

BHARAT HEAVY ELECTRICALS LIMITED

TIRUCHIRAPALLI-620 014

CONTROLS AND INSTRUMENTATION/FB



TECHNICAL SPECIFICATION

FOR

THERMAL IMAGING CAMERA WITH IR TECHNOLOGY

SPECIFICATION REF. CI:1723:IR CAM:SPEC / REV. 00

REV.NO	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
00	22/08/17	Initial Release	<i>Pong</i>	<i>Pong</i>	<i>APM</i>

SECTION - 1

I. GENERAL

- a. The various aspects covered in this specification are as follows :-
- b. The general points are covered in Section – 1 – General.
- c. The specification requirements are covered in Section – 2 – Specifications.
- d. The documents to be submitted along with the offer / after placement of Order / along with the panel are covered in Section – 3.
- e. The Inspection / Testing and Packing requirements are covered in Section – 4 Testing, Inspection and Packing.
- f. Commissioning spare list, if any, with price break up shall be furnished along with offer.
- g. Recommended spares list for two years operation with price break up shall also be furnished separately along with the offer.
- h. If any special or non-standard tools are required for installation, operation or maintenance, the same shall be supplied along with the panel.
- i. The entire system and accessories should not contain any asbestos material.
- j. The equipment shall be guaranteed for a period of 12 months from the date of commissioning OR 18 months from the date of dispatch whichever is earlier.
- k. Despatch clearance will be issued along with PGMA with DU Nos. for the ordered items to vendor after the receipt of technically accepted Inspection Report. Vendor shall mark the PGMA with DU Nos. on the casing of the packing and in the packing slip.
- l. Since the vendor's works alone is approved by BHEL, vendor shall manufacture this item in their own works only and shall not off-load the jobs to any other suppliers without the written approval by BHEL.
- m. All components of the system should be packed in such a way that it should not get damaged during transportation, storage and handling.

SECTION - 2

I. PRE - QUALIFICATION REQUIREMENT:

- a. The identical model of the thermal imaging camera offered shall be in successful operation for similar application in any coal (with ash content of at least 25%) fired thermal power plant for a period of three years.
- b. Performance certificate from authorised end user in valid letter head with seal and sign shall be provided as proof for the same.
- c. Commissioning and service support shall be available in India.

II. SPECIFICATION FOR THERMAL IMAGING CAMERA WITH IR TECHNOLOGY

Thermal imaging cameras with IR technology including all equipment and accessories shall be supplied for the purpose of getting temperature profile of the boiler wall in fossil fired boiler with balanced draft, tilting tangential and corner firing arrangement. Also the thermal imaging camera should give adequate data which will be used by the operator to optimize soot blower operation. The cameras are expected to withstand the temperature in the furnace of boiler, which will be 1600° C in the fireball region. Suitable air cooling arrangements shall be provided in the camera to suit this requirement. The camera system shall be suitable for all the fuels fired like light diesel oil, heavy fuel oil and sub-bituminous coal with high ash content. Cameras shall be suitable for viewing of boiler in a straight line of view.

Four number of such cameras per boiler complete with all mounting accessories shall be supplied with viewing angle sufficient to view the entire boiler wall. Maximum coverage of the boiler wall shall be ensured by the camera supplier.

The system should meet the following requirements as a minimum

- a. The system shall be supplied complete with all accessories, auxiliaries, interconnecting cables and pneumatic tubing's required for the system from the power/air terminal points indicated elsewhere in this specification. Camera shall be equipped with a pneumatic advance & retract system.
- b. Fully wired Panel/Camera Control box with IP:65 degree of protection shall be provided in the field near camera for mounting all the controls /electronics/accessories necessary for controlling camera operation as well as to take care of interlocks such as :
 - Automatic withdrawal of camera in case of pneumatic air supply failure, temperature exceeding the design set point at camera tip, camera control electronics failure and power supply failure.
 - Camera Local/Remote operation selection along with advance/ retract / reset provisions and indications (Camera IN, Camera OUT, Camera Fault) shall be provided.
- c. However, loose components which are designed for IP: 65 or better degree of protection can be neatly mounted in an open top covered rack near the camera.
- d. It shall be possible to view the temperature profile of the boiler wall in control room. All the analysis of the camera data like trends, graphs, variations with respect to time etc shall be included in the system. The data from this thermal imaging devices giving temperature profile of boiler walls shall also be suitable for effective optimistic operation of soot blower. The graphical interface shall be user-friendly. Also it shall be possible to insert and retract the camera from control room. All the camera fault conditions shall be informed to the operator in control room. One number of OWS with redundant server shall be provided for this purpose.

