भारत हैवी ईलैक्ट्रिकल्स लिमिटेड

BHARAT HEAVY ELECTRICALS LIMITED

पारेषण व्यापार अभियांत्रिकी प्रबंधन

TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

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				समूह/GROUP	TBEM	W.O. No	83001
ग्राहक/ CUSTOMER	RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED (RRVUNL)						
परियोजना/ PROJECT	2 X 660 MW SURATGARH TPS, UNIT 7&8/6 – 400KV SWITCHYARD & EXTN.						
CONSULTA NT	TATA CONSULTING ENGINEERS LTD.						

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ENCLOSURES

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- PQR of RRVUNL
- RRVUNL Technical specification for Fire Protection system & Fire Detection system

b. ANNEXURES TO SECTION -5

- Annexure-A - Drawings

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1.0 INTENT OF SPECIFICATION

1.0.0 This specification is intended to cover following activities and services in respect of all the equipment of the **Fire detection and protection System to be provided for 400 kV Substation of 2x660MW Suratgarh Unit 7 & 8, Stage V & Unit – 6, 420 kV switchyard extension** for **Thermal Power Station** of **Rajasthan Rajya Vidyut Utpadan Nigam Ltd (RRVUNL).**

i) Detailed design of all the equipment and equipment system(s).
ii) Complete manufacturing including shop testing.
iii) Providing engineering data, drawings, and O & M manuals as per specified format etc. for owners/purchaser's review, approval and records.
iv) Packing and transportation from the manufacturer's works to the site including customs clearance/port clearance, if required.
v) Receipt, storage, preservation and conservation of equipment at site.
vi) Fabrication, pre-assembly, if any, erection testing and putting into satisfactory operation all the equipment including successful completion of trial operation.
vii) Performance and Guarantee tests after successful completion of trial operation.

1.0.1 The requirements specified under SECTION 2, SECTION 3, SECTION 4 & SECTION 5 of the specification shall be considered as part of this section. In the event of any conflict between the various sections/sub-sections of this specification, SECTION 1 shall prevail. *RRVUNL contract specification attached with SEC 1 shall be referred strictly and requirements of the same for switchyard part shall be provided by the contractor.*

1.0.2 It is not the intent to specify herein all the details of design and manufacture. However, the equipment and the system shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Purchaser/ Owner, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance herewith.

1.0.3 **Contract shall be on lumpsum basis for the scope defined in the specification. Variations in quantities during contract stage without any change in input from BHEL side shall not have any commercial implications. The Bidder shall be responsible for providing all material, equipment and services, specified or otherwise which are required to fulfill the intent of ensuring operability, maintainability and the reliability of the complete work covered under this specification.**

1.0.4 The Bidder shall deem to have understood completely all the tender drawings and documents and quoted accordingly.

1.0.5 **Deviation:** There shall preferably be no deviation on technical specification. The bidder shall sign and stamp the "Certificate for No Deviation" enclosed in Schedule-2, Section-5 towards confirmation. Except for these deviations/variations covered under Deviation Schedules which are accepted by the Purchaser before the award of the Contract, it will be the responsibility of the Bidder to fully meet the intent and the requirements of the specification within the quoted price. *Deviations in any other form*

including clarifications / assumptions / etc will not be considered and it will be construed that the bid conforms strictly to the specification.

1.0.6 The Bidder to note carefully that the parameters, estimated capacities of equipment indicated and the tender drawings in the specification are only for the guidance of the Bidder. The system shall be designed as per relevant standards/ codes and exact capacities and quantities are to be estimated by the Bidder. All such estimations and design calculations shall be submitted for Purchaser's approval.

1.0.7 It is the responsibility of the successful Bidder to obtain necessary approval/ clearance from statutory organizations wherever applicable for the equipment/ systems under the scope specified.

1.0.8 The term '**Owner**' appearing in this specification shall refer to **Rajasthan Rajya Vidyut Utpadan Nigam Ltd (RRVUNL)**, the term '**Purchaser**' shall refer to **BHEL** and the term '**Contractor**' shall refer to the **successful Bidder**.

2.0 FIRE FIGHTING REQUIREMENTS FOR VARIOUS AREAS

The makes/models and technical features offered for various firefighting system components/ equipment shall comply with the standards of TAC/ BIS/ UL/ VDs and FM / NFPA/ FOC as applicable The key elements of fire protection cum detection scheme and the related areas are presented as under:

System	Areas Protected
Hydrant System	i. Switchyard Control Building ii. Outdoor Switchyard (400kV switchyard – Unit 7 & 8 and 400kV extn. switchyard - Unit-6)
HVW Spray System	i. 80 MVAr Line reactors – 2 nos. ii. 125 MVAr Bus reactors – 2 nos. iii. 50 MVAr Line reactors – 2 nos.
MVW Spray System	i. Cable Vault
Addressable Fire Detection & Alarm System	i. Switchyard Control Building (including Cable Vault) & Outdoor Switchyard.
Portable Fire Extinguisher	i. Switchyard Control Building
Evacuation system for Oil water emulsion from switchyard	i. Common oil pit (2 nos.) in switchyard connection with Oil/ water separator tank in Transformer yard

This system shall be designed to provide fire detection and protection services for Switchyard and its control Building. Design criterion shall be based on "**Ordinary Hazard Occupancies**" classification as described in Tariff Advisory Committee's (TAC) guidelines. All equipment or systems in the designed fire detection cum protection arrangement shall be completely in compliance with the regulations of Tariff Advisory Committee (TAC) of India/ Loss Prevention Association (LPA) / National Fire Protection Association (NFPA)/ LPCB/ VDs.

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3.1 DETECTION SYSTEM

a) The system shall consist of addressable manual call points, addressable intelligent automatic detectors of various types, addressable interface units, microprocessor based fire alarm panel as required for the complete system with associated cabling and cabling accessories, fire sirens, etc.

b) All detection and sensing devices forming an integral part of the microprocessor based, addressable, intelligent fire detection and alarm system shall be approved by UL/ FOC/ Any other internationally recognized body acceptable to the Owner.

c) The number of detectors, spacing and their locations shall comply with NFPA 72E/ BS 5839, Part 1/ IS 2189/ Rules for fire alarm system. The actual quantity of detectors required, taking into consideration the obstruction due to floor beams, air movement, air velocity, ceiling obstruction etc., so as to obtain complete coverage, shall be worked out based on the final drawings of the control building during detailed engineering.

d) Addressable multi-sensor type and photo-electric smoke detectors shall be provided in all areas of Control Building except for the Battery rooms, AHU room & Pantry where Addressable corrosion proof rate of rise of heat detector with fixed temperature element shall be provided.

e) Areas such as Control/ relay room, office room, shift manager room and maintenance staff room will have false ceiling.

f) In air conditioned areas of control room where false ceiling is present, the detectors shall be installed both above and below false ceiling. Photoelectric type smoke detectors shall be used for above false ceiling area of AC rooms. For above false ceiling detectors, a response indicator shall be provided below false ceiling for the purpose of detector's alarm status indication. Multisensor type smoke detectors shall be used for below false ceiling areas of AC rooms and other areas of control.

g) Cable Vault shall be provided with addressable multi-sensor smoke detector & temperature sensitive insulated wire (digital) linear heat sensor cables. The complete area shall be covered by cross zoning method. LHS cables shall be provided in top tray, bottom tray & in alternative trays. Suitable supports to clamp this cable shall be provided. DLHS detectors shall have adequate no. of interface units in cable vault room to give alarm and actuate water spray system.

h) Manual call points shall be provided as per the guidelines listed in NFPA 72E/IS 2189. These shall be of pull station type which can be reset and reused without the requirement to change components like glass etc after usage.

i) Manual call points shall be provided in switchgear room & control/relay room.

j) Manual call points with flame proof enclosure shall be located at each floor of control building such that no person needs to travel more than 30 meters from any point within the premises, in order to give an alarm. Manual call points shall be located on the exit routes and in particular on floor landings of stair cases and near exits from the building/ area. Pedestal mounted flame proof enclosure manual call points shall be provided for the outdoor switchyard.

k) All the detectors in the switchyard control building shall be looped into a Fire Alarm Panel situated in the switchyard control building.

l) Two loop Fire Alarm Panel of analogue addressable type shall be dedicated to Switchyard control building which shall evaluate the signals received from the detectors, transmit the fire or trouble alarms (audio-visual) to prearranged points, supervise and monitor the complete fire detection circuits

and initiate the shutdown of air-conditioning equipments. One no. spare loop card shall be provided in the FAP as hot standby.

m) The fire alarm panel shall be designed to include all the standard features and shall also accommodate programmed activation of various interlocks with fire protection system and other associated systems and programmed activation of sequence of events to be carried out in case of fire in any particular protective area.

n) All the circuits from the detectors to the panels and the circuits from the panels to the actuating devices shall be closed loop type and shall be supervised for open and short circuiting.

o) Facilities shall be provided on the fire alarm panel for simulating fire conditions, sensitivity adjustment, isolation of detectors etc. from the panel.

p) Fire alarm control panel shall have filters to ignore false alarm and increase sensitivity to real fire from sensors and provision for automatic re-calibration of sensitivity levels of over / under sensitive detectors. The sensitivity of each detector should be automatically raised if detectors are gradually polluted due to dust and dirt entering inside the detector. If detectors are more polluted the control panel shall give a warning. The trouble report shall indicate the location of device requiring service.

q) All devices shall be individually identifiable for its type, its zone location, and alarm set value, alarm and trouble indication by a unique alpha numerical label.

r) The detectors shall be self compensating for ambient temperature and humidity.

s) The detectors shall display a steady LED when in the alarm state. The LED shall flash when in standby or normal mode.

t) Each floor shall be provided with one electronic hooter besides the staircase.

u) All detectors and interface units for detectors which do not have response indicators (eg. LHS cables) shall be provided with local LED response indicators which will light up steadily when the detectors sense a fire and operates.

v) In air conditioned areas of control room where false ceiling is present, the detectors shall be installed both above and below false ceiling. For above false ceiling detectors a response indicator shall be provided below false ceiling for the purpose of detector's alarm status indication.

w) However other factors like beam depth and area separation criterion shall also be implemented in deciding coverage of each of the detectors.

x) Incipient fires sensed by these detectors shall trigger an alarm at the FAP.

y) The Batteries shall be of maintenance free sealed lead-acid type. The battery shall supply the normal power requirements for a period of 48 hours from the instant of charger AC supply failure, after which sufficient capacity would still be available to provide full load operation for atleast 30 minutes.

z) The detector cable and other control cable shall be armored, screened and twisted pair FRLS type which shall be cleated to roof/wall surface.

aa) Cable shall be 1100V grade, multicore, annealed, high conductivity stranded copper conductor, extruded PVC insulated, laid up inner sheathed, galvanized steel strip /wire armoured, outer FRLS extruded PVC sheathed cable as per IS-1554-Part - I, 1988.

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➢ **INTERFACES**

Fire detection & alarm system will have three interfaces-

i) Interface with air conditioning system of switchyard control building to shut down the AHU equipment in building.

ii) Interface with fire dampers to close it in case of fire.

iii) Interface with Main fire alarm panel in the power plant main control room.

Distance between main plant control room & switchyard control building is **450 m** approx.

10 nos. potential free contacts shall be provided to repeat the important fire alarm signals from the switchyard to the main plant control building.

3.2 Protection System

3.2.1 Hydrant System

a. Hydrant systems for the switchyard area shall be tapped off from main hydrant header for main plant. Double feed will be provided to the switchyard hydrant ring mains from the tap-off point. Tap-off coordinates for switchyard hydrant system shall be provided by main plant fire pipeline at **3638.5 S, 1044.0 E and 3870.5 S, 1044.0 E** as per the Plot plan.

b. Suitable no. of hydrants shall be provided mainly for the switchyard extension – Unit 6. Water connection for the same shall be tapped off from the nearby existing hydrant header.

c. **Hydrant system is designed for Ordinary Hazard Classification.**

d. An underground ring shall be formed around the switchyard. Isolation valve shall be provided in the ring main so that a portion of the loop can be taken out for maintenance without any loss of system in the balance part.

e. Hydrant risers in staircases shall be provided with isolation valves.

f. System shall be designed in a way so that minimum terminal pressure of 3.5 kg/cm^2 can be maintained at the farthest/remotest hydrant point of the switchyard.

g. All the outdoor & indoor hydrants shall be provided with a front glass type hose box carrying 2 nos. 15 mtrs hose for outdoor hydrant & 2 nos. 7.5 mtrs hose for indoor hydrant along with branch pipe coupling and nozzle.

h. All hydrant pipe ring mains/ pipe lines shall be routed underground duly covered with coating and wrapping as per specification. Road, Rail or pipe trench crossing shall be through RCC Hume pipes duly covered with coating and wrapping as per specification. Hume pipe for road crossing shall be NP3 class and that for rail crossing shall be NP4.

3.2.1.0 Specific Data

i) All hydrant valves shall be of 63 NB dia. Single headed, oblique type having Stainless steel construction conforming to IS: 5290, Type-A.

ii) Hoses shall be rubber impregnated woven jacketed type conforming to IS: 636 Type-II. Branch pipes shall be straight jet type conforming to IS: 903, MOC-SS.3

iii) **PIPING**

Specific features of piping for Fire Protection System shall be as follows: -

1. Pipe thickness shall be 6.35 mm for sizes 200 to 350NB, 7 mm for 400 NB and 8 mm for sizes 450 NB and above.
2. The pipe protection shall be as follows: To prevent soil corrosion, buried pipes shall be properly lagged with 4mm thick wrapping and coating corrosion protection tape as per IS: 10221.

A. Above ground piping

a. Material — GI for spray system after deluge valve / MS for other system
b. Standard (Pipes) — IS 1239/ IS 3589
c. Standard (Fitting) — IS 1239 part II/ TAC
d. Type of joint — Welded / Flanged
e. Type of protection: Painted (Two coats of Grey zinc primer. Two coats of enamel paint of 75 microns thickness with color shade conforming to IS: 5).

B. Underground piping

a. Material — MS
b. Standard (Pipes) — IS 3589/ IS 1239 Part – I
c. Standard (Fitting) — IS 1239 part II for fittings NB 150 & below & Fabricated from parent pipes for NB 200 & above.
d. Type of joints — Welded
e. Type of protection — IS 10221/ IS 15337-2003.
f. Class — Medium

C. FITTINGS

i. Unless otherwise specified all elbows/ bends shall be long radius type.
ii. All the fittings the material shall be mild steel shall be IS 1239 Part-II up to 150 mm dia and above shall fabricated from parent pipe in addition to following:
   - Unless otherwise specified all elbows/ bends will be long radius type.
   - The material will conform to IS-1239 part-II heavy grade /malleable iron as per IS: 1879 Part I to X
iii. Fittings (Normally filled with water): Elbow, Tee & Reducers.
   - Screwed Fittings up to 50 mm diameter
   - Butt welded fittings 65 NB to 150 NB
   - Site fabricated from parent pipe and fabricated as per BS: 2633/Bs: 534
   - (90 degree elbow 3 cut, 4piece construction. 45 deg elbow 2cut, 3 piece construction)
   - Slip-on flanges/blind flanges as per IS: 2062 Gr.A, Dimension/ Drilling standard as per ANSI B 16.5/ IS-1538 Table IV & VI F/F.
   - SS-304 for Bolt & Nuts.

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D. VALVES

i) All isolation valve/cut-off valves shall be CI as per IS: 210, FG 260 body, with 13% Cr. SS stem & seating surfaces of gate valves as per guidelines/requirements specified in TAC. All butterfly valves shall be CI as per IS: 210, FG 260 body, SS to AISI: 410 stem & seating surfaces of gate valves as per guidelines/ requirements specified in TAC manual. All globe/ check valves of sizes 50 NB and below shall be gunmetal valves conforming to IS: 778. These valves shall have screwed ends.

ii) All check valves of sizes 65 NB and above shall carbon steel valves conforming to BS: 1868: all globe valves of sizes 65 NB & above shall be CI valves confirms to BS: 5152 Valve shall have provision of locking arrangements in open and closed position. All the flanges & counter flanges will conform to IS-2062 Gr. A Slip on (Dimension/Drilling as per ANSI B 16.5 Cl. 150 /IS: 1538) All valves shall be of Minimum class of 150. Strainer Body shall be as per IS: 2062 (tested).

iii) Overground pipes normally empty, but periodic charge of water and for detector line for spray system shall be of mild steel galvanized pipes as per IS: 1239, Part-I medium grade (for pipes of sizes 150 NB and below) or IS: 3589, Fe 410 grade (for pipes of sizes 200 NB and above).

iv) All fitting used in GI piping shall be threaded type. Welding shall not be permitted on GI piping.

v) All piping system shall be capable of withstanding the maximum pressure (1.5 times of the maximum working pressure) arising from any condition of operation and testing including water hammer effects.

vi) Cast iron gate/sluice valve will be used for isolation of flow in pipe lines and shall be as per BS-5150. Valves shall be of rising spindle type. PN 1.6 class.

vii) Cast Iron non-return valves shall be swing check type. Valves will have a permanent "arrow" inscription on its body to indicate direction of flow of the fluid. These valves shall generally conform to IS: 5312.

3.2.2 HVW and MVW Spray System

- HVW Spray system is envisaged for reactors 80 MVAr – 2 nos., 50 MVAr – 2 nos., 125 MVAr – 2 nos.
- MVW Spray System is envisaged for Cable vault in switchyard control building.

I. General

a. System shall be pressurized continuously to normal working pressure up to the Deluge valves.

b. It shall consist of spray main tapped from the main spray header of power plant, Deluge valve, Isolation valves, Y-type strainer, spray nozzles/ projectors, spray nozzles piping network, detection system, instrumentation, junction boxes, cables etc.

c. Switchyard Spray System shall be tapped off the main spray header of power plant. Two nos. tap off points will be provided at **3603.7S, 1308.0E** and **3705.0S, 1044.0E** for HVW spray system of reactors. One no. tap off shall be provided at **3860.5S, 1044.0E** for MVW spray system near the control building.

d. Minimum pressure at these two tap-off points will be 7 Kg/ cm^2.

II. Design Criteria

a. The system for HVW spray system shall consist of water supply system, suitable number of spray nozzles, deluge valve, quartzoid bulb detectors, strainers, pipes and necessary valves.

b. The system for MVW spray system shall consist of water supply system, suitable number of spray

nozzles, deluge valve, LHS cable, strainers, pipes and necessary valves.

c. Minimum running water pressure at any projector/spray nozzle shall be not less than 3.5 Kg/ Sqcm and not greater than 5.0 Kg/ sq.cm.

d. For MVW spray system, minimum running water pressure at any projector/spray nozzles shall not be less than 2.8 Kg/ sq.cm for cable galleries.

e. Design discharge density shall be as per the rules of water spray system of Tariff Advisory Committee (TAC). Discharge density for HVW spray system shall be 10.2 lpm /sqm and that of MVW Spray system shall be 12.2 lpm/ sqm.

f. In cable galleries the water spray shall cover the exposed area of all the trays and racks.

g. An isolation valve shall be provided at upstream of each of the deluge valve. The size shall be same as that of the deluge valve.

h. Fast acting butterfly valves will be provided on the downstream of deluge valve, so that this valve can be kept closed and can be operated manually, if there is any malfunction of deluge valves.

i. In bypass line of deluge Valve, a globe valve shall be provided.

j. Facility for manual initiation of deluge valves locally, through hand operations (manually by operating the push button) shall also be provided.

k. Water motor gong shall form part of accessories to be provided with deluge valve. Local audible alarm is produced by water motor gong.

l. A strainer ('Y' type) shall be provided at upstream of deluge valve.

m. Strainer wire shall be SS (AISI 316), 30 SWG, and 30 mesh. Strainer area shall be at least 4 times the pipe cross-section at the pipe inlet, pressure drop across strainer in clean condition shall not exceed 1.0 kg/cm^2 at design flow of deluge valve.

n. Limit switch (open & close) for Deluge valves shall be provided for upstream & downstream isolation valve.

o. Pressure gauges at both upstream and downstream of deluge valves, and in the detector pipe network shall be provided.

p. Pressure switches shall be provided in spray and detector piping to exhibit "FIRE" and "SPRAY ON" annunciations and as well as for interlock.

q. Wet type detection shall be provided for actuating the Deluge system. QB detectors are set at 79°C. At the preset temperature the detector burst and releases the pressure with the detector piping network around the reactor & actuating the flow of water across deluge valve.

r. Sprayers/ projectors/ nozzles shall be arranged in the form of a ring around reactors and number of such rings/ tiers shall be decided considering maximum gap between two (2) consecutive tiers of rings shall be as per TAC. The distance of the deluge valves from the protected equipment shall be 6 m. (min.) in line with TAC manual.

s. LHS cable is used for detection in MVW spray system in the cable vault. FAP shall process the signal from smoke detectors of the cable vault & actuates the DV in case of any fire.

t. MVW system consists of a network of sprayers fitted with a special deflector to give required angle of discharge for the water around the area to be protected. The sprayers discharge a cone of water

spray consisting of medium size of droplets of water. The droplet size shall be designed so as to achieve efficient cooling of the flame zone by evaporation and also sufficiently large to penetrate the flame so as to reach and cool surfaces heated by the fire.

u. The cable galleries shall have number of rows of cable trays and each row shall have number of tiers of cable trays. Each of the cable tray rows shall be provided with a network of water distribution piping and nozzles. The distribution network shall have distribution header for each row of cable tray and on these header drop pipes located at interval of 3 m shall be provided to cover all tiers.

v. Pipe structure for pylon support around transformer shall be fixed to the bottom of sump with the help of Anchor fasteners. The structure will be in two pieces with a flanged joint at around Zero level above chequered plate. Pipe size for pylon, size of Anchor fasteners etc. shall be adequate for the support to provide sufficient rigidity against vibration & load during operation.

w. Sprayers/ projectors/ nozzles shall be arranged in the form of a ring around transformers and number of such rings/ tiers shall be decided considering maximum gap between two (2) consecutive tiers of rings shall be as per TAC. The distance of the deluge valves from the protected area / plant / equipment shall be 6 m. (min.) in line with TAC manual.

x. All Spray pipe mains/ pipe lines shall be routed underground duly covered with coating and wrapping as per specification. Road, Rail or pipe trench crossing shall be through RCC Hume pipes duly covered with coating and wrapping as per specification. Hume pipe for road crossing shall be NP3 class and that for rail crossing shall be NP4. Underground pipe shall be provided with coating and wrapping as per specification and IS: 10221 /TAC norms.

y. As per the modern practice of fire detection system, all Deluge Valves (DV's) will be networked to Micro-processor analogue addressable Fire Alarm Panel.

z. Facility for manual initiation of deluge valves locally, through hand operations (manually by operating the push button) shall also be provided.

aa. Each of the outdoor deluge valves and its accessories shall be provided with deluge valve housing. (As per TAC).

bb. Local control panel for deluge valves shall be provided. Remote actuation of the deluge valve shall be provided.

3.2.3 Portable Fire Extinguishers

- The switchyard control building including cable vault shall be provided with:
  a. Carbon dioxide of 4.5 kg capacity portable fire extinguisher conforming to IS 15683.
  b. Dry chemical powder type 6 kg capacity portable fire extinguishers conforming to IS 15683.
  c. Trolley mounted 22.5 kg CO_2 extinguisher conforming to IS 2878 shall be provided for control room.
- For switchgear rooms a combination of adequate number of DCP and CO_2 extinguishers shall be provided.
- Selection of type and location of installation of fire extinguishers for the various rooms of the switchyard control building shall be done in accordance with TAC guidelines.
  (Separate document shall be submitted for Portable & Mobile Fire extinguishers titled as "Fire Extinguisher Distribution Schedule")

3.2.4 Evacuation system for Oil Water Emulsion from Switchyard Common Oil collection pit

2 nos. common oil collection pit of capacity 84 m^3 has been provided in the switchyard for collection of oil / water from switchyard reactors. The collected oil / water shall be evacuated from common oil collection pit through automatic/ manually pumping arrangement.

Two numbers of vertical centrifugal pumps with motor of capacity 10 m^3/hr @ 20m head shall be provided on top of the common oil collection pit to evacuate oil/ water when level of oil / water reaches above 1 m in the common oil collection pit. Out of the two pumps, one will be working and one will be standby. A local control panel will be provided for auto/ manual operation of pumps. This system shall be provided with a canopy and suitable structure.

Oil/ water from pump outlet will be connected to a pipe header which in turn shall be connected to oil-water separator tank in the transformer yard through 100NB MS pipe (IS: 1239, Heavy grade). Transformer yard layout & switchyard layout indicating oil-water separator tank & common oil pits respectively are enclosed herewith for reference.

Pipe lines between common oil collection pit and oil-water separator tank shall be laid below underground in depth of 300 mm. Road, trench and drain crossing shall be through RCC Hume pipes duly covered with coating and wrapping. Hume pipe for road crossing shall be NP3 class. Non return gate valve will be provided at both ends of pipe line. Gate valves shall be provided as per requirement.

3.2.5 Mandatory spares

Spares shall be supplied by the contractor as per Cl. No. 9.0, Sl. No 3 of this section.

4.0 SCOPE OF SUPPLY & SERVICES

4.1. Exact requirements shall be worked out during detailed engineering after award of contract. The scope of the work under the contract shall be deemed to include all such items, which although not specifically mentioned in the bid documents and/or in the bidder's proposal, but are required to make the equipment/system complete for its safe, efficient, reliable and trouble free operation, unless the same is specifically excluded from the Bidder's scope of work under clause 5.0 of this section.

4.2. Bidders shall consider makes for various equipments as per Annexure B which shall be subjected to Owner's approval during design engineering stage. Price implication to BHEL later on account of non-acceptance of proposed vendors by Owner shall not be considered.

4.3. Bidder shall also consider the following while quoting for the system:

i) Power & Control cables for fire protection system (except for cable for detection and alarm system) will be supplied on free issue basis to contractor. BHEL shall procure various sizes of cables (as per Annexure 'A' of this section) for the complete requirement of sub-station. Contractor shall have to choose their cables from the available sizes only and necessary modifications in their equipment for termination of these cables shall be made by contractor.

ii) Since laying & termination of all power & control cables is in contractor's scope, supply of cable accessories such as lugs, glands, cable tags & markers etc. shall be included by the bidders in their offers alongwith supply of cable (2C X 1.5 sq.mm, FRLS, twisted pair, armoured Cu cable) for fire detection and alarm system.

