, Part-5. Resistant to Water Fungus, Termite & Rodent attack
	Thickness	:	As per VDE-815
	Type	:	Extruded
	Colour	:	Blue

9.0 VOLTAGE GRADE

As per VDE Standard.

10.0 TEMPERATURE RATING

70 Deg.C (minimum)

11.0 FRLS PROPERTIES FOR INNER AND OUTER SHEATH

	Oxygen Index	:	Minimum 29 @ room temperature as per ASTM-D-2863
	Temperature Index	:	Minimum 250oC at oxygen index of 21 as per ASTM-D-2863.
	Smoke Density	:	Maximum 60% as per ASTM-D-2843
	Acid Gas Generation	:	Maximum 20% by weight as per IEC-754.
	Flammability	:	As per IEEE-383, SS 4241475 Characteristics

12.0 ELECTRICAL VALUES OF CABLE @ 20 Deg.C

12.1	Insulation Resistance	:	100 M Ohm/KM (minimum)
12.2	Conductor Resistance	:	12.8 Ohm/KM (maximum)

13.0 TESTING AND INSPECTION

As per approved Quality Plan.

14.0 CABLE MARKING ON OUTER SHEATH

Manufacturer's Name, insulation, conductor, size, number of pairs, voltage rating, type of cable at every 625 mm length.

15.0 SEQUENTIAL MARKING ON OUTER SHEATH

15.1 Every one metre for length.

15.2 Every five metres to read "FRLS".

16.0 TOLERANCE

16.1	Tolerance for outer diameter of cable	:	+ 2mm
16.2	Tolerance for outer diameter for entire Length	:	+ 0.5mm
16.3	Ovality	:	+ 0.5mm

17.0 CABLE LENGTH

Ordered length + 5%. Non-standard length in multiples of 100 metres upto a maximum of 10% of the total quantity.

18.0 PACKING

500 metres + 5%. Shall be in non-returnable seasoned wooden drums with both ends of cable properly sealed, the end(s) protruding both side(s) shall be covered with sheet-steel. Rust preventive coating shall be applied on all ferrous parts. Drums shall be marked with cable details including Purchase Order number.

19.0 GUARANTEE

A Guarantee Certificate for 24 months of trouble-free operation/performance from the date of shipment or 12 months from the date of commissioning whichever is earlier, shall be furnished.

20.0 GENERAL

20.1 It is not the intent to specify completely herein all aspects of design and construction of equipment. Nevertheless the equipment shall conform 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 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).

20.2 Any deviation to this specification requirement shall be clearly brought out in the quotation stage itself.

Bharat Heavy Electricals Limited

HIGH PRESSURE BOILER PLANT, TIRUCHIRAPPALLI 620 014.