- e. The camera shall give the temperature profile in all the operating conditions of the boiler, from shut-down to full load. The temperature range of the operation of the camera shall be selected suitably to meet this requirement.
- f. Redundant OPC communication link with all necessary hardware and software shall be considered for connectivity with DCS.
- g. The system shall have bulk data storage and retrieval facility. One number of A4 size colour printer shall also be considered for this system.
- h. Any other hardware not specifically mentioned but required for the proper functioning and completeness of the system shall be considered by the camera supplier.
- i. All necessary software with all user's licence for lifetime operation shall be considered as part of the system.
- j. The placement of equipment related to camera in control room is at customer's discretion. Hence vendor should be ready to accommodate customer requirement regarding placement of equipment in control room.

III. OTHER SPECIFIC REQUIREMENTS OF THE SYSTEM

- a. It is vendor's responsibility that the offered system is complete in all aspects.
- b. Thickness of water wall including insulation thickness and refractory is approximately around 350mm. Vendor to select camera insertion/ retract lengths suitably.
- c. Any cooler unit required for lowering the temperature of cooling air shall be included in vendor's scope. Vendor shall take into account the pressure, temperature and quality of instrument air available for the purpose of cooling and purging.
- d. The proposed location of cameras along with the dimensions of the furnace are indicated in the location drawings attached along with this specification (Drg No :- 3-97-596-23828). Any alternate suggestions for camera location for better results shall be indicated along with the offer.
- e. Applicable drawings for furnace camera openings are "Furnace opening for Camera" (Drg ref. CI:FUR CAM OPNG), "Seal box for TV opening" (Drg ref. CI:SEBOX: OPNG), "Seal box" (Drg ref. CI:SEBOX) (enclosed in this specification). The suitability of the opening for inserting the camera shall be studied by the vendor. Any additional need of inserts pipe/tapping points for installing camera in seal boxes for fixing camera to be studied by vendor based on BHEL seal box drawing and to be included in offer. All necessary erection material for erection of camera and accessories as well as materials required for supporting the camera from boiler shall be in vendor scope.
- f. System will be installed by BHEL, as per the drawings furnished by vendor using the materials supplied by the vendor. On completion of installation, it is the responsibility of vendor to fully commission the system and prove the performance. Also, it is the vendor's responsibility to get the protocol signed from customer and BHEL site for successful operation and handing over of the system.
- g. Any accessories required for erection and commissioning of the system shall be included in the offer itself even though the same is not called for explicitly in the enquiry specification. This may be highlighted in the offer.
- h. All necessary remote/ local programming tools, if required, shall be included in the main offer itself.
- i. Any other accessory to make the system completely operational shall be included in the main offer itself.
- j. Any technical constraints in using the camera like lack of visibility in high ash content shall be brought out clearly in the offer itself. Any technical information required about the boiler conditions shall be obtained in the offer stage itself. After purchase order technical constraints will not be entertained at any cost.

IV. PROTECTION REQUIREMENTS OF THE SYSTEM:

- a. The Camera assembly & housing shall have air cooling arrangement with all accessories.
- b. The camera shall be mounted on a retract mechanism having automatic retraction facility with fail-safe feature. The automatic retraction unit shall be pneumatic operated. BHEL/Customer will provide instrument air for the camera lens tube and retract mechanism.
- c. Retract mechanism mounts shall have following features.
 - Retract mechanism shall be provided with suitable mounts to fix the camera housing, the lens tube and the wall box.
 - Mounts shall be sturdy and lightweight, capable of being supported from boiler.
- d. Protection shall be given against cooling medium failure.
- e. Automatic shutter/gate mechanism at the camera port to be supplied by vendor, so that port will be closed once camera is withdrawn from the furnace. In case camera retracts due to fault such as loss of air for prolonged duration necessary protections shall be built into the system so that camera do not drift into the furnace due to gravity.
- f. To protect the camera unit from the furnace heat, continuous air purging shall be maintained into the camera housing.
- g. In case of failure of purging air the camera assembly shall retract automatically to avoid any damage or deterioration due to overheating. Also, shutter/gate located in the furnace opening shall close to prevent radiant heating.
- h. Necessary limit switches shall be supplied along with the camera system by the vendor to detect camera advanced/retracted positions. Vendor shall build necessary interlocks for protection of camera with the same.
- i. Necessary interlocks to be built into the camera system such that once camera gets retracted due to fault, only after the cause of the fault is corrected and acknowledged by operator camera can be inserted again.
- j. Fault indications shall be provided to operator if camera does not insert/retract on command.
- k. For acknowledging and resetting the fault, necessary provisions shall be made in Control Room.
- l. An air tank shall be provided near the camera which can store sufficient instrument air for advancing and retracting the camera minimum three times into and out of the furnace in case of instrument air failure. The capacity of the air tank shall be decided by the vendor as per their standard suitable for advance / retract operations.