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iii) Necessary cable trays will be supplied on free issue basis to the contractor, however necessary hardware for fixing the same on walls or elsewhere shall be included by the bidders in their offers.

iv) Earthing material viz. GS flat & wire will also be supplied on free issue basis to contractor; however requirement shall be given by the bidders in their respective bids.

v) Bidder shall ensure that sufficient quantities of commissioning spares are made available for timely completion of commissioning of the system. The bidder shall furnish a list of Commissioning spares that will be brought by him. The unused commissioning spares shall be returnable to the bidder.

vi) The contractor shall lay the underground piping required for hydrant system and also shall construct RCC pedestals & pylon supports for above ground pipe if required.

vii) Pipe size for pylon, size of Anchor fasteners etc. shall be adequate for the support to provide sufficient rigidity against vibration & load during operation. The whole arrangement shall be in bidder's scope. The contractor shall justify adequacy of design during engineering.

viii) Conducting performance guarantee tests as per approved procedure to the satisfaction of Owner / Purchaser and handing over an operational system to the owner. Procedure for performance guarantee test shall be submitted by contractor for customer review and approval.

ix) Contractor shall submit valid Type test report for approval by owner. Fresh type test of equipment is not envisaged. It is presumed that equipment offered is duly type tested.

Type Test Certificate for degree of protection shall be submitted for all the electrical panels shall be as per customer specification.

In case the type test reports are found un-satisfactory, tests shall be carried out afresh by contractor without any additional cost implication to BHEL.

4.4. Scope of services

A. Erection, Testing & Commissioning (ETC) requirements

i) The scope of ETC shall include receipt of material at site, unloading, safe storage of material, handling of equipment/ material at site, erection of equipment /material at site including fabrication, equipment and system testing, commissioning of the entire system, conducting performance guarantee tests to the satisfaction of Owner / Purchaser and final handing over to the owner of the entire system.

ii) Furnishing technical calculations in support of equipment selection or sizing as and when required.

B. With Other Electrical System

i) Preparations of cable interconnection diagram for equipment supplied under this contract and accordingly offer guidance to the purchaser for laying necessary cables. Termination details shall also be furnished in the said interconnection table.

ii) Laying & Termination of Power and Control cables for the equipment under the scope of this specification. Bidders shall include all cable accessories like lugs, glands, cable tags, markers etc in their respective bids.

iii) Earthing of all installations (to the nearest earth mat/ earthing pad) supplied under the scope of this specification.

C. With Civil System

i) Providing location of pipes crossing the road & trenches and laying of adequately sized Hume pipes.

ii) Making RCC pedestals for above ground piping wherever required.

D. All machinery tools & tackles and consumables required for erection/testing / commissioning of the system shall be arranged by the Bidder.

E. Minor modifications, alterations in system installation as per customer's specific requirements shall be done without any extra cost to purchaser.

F. Bidders to ensure that sufficient quantity of spares are made available for timely completion of commissioning of the system. The bidder shall furnish a list of commissioning spares that will be brought by him. The unused commissioning spares shall be returnable to the bidder.

G. **Obtaining approval from TAC/ TAC accredited agency on documents & installations.**

i) Obtaining, "As Built" certification from purchaser or owner on applicable drawings. Completing documentation as per specification requirement.

ii) Obtaining customer's written acceptance of satisfactory completion of job. (Acceptance of PG + handing over of plant and mandatory spares (if any)).

iii) Any other service not explicitly illustrated herein but which may be required to complete the system with its desired functionality or in the spirit of contract shall also deemed to be under the scope of bidder.

H. Civil Works

Major civil works such as foundations, cut outs etc., shall be in Purchaser's scope. The Bidder shall however supply foundation bolts & hardware and undertake minor civil works such as grouting, filling up of crevices/ cut outs etc. Any damage caused to civil works during ETC work of the equipment/system shall have to be made good to the original finish by the Contractor at no extra cost to the Purchaser.

In addition the following shall be in the scope of Contractor:

i) Laying of underground piping and construction of RCC pedestals to support the above ground piping for hydrant wherever required.

ii) RCC supports to the base of pylon pipes (if required) of HVW system of various transformers/ reactors.

iii) Each of the outdoor deluge valves and its accessories shall be provided with deluge valve housing. (As per TAC). Construction of deluge valve housing with RCC roof and its painting (inside & outside).

5.0 Exclusions

a) Supply of power & control cables except for detection cable. However laying and termination of these cables shall be in contractor's scope. [redacted]

b) Supply of necessary cable trays for laying power and control cables, however hardware for fixing the same on wall trenches or elsewhere shall be included by the bidder in his bid.

c) Supply of GI flat for earthing of equipments.

6.0 Utilities Available

Construction water and electricity shall be available at one point each. Contractor shall be required to

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make own arrangement for taking supplies from there.

7.0 Engineering Drawings/ Documents

Engineering shall start immediately after the award of the contract.

Submission of all drg. / data sheet – Within 6 weeks from the PO date.

Approval of all drg. / data sheet – Within 9 weeks from PO date.

7.1 OPERATION & MAINTENANCE (O&M) MANUAL

Operation and Maintenance manuals shall be specifically compiled for the project by the bidders. The draft O&M manual shall be submitted along with the supply of the items. The O&M manual shall contain the following information:

a. Description of the system and equipment with design particulars.
b. Instruction for erection.
c. Instruction for operation, maintenance and repair.
d. Recommended inspection practices and inspection schedule.
e. Ordering information for all replaceable parts.
f. Recommendation for type of lubricants and frequency of lubrication.

8.0 Handing & Taking Over

It is the responsibility of the contractor to maintain the plant till it is handed over. Any defect noted during the period shall be rectified by the contractor without any price implication to BHEL. Also suitable PG tests shall be conducted by the contractor to show the achievement of guaranteed parameters in line with the requirements of specification/ standards/ codes and to the satisfaction of Purchaser/ Owner.

9.0 Various Heads to be quoted for

9.1.1 Based on the above input it is recommended that the bidders shall submit their LUMPSUM offers in the prescribed format only

TABLE- I

Sl. No.	Item Description	Unit	Qty	Rate	Amount
1.0	Supply of main items pertaining to following:				
1.A	Hydrant System	Lot	1		
1.B	HVW Spray System	Lot	1		
1.C	MVW Spray System	Lot	1		
1.D	Fire Detection & Alarm System	Lot	1		
1.E	Portable Extinguishers	Lot	1		
2.0	Erection, Testing & commissioning of the complete fire protection system	Lot	1		
3.0	Supply of Spares				
3.A	Automatic fire detectors & Manual call points	3% min. 2 nos. of each type.	1		
	Total LUMPSUM Price FOR THIS PACKAGE				

11.1 Sub-Vendor List

Bidder shall choose make of materials strictly from list enclosed in Annexure-B to this section only. However final applicable make is subject to ultimate customer approval. Bidder can provide any other make that is not included in the list below under special circumstances only if it is acceptable to ultimate customer without any cost implication to BHEL.

ANNEXURE- B TO SECTION-1

SUB-VENDOR LIST FOR FIRE FIGHTING SYSTEM

S.N.	ITEMS	APPROVED SUB-VENDOR	PLACE	REMARK
1	HYDRANT VALVES BRANCH PIPE, NOZZLES COUPLINGS	SHAH BHOGILAL	AHMEDABAD	ISI MARKED
		SUKAN	AHMEDABAD	ISI MARKED
		NEWAGE	SURENDRA NAGAR	ISI MARKED
		WINCO	AHMEDABAD	ISI MARKED
2	STRAINERS (Y-TYPE & BASKET TYPE)	SAROJNI ENTERPRISES	NEW DELHI	
		FILTRATION ENGRS.	KOLKATA	
		JAYPEE INDUSTRIES	MUMBAI	
			NEW DELHI	
3	FITTINGS & FLANGES	M S FITTINGS	KOLKATA	
		METAL LLOYDS	MUMBAI	
		BHARAT FORGE	PUNE	
		TUBE PRODUCTS	BARODA	
		NITIN PROFILE	BARODA	
4	MS/ GI ERW PIPES	JINDAL	GHAZIABAD	
		SURYA ROSHINI	BAHADUR GARH	
		GOOD LUCK TUBES	SIKANDRABAD	
		TATA	JAMDESHPUR	
5	FIRE HOSES	NEWAGE	SURENDRA NAGAR	ISI MARKED
		CHATTARIA RUBBER	BARUCH	ISI MARKED
6	DELUGE VALVES	HD FIRE	THANE	UL/FM /
		KIDDE (I) LTD.	MUMBAI	LPCB/VDS
7	HV SPRAY NOZZLE	HD FIRE	THANE	UL/FM /
		KIDDE (I) LTD.	MUMBAI	LPCB/VDS
		TYCO	USA	APPROVED
9	QUARTZOID BULB SPRINKLERS	TYCO	USA	UL/FM/
		NEWAGE INDUSTRIES	MUMBAI	LPCB/ VDS APPROVED

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ANNEXURE-'A'

CABLE SIZES BEING PROCURED BY BHEL FOR SUB-STATION

2C x 2.5 sq mm PVC/Copper, Armoured Control Cable
5C x 4 sq mm PVC/Copper, Armoured Control Cable
5C x 2.5 sq mm PVC/Copper, Armoured Control Cable
7C x 2.5 sq mm PVC/Copper, Armoured Control Cable
10C x 2.5sqmm PVC/Copper, Armoured Control Cable
14C x 2.5 sq mm PVC/Copper, Armoured Control Cable
19C x 2.5 sq mm PVC/Copper, Armoured Control Cable
2C x 10 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
4C x 16 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
3.5C x 35 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
3.5C x 95 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
3.5C x 400 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
1C x 50 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable
1C x 630 sq.mm XLPE/Aluminium, Armoured Auxiliary Power Cable

11.1 Sub-Vendor List

Bidder shall choose make of materials strictly from list enclosed in Annexure-B to this section only. However final applicable make is subject to ultimate customer approval. Bidder can provide any other make that is not included in the list below under special circumstances only if it is acceptable to ultimate customer without any cost implication to BHEL.

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		SUKAN	AHMEDABAD	ISI MARKED
		NEWAGE	SURENDRA NAGAR	ISI MARKED
		WINCO	AHMEDABAD	ISI MARKED
2	STRAINERS (Y-TYPE & BASKET TYPE)	SAROJNI ENTERPRISES	NEW DELHI	
		FILTRATION ENGRS.	KOLKATA	
		JAYPEE INDUSTRIES	MUMBAI	
			NEW DELHI	
3	FITTINGS & FLANGES	M S FITTINGS	KOLKATA	
		METAL LLOYDS	MUMBAI	
		BHARAT FORGE	PUNE	
		TUBE PRODUCTS	BARODA	
		NITIN PROFILE	BARODA	
4	MS/ GI ERW PIPES	JINDAL	GHAZIABAD	
		SURYA ROSHINI	BAHADUR GARH	
		GOOD LUCK TUBES	SIKANDRABAD	
		TATA	JAMDESHPUR	
5	FIRE HOSES	NEWAGE	SURENDRA NAGAR	ISI MARKED
		CHATTARIA RUBBER	BARUCH	ISI MARKED
6	DELUGE VALVES	HD FIRE	THANE	UL/FM /
		KIDDE (I) LTD.	MUMBAI	LPCB/VDS
7	HV SPRAY NOZZLE	HD FIRE	THANE	UL/FM /
		KIDDE (I) LTD.	MUMBAI	LPCB/VDS
		TYCO	USA	APPROVED
9	QUARTZOID BULB SPRINKLERS	TYCO	USA	UL/FM/
		NEWAGE INDUSTRIES	MUMBAI	LPCB/ VDS APPROVED

10	SOLENOID VALVE	ROTEX AVCON	BARODA MUMBAI	
11	MICROPROCESSOR BASED FIRE ALARM PANEL, DETECTORS & OTHER ALARM DEVICES	SIMPEX SCHRACK ESSER HONEYWELL DETECTOMAT NOTIFIER EST (EDWARD SIGNATURE SERIES)	USA AUSTRIA GERMANY GERMANY USA	UL/FM / LPCB/VDS APPROVED
12	COATING & WRAPPING MATERIAL/TAPE	MP TAR PRODUCTS RUSTECH	BHILAI MUMBAI	
13	CAST IRON GATE VALVE	H.SARKAR KBL LEADER KALPANA VENUS	KOLKATA KIRLOSKARWADI JALLANDAR KOLKATA KOLKATA	
14	BATTERY	EXIDE AMAR RAJA	KOLKATA TIRUPATI	
15	AIR RELEASE VALVE	H.SARKAR LEADER KALPANA VENUS A.V VALVES LTD. WINCO	KOLKATA JALLANDAR KOLKATA KOLKATA AHMEDABAD	
16	PRESSURE GAUGE	AN INSTRUMENTS H GURU MANOMETER FORBES MARSHALL (HYD)	KOLKATA KOLKATA THANE HYDERABAD	
17	PRESSURE SWITCH	INDFOS SWITZER SOR INC. DRESSER INDUSTRIES INC. BARKSDALE GMBH	GHAZIABAD CHENNAI USA USA GERMANY	
18	PAINT	SHALIMAR ASIAN PAINTS BERGER		
19	BATTERY CHARGER	EXIDE	KOLKATA	

		AMARA RAJA	TIRUPATI	
		AMCO	BANGALORE	
		HBL NIFE	HYDERABAD	
		CHHABI ELECTRICALS	JALGAON	
20	POWER & CONTROL CABLE	CORDS CABLE		
		NICCO		
		TORRENT		
		POLYCAB		
		DELTON		
		PARAMOUNT		
21	FIRE EXTINGUISHER	KANEX		ISI MARKED
		SAFEX		ISI MARKED
		NITIN		ISI MARKED
		VIJAY FIRE		ISI MARKED
		ZENITH		ISI MARKED

19.0 LIST OF SUB VENDORS FOR MECHANICALEQUIPMENT / SYSTEMS

Bidder to note that the list of preferred Sub- Vendors / Sub-contractors is furnished below. These are the local suppliers. In case the bidder desires to deviate from the list furnished or in case of overseas sub-vendors / sub-contractors, the Contractor shall furnish along with his offer alternative names of Sub Vendors along with the following supporting documentation.

1. Documentation to show that the equipment/system has been supplied for a plant of similar or higher capacity (Minimum 500MW supercritical / sub critical plant)

2. Documentation in the form of certificate that the equipment / system has been operating satisfactorily for two years as on the scheduled date of bid opening (Minimum 500MW supercritical / sub critical plant)

3. The list proposed by the bidder shall be subjected to the approval of purchaser/consultant.

NOTE 1: BIDDER SHALL GET THE APPROVAL FOR SUBVENDORS PROPOSED BY HIM FROM OWNER/CONSULTANT.

Note 2: For items not indicated below, the CONTRACTOR shall obtain approval from the PURCHASER.

ANNEXURE TO SECTION - 1

D6

FIRE PROTECTION SYSTEM

1.0 FIRE PROTECTION SYSTEM

This section covers the fire protection systems suitable for the type of risk/fire for different buildings, equipment, tanks transformers, etc., covering the power plant and associated auxiliaries/facilities completely. Various types of protection systems and associated equipment / system components shall be completely in compliance with the regulations of Tariff Advisory Committee (TAC) of India. CONTRACTOR shall obtain all necessary clearances from Purchaser's Insurance company.

2.0 CODES AND STANDARDS

The fire protection system shall comply with the following regulations:

Tariff Advisory Committee (TAC) of IRDA India

NFPA - National Fire Protection Association (for systems not covered by TAC regulations)

3.0 DESIGN REQUIREMENTS

(a) The makes/models and technical features offered for various components/ equipment shall comply with the standards of TAC/ BIS and FM/NFPA/ FOC as applicable.

(b) Type of Systems

The following type of systems shall be provided for the proposed power plant:

i Hydrant System for entire area of power plant.

ii High Velocity Water Spray System (HVWS) for Interconnecting **transformer, reactor**, generator transformer, Unit transformer, , main lube oil tank, clean and dirty lube oil tanks, BFP lube oil system, boiler burner front,TG oil canal and LDO/HFO storage tanks, rectifier transformer above ESP roof.

iii Medium Velocity Water Spray System (MVWS) for cable galleries and complete conveyer system, bunker floor, wagon tippler area and conveyor tunnel.

iv Portable Fire Extinguishers

v –VOID-

vi Foam system for fuel oil storage tanks:

(c) It is entirely the responsibility of the CONTRACTOR to obtain the approvals of agencies nominated by Purchaser's insurance company and ensure that the maximum allowable insurance rebates are obtained. CONTRACTOR shall ensure that the procedures are properly met and inspection are carried out as and when required and carry out all the necessary modification / augmentation in this fire protection system.

(d) Water supply to the proposed fire protection system shall be provided from the CW blow down tank. Fire water pumps shall be located in the pump house adjoining the tank along with other pumps viz. coal handling / ash handling pumps .

Adequate reserve storage shall be provided for fire protection system in line with TAC requirements (a minimum dead storage of 3000 cu.m shall be provided).

Separate header shall be provided for Hydrant system and spray system from the outlet of the pump house. Hydrant pump may feed spray system and not vice versa. Space for one more electric pump be kept for future for each system. Separate hydrant and spray pumps shall be provided with provision for interconnection between hydrant and spray system. Near the boiler area two (2) numbers (1 working – motor driven and one standby -diesel engine driven) booster pumps of capacity 137 m3/hr and head of 50 mwc shall be provided.

(e) Fire hose cabinets shall be provided on main locations of plant such as turbine floors, ESP area, Fire station, etc.

4.0 HYDRANT SYSTEM

The hydrant system shall be provided for all the areas of the power plant.
Foam hydrants shall be provided along the fuel oil dyke in addition to hydrants.
Horizontal centrifugal pumps with motor and diesel drive of adequate capacity and head shall be provided.

In order to provide make-up for minor leakages in the system and to maintain the system pressure, two (2) numbers electric motor driven (1 working and one standby) jockey pumps, Two (2) numbers air compressors (1 working and one standby) and one (1) number hydro-pneumatic tank shall be provided.

Jockey pumps shall not be running when main pumps are in operation.

Hydrant system shall consist of the underground ring headers, mains (piping)

upto the individual hydrant outlets, risers and above ground branch headers (terminal mains) with isolating valves in case of landing valves / internal hydrants, stand posts, single headed or double headed hydrant valves depending on the hazard covered, hoses, hose couplings, branch pipes and nozzle assemblies and all associated accessories, fittings, valves and specialities, etc. to be included in supply. All accessories required for external, internal and Foam hydrants shall be stored in Hose boxes located alongside of each hydrants.
CONTRACTOR shall study the layout given in the plot plan drawing and provide fire protection system accordingly to the complete power plant.

Sectionalizing valves shall be provided in the network header as per TAC to isolate a section of the header during maintenance without shutting down the hydrant system. These valves shall be provided after every 4-5 hydrants / Monitor connection from the header pipe.

The mode of operation of the hydrant system shall be automatic. Stopping of the pumps shall be manual.

Emergency Hydrants System:
In this package independent emergency hydrant system with minimum 25 number hydrants and other required accessories to be provided for protecting the power house building over and above the main normal hydrant system which will be connected with service water storage tank located at the top of bunker floor by minimum 200 NB pipe line. This system shall be interconnected with main normal hydrant header with valve and NRV

5.0 HIGH VELOCITY WATER SPRAY (HVWS) SYSTEM

This system shall be designed for automatic and remote manual operation for the Interconnecting transformer, Reactor, Generator Transformers, Unit Aux. Transformer and Station Transformer and remote manual operation for Main lube oil tanks, clean, dirty oil tank and LDO/HFO tanks.

The location of wet pilot type deluge valve shall be kept away from the equipment to be protected. The detection system for the transformer shall consist of heat sensing detectors of fusible type (quartzoid bulb) mounted on water filled detector pipe network around the equipment to be protected. Another network of water projectors shall be mounted around the equipment to be protected and this network shall be connected to the water supply mains through a deluge valve. The deluge valve shall be normally kept closed by the water pressure in the network against the water pressure in the mains. Remote / manual actuation push button units shall also be provided.

Suitable detectors shall be provided for the oil tanks for initiation of HVWS system manually. Fast acting butterfly valves shall be provided as a bypass valve to the deluge valve, so that the butterfly valve can be kept closed and

operated manually in the event of fire, if there is any malfunction of deluge valve. Isolation valves on upstream and downstream side of deluge valve shall be provided. One no. Testing valve of same size to test the deluge valve without spraying water on equipment.

Water supply for spray system shall be provided from the spray system header Sectionalizing valves shall be provided in the spray system header to isolate portion of the header during maintenance without shutting down the spray system. The design shall ensure alternate path of water supply to all other spray system. A section of the header shall be isolated by operating two consecutive sectionalizing valves.

All deluge valves with automatic re-set arrangement and Shed shall be provided.

Fire wall barrier of minimum 120 minutes rating at transformer yard area shall be provided.

6.0 MEDIUM VELOCITY WATER SPRAY (MVWS) SYSTEM

Medium velocity water spray system shall be provided for the cable vault/gallery of station building and coal conveyors. In order to avoid total flooding of the area in the event of fire in a particular zone, the area shall be divided into number of zones. Each zone will have separate water supply network controlled by a deluge valve. The fire in the cable vault/gallery and coal conveyors will be detected by a detection system which will give an electrical signal for the operation of the deluge valve. In the event of fire in a particular zone, the deluge valve of corresponding zone and those of adjacent zone on either side shall be opened. The Bidder shall decide the number of zones. Water required for this system shall be tapped off from spray fire water header. Opening of deluge valve will result in starting of pump. Fast acting butterfly vales shall be provided as a bypass to deluge valve, so that this valve can be kept closed and can be operated manually, if there is any malfunction of deluge valves. Isolation valves on upstream and downstream side of deluge valve shall also be provided .
The cable galleries will have number of rows of cable trays and each row will have number of tiers of cable trays. Each of the cable rows shall be provided with a network of water distribution piping and nozzles. The distribution network shall consist of distribution header for each row of cable tray and on these header drop pipes located at an interval not exceeding 3 metres shall be provided so as to cover all the tiers.

The MVWS system for coal conveyors shall be provided for both top and return conveyors. Hoppers and feeders shall also be covered. These conveyors shall be divided into number of zones. Operation of this system shall be in similar lines as explained for cable gallery. One no. Testing valve of same size to test the deluge valve without spraying water on equipment

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Water supply for spray system shall be provided from the spray system header.

All deluge valves with automatic re-set arrangement and shed shall be provided.

Fire wall barrier of minimum 120 minutes rating shall be provided in cable vaults and cable galleries

~~7.0 Foam Protection System~~

~~7.1 Automatic foam protection system (Pressure proportionating system) shall be provided for HFO and LDO oil storage tanks located in fuel oil dyke area. The system shall be designed as per NFPA – 11 / TAC.~~

~~The system shall consist of 2 x 100 % capacity foam concentrate tanks (MS with Epoxy or FRP lining inside the tank) with foam concentrate, , ratio proportioners, foam inductors / ejectors, balance proportioners, foam makers with discharge outlets, associated interconnection piping, valves, fittings, instrumentation etc., The foam shall be Aqueous Film forming Foam (AFFF) type. A tap-off from the hydrant line shall be connected to the foam ejector with a deluge valve, which shall open automatically on detection of fire.~~

~~7.2 The operation of foam protection system shall be automatic with the help of fire detection system. The type of fire detection for the fuel oil tank shall be tank mounted addressable flameproof rate of rise of temperature detector with fixed temperature element.~~

~~7.3 On detection of fire, the signal generated from detection system shall open the deluge valve provided in the tap-off from the hydrant line and therefore the foam is injected through the ejector in the fuel oil tank, which is under fire~~

~~8.0 Fire water storage system and Pressurisation System~~

~~8.1 Separate pumps for hydrant and spray system should be provided such that water flow from hydrant pump to spray system but not vice varsa. Spary system will be independent from hydrant system. In order to provide make-up for minor leakages in the system and to maintain the system pressure, two (2) numbers electric motor driven (1 working and one standby) jockey pumps, Two (2) numbers air compressors (1 working and one standby) and one (1) number hydro-pneumatic tank shall be provided.~~

~~The mode of operation of the pressurisation system shall be as follows:~~

~~(a) This system shall keep the hydrant and spray system under pressurised state under all conditions.~~

~~(b) The pressurisation in the hydro-pneumatic tank is achieved by means of two air compressors. Two (2) nos. jockey pumps shall assure that the~~

~~volume of water inside the hydro-pneumatic tank shall be refilled after reaching the minimum level.~~

~~(c) Small system leakages are met by make up water supply from hydro-pneumatic tank and electric driven jockey pump. When the water level in the hydro-pneumatic tank falls to a predetermined low level the jockey pump shall start automatically through an impulse from the level switch and pumps water to the hydro-pneumatic tank. The jockey pump shall stop when predetermined high level is reached in the tank through an impulse from the level switch. However compressor shall start only when the water level has reached a high set point and the pressure in the tank falls below the determined set point and stops when the pressure in the tank reaches the determined set point sensed through the pressure switch. While deciding the settings it shall be ensured that the jockey pump and compressor do not start simultaneously. The jockey pump and compressors shall be capable of both start and stop in either auto or manual modes.~~

~~(d) The local control panel shall have all necessary control for operation and control of the pumps and compressors.~~

~~(e) All the pumps shall be protected against low suction levels.~~

9.0 PORTABLE EXTINGUISHERS:

Portable Extinguishers with suitable capacity, rating and medium (water CO_2 foam etc.) in adequate numbers covering all the buildings in the power plant premises shall be provided. Trolley mounted 22.5 kg CO_2 extinguisher shall be provided for control room. Adequate number of Dry Chemical Powder (DCP) type extinguishers shall be provided for the control room. For switchgear rooms a combination of adequate number of DCP and CO_2 extinguishers shall be provided. Foam type portable extinguishers shall be provided for controlling oil fires. Sand / water buckets shall be avoided.

10.0 ELECTRICAL SYSTEM REQUIREMENTS

Equipments such as motors, control panels and cables shall conform to the requirements specified in electrical section.

Following panels for hydrant, HVWS and MVWS systems shall be provided:

(i) Local Control Panel complete with battery and charger for diesel engine driven pumps to be located in this water pump house.

(ii) Local Control Panels for deluge valves and other accessories for cable galleries where all necessary interlocks, relays, pressure switches, indicating lamps are wired. These panels shall be located near the cable gallery. The power for these panels shall be arranged from the nearest MCC. Necessary interlocks with fire detection panel shall also be provided.

(iii) Local Control Panels for deluge valves of Generator transformer, Unit auxiliary transformer, station transformer and ICT and LDO/HFO tanks. Other details shall be same as (ii) above. Additionally for all the transformers, fire protection system 'under test' contact shall be wired to generator control panel.

(iv) Local Control Panels for deluge valves of oil tanks in station building. Other details shall be same as (ii) above.

(v) Local Control Panel for MVW system for coal conveyors shall be provided in coal handling control room. The panel details shall be same as (ii) above.

(vi) Common annunciation cum control panel for hydrant system and spray system shall be provided in the fire water pump house. This panel shall have suitable relays and contacts for remote indication in the main control room.