CONTROLS AND INSTRUMENTATION / PE / FB

STANDARD SPECIFICATION FOR POWER CABLE

Data Sheet Format Prepared by C&I/PE/FB	Date : 23-03-2006

Filled in By : Name, Signature & Seal of Vendor	

APPROVAL SEAL

CABLE DATA SHEET

For Multicore Power Cables

Type of cable/No. of pair			2 Core x 2.5 sq.mm.	3 Core x 2.5 sq.mm.				
PO / Enquiry sl.numbers								
Name and Address of the Manufacturer								
1	Technical Specification		DS:TCI:239:STD / Rev00					
2	Applicable Standards		IS-1554, IS-3961, IS-4905, IS-5831, IS-8130, IS-9938, IS-10418, IS-10462, IS-10810, IEC-332, IEC-754, IEEE-383, ASTM-D-2843, ASTM-D-2863, SS-4241475					
3	Voltage grade	V	1100					
4	Temperature Rating Short circuit withstand Rating	°C	85 °C 160°C					
5	Construction of cable : As per Constructional Diagram Enclosed.							
6	Conductor :-							
a	No. Of Cores and Area of Conductor	No./ sq.mm	2 Core x 2.5 sq.mm.	3 Core x 2.5 sq.mm.				
b	No. of Strands / Strand Dia.	No./ mm	7 Nos. /0.68	7 Nos. /0.68				
c	Material		Annealed, Plain, Copper Conductor					
d	Grade / Standard		High Conductivity, Electrolytic grade Copper to IS 8130					
e	Dia. over Conductor (approx.)	mm						
7	Insulation :-							
a	Material		PVC					
b	Type and Standard		Type-C, as per IS-5831					
c	Thickness (Nominal) (As per IS:1554)	mm						
d	Method of application		Extruded					
e	Dia. over insulation (approx.)	mm						
f	Core Identification		Red, Black	Red, Yellow & Blue				
8	Dia. under Inner Sheath (app.)	mm						
9	Fillers (wherever applicable)		Flame Retardant, Non Hygroscopic, moisture resistant material, suitable for the operating temperature of the cable. Fillers shall not stick to the insulation and inner sheath					

CABLE DATA SHEET

For Multicore Power Cables

Type of cable/No. of pair			2 Core x 2.5 sq.mm.	3 Core x 2.5 sq.mm.				
PO / Enquiry sl.numbers								
10	Distinct Inner Sheath :-							
a	Material		PVC					
b	Type and Standard		Type-ST2, as per IS-5831					
c	Thickness (minimum) (As per IS:1554)	mm						
d	Method of application		Extruded					
e	Colour		Black					
f	Dia. over Inner Sheath (approx.)	mm						
11	Armouring :-							
a	Material		Galvanized Steel					
b	Standard		As per IS-3975 & IS-1554					
c	Direction of lay		Left Hand					
d	Shape and Dimension (As per IS:1554)	mm						
e	Dia. over armour (approx.)	mm						
12	Outer Sheath :-							
a	Material		PVC, With FRLS Properties					
b	Type and Standard		Type-ST2, as per IS-5831					
c	Thickness (minimum) (As per IS:1554)	mm						
d	Method of application		Extruded					
e	Colour		BLACK					
f	Dia. over Outer Sheath	mm						
13	Cable Marking on Outer sheath @ 1 metre interval		Manufacturer's Name, Insulation material, Conductor material, Conductor size, Insulation, Number of Cores, Voltage rating, Type of cable, Year of manufacture @ 1 Metre Interval. Printing/Embossing shall be legible and indelible.					
14	Sequential marking on Outer sheath		Every 1 Metre for Progressive Length by printing / Embossing . Every 5 Metre to read 'FRLS' by Embossing					
15	Tolerance on Outer diameter	mm	+/- 2 mm					
16	Tolerance on Outer diameter for the entire length	mm	1 mm	1 mm				
17	Ovality	mm	1 mm	1 mm				
18	Weight of cable (approx.)	kg/km						
19	Recommended Installation Radius							
20	Standard Packing Length	metre	1000 Metre	1000 Metre				