V. SERVER AND OWS SPECIFICATION

- a. Each Operating work station PC envisaged in plant shall meet following minimum requirements & as per latest trends at the time of supply:
 - On board Intel – Xeon quad core, 3.46 GHz processor with 1066 MHz bus with Hyper threading or higher.
 - 4GB DDR3 RAM (min.)
 - 1 x 1000 GB IDE Hard Disc Drive of 7200 RPM or higher
 - 1024 MB Graphic Accelerator
 - System chipset: Intel Express
 - 2 x RS – 232 ports
 - 1 x parallel port
 - 4 nos. USB ports. (2 nos. on front side)
 - 1 x 52X DVD/CD Read Drive
 - 16 X DVD R/W Drive
 - 2 x Ethernet (10 / 100 / 1000MB) cards (Industrial Grade)

- UXGA graphics and 24" coloured Full flat Monitors with LED back lighting, 1920 X 1080, 256 colours with MRPII compliant, viewing angle 178° vertical & Horizontal and fastest response time.
 - 1 x windows XP/7 Professional or latest & proven version of Windows OS professional with Multimedia
 - Ethernet adapter
 - Third party operating system, graphical users interface and software, if required.
 - 2 nos. graphic output cards minimum
 - Optical mouse
 - Sound card
 - Internal speakers
 - Wireless internet & Blue tooth Interface
 - Redundant power supply (In built)
 - General MS Windows latest, MS-Office Professional, Adobe
 - Acrobat, anti-virus McAfee or equivalent, AutoCAD etc.
- b. The server specification shall meet following minimum requirements & as per latest trends at the time of supply.
- Enclosure: 6U Rack Mountable server / Tower type Sever
 - Processor: Intel Xeon Quad (4) Core 64-bit Processor capable 3.6 GHz with 16MB L3 cache memory per processor, Dual independent 1333 MHz system bus (2 way SMF) or better.
 - Memory: 64GB ECC DDR – 3, 800 SDRAM
 - Video: Integrated with 64MB SDRAM
 - Resolution: 1920 x 1080
 - Drives: HDD – RAID 5 (1000 GB) Ultra 320 SCSI adaptors with internal storage capacity 3.6 TB DVD/CDROM – 24X CD – RW/DVD IDE combo USB – 4 ports DAT – 36 / 72 GB
 - Peripherals: PS/2 keyboard
 - Optical Mouse
 - Operating system: Windows 2008 server version standard / latest Enterprise Edition or latest & proven version of Windows Operating system
 - Backup & Disaster Recovery: VERITAS \ CA \ Tivoli \ any other
 - Environmental: Operating Temp range - 10°C to 35°C Humidity range - 8 to 80% (Non-Condensing) Vibration 0.25 G at 3 to 300 Hz for 15 Minutes.
 - Software - General MS Windows latest, MS- Office Professional, Adobe Acrobat, anti- virus McAfee or equivalent, etc.
 - Miscellaneous : i. 1 Parallel port ii. 1 Serial port iii. 4 – 10/100/1000 MB/1GB network ports iv. Two non-boards and two added v. External SCSI port vi. Dual hot plug power supplies vii. Dual Hot plug fans viii. 2 PCI Express slots (1x4 lane and 1x8 lane) ix. 2 PCI X slots (64bit/100MHz) x. 2 PCI slots (one 32bit/33MHz, 5V & one 64bit/66Mz) xi Redundant Server shall be provided, wherever required. xii. LED based 24" sized Monitors.
- c. Preferred makes of OWS & Servers are DELL, HPCOMPAQ, Lenovo.
- d. Coloured Laser Jet printer shall have the following specifications as a minimum
- Printing Speed 20 ppm (min.)
 - Resolution 1200 X 600 dpi
 - Memory 128 MB (min.)
 - External Port 1 no. USB 2.0 port, and TCP/IP 10/100
 - Ethernet, Blue tooth interface

- Duty Cycle 40,000 pages per month
- Pages size A3, A4, and Transparency etc. with automatic duplex printing facility.

VI. CABLES

- b. The Scope of Cables is as follows.
- All power, control and signal cables including video/fibre optic/ethernet cables etc required for the complete system shall be supplied by vendor.
 - The distance between camera location in field and control room shall be taken as 350m.

