Bharat Heavy Electricals Limited
High Pressure Boiler Plant, Tiruchirappalli - 620 014.

Technical Specification of
Bottom Ash Hopper Viewing Camera System

CI:BHC:DVC RAGHUNATHPUR
REV 00

Project: DVC Raghunathpur Combustion Modification Package

Rev.no.	Date	Description of events	Prepared	Reviewed	Approved
00	05-07-2020	Initial release	Balaji K	Balaji K	Aswini Kumar Panda

General Instructions

1. This specification covers briefly the requirement of furnace bottom ash hopper viewing camera system installed in boiler of thermal power plant.
2. Nothing in this specification shall be construed to relieve the vendor from his responsibility. It is the responsibility of the vendor to take care of all basic and essential requirements for the offered system to meet the indented application.
3. In the event of order, the entire specification will form part of purchase order for compliance during execution.
4. The scope of work includes design, engineering, manufacturing, fabrication, assembly, painting, inspection, Factory Acceptance Test, packing, supply, integrating the system at Project site (along with loose components/modules in case of loose supply of the same) with the supplied system peripherals, Erection assistance, Commissioning (inclusive of travel fares & accommodation of the engineers/ technicians), carrying out Site Acceptance Test, proving the performance of the system and handing over the system to customer. The system shall fully comply with this specification for meeting the entire functional and operational requirement.

Pre-Qualification Criteria

1. The offered combination of camera and video management software (VMS)/ Network Video Recorder (NVR), for CCTV system, shall have at least one-year satisfactory operation prior to date of enquiry in a large industrial setup like power plant, cement plant, petroleum refinery, steel plant or coal mine. Vendor to provide performance certificates / authentication letters in favour of Original Equipment Manufacturer (OEM) from any end user certifying the same.
2. Only OEM or system integrators authorized by OEM shall quote for this enquiry. If system integrators are quoting on behalf of OEM, manufacturer authorization letter from OEM in proper letter head format shall be submitted, which should clearly indicate that the particular system integrator is authorised to quote for this

enquiry on behalf of OEM and OEM shall extend full support to system integrator through-out the execution of this project.

Technical Specification

1. Fixed HD CCTV cameras are to be supplied for direct online continuous viewing of the ash build-up in furnace hopper (above S panel area) and bottom hopper of boiler in central control room of each unit of thermal power plant. These cameras are to be placed outside the hopper and continuously view through the sight glass (inspection window) of the hopper. (Sight glass of hopper is not in scope of camera vendor).

2. The approximate dimensions of sight glass in furnace hopper is 100mm (W) X 150mm (H) (rectangular window) and sight glass in bottom hopper is 175mm diameter (Circular opening).

3. Five numbers of cameras per boiler are envisaged for the application in total.

    a. Two (02) nos. of cameras shall be placed outside the furnace hopper (one on left and one on right) at about 10.20 M elevation (above boiler S panel).
    b. Three (03) nos. of cameras shall be provided outside the bottom ash hopper (two on left and one on right) at about 8.5 M elevation.

4. The video output from camera shall be continuously available in the Operator Work Station (OWS) proposed to be located in the control room. Vendor to provide one OWS with monitor for control and monitoring of all five cameras.

5. Necessary cables for the system, required hardware & software shall be in the scope of vendor. All the required accessories like Media converters/SFP's/OFC patch cords/LIU's/Ethernet switches/Network switch/Pigtail cables etc. shall be considered by the vendor. Any accessory not specifically mentioned but required for the working of the system shall be considered by the vendor.

6. The overall block diagram of the total system is attached along with the specification for information. Block diagram is for indicative/reference purpose of the overall arrangement. Any hardware specifically required for completeness of the system but not indicated in the block diagram shall be considered by the vendor in their scope.

7. All the cameras and accessories are to be housed in weather proof IP-65 environmental housing made of aluminium and sun shroud. All enclosures kept in field shall be suitable for weather proof IP-65 and provided with rain canopy.