(vii) Annunciation panel in fire station: This panel shall provide annunciation about the status of fire protection system in each area.

The annunciation panel specified at (vi) above shall have separate sectors, one each for hydrant, MVWS system and each sector shall provide annunciation for the normal and abnormalities in respective systems.

11.0 LAYOUT REQUIREMENTS

The layout shall be strictly in compliance with TAC especially with regard to clearances of mains from buildings/structures, spacing of hydrants, laying out of cables, etc.

Building regulations of TAC with respect to staircases, fire proof doors, fire resistant walls etc., and Electrical Regulations of TAC with regard to location of switchgears, segregation of electrical equipment/panel rooms, layout of cables, etc. shall be strictly adhered to.

12.0 DETAILS TO BE FURNISHED BY THE CONTRACTOR ALONG WITH THE BID

12.1 Preliminary Layout of Fire Protection System as detailed above.

12.2 Description of the fire protection system for the proposed plant.

12.3 Details of HVWS system for transformers lube oil tank, LDO/HFO tanks and MVWS system of cable gallery and coal conveyors and water requirement for

each equipment.

12.4 Scheme drawing of complete fire protection system indicating capacity and head of pumps, dead storage, number of hydrants, water flow requirements, for complete system, quantity of pumps etc.

12.5 Data Sheet B as called for in the following sections

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	VOLUME:III SECTION: D6
TCE.5750A-500-H-001 PART A	**RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan** **DATA SHEET A** FIRE PROTECTION SYSTEM	SHEET 1 OF 5

SL. NO.	ITEM	UNIT	
1.0	**HYDRANT SYSTEM**		
1.1	Areas covered by Hydrant system		Refer Plot plan – Complete power plant
1.2	Hydrants		As per IS 5290 (MOC-SS)
1.3	Hose pipes		Unlined flex canvas, UL listed and ISI stamped.(End couplings MOC- SS)
1.4	Hose cabinets (For indoor Foam/Water Hydrants)		As per TAC
1.5	Branch pipes & nozzle		As per IS 903. For branch pipes as per IS 903/IS 2871 (MOC-SS)
1.6	Monitors		As per IS 8422, (Nozzle and swivel bearing MOC-SS)
1.7	Valves		CI-IS 780/IS 5312 rising spindle
1.8	Foam Hydrants component		One nozzle with coupling, one foam branch pipe with nozzle, one cannister with 60 kg foam concentrate, two 7.5 m length hose and one foam concentrate pipe
2.0	**HVWS SYSTEM**		
2.1	Equipment to be protected		1. Generator transformer
			2. Unit transformer
			3. Main oil tank
			4. Clean oil tank
			5. Dirty oil tank
			6. Main Lub. Oil tank
			7. ICT 8. LDO/HFO tanks

SL. NO.	ITEM	UNIT	
			All nozzle MOC shall be SS
3.0	**MVWS SYSTEM**		
3.1	Design code		NFPA - 15/TAC
3.2	Deluge valve		Wet Pilot valve. Limit switches shall be provided for upstreams & downstream isolation valves
3.3	Total No. of zones (Coal conveyors)		Minimum three zones to be considered for operation
3.4	Total No. of zones for cable gallery		Minimum three zones to be considered for operation
3.5	System actuation		From the alarm & detection system with cross zoning All nozzle MOC shall be SS
4.0	**PORTABLE EXTINGUISHERS**		
4.1	Design Code		TAC/NFPA-10
4.2	Equipment Standard		As per relevant IS standard Caps MOC -SS
5.0	**PUMPS**		
5.1	Location		Blow Down Water tank /CMB Pump house
5.2	Capacity & designation		
	I) Hydrant pump a. Qty, Capacity & Head b. Drive type c. Speed II) Spray pumps a. Qty, capacity & Head b. Drive type		by bidder as per TAC. Working and standby pumps to be provided As per TAC 1500 RPM by bidder as per TAC. Working and standby pumps to be provided as per TAC

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	VOLUME:III SECTION: D6
TCE.5750A-500-H-001 PART A	**RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan** **DATA SHEET A** FIRE PROTECTION SYSTEM	SHEET 3 OF 5

SL. NO.	ITEM	UNIT	
	c. Speed III) Jockey pump a. Qty b. Capacity and Head c. Drive type d. Speed		1500 rpm 1w + 1s (Common for Hydrant and spray system) Contractor to decide motor driven 2900 rpm
5.3	Material of construction		
	a. Impeller		Bronze to IS 318 Gr.2 / SS
	b. Casing		Cl :IS 210 Gr. FG.260
	c. Shaft		SS 410
	d. Make & model		By bidder
5.4	Diesel engine & accessories		
	a. Make & model		By bidder
	b. Type		Turbo charged
	c. Accessories		As required
5.5	Spares shall be provided strictly in compliance with TAC regulations		
6.0	**PIPES**		
6.1	Underground piping		All underground pipes shall be provided in trenches in power block area.
	a. Material		MS
	b. Standard (Pipes)		IS 3589/IS 1239 Part – I
	c. Standard (Fittings)		IS 1239 part II for fittings NB 150 & below & Fabricated from parent pipes for NB 200 & above
	d. Type of joints		Welded
	e. Type of protection		IS 10221
	f. Class		Medium (pipes NB200 & above shall have thickness of 6.35 mm)

SL. NO.	ITEM	UNIT	
6.2	Above ground piping		
	a. Material		GI for spray system after deluge valve/MS for other system
	b. Standard (Pipes)		IS 1239/IS 3589
	c. Standard (Fittings)		IS 1239 part II/TAC
	d. Type of joints		Medium Note : pipes NB 200 & above shall have thickness of 6.35 mm
	e. Type of protection		Welded / Flanged
	f. Class		Painted Two coats of grey zinc primer. Two coats of enamel paint each 75 microns thickness
6.3	Mobile fire & foam tenders		As per TAC / BIS – IS : 10460
			one vehicle (Make-Mahindra -Bolero) with rescue articles such as Breathing apparatus (BA) set, fire entry suit , first Aid articles & other all fire safety articles / apparatus shall be provided to fire station for handling the catastrophe with seating arrangement for carrying 4/5 fire force.

Note:

1. Pipes shall be hydrotested at 1.5 times the pump shut-off head or twice the design head, whichever is higher.

SPECIFICATION NO.	TATA CONSULTING ENGINEERS LIMITED	VOLUME:III SECTION: D6
TCE.5750A-500-H-001 PART A	**RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan** **DATA SHEET A** FIRE PROTECTION SYSTEM	SHEET 5 OF 5

SL. NO.	ITEM	UNIT	

2. Motor rating shall be minimum 116% of duty point requirement and also to meet the maximum power requirement over the operating range at 52.5 Hz frequency.

3. Fire alarm, detection and annunciation system shall be offered as specified elsewhere in the specification.

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	**TATA CONSULTING ENGINEERS LIMITED** **RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan** **DATA SHEET B** **FIRE PROTECTION SYSTEM**	VOLUME:III SECTION: D6 SHEET 1 OF 2

ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	
1.0	**HYDRANT SYSTEM**		
1.1	External Hydrant	Nos.	
1.2	Internal Hydrant	Nos.	
1.3	Water monitors	(Nos./ size)	
1.4	Hose		
1.5	Hose Boxes	Nos.	
2.0	**SPRAY SYSTEM**		
2.1	Design code		
2.2	All Coal Conveyors		
2.2.1	Spray water required (for 3 zone operation)	m^3/hr	
2.2.2	Total no. of Zones		
2.3	**Cable Gallery**		
2.3.1	Spray water req.(for 3 zone operation)	m^3/hr	
2.3.2	Total no. of zones	Nos.	
2.4	Transformer		
2.4.1	Max. spray water demand	m^3/hr	

NOTES TO BIDDER	SIGNATURE OF BIDDER & DATE
1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	ISSUE R1

SPECIFICATION NO. TCE.5750A-500-H-001 PART B	**TATA CONSULTING ENGINEERS LIMITED** **RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan** **DATA SHEET B** **FIRE PROTECTION SYSTEM**	VOLUME: III SECTION: D6 SHEET 2 OF 2

ENQUIRY/SPECIFICATION NO.:			BIDDER:
SL. NO.	ITEM	UNIT	
	(Transformers)		
2.5	Main Lub oil tank	m^3/hr	
2.6	Spray water for clean & dirty oil tank.	m^3/hr	
2.7	Spray water for fuel oil tank	m^3/hr	

NOTES TO BIDDER	SIGNATURE OF BIDDER & DATE
1. ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	ISSUE R1

DATA TO BE FURNISHED AFTER THE AWARD OF CONTRACT

The vendor shall submit the following key drawings / data having engineering information to the Purchaser / engineer as listed below :

1.0 Design Philosophy including flow diagram and piping layout.

2.0 Hydraulic calculations

3.0 Detailed layout of complete FPS like Hydrant, HVWS & MVWS system

4.0 Potable Extinguisher layout

5.0 Data sheets for all equipment such as pumps , motors, pipes, valves, hydrants, Fire Tender etc.

6.0 Schematic wiring diagram & GA of all local control panel.

7.0 ~~Pump house piping layout, performance characteristics curve of pump, foundation details of pump, bill of material.~~

8.0 As built drawing.

9.0 Operation, erection and maintenance manuals.

10. Isometric view of flow diagram and piping layout for complete fire protection system.

ISSUE NO. R2	TCE.M4-111-12	TATA CONSULTING ENGINEERS LIMITED	SECTION : D 6.2
	ENQ.SPEC.NO. 5750A-500-H-001	DATA SHEET A FIRE PROTECTION EQUIPMENT MOBILE TENDER	SHEET : 1 OF 1

GENERAL	1. STANDARD : IS 10460	DESIGN AND CONSTRUCTION (CONTD.)	15. INSTRUCTION BOOK, ACCESSORIES AND EQUIPMENT AS PER CLAUSES 6.1 AND 6.2 OF IS 10460 REQUIRED : YES
	2. FIRE PUMP : 108 m^3 / hr 8.5 Kg / cm^2 (g)		16. SCHEDULE OF EQUIPMENT TO BE SUPPLIED WITH THE APPLIANCE : AS PER APPENDIX-B OF IS 10460 REQUIRED : YES
	3. WATER TANK : 4.5 m^3		17.
	4. FOAM TANK : 0.5 m^3		18.
	5. HOSE REEL REQUIRED : YES		19.
	6. SUPPLEMENTARY EXTINGUISHING AGENT AS PER APPENDIX-A OF IS 10460 REQUIRED : YES		20.
	7. FOAM COMPOUND : AS PER IS 4989 PART 1 / 2 / 3		21.
	8. FOAM CONCENTRATION : By Bidder	TESTS AND INSPECTION	22. AS PER TAC REGULATIONS AND IS 10460
	9. FOAM INDUCTION : AUTOMATIC/ MANUAL		23.
	10. MATERIAL SELECTION AND TREATMENT : AS PER IS 10460		24.
	11. PAINTING : FIRE RED SHADE NO. 536 OF IS 5. PAINT SHALL CONFORM TO IS 2932		25.
	12. CHASIS MAKE: TATA / ASHOK LEYLAND		26.
	13. QUANTITY:2 NOS. FIRE TENDER		27.
DESIGN AND CONSTRUCTION	14. ENGINE ELECTRICAL SYSTEM, WATER TANK, HOSE REEL, PUMP, PRIMER, FOAM EQUIPMENT, CONTROL PANEL, BODY WORK AND STOWAGE AND STABILITY : AS PER IS 10460	APPROVED SUB-VENDORS	28.
			29.
			30.
			31.
			32.

REV.NO.				JOB NO. TCE. 5750A	CLIENT : RRVUNL
DATE					Project: 2 x 660 MW, Super-Critical TPS, Stage- V Suratgarh, Rajasthan
REV BY.					

ISSUE NO. R2	SPECIFICATION NO. TCE.M4-111-12	**TATA CONSULTING ENGINEERS LIMITED**	SECTION : D6.2
		DATA SHEET B **FIRE PROTECTION EQUIPMENT** **MOBILE TENDER**	SHEET : 1 OF 1
	ENQUIRY/ SPECIFICATION NO.		

	SL. NO.	ITEM / BIDDER		
GENERAL	1.	SUB-VENDOR'S NAME		
	2.	ARE ALL ITEMS, EQUIPMENT AND ACCESSORIES AS PER IS 10460 INCLUDED		YES / NO
	3.	DESCRIPTIVE CATALOGUES LISTING ALL ITEMS, EQUIPMENT AND ACCESSORIES AS PER IS 10460 WITH BRIEF SPECIFICATIONS TO BE ENCLOSED		WHETHER ENCLOSED YES / NO
	4.	OVERALL DIMENSIONAL DRAWING OF MOBILE FOAM TENDER TO BE ENCLOSED		WHETHER ENCLOSED YES / NO
	5.	WHETHER MOBILE FOAM TENDER IS TAC APPROVED		YES / NO
	6.	WHETHER RELEVANT ITEMS ARE ISI MARKED		YES / NO
	7.			
	8.			

NOTES TO BIDDER

1 DATA SPECIFIED IN DATA SHEET-A HAS NOT BEEN REPRODUCED IN DATA SHEET-B. IN CASE OF DEPARTURE FROM DATA SHEET-A, BIDDER SHALL BRING OUT THE SAME IN SCHEDULE OF DEVIATIONS, FAILING WHICH IT SHALL BE CONSTRUED THAT BIDDER COMPLIES WITH THE REQUIREMENTS STIPULATED IN DATA SHEET-A.

2. THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.

SIGNATURE OF BIDDER	
DATE	

SPEC.NO. TCE.M4-111-12	TATA CONSULTING ENGINEERS LIMITED FIRE PROTECTION EQUIPMENT MOBILE TENDER	SECTION: D6.2 SHEET 1 OF 1

DATA SHEET C

DATA TO BE FURNISHED BY THE VENDOR AFTER THE ISSUE OF PURCHASE ORDER

1. List of drawings and documents to be submitted for review, approval and information with scheduled submission dates

2. Quality Assurance Plan (QAP)

3. Detailed dimensional drawings of mobile tender, all items, equipment and accessories with specifications, part list and materials of construction. Wherever necessary, cross-section drawings shall also be furnished.

4. Descriptive catalogues listing all items, equipment and accessories

5. Operation and maintenance manual along with lubrication schedule

SECTION 19

FIRE DETECTION AND ALARM SYSTEM

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D19
PART B	**RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Units 7 & 8, at Suratgarh, Rajasthan** FIRE DETECTION AND ALARM SYSTEM	SHEET 1 of 11

1.0 SCOPE

1.1. The scope of work shall include design, engineering, supply, erection, testing and commissioning of the complete fire detection and alarm system for the plant area listed below.

a) Main Plant areas which include TG area, ESP control room and ESP area/platforms & Boiler area/platforms.

b) Balance of plant area such as all electrical & switchgear rooms, Switchyard, Transformer yard, cable galleries, Coal handling plant, Ash Handling Plant, Cooling Tower, Cooling Water PH, Water treatment Plant, Fuel oil pump house, DG Building, Control Room, Service building, Admin building, Security office, storage area and parking area shown in Plot Plan.

1.2. An integrated micro-processor based addressable, analog fire detection and alarm system shall be provided covering the entire plant area.

1.3. The system shall comprise of but not be limited to the following:

1.3.1. Addressable analogue automatic detectors of various types,spark/ember type detector and manual call points.

1.3.2. Digital Linear Heat sensing cable along with necessary heat detector unit and interfacing modules for connection to Fire alarm panel.

1.3.3. Microprocessor based (with redundant processor) fire alarm panel common for both the units along with necessary software.

1.3.4. Repeater panels at required locations.

1.3.5. Mimic Panel

1.3.6. Fault isolator modules, monitor modules & control modules as required.

1.3.7. Response Indicator

1.3.8. Battery and Battery charger

1.3.9. Fire warning siren.

1.3.10. Cabling (including power & control) required for complete fire detection and alarm system. Cable carrying/supporting wherever purchaser's cable trays are not provided.

1.3.11. Earthing of complete fire detection and alarm system.

1.3.12. Terminal boxes and junction boxes as required for complete fire alarm system.

1.3.13. Accessories for mounting and supporting all equipment covered by this specification.

1.3.14. Audio hooters distributed over various areas to alert the people in that area during fire for evacuation. Addressable electronic hooters shall have a sound output not less than 80db.

1.3.15. All minor civil works as chipping, boring, making openings, grouting, cementing, embedded foundation bolts for installation of all electrical equipment supplied under this contract shall be carried out by the contractor.

1.3.16. Relay modules, necessary input/output modules.

1.3.17. Mandatory spares and tools for satisfactory operation & maintenance.

1.3.18. Any other items which are required to make the system complete in all respects and for satisfactory operation of the system.

2.0 CODES AND STANDARDS

2.1 All detection and sensing devices forming an integral part of the microprocessor based, addressable, fire detection and alarm system shall be approved by any of the following bodies as applicable.

(a) Underwriters Laboratories (UL)-USA

(b) Any other internationally recognised body acceptable to the OWNER/ ENGINEER. Approval certificates shall be furnished with the bid.

2.2 The CONTRACTOR shall be solely responsible for obtaining the required approval and clearances for the fire detection and alarm system from the following authorities as applicable:

2.2.1 FDA system approval shall be taken from TAC/accredited professional bodies.

2.2.2 Fire alarm system components shall be CBRI / CMRS / TAC / UL approved.

2.2.3 All documents required by local authorities shall be furnished accordingly.

3.0 DESIGN REQUIREMENTS

3.1 Fire alarm system shall be designed to provide continuous surveillance against fire in the areas covered by the system under all conditions.

3.2 The equipment shall be designed and manufactured in accordance with the best engineering practice and shall have proven for the services intended

3.3 The installation practices adopted for fire detection and alarm system shall be as per relevant standards.

3.4 **Analogue, addressable fire detectors**

3.4.1 The number of detectors, spacing and their locations shall comply with NFPA 72E/BS 5839, Part 1 / IS 2189. The actual quantity of detectors required, taking into consideration the obstruction due to floor beams,air movement, air velocity,ceiling obstruction etc., so as to obtain complete coverage, shall be

worked out by the Contractor based on the final drawings of the various buildings during detailed engineering.

3.4.2 Anologue addressable type smoke detectors & rate of rise of temperature detectors, Linear heat sensing cables. Manual call points etc shall generally comply with standard requirements.

3.4.3 The automatic fire detectors shall be of analogue addressable type having the following features :

(a) Individual addressing capability at the fire alarm panel to facilitate precise pointing of fire location / detector activated.

(b) Discrimination between a false fire and real fire condition.

(c) Detection and automatic calibration / setting of over / under sensitive detector by decreasing or increasing their sensitivity levels.

(d) Pre-alarm in case of detector or a section of detectors requiring maintenance.

(e) All types of addressable detectors / interface units shall be compatible with the fire alarm panel.

3.4.4 The type of fire detectors which shall be generally used in different areas of the plant have been listed below.

3.4.5 Detectors shall all be UL/FM listed and shall be approved for operation up to 49 deg C

Area wise Application of Automatic Fire Detectors and Manual Call Points

Sl. No.	Area	Type of Fire Detector
1.0	All switchgear & MCC rooms, Thyristor room, UPS room	Addressable multisensor detector and manual call points.
2.0	Cable galleries	Addressable multisensor smoke detectors, Linear heat sensor cables of Digital type running above cable trays (as per TAC) and manual call points. Multisensor detector and LHS detectors along with necessary number of interface units in the cable gallery shall be cross zoned to actuate the water spray system.
3.0	Control rooms, office rooms, security office and storage rooms, computer room &	Addressable multisensor detector and manual call points.

Sl. No.	Area	Type of Fire Detector
	control equipment room & relay rooms.	
4.0	Hazardous plant area (a) Fuel oil and seal oil areas, Lube oil area, Oil purifier area, Oil canals and Main Oil tank where fumes / vapours exist.	Addressable flame proof rate of rise of temperature detectors with fixed temperature element, flame proof manual call points.
	(b) HFO/LDO tanks	Rate of rise of heat detector on top of roof.
	(c) Hydrogen storage area and hydrogen charging header.	Addressable intrinsically safe rate of rise of temperature detector with fixed temperature element and manual call points.
5.0	TG building turbine floors, Boiler area	Manual call points.
6.0	Battery rooms	Multisensor smoke detectors
7.0	Transformer Yard and switchyard	Out door type manual call point.

Sl. No.	Area	Type of Fire Detector
8.0	Coal Handling Plant	
	Coal conveyor	Addressable spark / ember detectors & temperature sensitive insulated wire Digital linear heat sensor cables and flame proof manual call points
	Dusty areas in coal handling plants like crusher house, junction towers, etc.	Flame proof manual call points

3.4.6 The devices shall be looped together and then connected to the fire alarm panel. The address of each detector shall be indicated on the respective fire alarm panel. CONTRACTOR shall furnish in the BID, the number of detectors in each loop and the number of loops in each panel. CONTRACTOR shall furnish the areas covered in each loop. Optimization of cable quantities shall be considered while designing the system. The detectors to be wired to the panel shall be in accordance with NFPA. The detectors shall be suitably distributed in each loop and connected to the MFAP. Each close area shall have isolator at entry points and exit points which shall automatically open the part of the loop on short circuit.

3.4.7 The detectors shall be suitable for testing from the fire alarm panel without operating any detector & fire fighting system.

3.4.8 Areas where two types of detectors are provided such as multi-sensor and linear heat sensor cables in cable galleries both the type of detectors shall be suitably cross zoned such that fire is detected only when both types of detectors located in that area operate. Operation of any one of this type of detectors shall give an alarm.

3.4.9 The intelligent device and the loop card of FACP shall provide increased reliability and inherent survivability through intelligent stand alone operation. The device shall automatically change to standalone conventional device operation in the event of a communications failure with the loop controller.

3.4.10 In the standalone detector mode, the detector shall continue to operate using sensitivity and environmental compensation information stored in its microprocessor at the time of communications failure. The loop card shall

monitor the loop and activate a loop alarm if any detector reaches its alarm sensitivity threshold.

3.4.11 Each detector device shall be capable of automatic electronic addressing and/or custom addressing preferably without the use of DIP or rotary switches.

3.4.12 In case the operating voltage of the system is greater than 24V, all detector junction boxes, manual call points and cable marshalling boxes shall be earthed with 8 SWG GI wire. This earthing wire shall be connected to the plant earthing grid at the nearest point available.

3.4.13 Each detector shall be provided with an indicating lamp glowing steadily to indicate that it has operated which shall otherwise flash intermittently to indicate the healthy condition of the detector and sensing circuits.

3.4.14 The smoke detectors shall continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, etc. This information shall be stored in the processor and transferred to the loop controller.

3.4.15 The Analog detectors shall be suitable for mounting on any other detector mounting base.

3.4.16 When the detectors are mounted below the false floor or in inaccessible position, response indicator for each of the detectors and test switch shall be mounted on a separate box which shall be suitable for mounting on the wall. If the detectors are mounted above the false ceiling, response indicators with test switch shall be mounted directly below the detector (on the false roof).

3.4.17 Multisensor detectors shall be a combination of smoke and heat detection sensors. Ionization chambers shall not be present owing to the gradual phasing out of ionization sensors globally.

3.4.18 Multisensor detectors shall take alarm decision based on the existence of both smoke and heat. These sensors shall not cause fire alarm activation if only smoke or only heat is present.

3.4.19 Multi-sensor detectors shall have floating sensitivity, becoming more sensitive as temperature rises and less sensitive as temperature falls.

4.0 LINEAR HEAT DETECTION SYSTEM (LHS)

4.1 Linear heat detection system shall be provided for coal conveyors and in cable galleries.

4.2 Linear heat detection system shall essentially comprise sensor cables, interface units and necessary hardware required for installation.

4.3 Sensor cable shall be of digital type.

4.4 Laying of LHS cables shall be as per TAC rules. Linear heat sensor cables shall be provided in upper most and third cable tray from top in case where 4 to 5 tiers

of cable trays are provided and in the upper most tray when cable tray tiers are 2 to 3.

5.0 MANUAL CALL POINTS

5.1 Manual call points shall be provided as per the guidelines listed in NFPA 72E/IS 2189. Also, they shall generally be located as specified in 3.4.4

5.2 Each area shall be provided with a manual call point and hooter. Required number of response indicators and isolators and input/output modules shall be provided in each loop. Necessary relay modules to complete the scope shall be provided.

5.3 Manual call points shall be so located that no person need to travel more than 30 m from any point within the premises in order to raise an alarm.

5.4 Manual call points shall be of pull station type which can be reset and reused without the requirement to change components like glass etc after usage.

6.0 MAIN FIRE ALARM PANEL

6.1 Main fire alarm panel shall be complete with annunciator (with windows), necessary input modules, output modules, external hooter/lamp control, interface units wherever required for various control functions through relay contacts & communication modules, etc. for satisfactory operation of the system. The panel shall be located in the control room.

6.2 The main fire panel shall continuously monitor the status of the detectors and the connecting lines. The annunciation system shall have visual and audible alarms, with acknowledge, test, reset, lamp test, etc. push buttons. The panel shall provide annunciation about the status of the Hydrant system, MVWS system, HVWS system and deluge valves signals for each area to be protected (i.e., for transformers, tanks, cable gallery, etc.,) The panel shall have 'ON / OFF' PBs for operation of fire siren. The loop card of the Fire Alarm Panel shall be capable of connecting to more than 150 detectors and 150 modules. The panel shall also indicate the status of various pumps, compressors etc. installed in the Fire pump house.

The fire alarm panel shall also be linked with panel in the CHP control room to indicate the status of Fire detection system of CHP area.

6.3 The microprocessor based fire alarm panel shall incorporate the following features.

(a) Continuous supervision of detector connecting lines, individual detector performance / operation and disconnection/ removal of detectors

(b) Discrimination between a real fire alarm and false alarm

(c) Pre alarm in case any detector requires maintenance

(d) Automatic re-calibration of sensitivity levels of over / under sensitive detectors

(e) Programmed activation of various interlocks with fire protection system and other associated system such as ventilation and air conditioning, dampers etc. Necessary relay modules shall be suitably wired in the tripping circuit of the A/C & ventilation drives and tripping of the coal conveyor motors. Necessary logic shall be made available in the DCS for the above.

(f) Programmed activation of sequence of events to be carried out in case of fire in any particular protective area., including activation of hooter, sirens, etc.

(g) Ground fault detection

(h) Field programmable and configuration facility.

(i) The panel shall continue communication with the detectors and modules even when it is being programmed from its keyboard or when the program is being downloaded into the panel from the software utility.

(j) In areas where smoke is likely to spread out fast rather than getting accumulated at one place like corridors, the panel shall allow alarm decision to be taken based on the obscuration values in more than one detector. Thus, if more than one detector together signal the uniform existence of smoke over an area, then panel shall signal fire even if the smoke concentration is not sufficient to activate a single detector. Concurrently, if smoke accumulates into one detector, the panel shall also consider the obscuration values in neighbouring detectors before signalling alarm.