CABLE DATA SHEET

For Multicore Power Cables

Type of cable/No. of pair			2 Core x 2.5 sq.mm.	3 Core x 2.5 sq.mm.				
PO / Enquiry sl.numbers								
21	Tolerance on standard packing length	%	+/- 5%					
22	Non-standard Length		Last length, less than the packing length shall be supplied in single length					
23	Marking on Cable Drum		Manufacturer's Name, Conductor size, Insulation, Number of cores, Type of cable, Year of manufacture and Purchase order Number					
24	Electrical Parameters at 20° C :-							
a	DC Resistance (max.)	Ω/km	7.41Ω	7.41Ω				
b	Short circuit rating of conductor for 1 sec.	K Amp.						
c	Insulation Resistance (min.)	MΩ/km	100					
d	Test Voltage - Between Conductor- Conductor	KV/ minute						
25	FRLS Properties for Outer Sheath :-							
a	Oxygen Index @ ambient temp. As per ASTM-D-2863	%	Not Less than 29%					
b	Temperature Index @ oxygen index 21 As per ASTM-D-2863	° C	Not Less than 250 °C					
c	Smoke density rating As per ASTM-D-2843	%	Shall not be more than 60%					
d	Acid gas generation As per IEC 754-Part 1	%	Shall not be more than 20% by weight					
e	Flammability Tests As per IEEE 383, IEC 332 and SS 4241475		Shall pass IEEE-383 Class IE, IEC-332-Part 3, Category B, SS-4241475 (F3 Category)					
26	Quality Plan		AS PER APPLICABLE QUALITY PLAN REFERED IN ENQUIRY & PURCHASE ORDER					
27	Packing Details		Cables shall be supplied in Non-returnable wooden or steel drums of heavy construction. The surface of the drum and the outer most cable layer shall be covered with waterproof cover. Both the ends of the cables shall be properly sealed with heat shrinkable PVC/Rubber caps secured by 'U' nails so as to eliminate ingress of water during transportation, storage and erection. Wood preservative anti-termite treatment shall be applied to the entire drum. Wooden drums shall comply with IS-10418. Each drum shall carry Manufacturer's name, Purchaser's name, Address and Contract number, Item number and type, size and length of cable and net, gross weight stencilled on both the sides of the drum. A tag containing same information shall be attached to the leading end of the cable. An arrow and suitable accompanying wording shall be marked on one end of the reel indicating the direction of rotation in which it should be rolled.						

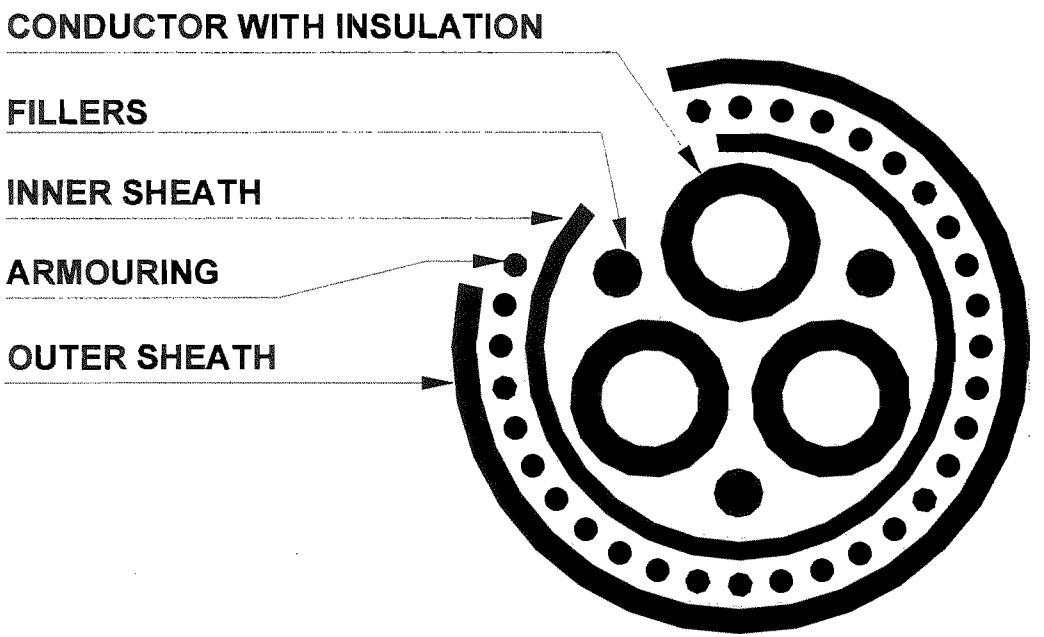
NOTE :- Vendor to Fill in the appropriate values wherever it is left blank, as per IS.