8. The housing, with heater and blower installed, shall provide protection for camera/lens assemblies in the ambient temperature range of – 0 deg. C to 50 deg. C.

9. The camera mount should be of the same make as that of camera and suitable for the model no. offered as specified by the manufacturer and should be an integrated unit.

10. The output of the camera system shall also be available in Large Video Screen (LVS). LVS will be BHEL scope. Vendor shall provide all interconnection cable and termination device including cable required for LVS connection. Any connectors/convertors/hardware required for connectivity to LVS also to be considered by vendor.

11. The detailed technical requirements of the cameras are indicated below

Description	**Requirement**
Image Device	1/2.8-1/3” Progressive scan CMOS
Number of Pixels	1920 X 1080 (Full HD)/2 MP at 25/30 IPS
Sensitivity(at f1.2,6dB)	0.21 Lux colour & 0.05 Lux B/W (at 30 IRE)

Lens	Varifocal Lens f=8-50 mm, CS-Mount
Lens Mount	CS-Mount
Focus	Auto with Manual Override
Iris Range	1.6 to 360
Audio	Full Duplex or 2-way
IR cut-filter	Yes
Protocols	IPV4/IPV6,RTP, UDP, TCP, IP, HTTP, HTTPS, FTP, DHCP, IGMP V2/V3, ICMP, ARP, SMTP, SNTP,SNMP or equivalent
Security	Password protection,
Iris Control	Auto with Manual Override
Analytics	Motion detection & Tamper alarm
PoE supply IEEE 802.3af compliant	Yes
SD/SDHC/SDXC in Camera (For Local alarm recording & scheduled local recording)	Yes ,minimum 32 GB capability
Rate Control	VBR/CBR
Back Light Compensation	Required
White Balance	Automatic with mode selection options
Electronic Shutter	1/50 to 1/10000 Auto
S/N Ratio	>50dB
Automatic Gain Compensation	Up to 18 dB
Gain Control	Auto/Off
Day/Night selection	Auto On-Off
Other Features	On Screen Menu Display, contour correction and contrast compensation control

	Automatic Picture Enhancement to give a balanced picture where there is too much/too little light
	Synchronization selection for line lock and free running
	Minimum One Alarm I/P
	Minimum One Alarm O/P

12. Power supply to be provided by BHEL at site is as follows

a. One number of 1 kVA, 240V, 50 Hz, 1 ph. UPS supply at field near camera. Vendor shall provide necessary arrangement to terminate this incoming power supply and further distribute to all the cameras in field. Necessary power distribution board for the same shall be considered by the vendor. Incoming power supply cable (3C X 10 Sq.mm Aluminium XLPE) for this power distribution board shall be in BHEL scope. All other power cables for further distribution shall be in vendor scope.

b. One number of 1 kVA, 240V, 50 Hz, 1 ph. UPS supply in control room. Necessary termination of this incoming supply and further distribution in control room shall be in vendor scope. Incoming power supply cable (3C X 2.5 Sq.mm Copper XLPE) shall be in BHEL scope. All other power cables for further distribution shall be in vendor scope.

c. Any other voltage required for the system shall be derived internally by the vendor from this power supply.

d. Power cables shall be armoured, XLPE insulated, FRLS cables with conductor size minimum 2.5 Sq.mm for Copper cable and 6 Sq.mm for Aluminium cable. 3 core cable shall be used for power distribution.

e. Unarmored signal cables (2P X 0.5 Sq.mm Cu MSC) shall be considered between each camera and common camera Field JB. Unarmored signal cable (1 run of 12P X 0.5 Sq.mm MSC) shall be considered between

common camera Field JB and Control Room Rack. This is for alarm signals from camera to control room.

f. Double compression brass cable glands and Annealed Tinned copper lugs for all the cables supplied by vendor is in vendor scope. The cables should be properly terminated in TB's using cable glands and lugs.

g. All cables in the system except signal cable (2P & 8P) shall be armoured and suitable for installation in field.

h. All cables for this system are proposed to be laid in bunches along with other cables in perforated GI cable trays to be supplied by BHEL. If individual cable trays are required for any of the cables in vendor scope (including fiber optic cable) to avoid problems like interference, drop in signal quality etc., those cables trays are also to be considered by the vendor in their scope. Any other items required for proper cable termination at site like GI conduits etc. shall be considered by the vendor.