VII. FACILITIES PROVIDED BY BHEL/CUSTOMER AT SITE :

- a. Power Supply
- Only one number 240V AC, 50 Hz single phase supply will be made available for each camera at Vendor's Field camera control box. Any other voltage required for the operation has to be derived by the vendor from the above supply. Isolation/ protection requirements for the same also shall be in vendor scope.
 - One feeder 240V AC, 50 Hz single phase will be given in Control Room. Electrical power requirements for all other accessories shall be derived by the vendor from this supply.
- b. Air Supply
- Instrument air at 4.0 to 5.0 kg / sq.cm (g) will be made available for camera housing cooling and lens tube cooling at one point for each camera, terminated with a valve of connection size Nb25 (F) within three metres from the camera. It shall be in vendor's responsibility to derive any other requirement for air supply from this available source. Vendor to provide all required accessories to receive this air and supply to the various components that requires air supply.
 - As boiler is not a fixed structure, tubes connecting camera with the air source shall consist of flexible, SS braided hoses with quick disconnect facility along with PVC coated copper /SS tubes /GI pipes and shall be supplied by the vendor along with the camera system.
 - Quality of instrument air provided may not be meeting the necessary standards all times and hence, it is vendor's responsibility to include suitable air filter arrangements for getting good quality instrument air for their system.

VIII. MAKE OF COMPONENTS OFFERED:

- a. Makes of all major brought out components shall be subjected to BHEL/Customer approval.

IX. VENDOR TO INCLUDE THE FOLLOWING IN THE OFFER:

- Commissioning spares, if any, with bill of materials.
- Commissioning of system is in the scope of vendor. Also, erection assistance shall be provided by vendor. Number of man-days to be accounted as 15 with three visits to site for erection/commissioning each boiler. All necessary arrangements for travel and stay shall be taken care by vendor only.
- Erection materials and supporting structures required for the CCTV system shall be estimated and supplied considering the furnace expansion as below. Necessary supporting required for camera system shall be from boiler only and not platforms considering the boiler movements.

Furnace expansion in horizontal direction - 39mm sideways
Furnace expansion in vertical direction - 150mm downward

X. OPTIONAL PRICE:

- Optional price for complete erection and commissioning of the system at site including man-power and material to be quoted separately along with the offer.

SECTION-3

I. DOCUMENTS TO BE FURNISHED BY THE VENDOR

- a. Along with the offer (Offer shall be given in duplicate. Each copy shall contain the following)
- Complete Bill of material.
 - Catalogue of the various equipment.
 - Block diagram showing inter-connection among various equipments (from field to control room) showing the components and cabling in-between.
 - Dimension of the equipments in control room.
 - Unit price for various equipments & cables (in the priced bid)
 - Vendor quality plan in BHEL format for camera system.
 - Any deviation from the specification shall be clearly spelt out in the "Sub-delivery enquiry deviation format" attached along with the enquiry. Only deviations explicitly mentioned in this format and accepted by BHEL in writing shall be considered in the event of purchase order. If there are no deviations from the enquiry specification, the format shall be submitted indicating "NIL Deviation"
- b. Documents to be given after placement of order
- One set of the following documents/drawings shall be sent to BHEL within 15 days from the date of placement of order for approval (in Adobe Acrobat reader - "*.pdf" format). Comments, if any, on the vendor drawings shall be incorporated and revised drawings shall be submitted within 15 days from the receipt of the BHEL commented drawings at vendors end.
- Block diagram showing inter-connection among various equipments (from field to control room).
 - Functional write up of the system offered including the functional requirements and interlocks provided.
 - Logic drawings
 - OGA / dimensional details for all the major components.
 - Power / signal external connection details.
 - Power / Air requirement.
 - Recommended erection/installation drawings for the camera & retract assembly showing mounting and support arrangements
 - Catalogues and Complete Bill of material.
 - Vendor quality plan in BHEL /Customer format after incorporation of BHEL comments and indicating PO number.
- c. O & M Manuals
- All O&M manuals shall be in A4 size in (in Adobe Acrobat reader - "*.pdf" format) and shall contain only the contract specific information. Irrelevant information's shall be scored-out.
 - All drawings shall be inserted in an appropriate place in O&M manuals with proper tagging.
 - All drawings in the O&M manual shall be in black and white and in A3 or A4 size format only. Bigger size drawings shall be reduced to A4 or A3 size before insertion.
 - O&M manuals in CD-ROM shall be sent to BHEL (T). It shall not be sent along with the equipment to site directly. O&M shall contain as built drawings, catalogues for all the components used in the system in addition to the erection, operating, maintenance and trouble-shooting instructions.