(k) The panel shall allow the setting of the sensitivity of the detectors over nine different levels. Panel shall allow setting of equal levels of sensitivity for both alarm and pre-alarm signalling.

6.4 Necessary grouping of the detectors/call points to actuate the above shall be done by the contractor.

6.5 Ni-cd Batteries and battery chargers of adequate capacity shall be provided. The battery shall supply the normal power requirements for a period of 48 hours from the instant of charger AC supply failure, after which sufficient capacity would still be available to provide full load operation for atleast 30 minutes. Full load being defined as the load of all hooters sounding simultaneously along with operation of all the associated visual signals, interlocks etc. A spare battery charger shall be provided. The battery shall be located inside the panel.

6.6 Fire alarm panels shall be provided with necessary contacts for performing following functions on occurrence of fire in corresponding areas:

a) initiating required alarm/indication in computer/repeater panel.

b) Operation of the deluge system provided in the cable gallery.

c) Tripping of:

- Air washer fans for ventilation system
- Air handling units for A/C system
- Package air conditioner
- VDBs
- Conveyor motor

6.7 Fire alarm panel shall have provision for repeating annunciation of a) fire ON b) water spray ON c) DV on test d) DV operated signals for each area to be protected (i.e for transformer, tanks,cable gallery etc) by interfacing with the pressure switch/test switch provided by the fire protection vendor. Supply & installation of cables for above shall be included under vendor's scope.

7.0 REPEATER PANEL

Repeater panel shall repeat all group annunciation/alarm that appear on MFAP & shall be located in fire station or gate house.

8.0 JUNCTION BOXES (JB)

8.1 Junction boxes shall be fabricated out of 2.0mm thick CRCA sheet steel & shall be hot dip galvanized. For outdoor installation, they shall be of cast iron type and provided with a canopy at the top.

8.2 Junction boxes for indoor installation shall have degree of protection of IP:54. JBs for outdoor installation and those located in coal handling area shall have a degree of protection of IP-55 & shall be provided with neoprene gasket. All the junction boxes shall have a weeping hole at the bottom plate and provided with necessary double compression brass cable glands. Two earthing terminals suitable for terminating 8 SWG GI wire shall be provided. All structures required for mounting the JBs shall be included in Contractor's scope.

9.0 VIDEO DISPLAY UNIT (VDU)

9.1 A VDU with processing unit, keyboard, track ball and printer shall also be provided in addition to the fire alarm panels to be located in the main control room.

The VDU shall have the following features :

(a) Colour monitor with graphic display facility.

(b) Data retrieval.

(c) Alarm annunciation, accept and reset facility.

(d) Display of individual detector status sensitivity and setting at detector sensitivity.

(e) Commands and programming for performing various functions.

(f) The graphic display shall cover all the areas of the plant and shall indicate the area / zone on fire by flashing. Upon selecting that area / zone, details of which detector / MFAP has picked up shall be displayed.

9.2 Any other features necessary for proper functioning of the system.

9.3 The VDU screen size shall be minimum 21 inches.

9.4 The software used shall be provided with brief user's guide menu to enable the operator for proper use of various menu functions.

9.5 Access to various programs and operation shall be through password to restrict the use to authorised personnel.

9.6 The VDU shall be suitable for 240 V, single phase AC Power Supply.

9.7 A printer shall be connected to print maintenance reports, alarm activation details, time of activation, time of attending, details of each location.

10.0 FIRE SIRENS

10.1 The sirens shall be capable of being heard distinctly throughout the plant area and shall comprise twin sounders having a suitable range.

10.2 The sirens shall be suitable for installation outdoors and shall be complete with rain shades and all other mounting accessories.

10.3 The sirens shall be motor operated type with AC motors of three phase design. The starters required for switching the sirens ON / OFF shall be supplied with them.

10.4 Siren shall be mounted on duct support near chimney(capacity 3 km range) to operate in case of any alarm other than fault registered in the composite panel.

11.0 EARTHING

Supply and installation of the earthing conductor for the entire system shall be in the vendor's scope.

12.0 CABLING

12.1 Supply , laying , termination , testing and commissioning of the cables required for complete fire detection and alarm system shall be in the scope of the vendor.

12.2 Cables for fire detection & alarm system will conform to the requirements of the system manufacturers. Cables in general will be multi-core, stranded copper

conductor, PVC insulated, inner PVC sheathed, unarmoured and outer sheath of FRLS PVC compound.

12.3 **Cable Installation And Accessories**

Cable for fire detection and alarm system shall be routed in a convenient route acceptable to PURCHASER and as per approved drawings. Cabling shall be done in a neat manner with clamps at regular intervals.

13.0 MINOR CIVIL WORKS

All minor civil works associated with the installation of equipment & cables, shall be done by VENDOR and made good. These minor civil works shall include chipping, punching of holes, pockets, welding or any such work required for the neat and aesthetic installation of all equipment covered under this contract.

14.0 TESTS

14.1 Contractor shall furnish test certificates/approval certificates for the equipment/ system offered from the Regulatory bodies indicated in the specification after the award of contract for Owner / Owner's Representative's review/approval.

14.2 Performance tests shall be conducted at site on the system to prove that the guarantees indicated for the individual components shall completely satisfy all specific requirements. All tests required by the relevant standards shall be conducted.

14.3 Any other area not specified, but within the battery limit of this Contractor shall be included and necessary cabling shall be provided till fire alarm panel.

15.0 Details to be furnished during detail engineering:

(a) Dimensional drawings, giving overall dimensional details, foundation and cable entry particulars, weights, the necessary internal details, bill of materials, etc., for main fire alarm panel, fire siren, manual call points.

(b) Detailed literature / catalogues giving full particulars, principle of operation, dimensional and mounting details for all types of detectors offered along with dimensional and mounting details of the detector junction boxes.

(c) Detailed internal schematic and wiring diagrams for Main fire alarm panel, manual call points and all types of detectors offered.

(d) Detailed write-up explaining the principle and operation of the complete fire alarm panel.

(e) Lay out drawing indicating the locations of Detectors, MCPs, etc.

1.0	DETECTORS		
1.1.	Resettability of detectors		Self-resetting/remote resettable/ locally resettable / non-resettable
1.2.	Interchangeability of detectors		To be provided
1.3.	Response Indicator		- Lights up steadily to indicate healthy condition.
			- Flashes intermittently under alarm condition.
1.4.	Test facility		To be provided
1.5.	Label		To be provided with tag no's.
1.6.	Mounting facilities		To be provided
1.7.	Radioactivity for ionisation smoke detector		- Limited to 0.5 - 0.9 μ curies
1.8.	POWER SUPPLY		*
(a)	Zone Indicating Panel		*
(b)	Main Annunciation Panel		*
(c)	Repeater Panels		*
(d)	Fire Siren		*
1.9.	Paint shade for Panels		*
1.10.	Degree of protection of components / panels		- IP52 for indoor protected areas - IP54 for indoor plant areas - IP55 for outdoor areas / coal handling plant
1.11.	Range / location of fire sirens		*
1.12.	Details of compressed air for air purging system of infra-red spark / ember detectors for coal conveyors.		* *
1.13.	Areas covered by gas flooding or water spray system, which require cross zoning of detectors.		*
2.0	BILL OF MATERIALS (SUMMARY)		*
2.1.	Manual call points		*
2.2.	Automatic fire detectors		*
2.3.	Remote response indicators.		*
2.4.	Marshalling Boxes		*
2.5.	Zone indicating panels (if applicable)		*
2.6.	Fire alarm panels (if applicable)		*
2.7.	Fire siren		*

2.8.	Cables		*
3.0	**ADDITIONAL SYSTEM REQUIREMENTS**		
3.1.	Interfacing with plant communication system required.	Yes / No.	Yes
3.2.	Area evacuation alarm sounders / siren required	Yes / No.	yes
3.3.	Addressable interface units for connecting level / pressure switches, etc., required	Yes / No.	*

ENQUIRY/SPECIFICATION NO.: BIDDER:

1.0	MANUAL CALL POINTS					
1.1	Make					
1.2	Model No.					
1.3	Applicable standards					
1.4	Type of glass provided on the manual call point for flame proof units.					
1.5	Degree of protection of enclosure	Yes / No				
2.0	AUTOMATIC FIRE DETECTORS (SPOT TYPE)		Non-flame Proof		Flame Proof	
			Ionisation	Optical	Ionisation	Optical
2.1	Automatic smoke detectors					
2.1.1	Make					
2.1.2	Model No.					
2.1.3	Application Standards					
2.1.4	Sensitivity / Response threshold value					
2.1.5	Maximum and minimum mounting height at which the detector operates satisfactorily.	m				
2.1.6	Listed spacing of detectors					
2.2	Automatic Fixed Temperature Heat Detectors					
2.2.1	Make					
2.2.2	Model No.					
2.2.3	Applicable Standards					

NOTES TO BIDDER

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SIGNATURE OF BIDDER & DATE

SPEC.NO. TCE.5750A-H-500-001	**TATA CONSULTING ENGINEERS LIMITED**	VOLUME IV SECTION:D19
PART B	**RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan** DATA SHEET B FIRE DETECTION AND ALARM SYSTEM	SHEET 2 OF 8
ENQUIRY/SPECIFICATION NO.:	BIDDER:	

2.2.4	Listed spacing for each grade of detectors offered furnished with bid.					
2.2.5	Whether setting adjustable at site. If so, type & range of setting provided.					
2.2.6	Maximum & minimum mounting height at which the detector operates					
(a)	Grade 1	m				
(b)	Grade 2	m				
(c)	Grade 3	m				
2.3	Rate of rise of temperature detector with fixed temperature element.					
2.3.1	Make					
2.3.2	Model No.					
2.3.3	Applicable Standards					
2.3.4	Response time for Grades 1, 2 & 3 at different rate of rise of temperatures as per standards.					
2.3.5	Setting of fixed temperature element					
(a)	Grade 1	m				
(b)	Grade 2	m				
(c)	Grade 3	m				
2.3.6	Maximum and minimum mounting height at which the detector operates satisfactorily					
(a)	Grade 1	m				
(b)	Grade 2	m				
(c)	Grade 3	m				

NOTES TO BIDDER	SIGNATURE OF BIDDER & DATE
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2.3.7	Whether different grades of detectors colour coded as per relevant standards.	Yes / No				
3.0	LINEAR HEAT DETECTORS					
3.1	Make					
3.2	Model No.					
3.3	Type of linear heat detector					
3.4	Applicable Standards.					
3.5	Maximum length that can be connected in one zone	m				
3.6	Details of setting range					
3.7	Whether open circuit and short circuit monitoring provided (Furnish details of scheme)					
3.8	Whether jointing kits for in line and end of line terminations included in the offer.					
4.0	RADIATION DETECTORS					
4.1	Ultra voilet & Infra red detectors					
4.1.1	Make					
4.1.2	Model No.					
4.1.3	Applicable Standards					
4.1.4	Frequencies in the electromagnetic spectrum (Bandwidth) sensed by the detector					
4.1.5	Response indicator provided			Yes / No		
4.1.6	Flame proof enclosure provided, if called for.			Yes / No		

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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D19
PART B	**RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan** DATA SHEET B FIRE DETECTION AND ALARM SYSTEM	SHEET 4 OF 8
ENQUIRY/SPECIFICATION NO.:	BIDDER:	

4.1.7	Whether test certificates for flame proof detectors from CMRS, Dhanbad or an equivalent authority enclosed with bid.					
4.1.8	Whether optical system and sensing circuits monitored continuously.				Yes / No	
4.2	Spark / Ember Detector					
4.2.1	Make					
4.2.2	Model No.					
4.2.3	Applicable Standards					
4.2.4	Frequencies in the electromagnetic spectrum (Band width) sensed by the detector					
4.2.5	(a)	Whether lens air purging system provided			Yes / No	
	(b)	Whether self-purging system provided / Details of purging air			Yes / No	
		(i) Pressure	kg/ sq.m			
		(ii) Flow Rate	Cu. m/ hr			
		(iii) Air quality				
5.0	Addressable Interface Unit					
5.1	Make					
5.2	Model No.					
5.3	Applicable Standards					

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5.4	Maximum number of non-addressable group of detectors / devices and MCP that can be connected to an addressable unit				
6.0	FIRE ALARM PANELS (Applicable for Microprocessor Based System)				
6.1	Make				
6.2	Degree of protection.				
6.3	Hooters :				
6.3.1	Type of hooters provided and make				
6.4	Batteries				
6.4.1	Integral battery back-up provided			Yes / No	
6.4.2	Make of battery & model number			Yes / No	
6.4.3	Type of battery				
6.4.4	Battery Voltage	Volts			
6.4.5	Battery capacity	AH			
6.4.6	Back-up time available				
6.5	Battery Chargers				
6.5.1	Type of battery charger provided				
6.5.2	Make and Model Number				
6.5.3	Rating of charging provided (Trickle)				
6.5.4	Boost charging time	Hrs			
6.5.5	Approximate dimensions of all panels				
7.0	ZONE INDICATING PANELS (Applicable for Conventional System)				
7.1	Make				
7.2	Degree of protection.				
7.3	Hooters :				

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7.3.1	Type of hooters provided and make				
7.4	Batteries				
7.4.1	Integral battery back-up provided			Yes / No	
7.4.2	Make of battery & model number			Yes / No	
7.4.3	Type of battery				
7.4.4	Battery Voltage	Volts			
7.4.5	Battery capacity	AH			
7.4.6	Back-up time available				
7.5	Battery Chargers				
7.5.1	Type of battery charger provided				
7.5.2	Make and Model Number				
7.5.3	Rating of charging provided (Trickle)				
7.5.4	Boost charging time	Hrs			
7.5.5	Approximate dimensions of all panels				
8.0	Central Processing Unit (CPU) (Applicable for Microprocessor based System)				
(a)	Make				
(b)	Model No.				
(c)	Applicable Standards				
8.1	Video Display Unit (VDU)				
(a)	Make				
(b)	Model				
(c)	Power Supply required	V,W			
8.2	Printer				
(a)	Make				
(b)	Model				
(c)	Power Supply required	V,W			

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ENQUIRY/SPECIFICATION NO.: BIDDER:

9.0	FIRE SIRENS				
9.1	Make and Model No.				
9.2	Type of tone				
9.3	Sound level	dB(A)			
9.4	Range of siren	kms			
9.5	Power supply required.				
9.6	Whether mounting accessories & starters for siren provided	Yes / No.			
10.0	Additional Hooters (Located in plant areas)				
10.1	Make				
10.2	Model No.				
10.3	Type of Hooter				
10.4	Applicable Standards				
10.5	Type of tone				
10.6	Sound level				
10.7	Range of Hooter	m			
10.8	Power supply for Hooter				
10.9	Degree of protection for Hooter				
11.0	CABLES (Supplied by Contractor)				
11.1	Make				
11.2	Type				
11.3	Voltage grade				
11.4	Size and No. of cores				
11.5	Standards Applicable				
11.6	Whether ISI approved			Yes / No	
12.0	MARSHALLING BOXES				

NOTES TO BIDDER

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SIGNATURE OF BIDDER & DATE

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D19
PART B	**RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage- V, Units 7 & 8, at Suratgarh, Rajasthan** DATA SHEET B FIRE DETECTION AND ALARM SYSTEM	SHEET 8 OF 8

ENQUIRY/SPECIFICATION NO.: | BIDDER:

12.1	Make				
12.2	No. of ways				
12.3	Degree of protection of enclosure				
12.4	Sheet steel thickness	mm			
12.5	Removable gland plate provided			Yes / No	
12.6	Compression type cable glands provided			Yes / No	
12.7	Type of cable entry			Top / Bottom	
12.8	Make of terminal blocks provided				
13.0	MISCELLANEOUS DETAILS				
13.1	Whether price for list of essential spares as specified included in the offer with			Yes / No	
13.2	Whether list of recommended spares together with cost details enclosed with the offer.			Yes / No	
13.3	Maximum no. of detectors that can be connected in a circuit.				

NOTES TO BIDDER

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ISSUE R1

INFORMATION TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT

1.0 For Approval

1.1 Dimensional drawings, giving overall dimensional details, foundation and cable entry particulars, weights, the necessary internal details, bill of materials, etc., for :

(a) Zone indicating panels (applicable for conventional system)

(b) Fire alarm panel (applicable for microprocessor based system)

(c) Main annunciation panels (applicable for conventional system)

(d) Repeater panels

(e) Marshalling boxes

(f) Fire sirens

(g) Manual call points

1.2 List of inscriptions on modules / facia windows of the zone indicating panels, main annunciation panels and repeater panels.

1.3 Detailed layout drawings of all areas in the plant indicating location of detectors, manual call points, fire alarm panels, marshalling boxes, sirens, etc., and showing details of mounting of the detectors and routing of the CONTRACTOR's cables between detectors, manual call points and marshalling boxes along with calculations. .

1.4 Technical details of all cables being supplied by the CONTRACTOR.

1.5 Block diagram showing the Detectors connected in each loop with address of each in the case of microprocessor based system and Block diagram showing the zone indicating panels and the detectors connected to each in the case of conventional system.

2.0 For Information

2.1 Detailed literature / catalogues giving full particulars, principle of operation, range and settings whether settings adjustable at site, colour, material of detector enclosures, degree of protection, dimensional and mounting details for all types of detectors offered along with dimensional and mounting details of the detector junction boxes.

2.2 Detailed internal schematic and wiring diagram for :

(a) Zone indicating panels (if applicable)

(b) Fire alarm panel (if applicable)

(c) Main annunciation panels (if applicable)

(d) Repeater panels

(e) Manual call points

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(f) All types of detectors offered.

2.3 Detailed write-up explaining the principle and operation of the complete fire alarm system.

2.4 Interconnection schedule giving full particulars of cable connections to be made by the PURCHASER between various components of the fire alarm system supplied under this contract.

2.5 Approval of all relevant drawings from the Tariff Advisory Committee and other bodies as applicable.

2.6 Approvals / clearances and test certificates for :

(a) All flame-proof equipment

(b) All types of detectors offered.

(c) Cables.

2.7 List of routine, type and functional tests and the test procedure, for all equipment supplied under the contract.

2.8 Guaranteed technical particulars of all equipment supplied under the contract as per Data Sheet - B and additional details as required.

2.9 Copies of all routine and type test certificates for all equipment / systems covered under this contract.

2.10 Sensitivity / response time for all detectors.

2.11 Detailed instruction manual for the fire alarm system supplied.

2.12 The CONTRACTOR shall also furnish to the PURCHASER / CONSULTANT the required data / drawings / information called for elsewhere in the specification and also deemed necessary from time to time for design and engineering of the project.

2.0 CODES AND STANDARDS

The design, manufacture, inspection and testing of complete system shall comply with the latest applicable Indian/British/American standards. The equipment shall conform to the latest edition to the following standards:

a. "Fire Protection Manual" - Issued by the Regional Committees of Tariff Advisory Committee (TAC).
b. Underwriters Laboratories of USA
c. LPCB – United Kingdom
d. National Fire Codes of National Fire Protection Association (NFPA) of USA.

2.1 GENERAL DESIGN AND CONSTRUCTIONAL REQUIREMENT

It is not the intent to specify herein all the details of design and manufacture. However the equipment and the system shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser /Owner who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgment is not in full accordance herewith.

2.2 SPECIFIC DATA OF HYDRANT SYTEM

i. All hydrant valves should be of Stainless steel construction conforming to IS: 5290 or Equivalent.
ii. Hoses shall be of non-percolating flexible type as per IS: 4927 or Equivalent.
iii. Branch pipes (Stainless steel) shall be Universal type (as per IS: 2871 for transformer yard area) and Straight jet type (IS: 903) for control building.

2.3 EQUIPMENT DETAILS OF DETECTION SYSTEM

A. Fire Alarm Panel

Fire Alarm Panel shall be two loop analogue addressable type having UL/FM approval. All devices like detectors, MCP, hooters etc shall be looped into the FAP, which continuously monitor the status of each detector and shall directly pinpoint the seat of fire depending upon the individual address of detectors.

B. Multisensor Smoke Detectors

i. Incorporate two or more sensors of different of different types and processes the signals to produce one output on which the decision fire/no fire is based.
ii. Possesses micro-processors in the detector head to carry out this processing
iii. Uses an algorithm for processing of the signals which are written by the manufacturer.

C. Photoelectric Smoke Detector

i. Detectors shall be housed or mounted in suitable enclosures in such a way that their performance is in no way affected.

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ii. The detectors shall be located where the largest combustion gas concentration can be expected

iii. All detectors shall be provided with built in response indicating lamp /LED which shall give local visual indication, in dense smoke condition when it will operate. The failure of lamps shall not prevent the function of detector.

iv. When the detectors are mounted above the false ceiling response indicators with test switch shall be mounted directly below the detector (on the false roof).

v. Fire detectors shall be guaranteed to function properly without any maintenance work for a period of not less than ten (10) years.

D. Rate-of-Rise and Fixed Temperature Heat Detector

i. The detector shall be solid thermal detector.

ii. It shall operate on electronic principle to provide precise fire detection.

iii. The detector shall be of integrated circuit design enclosed in a robust moulded base.

iv. It shall be completely moisture proof and air tight with exposed metal part specially treated to allow the device to be used in particularly corrosive atmospheres.

v. The detector shall work on rate-of-rise and fixed temperatures modes of operation.

vi. It shall have no moving mechanical parts.

vii. The detector shall be either surface mounted or with the body concealed above the ceiling and only the detecting element in view.

viii. The rate-of-rise detector shall function when the rate of temperature increase exceeds a pre-determined value, around 7 to 8 Deg C per min. This detector shall be designed to compensate with the normal changes in ambient temperature, less than 6.7 Deg C per min., which are expected under non-fire conditions.

ix. Fire detectors shall be guaranteed to function properly without any maintenance work for a period of not less than ten (10) years.

E. Manual Call Point

i. Each Manual Call Point unit shall comprise of a push button of reputed make enclosed in a M.S Box. The push button shall have minimum 1 NO and 1 NC contact. The push button shall not be shrouded and the same shall be projected out from surface the MS Box. This whole assembly of push button in MS box shall again be enclosed in an external MS enclosure with all sides covered except the front side. The front side shall be sealed with breakable glass cover using neoprene or equivalent gasket. The glass cover shall be fixed in such a way that the actuating push button is kept depressed (with NC contact closed and NO contact Open) so long as the glass cover is intact. In case of fire, when glass cover is broken to give fire warning, the push button shall be released due to spring action hence giving remote fire alarm through NC contact which is now changed over.

ii. The MS Box and the external MS enclosure shall be completely dust, weather and vermin proof. The housing of the electronic circuitry shall have minimum IP 65 protection.

iii. The complete unit shall be suitable for wall/column mounting with necessary mounting accessories.

iv. Clear inscription reading (in English) "FIRE ALARM – IN CASE OF FIRE BREAK GLASS" shall be provided for each manual call point unit, either on the MS enclosure or on a separate metal mounted behind the glass cover. The metal plate for inscription shall not tarnish under the atmospheric conditions.

2.4 EQUIPMENT DETAILS OF FIRE EXTINGUISHERS

i. All the extinguishers offered by the bidder shall be reputed make and should have been approved by tariff advisory committee of India or any other international authorities like FOC-London /NFPA-USA. Certificates to this effect shall be furnished by the bidder. All extinguishers shall be ISI marked.
ii. All the portable extinguishers shall be of freestanding type and shall be capable of discharging freely and completely in upright position.
iii. Each extinguisher shall have the instructions for operating extinguishers on its body itself.
iv. All extinguishers shall be supplied with initial charge and accessories as required.
v. Portable type extinguishers shall be provided with suitable clamps for mounting on walls or columns.
vi. All extinguishers shall be painted with durable enamel paint of fire red colour conforming to relevant Indian standards.
vii. Dry chemical powder type extinguisher shall conform to IS: 15683.
viii. Carbon dioxide type extinguisher shall conform to IS: 15683.
ix. Pressurized Water Type CO_2 extinguishers shall conform to IS: 15683.

2.5 SHOP & SITE TESTS

2.5.1 SHOP TESTS

All acceptance and routine tests in accordance with relevant IS codes/standards shall be carried out by the contractor/manufacturer as per BHEL/ Customer approved QAP. Charges for all these routine and acceptance tests for all the equipment & components shall be deemed to be included in the bid price.

Contractor shall submit the QP for all such equipments calling inspection/ testing for purchaser's approval in the prescribed format enclosed as Schedule-5 in Section 5 of the technical specification. This Owner/Purchaser approved QP shall be the basis of inspection/ testing.

2.5.2 SITE TESTS

The Contractor shall prepare and submit detailed field quality plans in the format prescribed, setting out the quality practice and procedures to be adopted by him for assuring quality of each equipment/material from the receipt of material at site, during storage erection, pre-commissioning to final commissioning of the system. These procedures shall necessarily include all checks/tests conducted at site for preservation, assembly, alignment, positioning of equipment, foundation preparation, welding/bolting heat treatment, non-destructive examination, hydraulic test, running test, performance test etc.

Performance test and guarantee

After erection at site, the Fire Protection system shall be subjected to tests to show achievement of guaranteed parameters in line with the requirements of specification/ standards/ codes and to the satisfaction of Purchaser/ Owner.

The Contractor shall take full responsibility for the safe and efficient operation of each of the

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equipment as well as the whole system. If the shop/ site tests indicate failure of the equipment or if the system does not meet the guarantee in any respect, the Contractor may be required to make alterations in the system/ equipment. Such alterations shall be carried out after purchaser's/ Owner's approval at no extra cost to purchaser. Additional tests required to show the effect of such alterations should also be performed at no extra cost to Purchaser. Above mentioned tests shall be carried out separately for each sub-system. All the testing instruments shall be tested/ calibrated in accordance with the applicable codes & standards. Under PG testing, interlocks, protections, vibrations & noise levels shall also be checked. Detailed procedure for PG test shall be submitted by the contractor in advance. The Contractor shall give guarantee of satisfactory and trouble free operation of the equipment/ systems for a duration described in Section-3 of this specification.

The following codes and standards shall be applicable for conducting test unless otherwise modified or supplemented by the enclosed procedure and mutually agreed to between the purchaser and contractor.

1. NFPA – 72 E3: Standard on Automatic Fire Detectors.
2. Fire Protection manual of TAC (Latest edition) IS 3034: Fire safety

3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.
The provisions under this section are intended to supplement general requirements for the materials, equipments and services covered under other respective sections and are not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall hold good.