13. Following cable run lengths shall be considered by the vendor

a. UPS Power Distribution Board to camera JB – 40 M

b. Camera to Camera JB (nearby camera) – 10 M

c. Camera to Common Camera Field JB (with Ethernet switch) – 50 M

d. UPS PDB to Common Camera Field JB (with Ethernet switch) – 20 M

e. Common Camera Field JB to Control Room Rack – 400 M

f. Control Room Rack to Monitor – 30 M

g. Control Room Rack to LVS – 50 M

14. The VMS/NVR specified shall be an enterprise class client / server based IP video security solution that provides seamless management of digital video and data across an IP network. VMS/NVR shall support additional cameras, if added, in future. All ON screen controls shall be provided to achieve remote operation. The VMS/Recording Server shall record and store a minimum of fifteen (15) days at 1080p & 25 FPS resolution of video images from all cameras

as well as the historical data of system activities. All storage calculations should be based on this requirement and calculations for sizing should be indicated in offer.

15. OWS shall be suitable for smooth functioning of video management software of the OEM. OWS shall have following specifications as minimum. Intel i7 Processor with latest generation / 8GB Memory / 4 TB HDD / 2GB Graphics Card / DVD RW / 24" LED Monitor / Windows Operating System. Computer table shall be provided along with the OWS. Spike busters shall be considered along with the OWS for power distribution. The specifications mentioned for OWS are minimum required and any additional specification required for smooth functioning of the system shall be considered by the vendor.

16. All the software licences shall have full validity for the entire lifetime of the system.

17. Vendor Quality Plan (VQP) shall be followed for testing/acceptance of the system. All the functional tests and test reports shall be clearly indicated in the VQP. Inspection will be carried out by BHEL/Customer as per VQP at vendor works before despatch. BoM verification and functional testing of the camera system will be carried out at system integrators works in the presence of BHEL/Customer/TPI in the event of an order.

18. Documents to be submitted along with the offer.

    a. Sub-delivery enquiry deviation format – If any deviation is there from the specification, the same shall be explicitly mentioned in the format. Only deviations mentioned in the format and accepted by BHEL in writing will be considered in the event of order. If there are no deviations, the format shall be submitted indicating “Nil deviation”.
    b. Camera datasheet.
    c. Block diagram and BoM of the total system.

d. Total electric power requirement for the system.

e. Vendor Quality Plan (VQP) proposed to be followed.

19. Documents to be submitted after PO.

a. Detailed Camera/Field JB GA drawings

b. Detailed Camera Technical datasheet

c. Block diagram and BoM of the total system.

d. Total electric power requirement for the system.

e. Any documents required for erection at site.

f. Vendor Quality Plan (VQP) proposed to be followed.

20. Vendor documents after PO (including camera documents and VQP) are subject to customer approval. Vendor shall provide all the supporting documents required by customer for document approval.

21. Packing shall be as per vendor standard. Vendor shall be fully liable for proper, sufficient and adequate packing, completeness of contents, protection of contents during storage time and correct preparation of the packing list. All damage and costs whatsoever resulting from inadequate or insufficient packing shall be fully charged to vendor. Packing and conservation of goods shall be sufficient to protect from damage during transit from point of manufacturer and storage at job site under conditions which may involve multiple handling, extended storage, exposure to moisture and the possibility of pilferage. Packing shall be sufficient to prevent rain water entry.

22. Erection assistance at site and commissioning of the system is in vendor scope. Fiber optic cable termination (including of splicing of all cables) at site shall be in vendor scope. Any erection work requiring specific expertize shall be considered by the vendor in their scope. Minimum Two visits to site (including travel and stay) with 5 Man days shall be considered for erection assistance and commissioning for each unit. Lump sum charges shall be considered in the

priced bid for the same. Any accessories/spares required for commissioning shall be carried by the vendor which can be taken back by the vendor after successful commissioning.