CABLE DATA SHEET

For Multicore Power Cables

TYPICAL CONSTRUCTIONAL DIAGRAM

OF A 3 CORE POWER CABLE



FOR OTHER CABLES, THE RESPECTIVE NUMBER OF CORES SHALL BE LAID UP ALONG WITH FILLERS (IF APPLICABLE) BEFORE APPLICATION OF INNER SHEATH

CABLE DATA SHEET

For Multicore Power Cables

SITE CONDITIONS :- Atmosphere	Dusty, Salty, corrosive & Heavily polluted
Over all Quantity Tolerance	± 5 %
Guarantee	A Guarantee Certificate for 18 months of trouble-free operation/performance from the date of shipment or 12 months from the date of commissioning whichever is earlier shall be furnished.
Documents to be submitted by the vendor, along with the offer.	1. Any deviation to this Data sheet requirement shall be clearly brought out in the offer, separately in the format specified. 2. In case, vendor does not take any deviation, sub-delivery enquiry deviation format has to be filled in with indicating "No Deviation" against this specification and quality plan and furnished along with the offer. 3. Vendor to submit the Filled in, hard copy of the Data sheet along with the offer. Vendors shall comply to the requirements against points 1, 2 & 3 above, otherwise their offer will get rejected.
Documents	With in 15 days of placement of a purchase order, vendor shall submit 3 copies of cable data sheet, and get it approved by BHEL(T) before start of manufacture.

TOLERANCE ON OUTER DIAMETER

Definition :-

This is the allowable Limits on the diameter of the actual cable from the Data sheet value /Design value.

The specification indicates ± 2 mm. This means that if the Data sheet value / Design value of the cable diameter is 'X' mm, then all the actual cable diameter measured over the entire length / quantity shall fall within the Upper Limit 'X + 2' mm and the Lower Limit 'X - 2' mm. However, the following clauses must also be satisfied.

Example :-

Let the Data sheet value / Design value of the cable diameter be = 14 mm (X)

Then, the measurements of the actual cable diameter taken over the entire length shall fall between the Limits = 16 mm (X + 2) and 12 mm (X - 2)

CABLE DATA SHEET

For Multicore Power Cables

TOLERANCE ON OUTER DIAMETER FOR THE ENTIRE LENGTH

Definition :-

This is the maximum allowable difference between the highest actual cable diameter and the lowest actual cable diameter measured over a drum length.

The specification indicates 1 mm. This means that if the Highest actual cable diameter is say, 'D1' mm, and the Lowest actual cable diameter is 'D2' mm, then, 'D1 - D2' shall be maximum 1 mm and 'D1' and 'D2' shall also fall within the Upper and Lower limits as above.

Example :-

Let the Highest actual cable diameter measured be } = 16 mm (D1)

Let the Lowest actual cable diameter measured be } = 15 mm (D2)

Then, Tolerance for the entire length } = 16 mm (D1) - 15 mm (D2) = 1 mm

Comment :-

As the Highest actual cable diameter and Lowest actual cable diameter falls within the Upper and Lower Limits as above, and the difference between them is 1 mm maximum, the diameter values are acceptable.

CABLE DATA SHEET

For Multicore Power Cables

OVALITY

Definition :-

This is the maximum allowable difference between the measurements of the actual cable diameter in 'x' and 'y' directions in any particular section.

The specification indicates 1 mm. This means that if the actual cable diameters measured are say, 'D3' mm, and 'D4' mm, in 'x' and 'y' directions respectively in one particular section. Then, the difference between 'D3' and 'D4' shall be maximum 1 mm. Also 'D3' and 'D4' shall fall within the Upper and Lower limits as above.