3.1 PROJECT INFORMATION AND SYSTEM PARAMETERS

a)	Customer/ Purchaser/ Owner	Rajasthan Rajya Vidyut Utpadan Nigam Ltd. , Jaipur
b)	Consultant	Tata consulting Engineer Ltd. , Bangalore
c)	Project Title	2X660MW Super –Critical Thermal Power Station, Stage –V, Unit 7 & 8-400kV Switchyard at Suratgarh
d)	Location	Prabat Nagar , Suratgarh Sriganganagar district, Rajasthan
e)	Altitude and longitude	Lattitude:29 deg. 10 min. N Longitude: 74 deg. 01 min. E
f)	Elevation above mean sea level	186 m(approximately)
g)	Transport Facilities	Suratgarh project is located 27 km from Suratgarh , 15 km from Suratgarh to Biradhwal on NH15, 12km in east from NH15.
h)	Postal Address	To follow
SITE CONDITIONS		
a)	Mean of daily maximum temperature	32.3 deg. C
b)	Mean of daily minimum temperature	19.6 deg. C
c)	Highest temperature recorded	50 deg. C
d)	Lowest temperature recorded	-2.8 deg. C
e)	Design ambient temperature for electrical equipment design	50 deg. C
f)	Relative humidity	Varies between 21 % and 81%
g)	Pollution Severity	Heavily Polluted
h)	Seismic zone	II
i)	Basic Wind speed	47 m/sec
j)	Annual mean wind speed	4km/hr
k)	Terrain category	2

l)	Annual average rain fall	312 mm

SYSTEM PARAMETERS

Nominal system voltage	**400 kV**	**11kV**
Highest system voltage	420 kV	12kV
Basic Impulse level(dry /wet)	1425kVP	75kVP
Power frequency withstand voltage	630kVrms	28kVrms
Switching Impulse withstand voltage	1050 kVP	NA
Rated short time current	50 kA for 3 sec	40 kA for 1 sec
Frequency	50 Hz	50 Hz
Creepage distance	31mm/kV	31mm/kV
System Earthing	Effectively Earthed	Effectively Earthed

AUXILIARY POWER SUPPLY

3 phase A.C power supply	415V ± 10%, 50 Hz, 3-phase 4 wire, solidly earthed with variation in frequency of ± 5%
1 phase A.C power supply	240V ± 10%, 50 Hz, 1-phase , 2 wire , AC supply with variation in frequency of ± 5%
D.C. power supply	220V ±15%, 2-wire ungrounded 48V ±10%, 2 wire system positively earthed

Combined variation of voltage and frequency shall be +/- 10%

3.2 GENERAL TECHNICAL REQUIREMENT

3.2.1 TYPE TESTS

All equipment/systems to be supplied shall conform to type tests as per relevant standards and proven type. The Bidder / Contractor shall furnish the reports of all the type tests carried out within last **five years from the date of opening of the tender** (i.e. 03.12.2012) as listed in relevant clauses in respective electrical specification and relevant standards for all components / equipment / systems. These reports should be for the tests conducted on identical/ similar components /equipment/systems to those offered / proposed to be supplied under this contract.

Type tests done in an independent government laboratory or in the presence of representative of State Electricity Board or other reputed public undertakings, the type test reports of the same shall be submitted for scrutiny /approval. If these are found suitable and technically acceptable, conducting of type tests shall be waived off.

In case Contractor is not able to submit report of type test(s) conducted in last five years, or in case type test report(s) are not found to be meeting the specification/relevant standard requirements, then all such tests shall be conducted under this contract by the Bidder free of cost to Employer/Purchaser, and reports shall be submitted for approval. No charges shall be paid under this contract. All acceptance and routine tests as per relevant standards and specification shall be deemed to be included in the bid price.

3.2.3 CODES AND STANDARDS

All materials and equipment shall generally comply in all respect with the latest edition of relevant international electro-technical commission (IEC) or any other internationally accepted standard which ensure equal or better quality or relevant Indian standard(IS) mentioned against each equipment and this specification.

3.3 MATERIAL/WORKMANSHIP

3.3.1 General Requirement

Where the specification does not contain characteristics with reference to workmanship, equipment, materials and components of the covered Equipment it is understood that the same must be new, of highest grade of the best quality of their kind conforming to best engineering practice and suitable for the purpose for which they are intended.

The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements and shall be used throughout the design. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall be interchangeable with, and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be constructed as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances and instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacture's limits suitable guards shall be provided for the protection of personal on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for maintenance purpose. The spare equipment(s) shall be installed at designated locations and tested for healthiness.
The Contractor shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Contractor shall apply all operational lubricants to the equipment installed by him.

All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Contractor has any special requirement for the specific application of a type of oil or grease not available in India. If such is the case, he shall declare in the proposal, where such oil or grease is available. He shall help purchaser in establishing

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equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favorable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

3.4 COLOUR SCHEME AND CODES FOR PIPE SERVICE/PANELS

The contractor shall propose a color scheme for those equipment/Items for which the colour scheme has not been specified in the specification for the approval of purchaser. The decision of purchaser shall be final. The scheme shall include:

Finishing colour of Indoor equipment

Finishing colour of Outdoor equipment.

Finish colour of all cubicles.

1.1 Finishing colour of various auxiliary system equipment including piping

Finishing colour of various building items.

All the steel works shall be thoroughly cleaned of rust, scale, oil, grease, dirt and scarf by pickling, emulsion cleaning, etc. The sheet steel shall be phosphate /oven dried and then painted with two coats of zinc rich primer paints. After application of the primer, two coats of finished synthetic enamel paint shall be applied. The colour of the finished coats inside shall be **glossy white** and exterior of the treated sheet steel shall be **shade 631 of IS 5 /RAL 7032** for all switchboard /MCC/distribution board, control panels etc.

Sufficient quantities of touch paint shall be furnished for application at site. All the indoor cubicles shall be the same as exterior surface and for other miscellaneous items, colour scheme will be approved by the purchaser.

3.5 PROTECTION

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves, pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.

All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner. Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent entry of insects.

3.6 FUNGI-STATIC VARNISH

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on the parts, which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application to the varnish.

3.7 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be thoroughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible, shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for painting shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitably wrapped or otherwise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling.

3.8 GALVANIZING

All ferrous parts including all sizes of nuts, bolts, Plain and spring washers, support channels, structures, shall be hot dip galvanized conforming to latest version of IS:2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvanized. Minimum weight of zinc coating shall be **610 gm/sq.m** and minimum thickness of coating shall be 85 microns for all items thicker than 6mm. For items lower than 6 mm thickness, requirement of coating shall be as per relevant ASTM. Average weight of zinc coating shall be **750gm/sq.m.**

3.9 PACKING

The following details are to be clearly indicated in the material forwarding documents:

a) Name and address of the consignee.
b) Purchase order number.
c) Name of supplier/s.
d) Description of equipment / material.
e) Net weight.
f) Gross weight.

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the purchaser, the Contractor shall also submit packing details/associated drawing for any equipment material under his scope of supply, to facilitate the purchaser to repack any equipment/ material at a later date, in case the need arises. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbol i.e. fragile, handle with care, use no Hooks etc.

3.10 HANDLING, STORING AND INSTALLATION

Contractor may engage manufacturer's Engineers to supervise if required for unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the purchaser. Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.

Where assemblies are supplied in more than one section, contractor shall make all

(14)

necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning.

Contractor shall be responsible for examining all the shipment immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. Any demurrage, pilferage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. The Contractor shall be fully responsible, for the equipment/material until the same is handed over to the purchaser in an operating condition after commissioning.

The minimum phase to earth, phase to phase and section clearance along-with other technical parameters for the various switchyard voltage levels to be maintained shall be strictly as per the approved drawings.

The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances, the Contractor shall immediately proceed to correct the discrepancy at his risks and costs.

3.11 DEGREE OF PROTECTION

The enclosures of the Control Cabinets, Junction boxes and Marshalling boxes panels etc to be installed shall be provided with degree of protection as detailed here under:

a) Installed outdoor: IP-55

b) Installed indoor in air conditioned area: IP-42

c) Installed in covered area IP: 52

d) For LT switchgear (AC & DC distribution Boards): IP-54

The degree of protection shall be in accordance with IS: 13947, (Part-1)/IEC-947(Part-1). Type test report/or degree of protection test on each type of the box shall be submitted for approval.

3.12 RATING PLATES, NAME PLATES AND LABELS

Type or serial number together with details of the loading conditions under which the item of the substation in question has designed to operate and such diagram plates as may be required by the Purchaser. The rating plate of each equipment shall be according to IEC requirements.

All such nameplate instruction plates, rating plates shall be bilingual with Hindi inscription first followed by English. Alternately two separate plates one with Hindi and other with English inscriptions may be provided.

3.13 EARTHING

Circuit breakers, LA, Isolator, CVT, CT, BPI shall be provided with two grounding pads suitable for connection to galvanized steel flat. Control panels, Relay panel, outdoor marshalling boxes, Junction boxes, Lighting panels and distribution board shall be provided with two grounding pads, for connection to galvanized steel flat. The two pads shall be provided, one each at the middle of the two opposite sides of the bottom frame of the equipment. Earthing of hinged door shall be done by using a separate earth wire.

3.14 CONTROL CABINETS, JUNCTION BOXES, TERMINALS BOXES AND MARSHALLING BOXES FOR OUTDOOR EQUIPMENTS

All types of boxes, cabinets etc. shall generally conform to and be tested in accordance with IS-5039, IS-8623 or IEC-439, as applicable and the clause given below.

Control cabinet, Junction boxes, Marshalling boxes & Terminal boxes shall be made of sheet steel. Sheet steel used shall be at least 2.0 mm thick cold rolled 2.5 mm hot rolled. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. Cabinet/boxes shall be free standing floor mounting type, wall mounting type or pedestal mounting type as per requirements.

Cabinet /boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of gaskets shall be such that it does not get damaged/ cracked during the operation of the equipment.

All door, removable covers and plates shall be gasketed all around with suitably profiled **Neoprene gaskets**. The gasket shall be tested in accordance with approved quality plan. The quality of gasket shall be such that it does not get damaged /cracked during the years of the equipment or its major overhaul whichever is earlier. All gasketed surfaces shall be smooth, straight and reinforced if necessary to minimize distortion and to make a tight seal. Ventilating Louvers, if provided, shall have screen and filters. The screen shall be fine wire mesh made of brass.

All boxes/cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable gland plate projecting atleast 150 mm above from the base of the Marshalling Kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland. The gland shall project atleast 25mm above gland plate to prevent entry of moisture in cable crutch. Gland plate shall have provision for some future glands to be provided later, if required

3.15 SPACE HEATERS

The heater shall be suitable for continuous operation at 240 V AC supply voltage and shall be provided with on – off switch and fuse shall be provided for heater.

One or more adequately rated, thermostatically connected heaters shall be supplied to prevent condensation in any compartment. The heater shall be installed in the lower portion of the compartment and electrical connections shall be made from below the heater to minimize deterioration of supply wire insulation. The heaters shall be suitable to maintain the compartment temperature to prevent condensation.

The heaters shall be suitably designed to prevent any contact between the heater wire and air and shall consist of coiled resistance wire centered in metal sheath and completely encased in a highly compacted powder of Magnesium Oxide or other material having equal heat conduction and electrical insulation properties, or they shall consist of a resistance wire wound on a ceramic and completely covered with a ceramic material to prevent any contact between the wire and air. Alternatively, they shall consist of resistance wire mounted into a tubular ceramic body built into an envelope of stainless steel or the resistance wire is wound on a tubular ceramic body and embedded in glaze the surface temperature of the heaters shall be restricted to a value which will not shorten the life of the heater sheaths or that of insulated wire or other component in the

compartments.

3.17 QUALITY

BHEL quality plan to be followed subject to TBEM / customer's approval.

3.18 DOCUMENTATION

3.18.1 LIST OF DOCUMENTS

The bidder shall submit a detailed list of drawings / documents along with the bid proposal which he intends to submit to the Employer after award of the contract.

The supplier shall necessarily submit all the drawings / documents unless any thing is waived.

All engineering data submitted by the Contractor after final process including review and approval by the Employer shall form part of the Contract Document and the entire works performed under this specification shall be performed in strict conformity, unless otherwise expressly requested by the Employer in writing.

3.18.2 DRAWINGS

All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, the external connections, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearances and spaces required for installation and interconnection between various portions of equipments and any other information specifically requested in the specifications.

Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, name of consultant, the unit designation, RRVUNL contract no. and the name of the Project .If standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

Further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Employer if so required.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Employer. Approval of Contractor's drawing or work by the Employer shall not relieve the contractor of any of his responsibilities and liabilities under the Contract.

3.18.3 APPROVAL PROCEDURE

The scheduled dates for the submission of these as well as for, any data/information to be furnished by the Employer would be discussed and finalised at the time of award. The supplier shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer. The following schedule shall be followed generally for approval.

i.	Approval/comments/by employer on Initial submission	Within 3 weeks of receipt

ii.	Resubmission	Within 2 (two) weeks (whenever from date of comments required) Including both ways postal time.
iii.	Approval or comments	Within 2 weeks of receipt of resubmission
iv.	Furnishing of distribution copies	2 weeks from the date of last approval.

Note: The contractor may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

The title block of drawings shall contain the following information incorporated in all contract drawings. Please refer enclosed sheet for details of Title block.

3.18.4 DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

1) Drawings
2) Guaranteed Technical Particulars
3) Type Test Reports
4) Manufacturing Quality Plan

3.18.5 DOCUMENTATION SCHEDULE

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE FOR APPROVAL	FINAL DOCUMENTATION	
			Prints	Prints	CDs
1	Drawings and Data Sheets	1	7	8	-
2	Drawings "As Built "	-	-	8	05
3	Type Test Reports	1	3	4	-
4	Erection Manuals	-	7	8	-
5	Operation and Maintenance Manuals	-	7	8	-
6	Manufacturing Quality Plan	1	7	8	-
7	Field Quality Plan	1	7	8	-
8	Inspection Test Reports	-	-	8	-

Soft copies of drawings at contract stage shall also be submitted in **PDF format.**

Drawings will also be submitted in CD in AUTOCAD package for all major items.

Final Documentation shall be submitted in bound volumes with Customer & Project etc. written on top.

1.0 LIST OF [illegible] DATASHEETS

In this section Technical Datasheets (TDS) of various equipment/items and system drawings that are required to be generated is furnished herewith. List of datasheets/drawings and numbers to be accorded is also given below.

The list furnished here is tentative and additional documents may be required during detailed engineering.

List of Data Sheets		
S No	**Item Description**	**BHEL's Doc. No.**
01.	TDS for M.S Pipes & Fittings	TB-DS-360-552-01
02.	TDS for Hydrant Valves/ Branch pipe with nozzle/Hose pipe/ Hose box	TB-DS-360-552-02
03	TDS for Wrapping Coating	TB-DS-360-552-03
05.	TDS for Gate Valves	TB-DS-360-552-04
06.	TDS for CO_2/ DCP type portable extinguisher	TB-DS-360-552-05
07.	TDS for Trolley mounted CO_2 Extinguisher - 22.5 Kg	TB-DS-360-552-06
08.	TDS for Air release valve	TB-DS-360-552-07
09.	TDS for Deluge valve	TB-DS-360-552-08
10.	TDS for Q.B. detector	TB-DS-360-552-09
11.	TDS for Y - Strainer	TB-DS-360-552-10
12.	TDS for Twisted Pair Control Cable	TB-DS-360-552-11
13.	TDS for Main Fire Alarm Panel	TB-DS-360-552-12
14.	TDS for Fire Detection items	TB-DS-360-552-13
15.	TDS for LHS Cable	TB-DS-360-552-14
17	TDS for Pressure Gauge & Pressure Switch	TB-DS-360-552-15
18.	TDS for Solenoid Valve	TB-DS-360-552-16
19.	Data Sheet of Vertical Centrifugal Pumps	TB-DS-360-552-17
20.	Data Sheet of Level Switch	TB-DS-360-552-18
19.	BOQ	TB-DS-360-552-19
List of Drawings		
01.	P & I Diagram	TB-DG-360-552-002

02.	Fire Water Piping Layout	TB-DG-360-552-002
03	MVW Spray System for Cable Vault - Plan, Elevation & Side View (Sheet 1 of 2)	TB-DG-360-552-003
05.	MVW Spray System for Cable Vault- Isometric View (Sheet 2 of 2) (with hydraulic calc)	TB-DG-360-552-003A
06.	HVW Spray system of 125 Mvar Reactor Elevation & Side View (Sheet 1 of 2)	TB-DG-360-552-004
07.	HVW Spray system of 125 Mvar Reactor Isometric View (Sheet 2 of 2) (with hydraulic calc)	TB-DG-360-552-004A
08.	HVW Spray system of 80 Mvar Reactor Elevation & Side View (Sheet 1 of 2)	TB-DG-360-552-005
09.	HVW Spray system of 80 Mvar Reactor Isometric View (Sheet 2 of 2) (with hydraulic calc)	TB-DG-360-552-005A
10.	HVW Spray system of 50 Mvar Reactor Elevation & Side View (Sheet 1 of 2)	TB-DG-360-552-006
11.	HVW Spray system of 50 Mvar Reactor Isometric View (Sheet 2 of 2) (with hydraulic calc)	TB-DG-360-552-006A
12.	Distribution of Extinguisher inside control room	TB-DG-360-552-007
13.	Schematic of Fire detection system	TB-DG-360-552-008
14.	Fire Alarm & Detection system inside control room	TB-DG-360-552-009
15.	LCPDV Drawing	TB-DG-360-552-010
16	GA, SLD, Wiring Diagram for Local control panel for Pumps	TB-DG-360-552-011
17	MCP for outdoor switchyard area	TB-DG-360-552-012
18.	Piping Layout of Oil-water evacuation from common oil pits	TB-DG-360-552-013

SECTION-5

ENCLOSURES TO SPECIFICATION

SCHEDULES TO BE FILLED UP BY THE BIDDER

Schedule 1	**Schedule of makes of Equipments**
Schedule 2	**Schedules of Deviations**
Schedule 3	**Schedule of past experience and qualifying requirements**
Schedule 4	**Schedule of performance certificates**
Schedule 5	**Schedule of type test and special tests**
Schedule 6	**Details of contact persons (technical & commercial)**
Schedule 7	**Enclosures to Specification**

ANNEXURE-A Drawings

SCHEDULE-1

MAKES OF IMPORTANT ITEMS / COMPONENTS OF EQUIPMENTS AND THEIR DETAILS

ITEM NAME	NAME OF MANUFACTURER	PLACE OF MANUFACTURE OF ITEM	PLACE OF TESTING AND INSPECTION	COMPLIANCE WITH ISO 9001 (YES/NO)

Place

Date

Signature of the authorized representative of Bidder

Name ----------

Designation----------

Company seal----------

SCHEDULE-2

SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations / variations / exceptions from the specification:

Section	Clause No. / Page No.	Statement of deviation/ Variations/Exceptions

1) In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract are deemed to be in compliance with the specification.

2) If there is NIL deviation, even then the format to be filled as **NIL DEVIATION**

3) Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

Place

Date

Signature of the authorized representative of Bidder

Name ——————————

Designation——————————

Company seal——————————

SCHEDULE – 3

SCHEDULE OF PAST EXPERIENCE AND QUALIFYING REQUIREMENT

Following is the list of earlier orders executed by us for supply of equipment / material of similar nature over the last past five years:

S.No.	Item	Brief rating	Qty	customer	Date Of order	Date of supply	Order value

Place

Date

Signature of the authorized representative of Bidder

Name----------

Designation----------

Company seal ----------

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

SCHEDULE – 4

SCHEDULE OF PERFORMANCE CERTIFICATE

Bidder shall furnish the performance certificate of the similar equipment having The following details:

S.No.	Item	Brief rating	Qty	Customer	Date Of supply

Place

Date

Signature of the authorized representative of Bidder

Name----------

Designation----------

Company seal ----------

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

SCHEDULE-5

SCHEDULE OF TYPE TESTS AND SPECIAL TESTS

The following type tests and special tests as called for in the Specification shall be conducted (all type tests / special tests as mentioned in the relevant clauses of the Specification shall be listed here):

Sl no.	Clause no/ page no of Specification	Details of test	Lab in which to be conducted	Whether test to conducted free or chargeable basis. Mention 'FREE' 'CHARGEABLE'	If charges per test have been quoted for in the price bid. YES / NO
		A. Type Tests			
		1.			
		2.			
		B. Routine Tests			**DO NOT**
		1.			**MENTION**
		2.			**ANY PRICE**
		C. Site Tests			**IN THIS**
		1.			**COLUMN**
		2.			
		D. Special Tests (specified)			
		1.			
		2.			
		E. Other tests at works / site recommended by the Bidder			
		1.			
		2.			

NOTE:

1) Details have to be furnished on cables as well as accessories, each separately.
2) **NO PRICE SHALL BE FURNISHED IN THIS FORMAT.**

Place

Signature of the authorized representative of Bidder

Name----------

Date

Designation----------

Company seal----------

SCHEDULE-6

DETAILS OF CONTACT PERSON BOTH TECHNICAL AND COMMERCIAL

Name

Address for correspondence

Phone No.

Fax No.

Email

Place

Date

Signature of the authorized representative of Bidder

Name----------

Designation----------

Company seal ----------

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

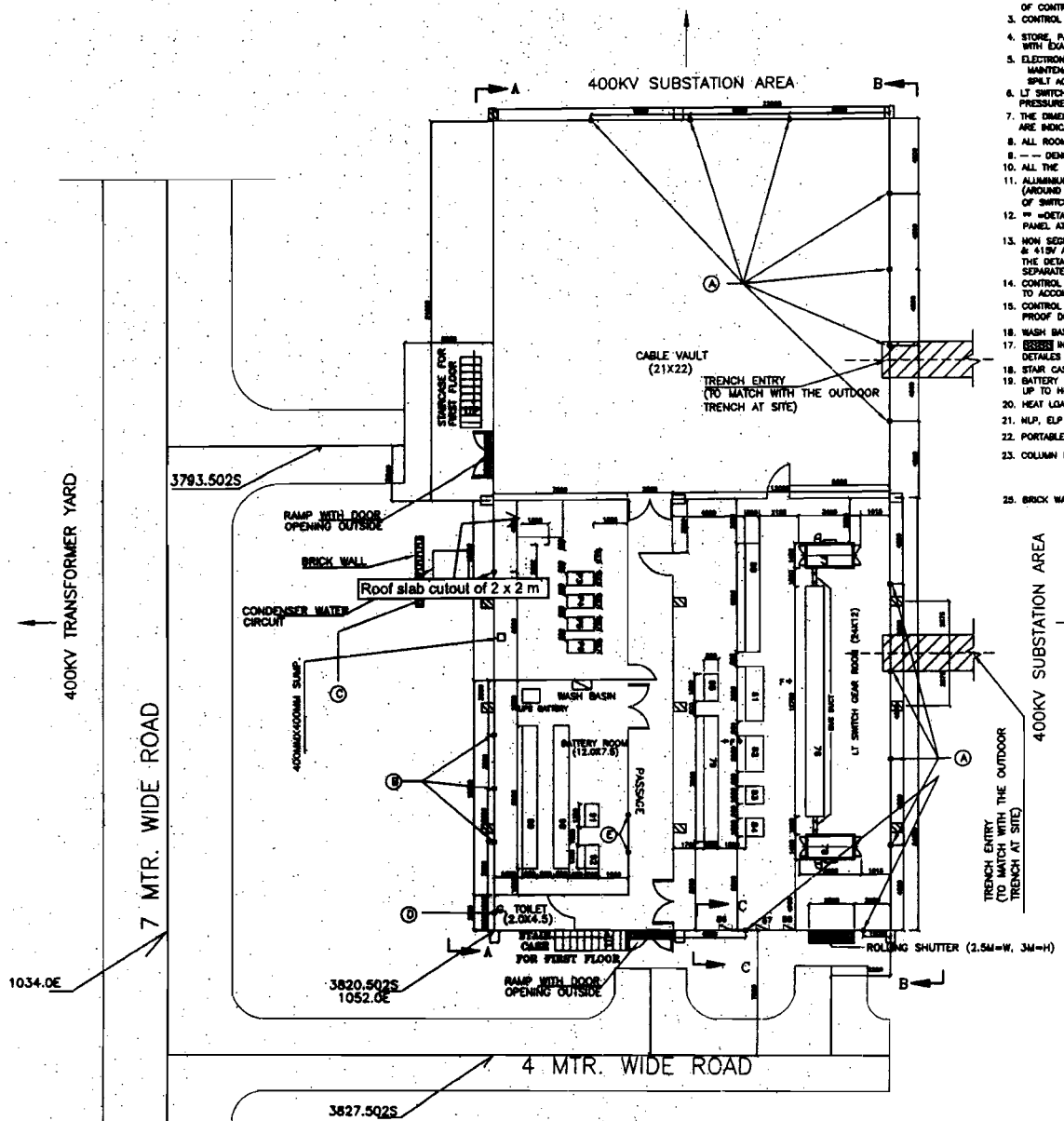
SCHEDULE –7

ENCLOSURES TO SPECIFICATION

DRAWINGS (ANNEXURE-D)

1. PLAN LAYOUT OF 400/220 KV SWITCHYARD AT SURATGARH.
   DRG. NO. TB-0-360-316-001 REV.03
2. PLAN LAYOUT OF 400 KV SWITCHYARD AT SURATGARH.
   DRG. NO. TB-0-360-316-002 REV.03
3. TRANSFORMER YARD LAYOUT AT SURATGARH TPS.
   DRG. NO. PE-DG-392-100-E001 REV.02
4. CONCEPTUAL CONTROL ROOM BUILDING LAYOUT FOR SWITCHYARD EXT.
   DRG. NO. TB-3-360-316-009 REV.03
5. OGA OF 125 MVAR REACTOR.
   DRG. NO. 34690001468 REV.01
6. OGA OF 80 MVAR REACTOR.
   DRG. NO. 34690001477 REV.01

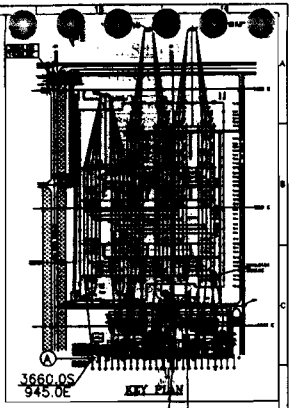
- **ABOVE ENCLOSED DRAWINGS ARE TENTATIVE AND MAY UNDERGO CHANGES DURING DETAILED ENGINEERING.**