23. Optional price for complete Erection and Commissioning of the camera system (including all cable laying in field and from field to control room) shall also be quoted separately along with the offer.

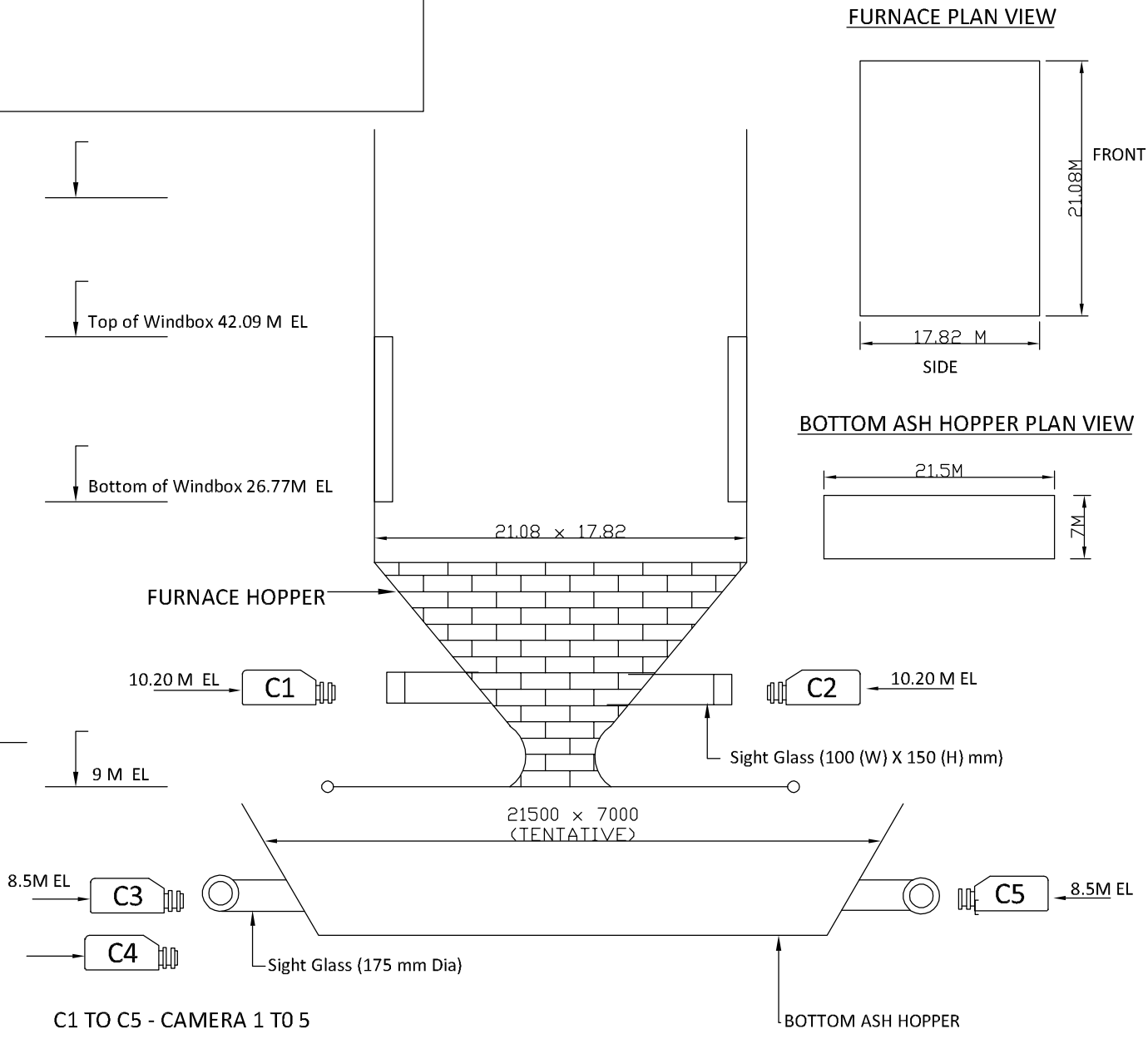
24. It is the responsibility of the vendor to successfully handover the system to the satisfaction of the customer. Vendor to obtain necessary protocol signing with customer after handing over the system.