Example :-

Let the actual cable diameter in 'x' direction in one section be } = 16 mm (D3)

Let the actual cable diameter in 'y' direction in the same section be } = 15 mm (D4)

Then, Ovality = 16 mm - 15 mm = 1 mm
(D3) (D4)

Comment :-

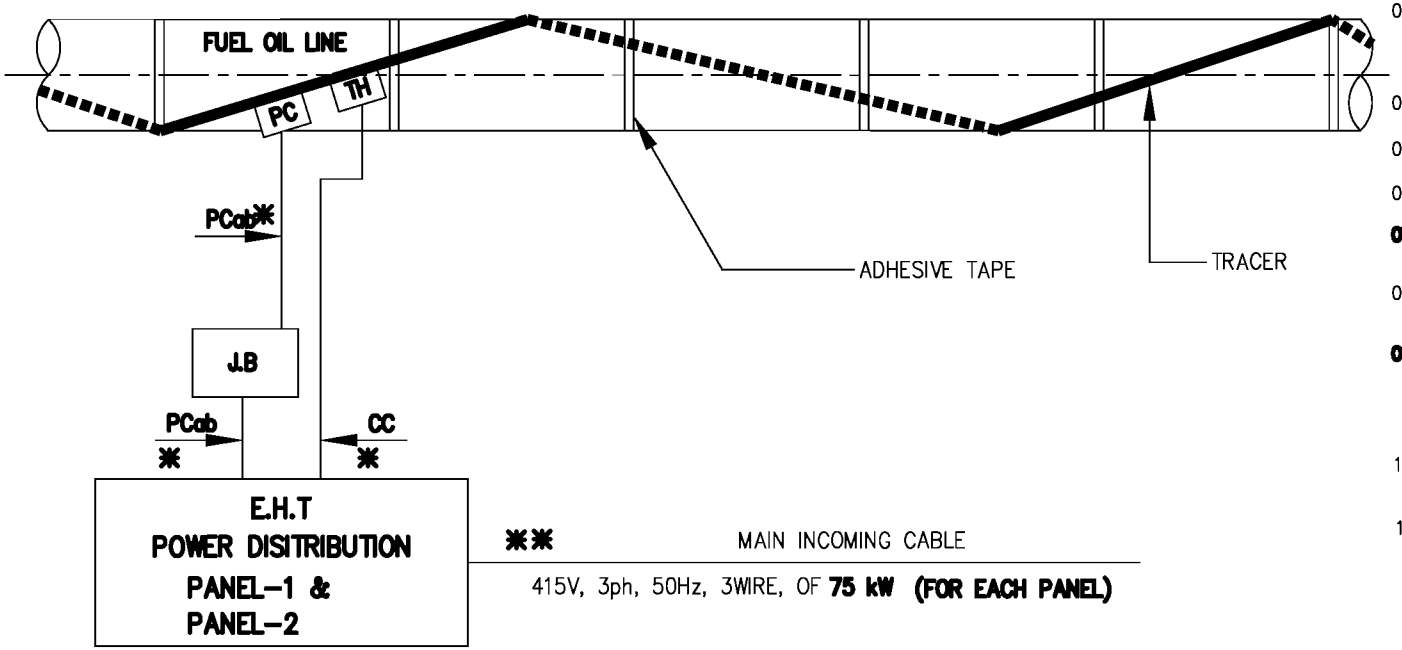
As the actual cable diameters measured in 'x' and 'y' directions of the same section falls within the Upper and Lower limits as above, and the difference between them is 1 mm maximum, the diameter values are acceptable.

FIRST ANGLE PROJECTION(ALL DIMENSIONS IN MILLIMETRES)

DRAWING No 4-81-441-04855

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

CIRCUIT – 1 (TYPICAL)



** MAIN INCOMING CABLE
415V, 3ph, 50Hz, 3WIRE, OF **75 kW (FOR EACH PANEL)**

PCab : POWER CABLE
CC : CONTROL CABLE

PANEL–1 LOCATED IN FUEL OIL PUMP HOUSE MCC ROOM
PANEL–2 LOCATED IN DM PLANT MCC ROOM
(BOTH PANELS ARE IN BHEL–PC SCOPE)

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) TWO NUMBERS OF EHT PDP SUPPLIED BY BHEL(PC). ONE WILL BE LOCATED IN F.O. PUMP HOUSE MCC ROOM & THE OTHER ONE WILL BE LOCATED BEHIND THE 415V POST IN DM PLANT MCC ROOM.