GROUND FLOOR PLAN AT E.L=+0.5M

NOTES:-

1. ALL DIMENSION ARE IN mm EXCEPT ELEVATION OF BUILDING AND OVERALL ROOM DIMENSION ARE IN METER.
2. SEPARATE DRAWING SHALL BE SUBMITTED FOR DETAILED ARCHITECTURE AND TRENCH LAYOUT OF CONTROL ROOM BUILDING.
3. CONTROL ROOM, RELAY ROOM, PLCC ROOM AND CONFERENCE ROOM SHALL PACKAGE AIRCONDITIONED.
4. STORE, PANTRY AND TOILET SHALL BE PROVIDED WITH EXHAUST FAN. BATTERY ROOM SHALL BE PROVIDED WITH EXAUST FAN AND LOUVERS FOR FRESH AIR.
5. ELECTRONICS TEST LAB, LIBRARY CUM RECORD ROOM, SHIFT INCHARGE ROOM, MAINTENANCE STAFF ROOM, MAINTENANCE ROOM & ENGINEERS ROOM SHALL BE PROVIDED WITH SPILT AC OF ADEQUATE CAPACITY.
6. LT SWITCH GEAR ROOM & CABLE VAULT SHALL BE PROVIDED WITH SUPPLY AIR FAN FOR POSITIVE PRESSURE VENTILATION. AHU ROOM SHALL BE PROVIDED WITH FRESH AIR FAN.
7. THE DIMENSION AND ARRANGEMENT OF PANELS INSIDE ROOM ARE INDICATIVE AND SHALL BE FINALISED DURING DETAILED ENGINEERING.
8. ALL ROOM EXCEPT AHU ROOM SHALL BE PROVIDED WITH WINDOW.
8. — — DENOTE FUTURE PANEL
10. ALL THE DIMENSIONS OF THE ROOMS ARE FROM CENTER LINE OF WALL (THICKNES OF WALL 230MM)
11. ALUMINIUM GLAZED WINDOW SHALL BE PROVIDED IN THE FIRST FLOOR (AROUND THE CONTROL ROOM, RELAY ROOM & PLCC ROOM) TO HAVE A CLEAR VIEW OF SWITCHYARD EQUIPMENT
12. ** =DETAILED ARRANGEMENT OF MONORAIL, PLATFORM, REMOVABLE HANDRAIL AND ELECTRICAL HOIST FOR LIFTING OF PANEL AT FIRST FLOOR SHALL BE SHOWN IN CIVIL DRAWING. RATING OF MONORAIL FOR EQUIPMENT LIFTING IS 1.5 TON.
13. NON SEGREGATED PHASE BUS DUCT BETWEEN DRY TYPE TRANSFORMER & 415V ACDB SHALL BE SUITABLE FOR TOP ENTRIES. THE DETAILED OF BUS DUCT CONNECTION SHALL BE SHOWN IN SEPARATE DRAWING.
14. CONTROL ROOM TOWARDS CABLE VAULT SHALL BE SUITABLE EXTENDIBLE TO ACCOMMODATE CONTROL & RELAY PANEL FOR FOUR FUTURE BAYS.
15. CONTROL ROOM, RELAY ROOM, LT SWITCH GEAR ROOM, BATTERY ROOM & PLCC ROOM SHALL BE PROVIDED WITH FIRE PROOF DOOR. THE FIRE PROOF DOOR SHALL BE RATED FOR A MINIMUM OF TWO HOURS.
18. WASH BASIN SHALL BE PROVIDED IN BATTERY ROOM
17. [illegible] IN AIR LOCK LOBBY ENTRY ALUMINIUM GALZED AUTOMATIC CENTER OPENING SLIDING DOOR SHALL BE PROVIDED . DETAILES SHALL BE SHOWN IN CIVIL DRAWING. AUTOMATIC DOOR POWER SUPPLY SHALL BE FED FROM EMERGENCY AC SECTION OF LT SWITCHGEAR.
18. STAIR CASE SHALL BE COVERED. LOWER HEIGHT DOOR SHALL BE PROVIDED FOR BOTH EXTERNAL STAIR CASE.
19. BATTERY SHALL BE LEAD ACID PLANTE TYPE. BATTERY ROOM FLOOR SHALL BE PROVIDED WITH ACID PROOF TILES. UP TO HEIGHT 2.3M FROM FFL.
20. HEAT LOAD PER PANEL IS APPROX. 100W. WEIGHT PER PANEL IS APPROX. 300Kg
21. NLP, ELP ,DLP , ACAN AND FIRE ALARM PANEL SHALL BE WALL MOUNTED.
22. PORTABLE PUMP AND MOTOR SHALL BE PROVIDED IN AHU ROOM FOR LIFTING THE WATER FROM 400MMX400MM SUMP.
23. COLUMN LOCATION ARE INDICATIVE AND DETAILED SHALL BE SHOWN IN CIVIL DRAWING.
25. BRICK WALL SHALL BE PROVIDED TOWARDS SOUTH OF CONDENSER WATER CIRCUIT.



LEGEND-

MLDB= MAIN LIGHTING DISTRIBUTION BOARD
WDB= WELDING DISTRIBUTION BOARD
ELDB= EMERGENCY LIGHTING DISTRIBUTION BOARD
LT= LIGHTING TRANSFORMER
DCDB= DC DISTRIBUTION BOARD
AHU= AIR HANDLING UNIT
PLCC= POWER LINE CARRIER COMMUNICATION
P1 TO P6= PACKAGE UNITS
PH= PAN HUMIDIFIER
PDB= POWER DISTRIBUTION BOARD
MT= 11/0.433kV, 630kVA DRY TRANSFORMER
FFL= FINISHED FLOOR LEVEL
FGL= FINISHED GROUND LEVEL
F = FRONT
CH = CHARGER
NLP = NORMAL AC LIGHTING PANEL
ELP = EMERGENCY AC LIGHTING PANEL
DLP = DC LIGHTING PANEL
EPABX = ELECTRONIC PRIVATE AUTOMATIC BRANCH EXCHANGE
= BUS DUCT
FA =FIRE ALARM PANEL
ACAN= AIR CONDITIONING ANNUNCIATION PANEL
D2 AUTOMATIC (CENTER OPENING) DOUBLE SLIDING DOOR ALUMINIUM GLAZE

REFERENCE DWG. :-
LAYOUT PLAN FOR 400kV S/S AT SURATGARH
DWG. NO. TB-0-360-316-002

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
03	05-08-14	AS PER TCE LETTER DATED- 11-07-14	SK	SK	SKS	RS
02	18-06-14	AS PER TCE LETTER DATED- 16-05-14	SK -SD-	SK -SD-	SKS -SD-	RS -SD-
01	11-04-14	AS PER TCE LETTER DATED- 29-10-13	SK -SD-	SK -SD-	SKS -SD-	RS -SD-

OWNER
RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

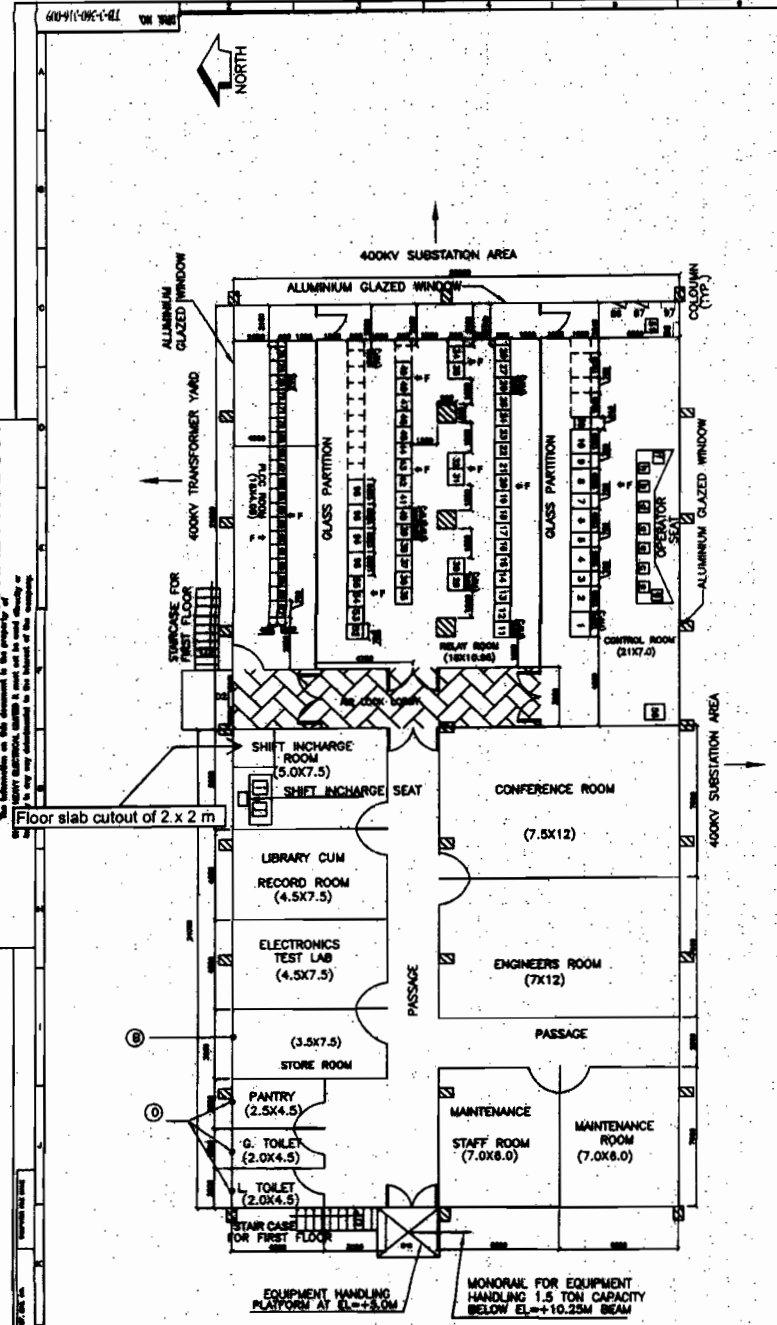
OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

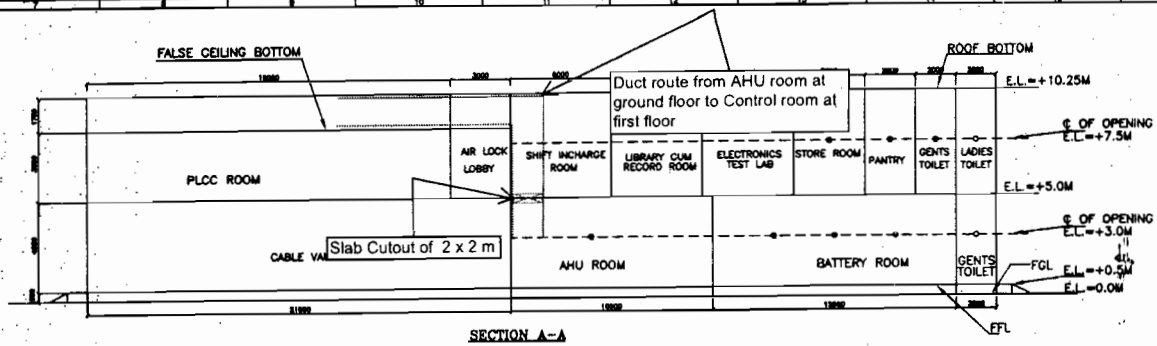
DEPT CODE		NAME	SIGN.	DATE
422	DRN.		-SD-	14.08.13
	CHD.		-SD-	
	APP.		-SD-	
	DES.		-SD-	

TITLE
CONCEPTUAL CONTROL ROOM BUILDING LAYOUT FOR 400kV S/S AT SURATGARH

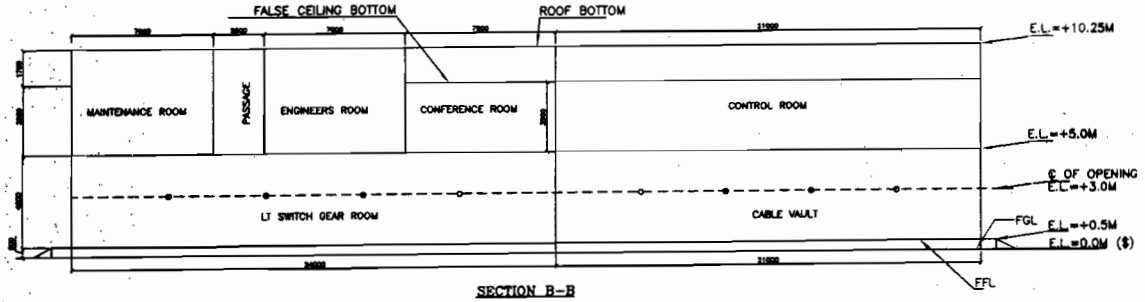
CV	ME	EL	I&C			DEPT.	SCALE 1:100	BHEL CONTRACTOR DRG NO. 316-009
						SIGN		
						DATE		SHT. REV. 03



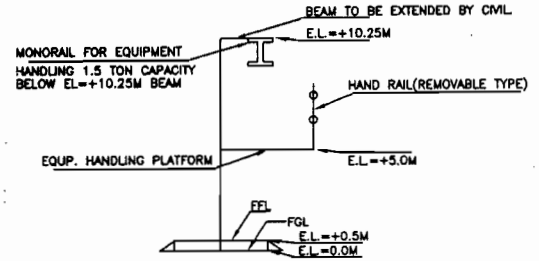
FIRST FLOOR PLAN AT E.L=+5.0M



SECTION A-A



SECTION B-B



SECTION C-C

$= EL=0.0M IS EQUAL TO RL=193.0 M OF UNIT 7&8 SWITCHYARD.

DETAILS OF CIRCULAR OPENING HOLES IN CONTROL ROOM BLDG.

1. Ⓐ – CIRCULAR OPENING ϕ 700MM FOR PRESSURIZED VENTILATION SYSTEM SHALL BE PROVIDED AT A ELEVATION OF 2500MM (BOTTOM OF OPENING) FROM FFL.
2. Ⓑ – CIRCULAR OPENING ϕ 550MM FOR EXHAUST FANS SHALL BE PROVIDED AT A ELEVATION OF 2500MM (BOTTOM OF OPENING) FROM FFL.
3. Ⓒ – CIRCULAR OPENING ϕ 700MM IN AHU ROOM FOR FRESH AIR UNIT SHALL BE PROVIDED AT A ELEVATION OF 2500MM(BOTTOM OF OPENING) FROM FFL.
4. Ⓓ – CIRCULAR OPENING ϕ 400MM FOR EXHAUST FANS SHALL BE PROVIDED AT A ELEVATION OF 2500MM (BOTTOM OF OPENING) FROM FFL.
5. Ⓔ – RECTANGULAR OPENING 200X200MM FOR FRESH AIR SHALL BE PROVIDED AT ELEVATION OF 2500MM (BOTTOM OF OPENING) FROM FFL.

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
03	05-08-14	AS PER TCE LETTER DATED- 11-07-14	SK	SK	SKS	RS
02	18-06-14	AS PER TCE LETTER DATED- 16-05-14	SK -SD-	SK -SD-	SKS -SD-	RS -SD-
01	11-04-14	AS PER TCE LETTER DATED- 25-10-13	SK -SD-	SK -SD-	SKS -SD-	RS -SD-

OWNER
RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	SK	-SD-	14.08.13
	DES	SK	-SD-	
	CHD	RS	-SD-	
	APPD	RS	-SD-	

TITLE
CONCEPTUAL CONTROL ROOM BUILDING LAYOUT FOR 400kV S/S AT SURATGARH

CV	ME	EL	I&C			DEPT.
						SIGN
						DATE

SCALE 1:600

BHEL/SUB VENDOR ORG NO.
TB-3-360-316-009

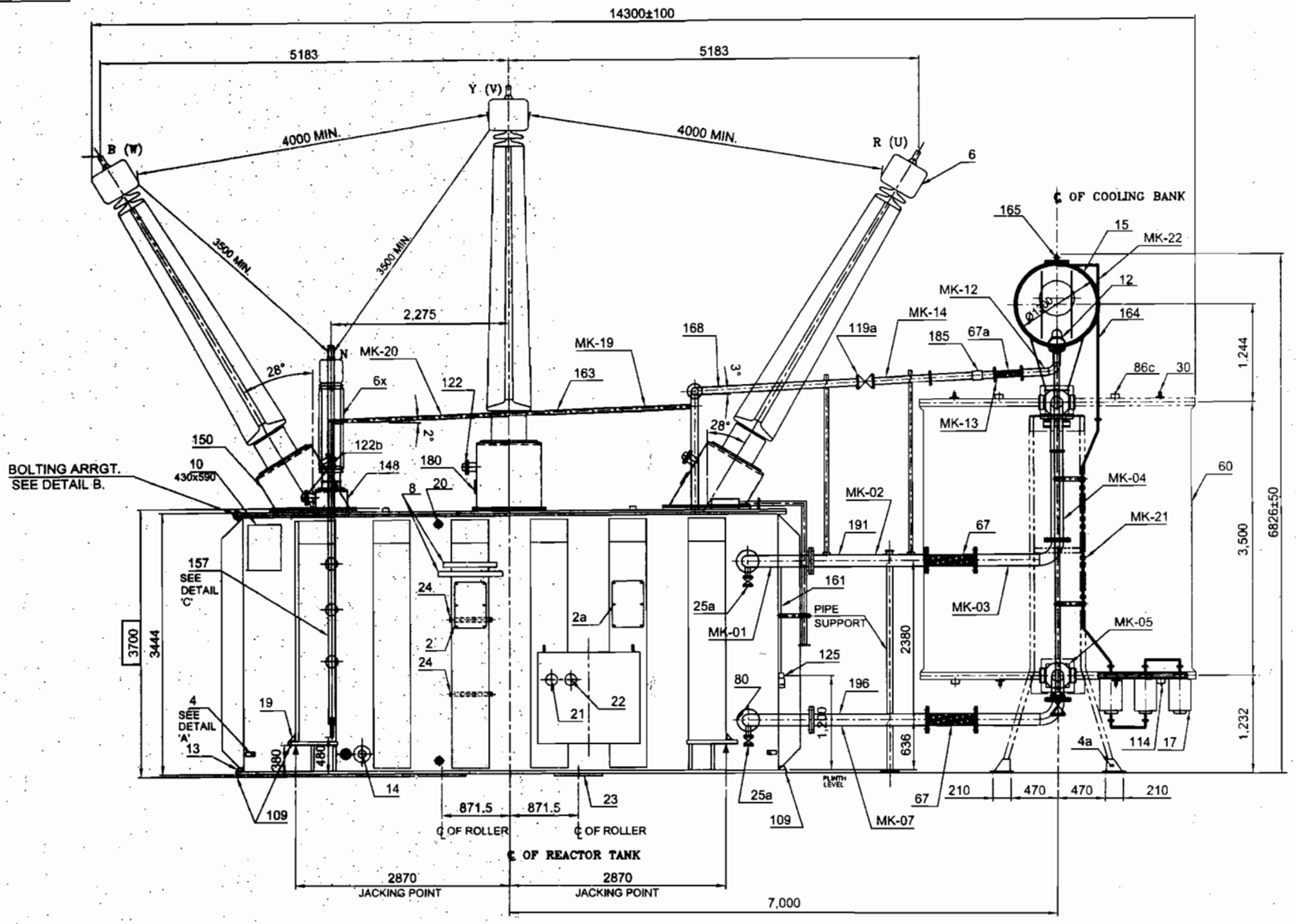
SHT. No 02 OF 03 REV. 03

PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT

FIRST ANGLE PROJECTION

DRG. NO. 3 469 00 01468

(ALL DIMENSIONS ARE IN mm)



REV.	DATE	ALT.			REV	DATE	ALT.	RAKESH	
		CKD.			01	20.01.15	CKD.	KD	
		APPD.					APPD.	KD	
ZONE					ZONE	DRAWING REVISED INLINE WITH CUSTOMER COMMENTS.			

TYPE OF PRODUCT	125 MVAR, 420KV, 3-PHASE ONAN BUS REACTOR
PO. NO.	RVUN/ACE(TD)/XEN(TD-II)/D.2908/DATED 28.03.2013
PROJECT	400 KV SWITCHYARD FOR 2X660 MW SURATGARH STPP. UNIT 7 &8
NAME OF CUSTOMER	M/S R.R.V.U.N.LTD.

ADDITIONAL INFORMATION	
W.O.- 63003 - P - 517 - 01	
STATUS OF DRAWING	"PR"
DISTRIBUTION OF PRINTS	TRE
	TRE-1, TRM-3

भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

DEPT	CODE	WEIGHT(kg)	SCALE
TRE	406	-----	COMP.SCALE-1:1

TITLE: OUTLINE GENERAL ARRANGEMENT ELEVATION VIEW

	NAME	SIGN	DATE
DRN.	RAKESH	-SD-	01.11.14
CHD.	KD	-SD-	
APPD.	KD/AC	-SD-	

DRG. NO 3 469 00 01468 REV. 01

SHEET 02 OF 04

INVENTORY NO. | SIGN.DATE | REF.DRG.NO.

6

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 3 469 00 01468

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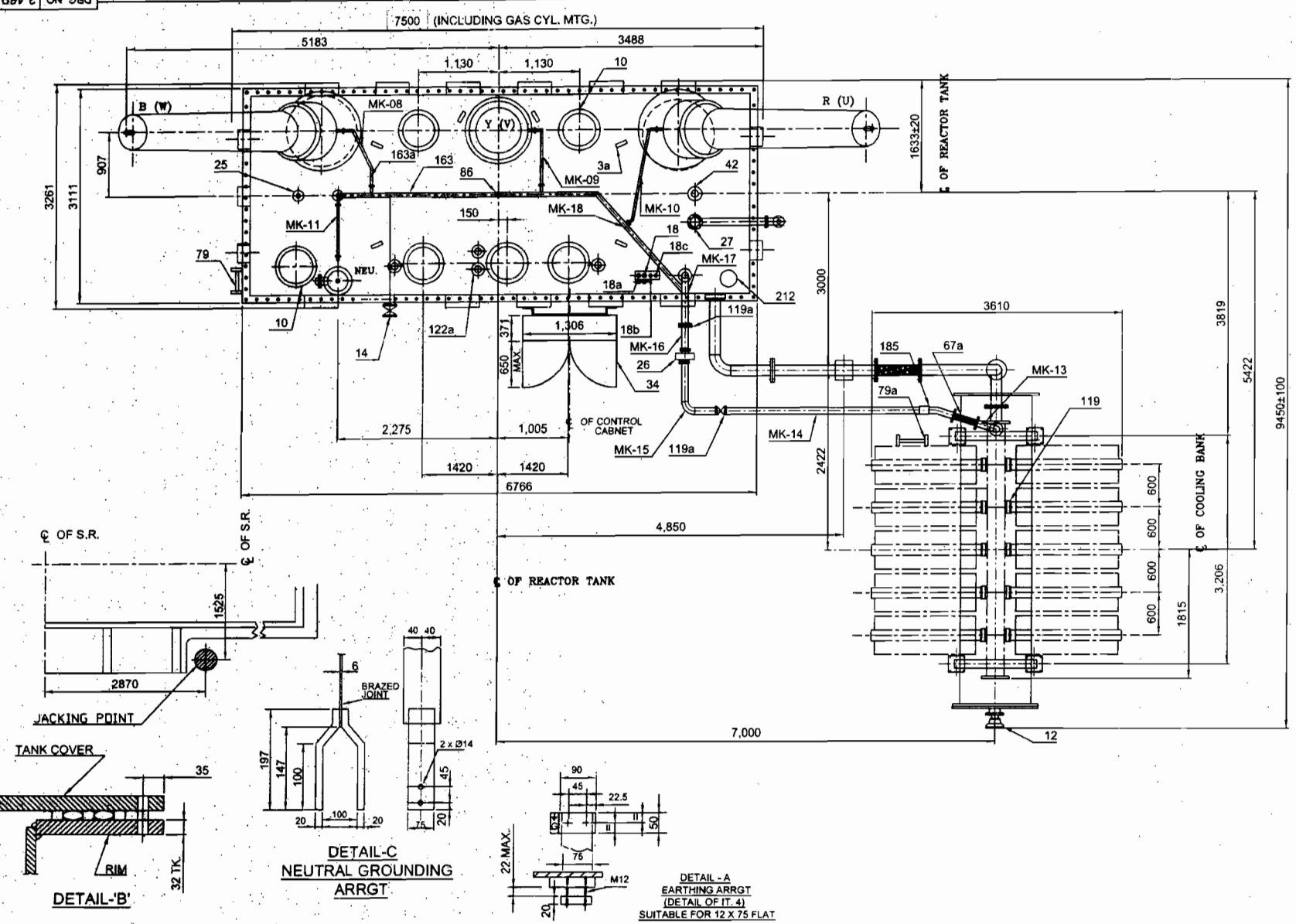

REV.	DATE	ALT.	
		CKD.	
		APPD.	

REV	DATE	ALT.	RAKESH
01	20.01.15	CKD.	KD
		APPD.	KD

ZONE: DRAWING REVISED INLINE WITH CUSTOMER COMMENTS.

TYPE OF PRODUCT	125 MVAR, 420KV, 3-PHASE ONAN BUS REACTOR
PO. NO.	RVUN/ACE(TD)/XEN(TD-II)/D.2908/DATED 28.03.2013
PROJECT	400 KV SWITCHYARD FOR 2X660 MW SURATGARH STPP. UNIT 7 &8
NAME OF CUSTOMER	M/S R.R.V.U.N.LTD.