25. Makes of major sub-items shall be chosen from the attached list.

Sl no.	Major Sub-Items	List of Approved vendors
1	CCTV Camera	Pelco/Bosch
2	Operator Workstation	HP/DELL
3	Network Switch (Gigabit)	D-Link/Netgear/Allied Telesys/Juniper (USA)/Hirschmann(Germany)/Cisco
4	Wall mountable Panel/Enclosures/Racks	Rittal/Pyrotech/Pentair Technical products India Pvt Ltd Hoffman (Bangalore)/Schneider Electric (Bangalore)
5	Power cables	Advance Cable/Cable Corporation of India/Cords Cables/Delton Cables Ltd/Elkay Telelinks/Finolex/Gemscab Industries/Gupta Power Cables/Havells India Ltd/KEI/Nicco Corporation/Paramount Communications/Polycab/ /RR Kabel/Thermocables
6	Fibre Optic Cable	Birla Erricson/Aksh Fibre/D-Link/Finolex

7	CAT 6 UTP Cable / Patch cable/Patch Panel/LIU:	AMP/Digilink/D-Link/Systemax
8	Single Mode Fibre Patch cable/SC Pigtail Simplex	Avaya/Belden/D-Link/Digilink/Tyco
9	Single Mode Media Converter/SFP	Avaya/Belden/D-Link/Digilink/Tyco/CTC Union

REV	DATE	ALTERED :
		CHD./APPD. :



GA Drawing of Boiler With Camera (Typical)

TYPE OF PRODUCT
OR NAME OF
CUSTOMER / PROJECT

बी एच ई एल
BHEL

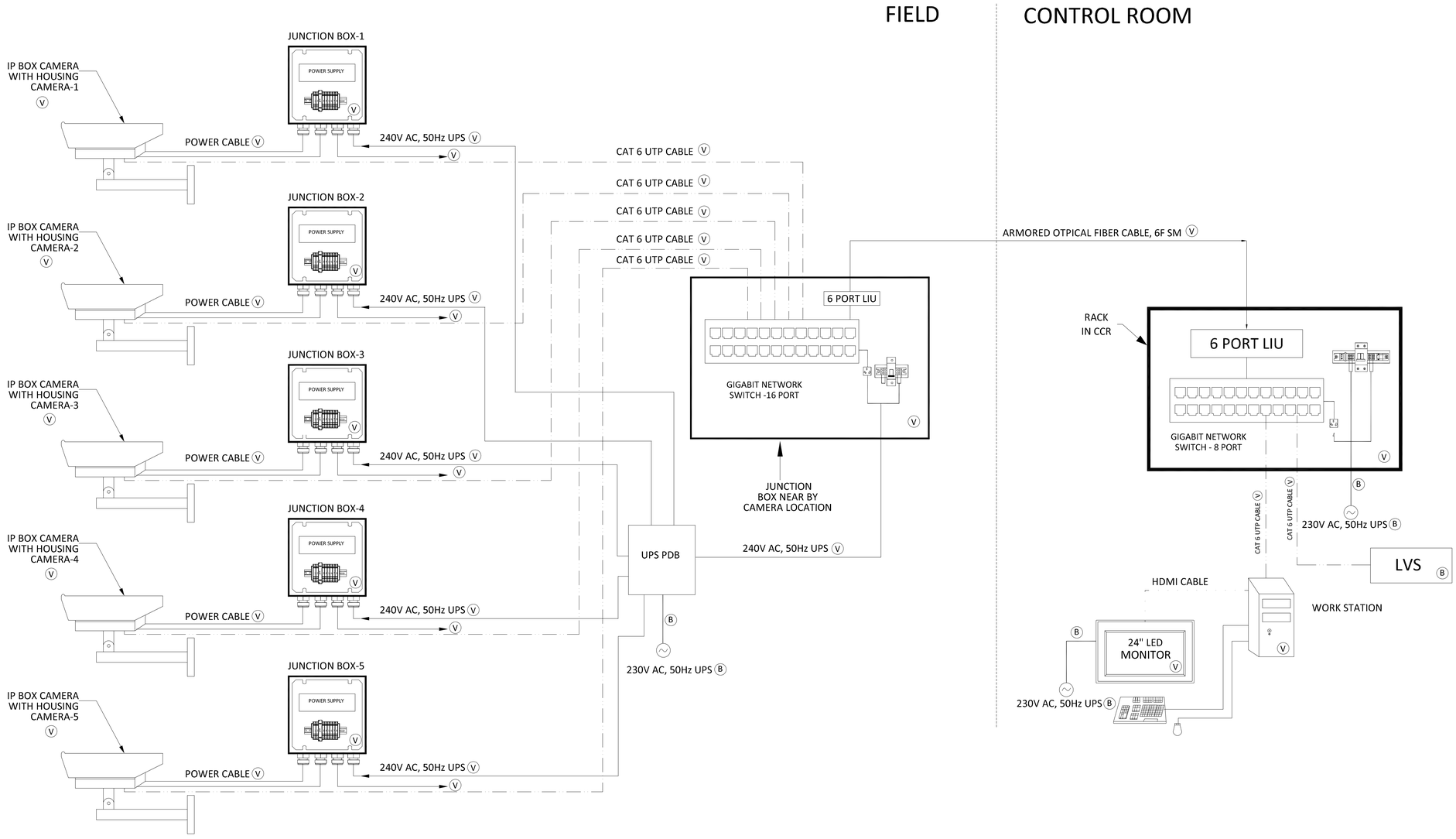
Bharat Heavy Electricals Ltd
UNIT : HIGH PRESSURE BOILER PLANT
TIRUCHIRAPPALLI - 620014