SECTION-4

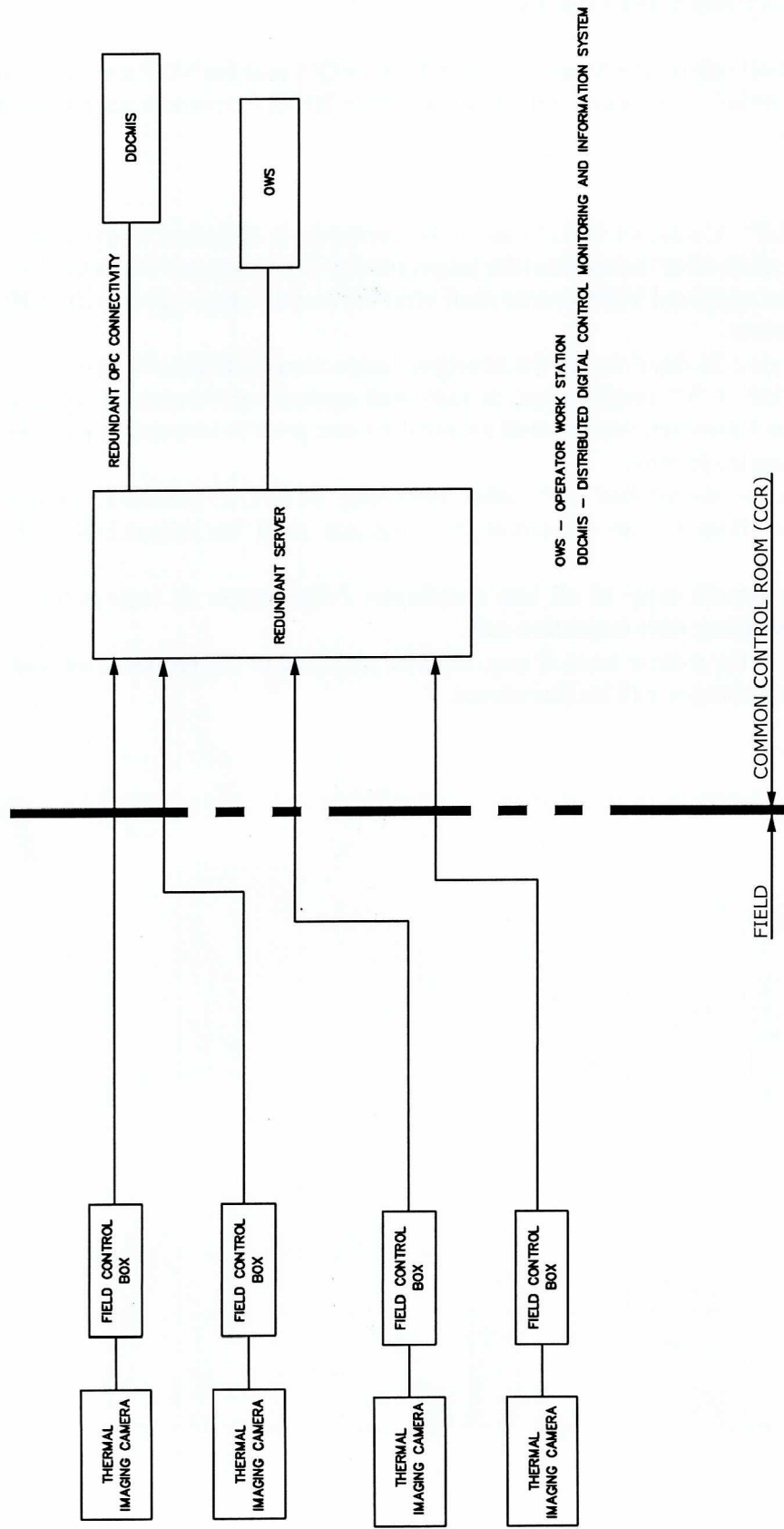
I. INSPECTION AND TEST REQUIREMENTS

- The vendor shall submit the Vendor Quality Plan (VQP) and the VQP shall be as per the "BHEL format". The same will be subjected to BHEL/ customer approval after purchase order.