ADDITIONAL INFORMATION: W.O.- 63003 - P - 517 - 01

STATUS OF DRAWING: "PR" | DISTRIBUTION OF PRINTS: TRE-1, TRM-3

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BHARAT HEAVY ELECTRICALS LTD, BHOPAL

DEPT	CODE	WEIGHT(kg)	SCALE
TRE	406	-----	COMP.SCALE-1:1

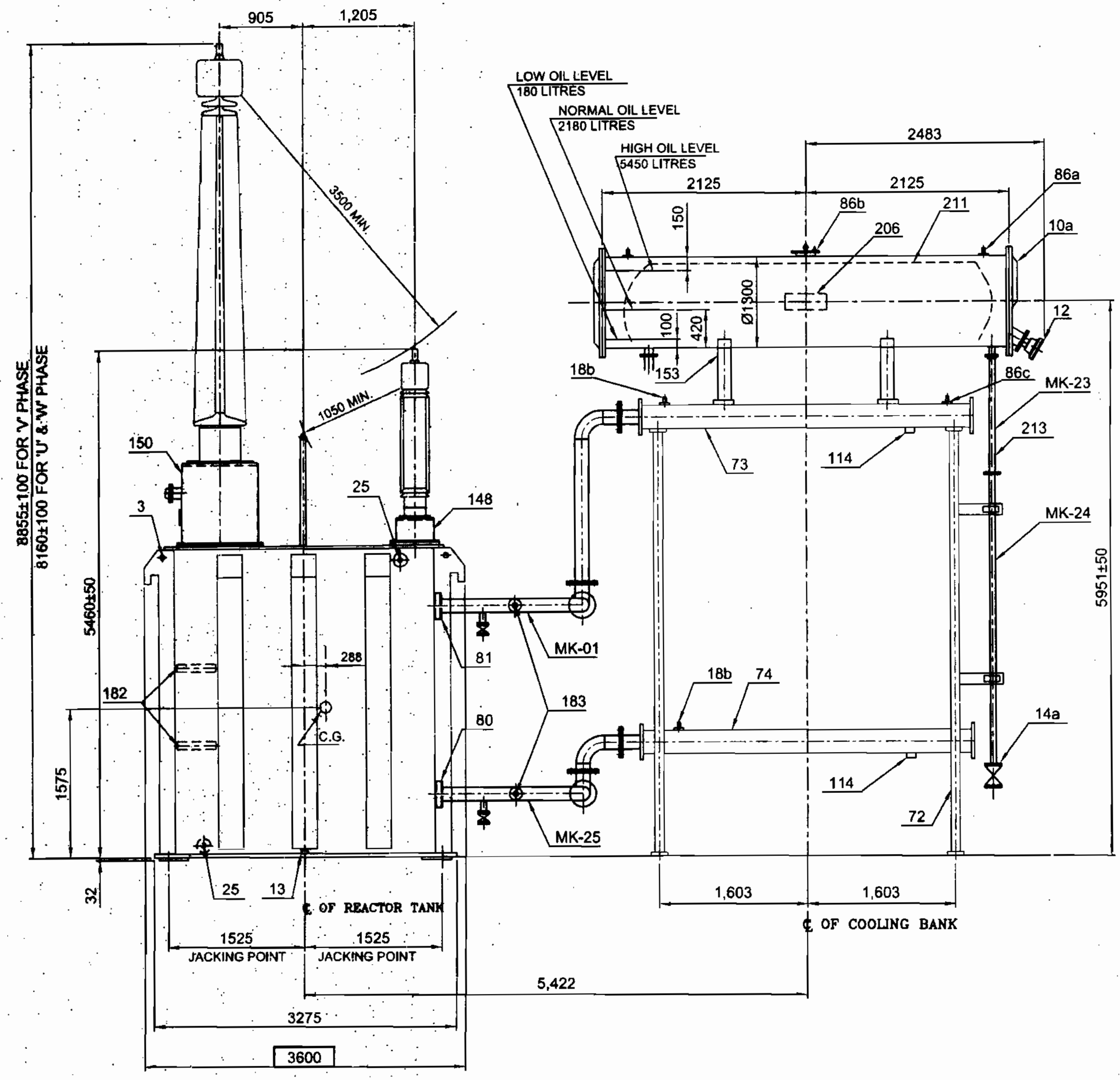
TITLE: OUTLINE GENERAL ARRANGEMENT PLAN VIEW

	NAME	SIGN	DATE
DRN.	RAKESH	-SD-	01.11.14
CHD.	KD	-SD-	
APPD.	KD/AC	-SD-	

DRG. NO 3 469 00 01468 REV. 01

SHEET 03 OF 04

INVENTORY NO. | SIGN.DATE | REF.DRG.NO.



REV	DATE	ALT.			REV	DATE	ALT.	RAKESH
		CKD.			01	20.01.15	CKD.	KD
		APPD.					APPD.	KD
ZONE					ZONE	DRAWING REVISED INLINE WITH CUSTOMER COMMENTS.		

TYPE OF PRODUCT	125 MVAR, 420KV, 3-PHASE ONAN BUS REACTOR
PO. NO.	RVUN/ACE(TD)/XEN(TD-II)/D.2908/DATED 28.03.2013
PROJECT	400 KV SWITCHYARD FOR 2X660 MW SURATGARH STPP. UNIT 7 &8
NAME OF CUSTOMER	M/S R.R.V.U.N.LTD.

ADDITIONAL INFORMATION
W.O.- 63003 - P - 517 - 01
STATUS OF DRAWING "PR"
DISTRIBUTION OF PRINTS
TRE-1, TRM-3

भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

DEPT	CODE	WEIGHT(kg)	SCALE
TRE	406	-----	COMP.SCALE-1:1

TITLE: OUTLINE GENERAL ARRANGEMENT
END VIEW

	NAME	SIGN	DATE
DRN.	RAKESH	-SD-	01.11.14
CHD.	KD	-SD-	
APPD.	KD/AC	-SD-	

DRG. NO 3 469 00 01468 REV. 01
SHEET 04 OF 04

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IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

REF.DRG.NO. | REVISION DATE | INVENTORY NO.

DRG. NO. 3 469 00 01468

FIRST ANGLE PROJECTION

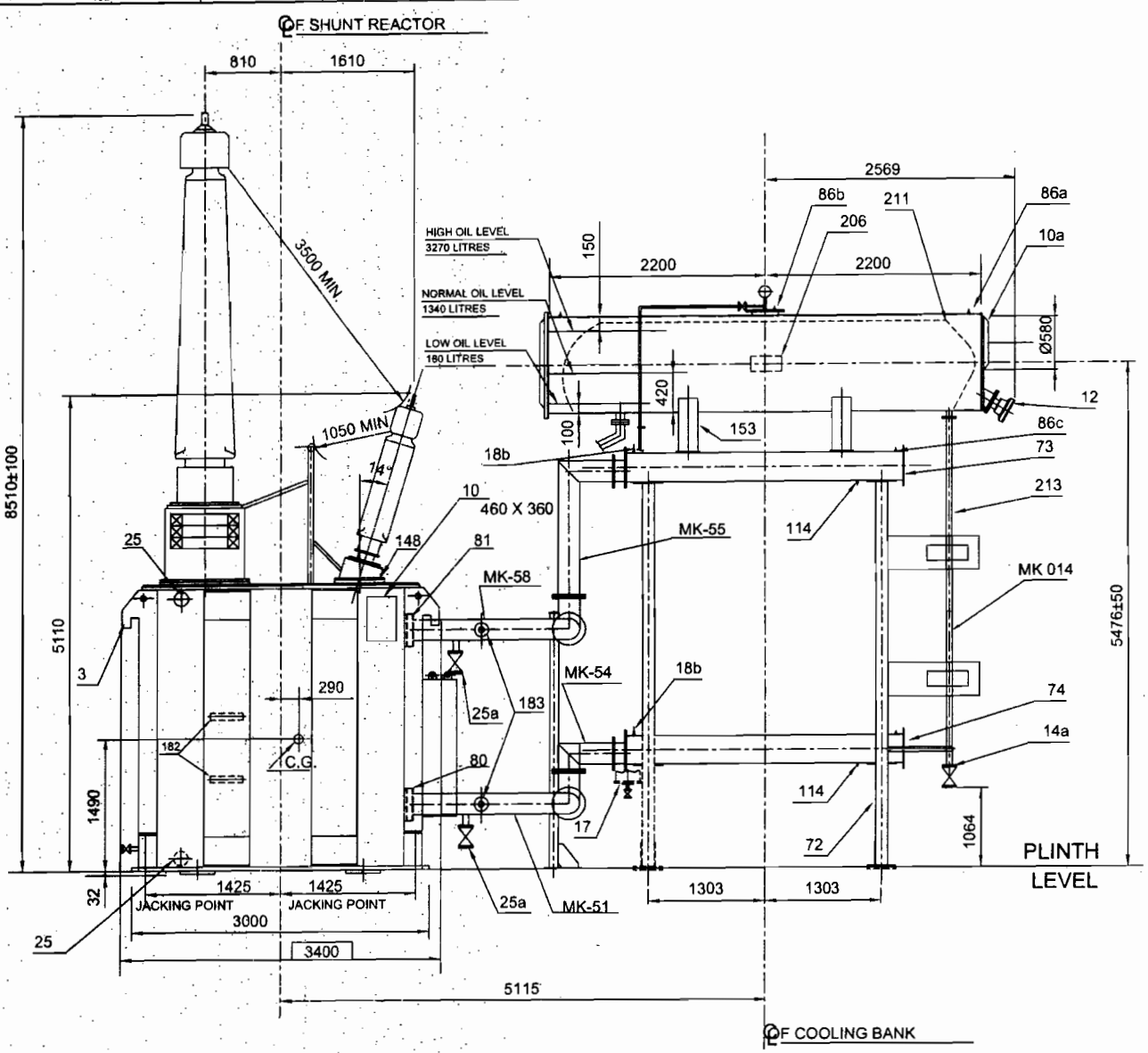
(ALL DIMENSIONS ARE IN mm)

5

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 3 469 00 01477



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		CKD.					
		APPD.					
ZONE							

REV	DATE	ALT.	RAKESH
01	20.01.16	CKD.	KD.
		APPD.	KD

ZONE DRAWING REVISED INLINE WITH CUSTOMER COMMENTS.

TYPE OF PRODUCT	80 MVAR, 420KV, 3-PHASE ONAN SHUNT REACTOR
PO. NO.	RVUN/AGE(TD)/XEN(TD-II)/D.2908/DATED 28.03.2013
PROJECT	400 KV SWITCHYARD FOR 2X660 MW SURATGARH STPP. UNIT 7 &8
NAME OF CUSTOMER	M/S R.R.V.U.N.LTD.

ADDITIONAL INFORMATION	W.O.- 63004 - P - 517 - 01
STATUS OF DRAWING	*PR*
DISTRIBUTION OF PRINTS	TRE-1, TRM-3

भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD, BHOPAL

DEPT	CODE	WEIGHT(kg)	SCALE
TRE	406	-----	COMP.SCALE-1:1

TITLE: OUTLINE GENERAL ARRANGEMENT
END VIEW

	NAME	SIGN	DATE
DRN.	RAKESH	-SD-	01.11.14
CHD.	KD	-SD-	
APPD.	KD/AC	-SD-	

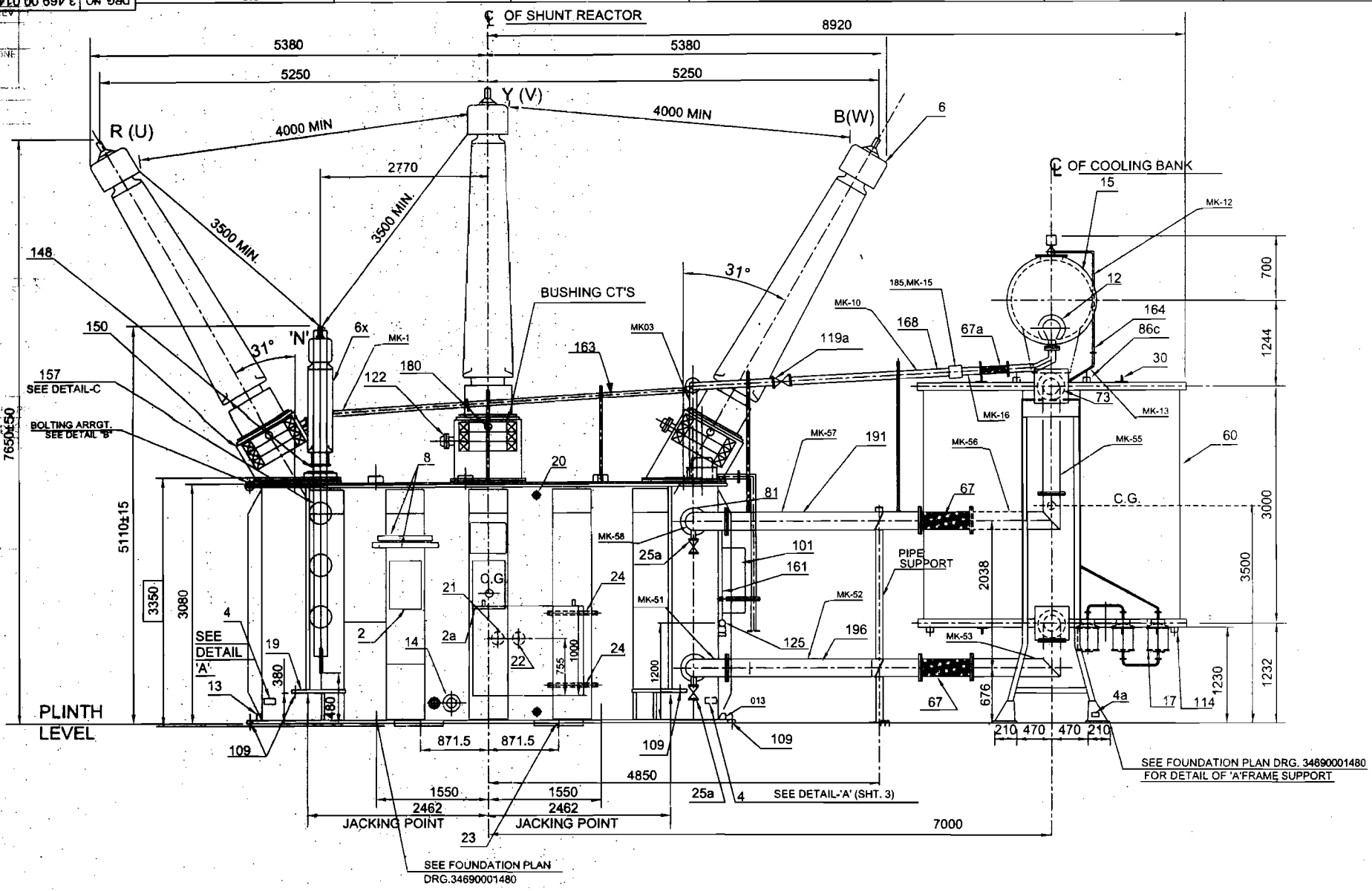
DRG. NO. 3 469 00 01477 REV. 01

SHEET 04 OF 04

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 3 469 00 01477



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INVENTORY NO. | SIGN.DATE | REF.DRG.NO.

REV	DATE	ALT.	
		CKD.	
		APPD.	
ZONE			

REV	DATE	ALT.	RAKESH
01	20.01.15	CKD.	KD.
		APPD.	KD.
ZONE	DRAWING REVISED INLINE WITH CUSTOMER COMMENTS.		

TYPE OF PRODUCT	80 MVAR, 420KV. 3-PHASE ONAN SHUNT REACTOR
PO. NO.	RVUN/ACE(TD)/XEN(TD-II)/D.2908/DATED 28.03.2013
PROJECT	400 KV SWITCHYARD FOR 2X660 MW SURATGARH STPP. UNIT 7 &8
NAME OF CUSTOMER	M/S R.R.V.U.N.LTD.

ADDITIONAL INFORMATION					
W.O.- 53004 - P - 517 - 01					
STATUS OF DRAWING "PR"	DEPT	CODE	WEIGHT(kg)	SCALE	
DISTRIBUTION OF PRINTS	TRE	406	-----	COMP.SCALE-1:1	
TRE-1, TRM-3					

भारत हेवी इले्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

TITLE: OUTLINE GENERAL ARRANGEMENT ELEVATION VIEW

	NAME	SIGN	DATE
DRN.	RAKESH	-SD-	01.11.14
CHD.	KD	-SD-	
APPD.	KD/AC	-SD-	

DRG. NO. 3 469 00 01477 REV. 01

SHEET 02 OF 04

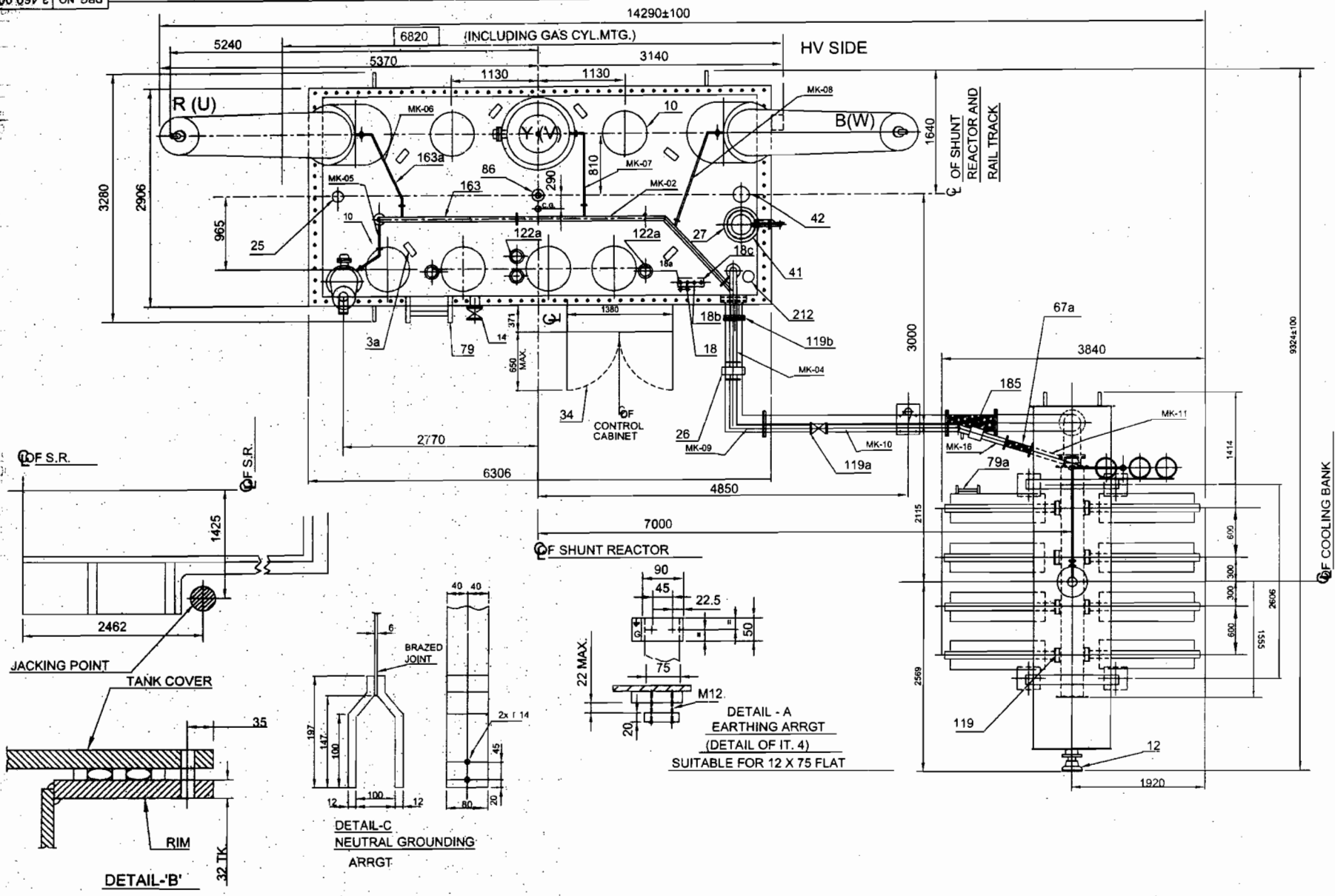
201 202 203 204 205 206 207 208

(7)

FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 3 469 00 01477



REV	DATE	ALT.		REV	DATE	ALT.	RAKESH
		CKD.		01	20.01.15	CKD.	KD.
		APPD.				APPD.	KD
ZONE				ZONE	DRAWING REVISED INLINE WITH CUSTOMER COMMENTS.		

TYPE OF PRODUCT	80 MVAR, 420KV, 3-PHASE ONAN SHUNT REACTOR
PO. NO.	RVUN/ACE(TD)/XEN(TD-II)/D.2908/DATED 28.03.2013
PROJECT	400 KV SWITCHYARD FOR 2X660 MW SURATGARH STPP. UNIT 7 &8
NAME OF CUSTOMER	M/S R.R.V.U.N.LTD.

ADDITIONAL INFORMATION	भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल			
W.O.- 63004 - P - 517 - 01	BHARAT HEAVY ELECTRICALS LTD. BHOPAL			
STATUS OF DRAWING "PR"	DEPT	CODE	WEIGHT(kg)	SCALE
DISTRIBUTION OF PRINTS	TRE	406	-----	COMP.N/SCALE-1:1
TRE-1, TRM-3	TITLE	OUTLINE GENERAL ARRANGEMENT PLAN VIEW		

	NAME	SIGN	DATE
DRN.	RAKESH	-SD-	01.11.14
CHD.	KD	-SD-	
APPD.	KD/AC	-SD-	

DRG. NO. 3 469 00 01477 REV. 01

SHEET 03 OF 04

DRG. NO. 3 469 00 01471 REV

(ALL DIMENSIONS ARE IN mm)

12-FOUNDATION BOLTS FOR LOCKING THE SHUNT REACTOR, EACH SUITABLE FOR SHEARING LOAD 6000KG. SEE DETAIL-C

IT. NO. 001

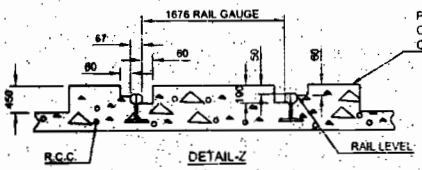
REACTOR FOUNDATION PLATFORM OF SIZE MIN. 7.5 X 3.7 MTR. TO BE SUITABLE FOR BEARING LOAD 7.5 TONNES/Sq.M.

4-NOS. JACKING POINTS 150 DIA ON S.R. EACH SUITABLE FOR BEARING LOAD 60000 KG.

SEE DETAIL 'Z' AND NOTE-3 FOR LAYING OF RAIL. "RAIL TYPE 90 lbs"

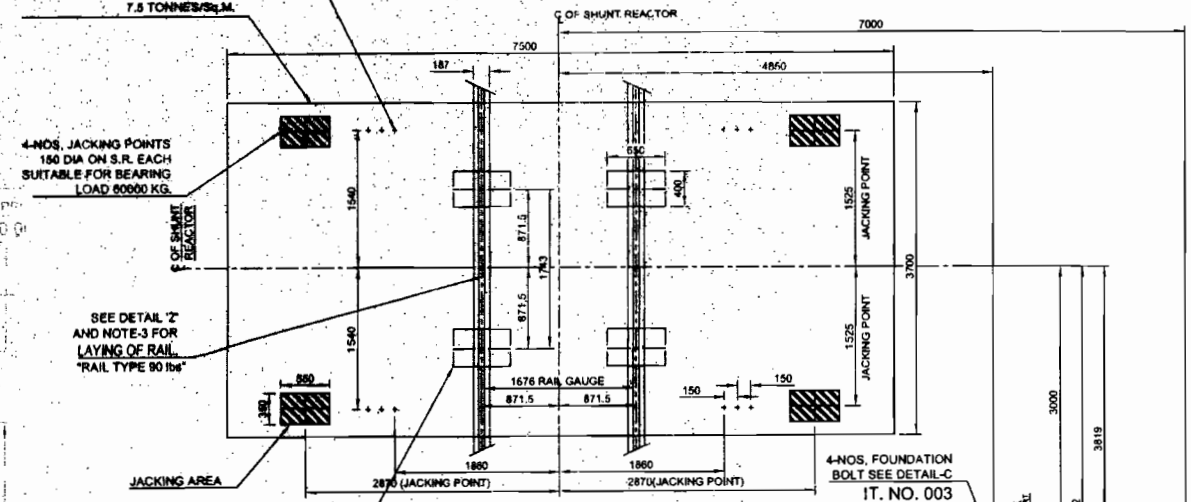
4-LOCALPOCKETS IN FOUNDATION OF SHUNT REACTOR PLINTH, EACH OF SIZE 400 X 650 X 50 DEEP TO ACCOMODATE ROLLER MTG. PADS. (WELDED ON TANK BASE) IT WILL BE SAME FOR ANY DIRECTION OF RAIL TRACK POSITION.

JACKING AREA



DETAIL-Z

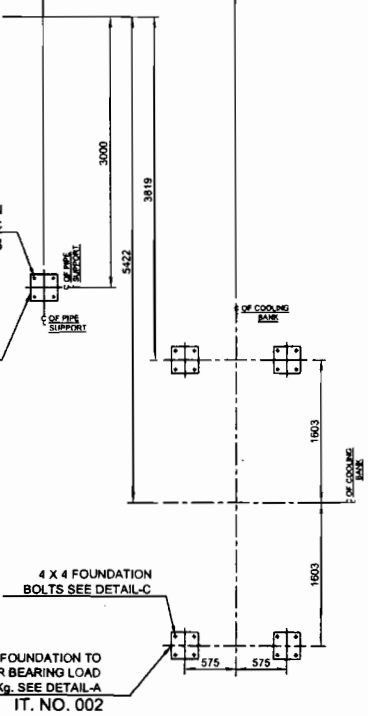
PLINTH LEVEL OF SHUNT RREACTOR COOLING BANK, PIPE SUPPORT & CONTROL CABINET.



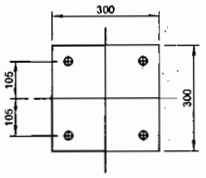
4-NOS, FOUNDATION BOLT SEE DETAIL-C

IT. NO. 003

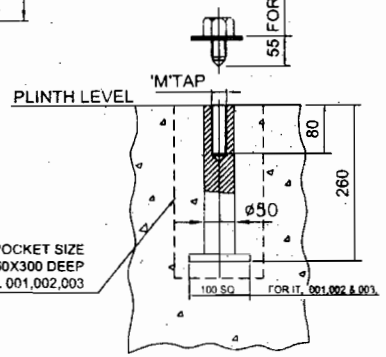
CONCRETE FOUNDATION TO BE SUITABLE FOR BEARING 1500 Kg. SEE DETAIL-A



IT. NO. 002



DETAIL-A



DETAIL OF FOUNDATION BOLTS DETAIL-C

NOTES:-

1. FOUNDATION BOLTS WITH HARDWARES WILL BE SUPPLIED BY BHEL.
2. FOR OUTLINE GENERAL ARRGT. REFER DRG. 3 469 00 01468.
3. POSSITION OF RAILS HAVE BEEN SHOWN IN BOTH TRANSVERSE AND LONGITUDINAL DIRECTIONS.
4. THE DRAWING GIVES THE SIZE AND LOCATING DIMENSIONS OF THE LOAD BEARING PADS PROVIDED WITH REACTOR AND ACCESSORIES. SUITABLE CONCRETE SLAB SIZE TO RECEIVE THESE PADS TO BE DECIDED BY CUSTOMER'S CIVIL ENGINEER.
5. POCKETS OF SUITABLE SIZE MAY BE LEFT WHILE CASTING. FOUNDATION FOR EMBEDDING FEMALE PART OF FOUNDATION BOLT (TO BE SUPPLIED BY BHEL) AT THE TIME OF FINAL.
6. SUPPORTS FOR NIFPS & ONLINE DGA PANNEL & LOCATION ARE NOT SHOWN. IT SHALL BE FINALAISED BY SUPPLIERS SITE VISIT.
7. PLINTH LEVEL :- LEVEL OF TOP OF CONCRETE OF ALL STRUCTURES FOUNDATION.