10) FOR BASIC SCOPE OF EHT FOR F.O. SYSTEM REFER DRG.No. 4–81–441–04854

11) REQUIREMENT OF JB TO BE DECIDED BY VENDORS

CUSTOMER NO : 7044

REV	DATE	ALTERED / APPROVED	REV	DATE	ALTERED / APPROVED	REV	DATE	ALTERED / APPROVED
03		ALTERED / APPROVED	02	10.05.12	ALTERED BS / APPROVED RP	01	06.08.11	ALTERED EL –Sd– / APPROVED RP –Sd–
ZONE			ZONE		GENERALLY REVISED	ZONE		INLINE WITH M/S MAHAGENCO MAIL DTD 06.08.11

CUSTOMER
MAHARASHTRA STATE ELECTRICITY BOARD

PROJECT
NEW PARLI THERMAL POWER STATION EXTN#3
1 x 250 MW BOILER – UNIT NOs. 8

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

	NAME	SIGNATURE	DATE
DRN.	B.SUMITH	–Sd–	25.04.11
CHD.	E.LOGANATHAN	–Sd–	25.04.11
APPD.	R.PRABHA	–Sd–	25.04.11

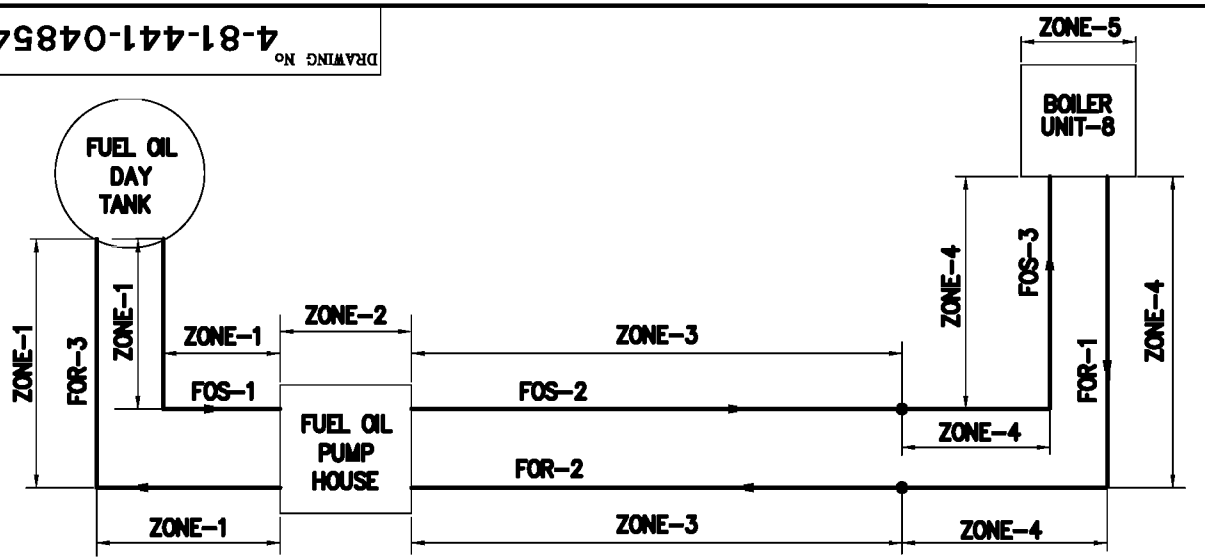
ALL DIMENSIONS IN MILLIMETRE
PROJECTION SCALE NTS

TITLE: CABLING SCOPE FOR E.H.T SYSTEMS

DRG.No. 4-81-441-04855 REV. 02

FIRST ANGLE PROJECTION(ALL DIMENSIONS IN MILLIMETRES)