Other Requirements:

- Wherever 'CHP' (Customer Hold Point) / 'W' (witness) is indicated in the approved VQP, vendor shall offer the material for inspection by Customer and wherever 'W' is indicated in the approved VQP, vendor shall offer the material for inspection by BHEL and / or Customer.
- Vendor shall give 21 days' notice for arranging inspection by BHEL/ Customer.
- Wherever 'CHP' / 'V' (verification) is indicated against verification of Type test, clearance from Customer, vendor shall ensure the same prior to inspection and submit the same during inspection.
- Material can be despatched only after obtaining M.D.C.C (Material Despatch Clearance Certificate) from Customer. No material shall be despatched without MDCC.
- Vendor shall submit copy of all test certificates / documents as indicated in the approved VQP along with inspection call.
- Testing charges for routine tests, if any, shall be included in the product cost and no separate testing charges will be considered.

PROPOSED BLOCK DIAGRAM OF THERMAL IMAGING CAMERA SYSTEM WITH IR TECHNOLOGY



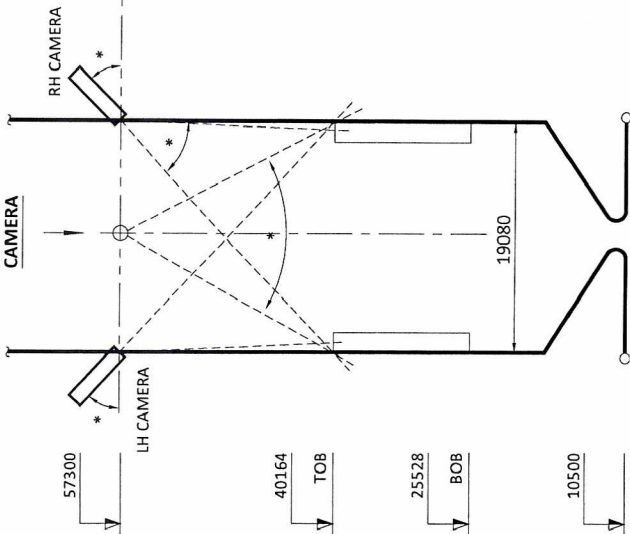
NOTES

1. ALL CABLES REQUIRED FOR THE SYSTEM WILL BE IN VENDOR SCOPE OF SUPPLY.

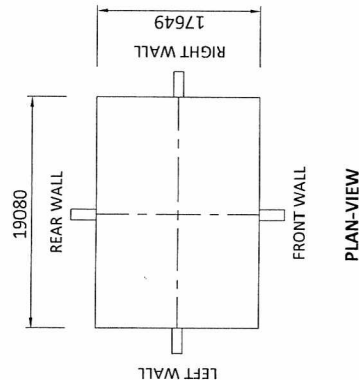
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DRAWING NO.

FRONT SIDE CAMERA

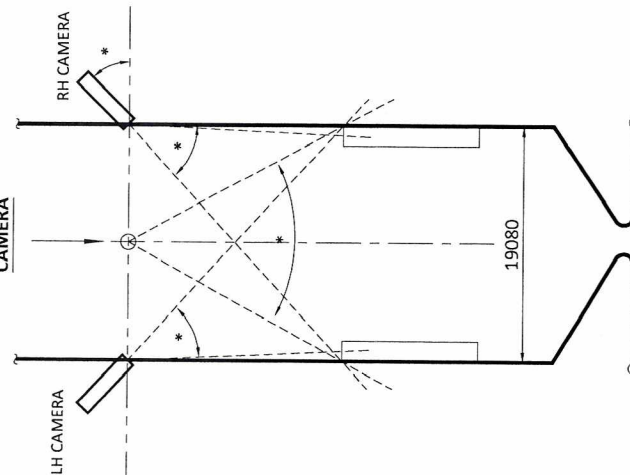


FRONT SIDE (ELEVATION VIEW)



PLAN-VIEW

REAR SIDE CAMERA



REAR SIDE (ELEVATION VIEW)

RIGHT SIDE (ELEVATION VIEW)
(SIMILAR FOR LEFT SIDE)

NOTES

- * ANGLE OF ERECTION & VIEWING SHOULD BE INDICATED BY THE VENDOR.
- THIS DRG. IS DRAWN NOT TO SCALE AND HENCE SHOULD NOT BE DIRECTLY USED FOR THE PURPOSE OF ANGLE CALCULATION.
- TYPE OF BOILER : TANGENTIALLY FIRED, BALANCED DRAFT, ONCE THROUGH SUPER CRITICAL.
- TOB : TOP OF BURNER, BOB : BOTTOM OF BURNER
- ONE NUMBER OF CAMERA SHALL BE PROVIDED ON EACH SIDE OF FURNACE. TOTAL FOUR NUMBER OF CAMERAS.