TABLE FOR FOUNDATION BOLT

IT. NO.	DESCRIPTION	BOLT SIZE M TAP	HOLE SIZE IN PAD (Ø)	QTY. (PAD)	QTY. OF HOLE FOR PAD	TOTAL QTY. OF BOLTS
001	SHUNT REACTOR MTG.	M-20	24	1	12	12
002	RADIATOR SUPPORT	M-20	24	4	4	16
003	PIPE SUPPORT	M-20	24	1	4	4

REV	DATE	ALT.			REV	DATE	ALT.		
		CKD.					CKD.		
		APPD.					APPD.		
ZONE					ZONE				

TYPE OF PRODUCT	125 MVAR, 420KV, 3-PHASE ONAN BUS REACTOR
PO. NO.	RVUN/ACE(TD)/XEN(TD-II)/D.2908/DATED 28.03.2013
PROJECT	400 KV SWITCHYARD FOR 2X660 MW SURATGARH STPP, UNIT 7 &8
NAME OF CUSTOMER	M/S R.R.V.U.N.LTD.

ADDITIONAL INFORMATION	
W.O.- 63003 - P - 517 - 01	
STATUS OF DRAWING "PR"	
DISTRIBUTION OF PRINTS	
TRE-1, TRM-3	

भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

DEPT	CODE	WEIGHT(kg)	SCALE
TRE	406	-----	COMP SCALE-1:1

TITLE: FOUNDATION PLAN

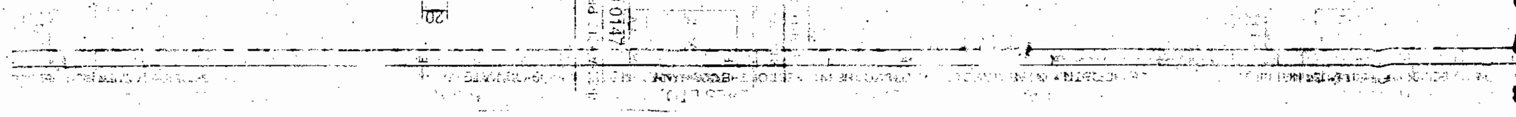
	NAME	SIGN	DATE
DRN	RAKESH		01.11.14
CHD.	KD		
APPD.	KD/AC		

DRG NO 3 469 00 01471 REV. 00

SHEET 02 OF 04

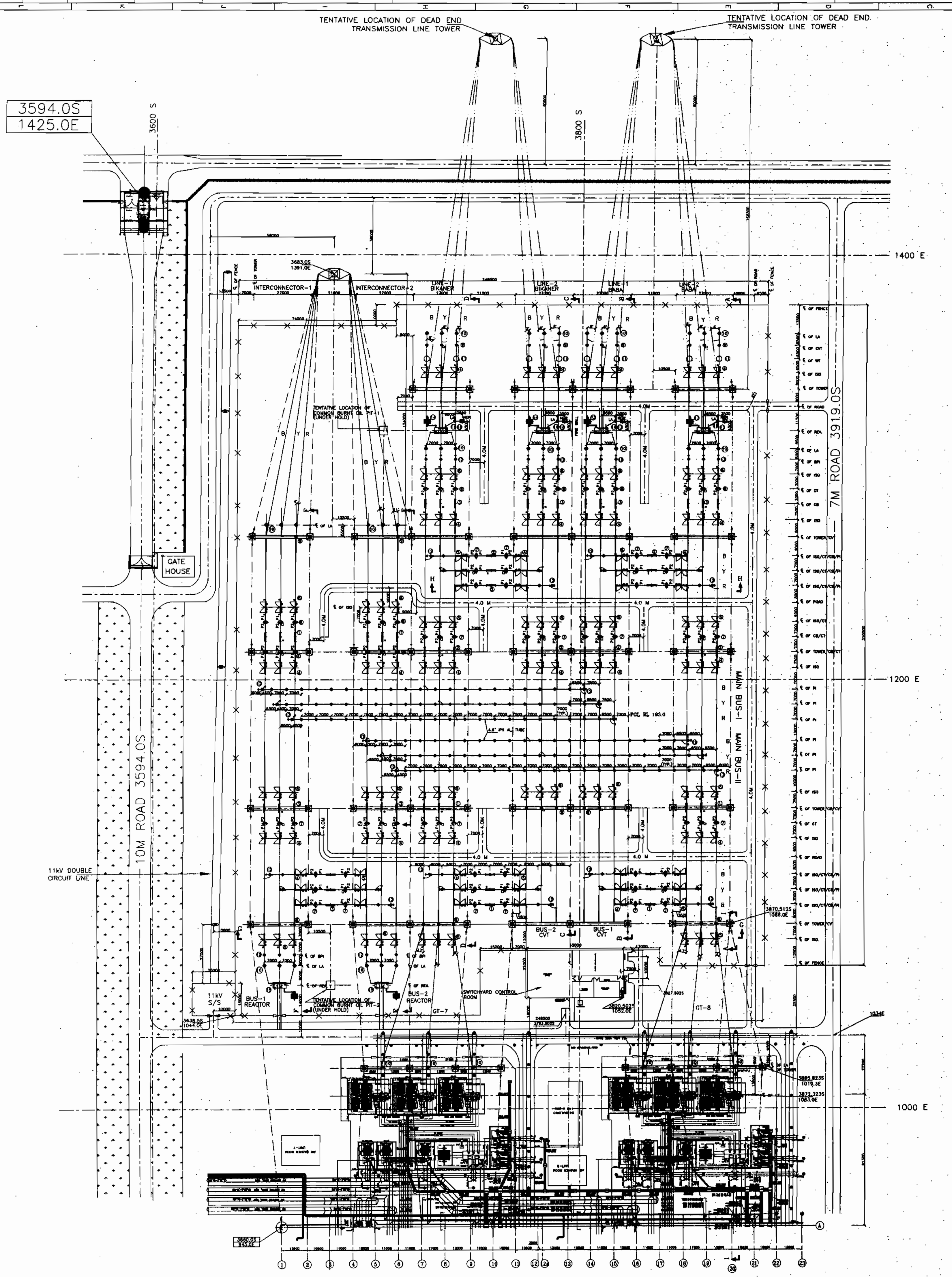
INVENTORY NO. | REF. DRG. NO. | SUBSTITUTES

(3)

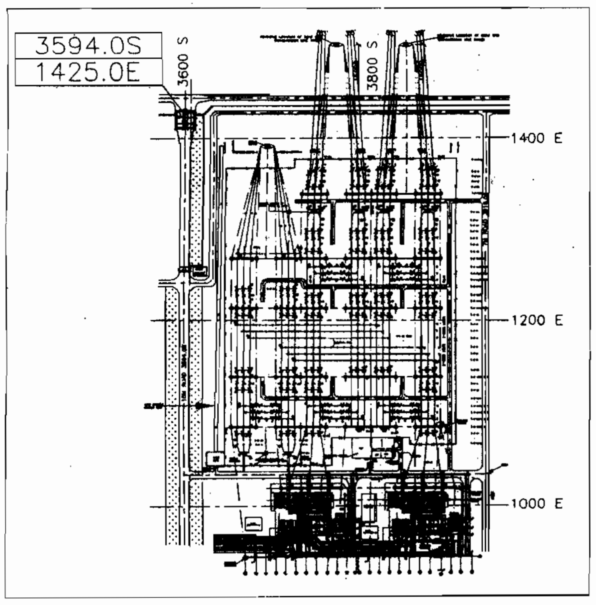


INVENTORY NO	SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME

DRG. NO. TB-0-360-316-002



LAYOUT PLAN OF UNIT-7 & 8 420kV SWITCHYARD



KEY PLAN

REV.	DATE	REASONS FOR REVISION	DRN.	PREPARED BY	CHECKED BY	APPROVED BY
03	13.08.14	AS PER TCE LETTER DATED 27.02.14	RK	SK	SKS	RS
02	05.02.14	AS PER TCE LETTER DATED 29.11.13	RK	SK -SD-	KS -SD-	RS -SD-
01	04.10.13	AS PER TCE LETTER DATED 18.09.13	RK	SK -SD-	KS	RS -SD-

OWNER
RAJASTHAN RAJYA VIDYUT UTPANDAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH STAGE -V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

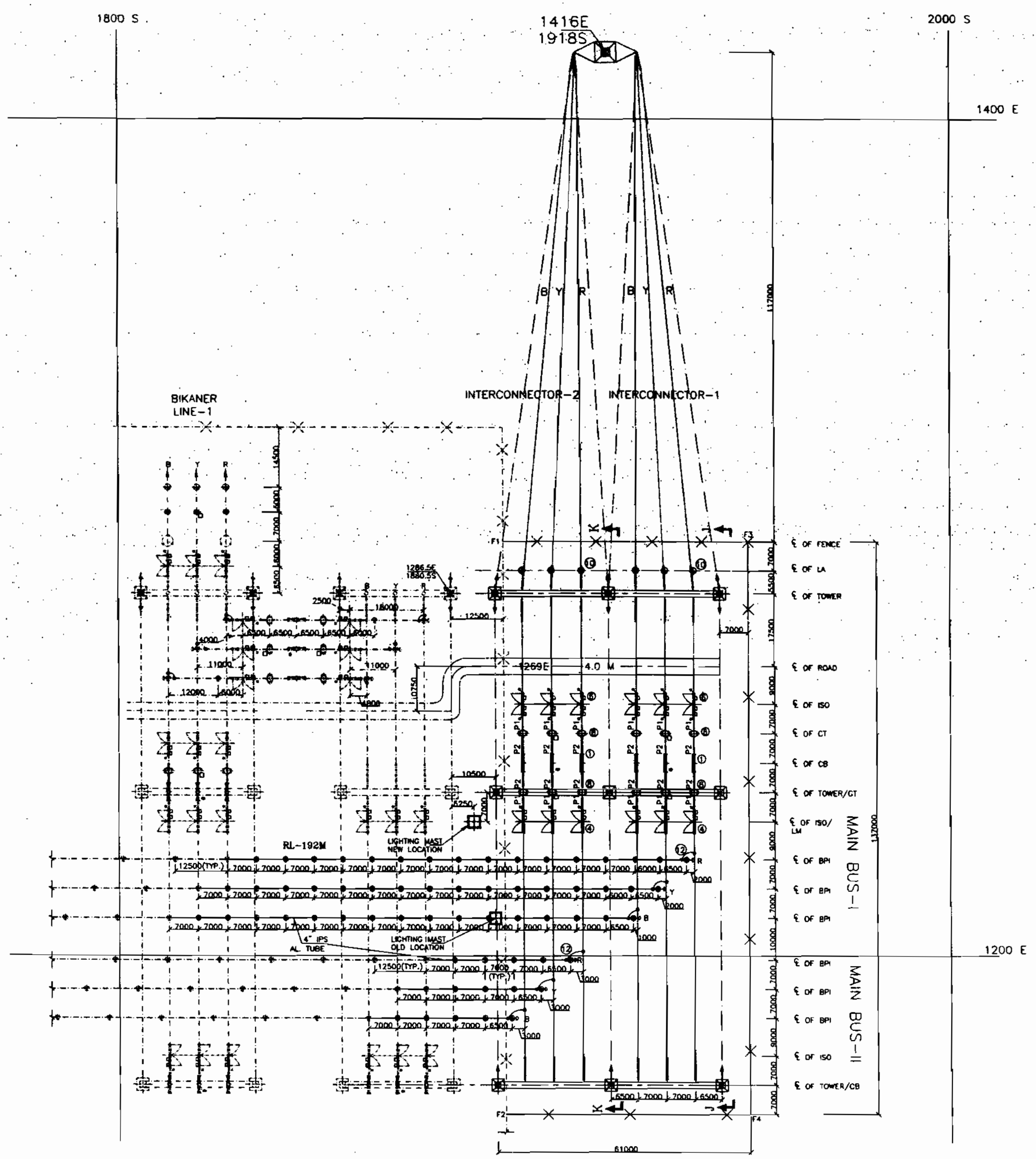
DEPT CODE		NAME	SIGN.	DATE
422	DRN	RK	-SD-	05.08.13
	DESN	SK	-SD-	
	CHD	SKS	-SD-	
	APPD	SS		

TITLE
LAYOUT PLAN FOR 400kV S/S AT SURATGARH

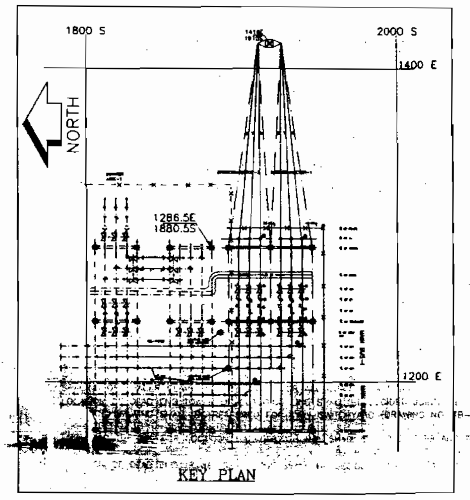
CV	ME	EL	I&C			DEPT.	SCALE 1:650	BHEL/SUB VENDOR DRG NO. TB-0-360-316-002
						SIGN		
						DATE		SHT. No 02 OF 02 REV. 03

FIRST ANGLE PROJECTION

DRG. NO. TB-0-360-316-002



LAYOUT PLAN OF UNIT-6 EXTENSION 420kV SWITCHYARD



KEY PLAN

SCHEDULE OF EQUIPMENT (OUTDOOR)

ITEM CODE	DESCRIPTION	SYMBOLS	QUANTITY IN NOS. UNIT 7&8 SWITCHYARD	UNIT 6 EXTN. SWITCHYARD
1.	420kV, 3150A, 3-PHASE, 50 kA FOR 3 Sec. SF6 CIRCUIT BREAKERS WITHOUT CLOSING RESISTOR SUITABLE FOR SINGLE AND 3-PHASE OPERATION.		6	2
2.	420kV, 3150A, 3-PHASE, 50 kA FOR 3 Sec. SF6 CIRCUIT BREAKERS WITH CLOSING RESISTOR SUITABLE FOR SINGLE AND 3-PHASE OPERATION.		6	-
3	420kV, 3150A, 3-PHASE, 50 kA FOR 3 Sec. SF6 CIRCUIT BREAKERS WITHOUT CLOSING RESISTOR WITH CONTROLLED SWITCHING DEVICE SUITABLE FOR SINGLE AND 3-PHASE OPERATION.		7	-
4	420kV, 3150A 3-PHASE, 50 kA FOR 3 Sec. HCB ISOLATOR (ELECTRICALLY GANGED MOTOR OPERATED) WITH ONE E/S ON RIGHT SIDE (MANUALLY OPERATED)		23	2
5	420kV, 3150A 3-PHASE, 50 kA FOR 3 Sec. HCB ISOLATOR (ELECTRICALLY GANGED MOTOR OPERATED) WITH ONE E/S ON LEFT SIDE (MANUALLY OPERATED)		17	-
6	420kV, 3150A 3-PHASE, 50 kA FOR 3 Sec. HCB ISOLATOR (ELECTRICALLY GANGED MOTOR OPERATED) WITH TWO E/S (MANUALLY OPERATED)		8	2
7	420kV, 3000A, 50kA FOR 3 Sec: 1-PHASE, 8 CORE CURRENT TRANSFORMER		54	-
8	420kV, 3000A, 50kA FOR 3 Sec. 1-PHASE, 3 CORE CURRENT TRANSFORMER		24	12
9	420kV, 4400 pF, $\frac{400}{\sqrt{3}}$ / $\frac{0.110}{\sqrt{3}}$ / $\frac{0.110}{\sqrt{3}}$ / $\frac{0.110kV}{\sqrt{3}}$ / $\frac{0.110kV}{\sqrt{3}}$, 1-PHASE, 4 CORE CAPACITOR VOLTAGE TRANSFORMER		26	0
10	390kV, 1-PHASE LIGHTNING ARRESTERS,20KA,CLASS-5		42	6
11	420kV, 3150A, 1mH, 1-PHASE WAVE TRAP 50 kA FOR 1 Sec.		8	-
12	420kV, 1-PHASE BUS POST INSULATOR		186	63
13	420kV, 80MVAR, 3-PHASE LINE SHUNT REACTOR		02	-
14	420kV, 50MVAR, 3-PHASE LINE SHUNT REACTOR		02	-
15	420kV, 125MVAR, 3-PHASE BUS SHUNT REACTOR		02	-
16	120kV, 1-PHASE LIGHTNING ARRESTERS,10KA,CLASS-3		04	-
17	145kV NGR(60 KVAR, 800 ohm) FOR BABAI LINE REACTOR		02	-
18	145kV NGR FOR BIKANER LINE REACTOR		02	-

\# NGR RATING SHALL BE CONFIRMED BY CUSTOMER

LEGEND TABLE

	PRESENT BHEL SCOPE OF SUPPLY
	EXISTING
	CUSTOMER SCOPE
	SHIELD WIRE
	FENCE
	TENSION STRING INSULATOR
	SUSPENSION STRING INSULATOR
	COLUMN WITH PEAK
	CORONA END BELL
	TUBE
	CONDUCTOR
	RAIL

REFERENCE

1. SINGLE LINE DIAGRAM FOR 400 kV SURATGARH SUBSTATION - ORG. TB-1-360-510-001
2. PLOT PLAN DRAWING NO. PE-DG-392-100-M001
3. LAYOUT OF TRANSFORMER YARD DRAWING NO. PE-DG-392-100-E001
4. 400kV SWITCHYARD LAYOUT PLAN & SECTION DRAWING NO. TCE.5750A-739-GA-3011,P4
5. 400/220kV SWITCHYARD LAYOUT PLAN OF UNIT-6 DRAWING NO. 3VYN191103
6. SWITCHYARD CONTROL ROOM DRAWING NO. TB-3-360-316-009
7. LAYOUT & ELEVATION OF 11kV S/S DRAWING NO. TB-3-360-316-016
8. LAYOUT & ELEVATION OF INTERCONNECTION LINE DRAWING NO. TB-0-360-316-[illegible]
9. ELECTRICAL CLEARENCE DIAGRAM DRAWING NO. TB-3-360-316-015
10. TRENCH LAYOUT OUTDOOR S/S DRAWING NO. TB-0-360-316-008
11. EARTHMAT LAYOUT DRAWING NO. TB-0-360-316-007
12. ERECTION KEY DIAGRAM OF S/S DRAWING NO. TB-3-360-316-006
13. STRUCTURE LOADING DIAGRAM DRAWING NO. TB-0-360-316-010

NOTE :-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. SYSTEM PARAMETERS

S. NOS.	DESCRIPTION	UNIT	
1	NOMINAL SYSTEM VOLTAGE	kV	400
2.	HIGHEST SYSTEM VOLTAGE	kV	420
3.	BASIC IMPULSE LEVEL	kVP	1425
4.	POWER FREQUENCY WITHSTAND	kVrms	630
5.	SWITCHING IMPULSE WITHSTAND VOLTAGE	kVrms	1050
6	CREEPAGE DISTANCE (MINIMUM)	mm/kV	31
7.	SYSTEM FAULT LEVEL FOR 3 SEC	kA	50

3. CONDUCTOR DETAIL

S. NOS.	DESCRIPTION	UNIT 6 EXTN. SWITCHYARD	UNIT 7&8 SWITCHYARD
1.	MAIN BUS	4"IPS (EXTRA HEAVY DUTY) AL TUBE OD=114.20mm ID=97.18mm	4.5"IPS (EXTRA HEAVY DUTY) AL TUBE OD=127mm ID=108.967mm
2.	EQUIPMENT INTERCONNECTION	4.5"IPS (EXTRA HEAVY DUTY) AL TUBE/TWIN/ QUAD MOOSE ACSR	4.5"IPS (EXTRA HEAVY DUTY) AL TUBE/TWIN/ QUAD MOOSE ACSR
3.	JUMPER /DROPPERS	TWIN/QUAD MOOSE ACSR	TWIN/QUAD MOOSE ACSR
4.	SHIELD WIRE	7/4.06 (7/8 SWG) GALVANISED STEEL (12.2mm DIA)	7/4.06 (7/8 SWG) GALVANISED STEEL (12.2mm DIA)

4. ALL THE BUS BARS AND STRUNG BUSES ARE PROTECTED FROM 7/4.06 GALVANISED STEEL WIRE.
5. DURING ERECTION, 3 NOS. FOUNDATIONS FOR WAVE TRAP IN EACH FEEDER BAY OF 400KV SWITCHYARD TO BE CASTED, ONLY 2 NOS. WAVE TRAP PER FEEDER BAY WILL BE UTILISED DURING COMMISSIONING AS PER PLCC REQUIREMENT AND AFTER NECESSARY TESTING.
6. SUPPLY AND STRINGING OF BIKANER & BABAI LINE CONDUCTOR, SHIELD WIRE, INSULATOR AND HARDWARE BETWEEN DEAD END TOWER AND SUBSTATION TERMINAL GANTRY ARE NOT IN BHEL SCOPE. HOWEVER, JUMPERING FOR THE RESPECTIVE EQUIPMENT SHIELDING REQUIREMENT FOR PROTECTION OF LIVE EQUIPMENT, JUMPERS & HARDWARE REQUIRED FOR JUMPERS ARE IN SCOPE OF BHEL.
7. ROAD INSIDE SWITCHYARD FENCE & APPROACH ROAD TO SWITCHYARD FROM POWER PLANT ROAD SHALL BE IN TBC SCOPE.
8. ALL SWITCHYARD EQUIPMENTS & TOWER STRUCTURE SHALL BE LATTICE TYPE.
9. THE TOP OF THE BOLT OF LA (COMING IN TRANSFORMER YARD) FOUNDATION SHALL BE LOWER BY 150MM THAN THE TOP OF RAIL. THIS IS TO FACILITATE THE REMOVAL OF LA STRUCTURE DURING TRANSFORMER TO BE TAKEN OUT FOR REPAIR/ REPLACEMENT
10. REFER PLOT PLAN FOR MAIN ROAD OUTSIDE OF SWITCHYARD.
11. SEPARATE DRAWING SHALL BE REFERRED FOR ERECTION KEY DIAGRAM, TRENCH LAYOUT, EARTHMAT LAYOUT, CONTROL ROOM, TOWER/ BEAM, FIRE FIGHTING SYSTEM, ILLUMINATION SYSTEM, AIR CONDITIONING & VENTILATION SYSTEM, FENCE, GATE, GRAVEL ETC
12. RL OF UNIT 6 EXTENTION SWITCHYARD IS RL-192MTR. FGL RL OF UNIT 7 & 8 SWITCHYARD IS 193.0 MTR. FFL/PAVING LEVEL OF TRANSFORMER YARD IS 193.4MTR. FGL OF TRANSFORMER YARD IS 193.0MTR.
13. STATIC TENSION ON THE BUSES AND SHIELD WIRE SHALL BE SHOWN IN THE STRUCTURE LOADING DIAGRAM SEPARATELY.
14. EXISTING FENCE BETWEEN F1-F2 SHALL BE DISMANTLED BY BHEL & DISMENTALED FENCE SHALL BE USED BY RUVNL. NEW FENCE BETWEEN F1-F3, F3-F4 & F4-F2 WILL BE PROVIDED BY BHEL.
15. SIZE OF CONTROL BUILDING IS TENTATIVE & SAME SHALL BE FINALIZED AFTER THE APPROVAL OF CONTROL BUILDING DRAWING.
16. SPACING OF SPACER CLAMP WILL BE 4MTR. FOR ALL QUAD/TWIN SPAN.
17. [illegible] BE DECIDED JOINTLY BY BHEL & CUSTOMER.
18. [illegible] DRAWING NO. TB-3-360-316-016 [illegible] 420kV INTERCONNECTING LINE
19. [illegible] TO SUIT TO AND FRO MOVEMENT OF TRAILOR CARRYING 80/50 MVAR LINE REACTOR
20. [illegible] REACTOR WILL BE MOUNTED ON STRUCTURE OF MINIMUM HEIGHT OF 2.5 MTR.
21. LOCATION OF [illegible] LINE SHALL BE DECIDED JOINTLY BY BHEL & CUSTOMER.

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02	05.02.14	AS PER TCE LETTER DATED 29.11.13	RK	SK -SD-	SKS-SD-	RS -SD-
01	04.10.13	AS PER TCE LETTER DATED 16.09.13	RK	SK -SD-	SKS -SD-	RS -SD-

OWNER
RAJASTHAN RAJYA VIDYUT UTPANDAN NIGAM LIMITED

PROJECT
2X660MW THERMAL POWER PLANT,SURAT GARH STAGE-V, UNIT 7 & 8 AT SURATGARH , RAJASTHAN

OWNER'S ENGINEER
TATA CONSULTING ENGINEERS LIMITED

EPC CONTRACTOR
BHARAT HEAVY ELECTRICALS LTD
TRANSMISSION BUSINESS GROUP

DEPT CODE		NAME	SIGN.	DATE
422	DRN	RK	-SD-	05.08.13
	DESN	SK	-SD-	
	CHD	SKS	-SD-	
	APPD	SS	-SD-	

TITLE
LAYOUT PLAN FOR 400kV S/S AT SURATGARH

CV | ME | EL | I&C | DEPT | SIGN | DATE

SCALE 1:600

DRG. NO. TB-0-360-316-002

SHT. No 01 OF 02 REV. 03

NORTH

SERVICE BUILDING
3624.3 S
945.0 E

3660.0S
945.0 E

AIR WASHER ROOM UNIT-8

MCC ROOM

AIR WASHER ROOM UNIT-7

MCC ROOM

COMPRESSOR HOUSE

SPACE FOR UNLOADING

SPACE FOR UNLOADING

CL OF GENERATOR

CL OF GENERATOR

PASSAGE AREA

PASSAGE AREA

16000

14000

29400

15000

15000

248500

2M WIDE ROAD 1034.0E

TRANSFORMER # R&I

TRANSFORMER # R&I

TRANSFORMER # R&I

TRANSFORMER # R&I

TRANSFORMER # R&I

TRANSFORMER # R&I

3812.700 S
1016.000 E

3690.200 S
1025.000 E

CUSTOMER : RAJASTHAN RAJYA VIDYUT UTPADAN NIGAM LTD

2 X 660 MW SUPER CRITICAL THERMAL POWER PROJECT, STAGE-V, UNITS #7 & #8 AT SURATGARH, RAJASTHAN

CONSULTANT : TATA CONSULTING ENGINEERS LIMITED

PROJECT : 2 X 660 MW SUPER CRITICAL TPS
(SURATGARH, STAGE-V, UNIT # 7 & 8)

STATUS : CONTRACT

DISTRIBUTION :

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

TITLE : TRANSFORMER YARD LAYOUT

DRAWING No : PE-DG-392-100-E001

SCALE :

SHEET 1 OF 2

REV 02

SIZE-A0