	NAME	SIGNATURE	DATE	NO. OF VAR
DRN				
CHD				
APPD				

DEPT. : C&I		ALL DIMENSIONS ARE IN MM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	No OF ITEMS
CODE : 392							

TITLE: GA Drawing of Boiler With Camera	CARD CODE U 01	DRAWING NO :	REV

FILE NAME:



LEGEND	
———	ARMOURED POWER CABLE
- - - - - -	HDMI CABLE, 10M LONG
— — —	ARMOURED CAT 6 UTP CABLE
———	ARMOURED OPTICAL FIBER CABLE, 6F SM
———	FIBER PATCH CORD
———	UNARMOURED SIGNAL CABLE
(V)	VENDOR SCOPE
(B)	BHEL SCOPE
UPS PDB	UPS POWER DISTRIBUTION BOARD

NOTES

1. NVR IF APPLICABLE SHALL BE KEPT IN CCR RACK
2. THIS BLOCK DIAGRAM IS INDICATIVE ONLY. ANY ADDITIONAL HARDWARE REQUIRED FOR THE COMPLETENESS OF THE SYSTEM IS IN VENDOR SCOPE.
3. JUNCTION BOX/RACK SIZES SHALL BE SELECTED SUITABLY TO ACCOMODATE ALL THE COMPONENTS.

TYPE OF PRODUCT OR NAME OF CUSTOMER/ PROJECT

DVC RAGHUNATHPUR COMBUSTION MODIFICATION PROJECT

Bharat Heavy Electricals Ltd
UNIT: HIGH PRESSURE BOILER PLANT
TIRUCHIRAPPALLI - 620014

	NAME	SIGNATURE	DATE	NO. OF VAR
DRN				—
CHD				
APPD				

ALL DIMENSIONS ARE IN MM	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	ITEM NO	No OF ITEMS
		———	—	—	—

TITLE: Schematic Diagram of Hopper Viewing IP Camera system

CARD CODE: U 01

DRAWING NO:

REV: 01

FILE NAME :


SIGHT GLASS
CAMERA