OWNER :

PROJECT :

TAMIL NADU GENERATION AND DISTRIBUTION CORPORATION LIMITED
ENNORE SEZ SUPERCritical THERMAL POWER PROJECT
AT ASH DYKE OF NCPTS, CHENNAI
2 x 660 MW, Customer No. 1723 & 1724

CONSULTANT :

DESEIN PRIVATE LIMITED - DESEIN HOUSE , NEW DELHI.

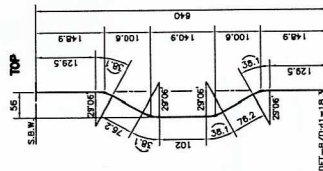
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.

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				APPD	K. Balaji	[Signature]	06-04-18	—

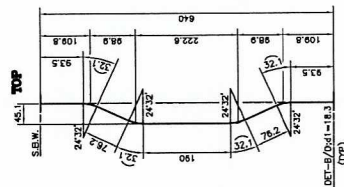
REF TO ASSY / OLD DWG	ITEM NO	NO OF ITEMS
—	—	—

LOCATION DRAWING FOR THERMAL IMAGING IR CAMERA		CARD CODE	DRAWING NO :	REV
Sheet 01 of 01		U 01	3-97-596-23828	00

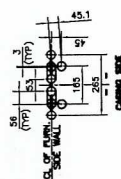
ASSEMBLY OF TV-1 OPENING



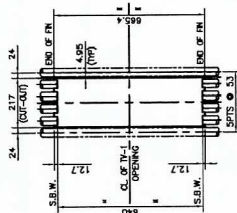
DETAIL OF ITEM NO. 01



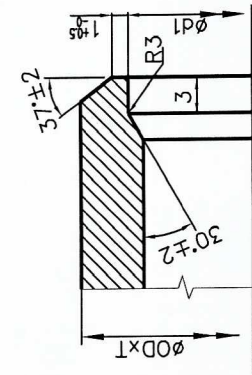
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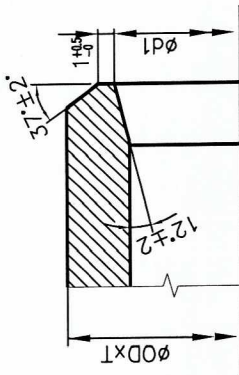
SECTION D-D



DETAIL OF PANEL CUT OUT



DETAIL-B



DETAIL-D

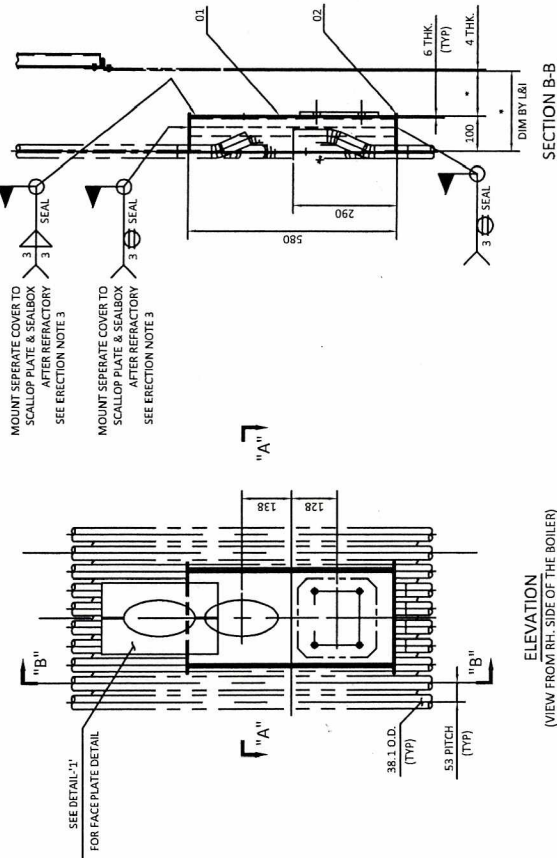
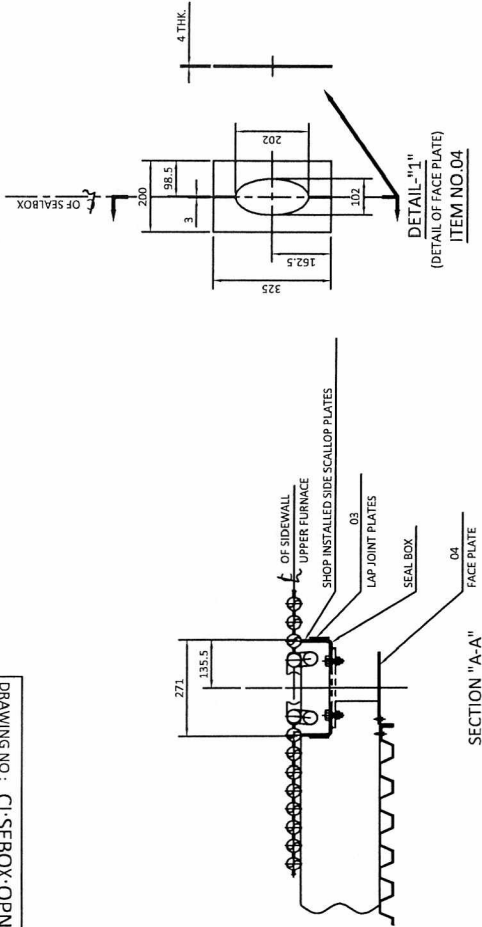
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STANDARD