DRAWING No 4-81-441-04854



SL.NO	PANEL DESIGNATION	LOCATION OF PANEL	PANEL SCOPE	MAIN IN COMING POWER SUPPLY	
				RATING	SCOPE
01	**PANEL-1** (ZONE-1,2 & ZONE-3)	FUEL OIL PUMP HOUSE	BHEL (PC)	**75 kW** 415V, 3Ph, 3 WIRE	CUSTOMER
02	**PANEL-2** (ZONE-4)	DM PLANT MCC ROOM	BHEL (PC)	**75 kW** 415V, 3Ph, 3 WIRE	CUSTOMER
03	**PANEL-3** (ZONE-5)	BOILER OPERATING FLOOR	BHEL (T)	**40 kW** 415V, 3Ph, 3 WIRE	CUSTOMER

SL.NO	SERVICE	LINE SIZE (Nb)	LENGTH (meters)	INSULATION THICKNESS (mm)	REMARKS
01	FOS-1	80	50	45	
02	FOS-2	80	650	45	
03	FOS-3	80	800	45	
04	FOR-1	50	800	30	
05	FOR-2	50	650	30	
06	FOR-3	50	50	30	
07	DRAINS	25	150	25	

NO. OF VALVES = 30 Nos.
TRACER PER VALVE = 3.0 m
NO. OF SUPPORTS = 300 Nos.
TRACER PER SUPPORT = 0.3 m

LEGEND :

FOS-1 : FUEL OIL SUPPLY LINE FROM DAY TANK TO PUMP HOUSE
FOS-2 : FUEL OIL SUPPLY LINE FROM PUMP HOUSE TO COMMON POINT
FOS-3 : FUEL OIL SUPPLY LINE FROM COMMON POINT TO BOILER UNIT-8
FOR-1 : FUEL OIL RETURN LINE FROM BOILER UNIT-8 TO COMMON POINT
FOR-2 : FUEL OIL RETURN LINE FROM COMMON POINT TO PUMP HOUSE
FOR-3 : FUEL OIL RETURN LINE FROM PUMP HOUSE TO DAY TANK

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-PC
05) **ZONE-4** E.H.T. AND ACCESSORIES ARE SUPPLIED BY BHEL-PC
06) **ZONE-5** E.H.T. AND ACCESSORIES ARE SUPPLIED BY BHEL-TRICHY
07) **POWER DISTRIBUTION PANEL-1 SUPPLIED BY BHEL-PC,** POWERS THE E.H.Ts IN **ZONE-1 ZONE-2 & ZONE-3** **THIS PANEL IS LOCATED IN FUEL OIL PUMP HOUSE.**
08) **POWER DISTRIBUTION PANEL-2 SUPPLIED BY BHEL-PC,** POWERS THE E.H.Ts IN **ZONE-4** **THIS PANEL IS LOCATED IN DM PLANT MCC ROOM. (BEHIND THE 415V POST)**
09) **POWER DISTRIBUTION PANEL-3 SUPPLIED BY BHEL-TRICHY,** POWERS THE E.H.Ts IN **ZONE-5** **THIS PANEL IS LOCATED IN BOILER OPERATING FLOOR.**

CUSTOMER NO : 7044

REV	DATE	ALTERED / APPROVED	ZONE
03		ALTERED / APPROVED	ZONE
02	18.10.11	ALTERED EL / APPROVED RP	ZONE: INLINE WITH M/S DESEIN LETTER REF:D-3037/PRL/CC-20/SKJ/2071 DTD. 05.10.2011
01	06.08.11	ALTERED EL -Sd- / APPROVED RP -Sd-	ZONE: INLINE WITH M/S MAHAGENCO MAIL DTD 06.08.11

CUSTOMER
MAHARASHTRA STATE ELECTRICITY BOARD

PROJECT
NEW PARLI THERMAL POWER STATION EXTN#3
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APPD.	R.PRABHA	-Sd-	25.04.11

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

ALL DIMENSIONS IN MILLIMETRE
PROJECTION
SCALE NTS

DRG.No. 4-81-441-04854
REV. 02