DECLARATION : The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.									
C A U T I O N : The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company.									
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT									
		Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPPALLI - 620014				DRN CHD APPD			
DEPT. : C & I CODE : 392		ALL DIMENSIONS ARE IN MM		SCALE NTS		WEIGHT (Kg) —		SIGNATURE —	
DATE 08-03-17		DATE 08-03-17		DATE 08-03-17		DATE 08-03-17		DATE 08-03-17	
NO OF ITEMS —		ITEM NO —		ITEM NO —		ITEM NO —		ITEM NO —	
REV —		REV —		REV —		REV —		REV —	
DRAWING NO : CI:FUR CAM OPNG		DRAWING NO : CI:FUR CAM OPNG		DRAWING NO : CI:FUR CAM OPNG		DRAWING NO : CI:FUR CAM OPNG		DRAWING NO : CI:FUR CAM OPNG	
CARD CODE U 01		CARD CODE U 01		CARD CODE U 01		CARD CODE U 01		CARD CODE U 01	
TITLE FURNACE OPENING FOR CAMERA		TITLE FURNACE OPENING FOR CAMERA		TITLE FURNACE OPENING FOR CAMERA		TITLE FURNACE OPENING FOR CAMERA		TITLE FURNACE OPENING FOR CAMERA	
Sheet 01 Of 01		Sheet 01 Of 01		Sheet 01 Of 01		Sheet 01 Of 01		Sheet 01 Of 01	

NOTES: -

1. ALL WELDS ARE TO BE SEAL WELDED GAS TIGHT UNLESS OTHERWISE SPECIFIED.
2. ERECTOR TO CUT CORNER OF SCALLOPPED BAR SO AS TO PROVIDE A CLEARANCE BETWEEN ADJACENT TUBE AND A COMPLETE SEAL WELD AROUND THE EDGE OF SEAL BOX.
3. SEAL BOX IS TO BE FILLED WITH CASTABLE REFRACTORY.
4. PAINT THE SURFACE OF ALL TUBES THAT ARE EMBEDDED IN CASTABLE REFRACTORY WITH TWO COATS OF BITUMASTIC PAINT.



STANDARD

VARIANT	ITEM NUMBER	DESCRIPTION	DRAWING NUMBER	ITEM NO	MATERIAL CODE	MATERIAL SPECN	UNIT WEIGHT	QUANTITY	ZONE
04	FACE PLATE 4X200X325			15 042	332	C	L	2.040	1
03	LAP JOINT 6X50X568			15 042	277	C	L	1.340	2
02	PL 6x40x310			15 042	277	C	L	0.584	2
01	SEAL BOX	3-09-001-00586		15 042	277	C	L	8.500	1

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TYPE OF PRODUCT OR NAME OF CUSTOMER / PROJECT		Bharat Heavy Electricals Ltd UNIT: HIGH PRESSURE BOILER PLANT TIRUCHIRAPPALLI - 620014		DRN	S. RAJESWARI	SIGNATURE	DATE	NO. OF VAR
				CHD	K. BALAJI		08-03-17	08-03-17
				APPD	ASWINI KUMAR PANDA		08-03-17	08-03-17
DEPT. : C & I		WEIGHT (kg)		REF TO ASSY / OLD DWG		ITEM NO		NO OF ITEMS
CODE : 392		SCALE NTS						
ALL DIMENSIONS ARE IN MM								
TITLE		SEAL BOX FOR TV OPENING		CARD CODE U 01		DRAWING NO: CI:SEBOX:OPNG		REV 00

