

DATA SHEET FOR IONISATION SMOKE DETECTOR

1.0	Manufacturer	POWERGRID Approved make
3.0	Principle of operation	Ionisation of air by Radio-active source.
4.0	Radio-active source	Americium - 241
5.0	Max. recommended spacing	9 m.
6.0	Normal operating temperature	-10°C to 60°C
8.0	Guaranteed to function properly without any maintenance work for a period of not less than ten (10) years	Yes. Accumulated dust to be removed periodically by blowing air.
9.0	Approval of detector	FM of USA, UL of USA, LPCB of U.K. or VDS of Germany
10.0	Cabling.	2C x 1.5 sq.mm. Un-armoured PVC insulated FR cables conforming to IS 1554 (Part 1).

<u>DATA SHEET FOR 2C x 1.5sq.mm Un-armoured cable.</u>		
1	Make	POWERGRID approved make
2	Type	Control Cable
3.	Number of cores	Two (2)
4.	Size	1.5 sq. mm.
5.	Voltage Grade	1.1 kV
6.	Applicable standard	IS:1554 Part 1
7.	Conductor Material	Plain annealed electrolytic copper
8.	Conductor construction	Stranded
9	Conductor resistance.	12.1 Ohms/kM at 20 ^o C
10	Insulation material	PVC insulation Type A as per IS:5831
11	Insulation thickness	0.8 mm Nominal
12	Identification	Red & Black
13	Inner sheath material	PVC compound Type ST1 as per IS:5831
14	Inner sheath thickness	0.3 mm Minimum
15	Outer sheath material	PVC compound Type ST2 as per IS:5381,FR.
16	Outer sheath thickness	1.8 mm Nominal.
17	outer sheath colour	Grey
18	Overall Diameter	As per manufacturer design data

DATA SHEET FOR MANUAL CALL POINT

1.0	Manufacturer	POWERGRID Approved make
2.0	Construction	Deep drawn sheet steel
3.0	Type	Break glass with push button.
4.0	Operating Voltage	24V DC $\pm$ 10%
5.0	Type of control	Pole- NO/NC
6.0	Degree of protection	IP 52
7.0	Material of housing.	M.S. 18 Gauge
8.0	Colour	FIRE RED
9.0	Accessories	Hammer & Chain assembly

DATA SHEET FOR FIRE ALARM SOUNDER (HOOTER)

1.0	Manufacturer	POWERGRID Approved make
2.0	Construction	Deep drawn sheet steel
3.0	Type	Dual tone/ Single tone
4.0	Operating Voltage	24V DC $\pm$ 10%
5.0	Output	Not less than 80dB(A) but not more than 120dB(A) at 1.5m distance.
6.0	Output frequency range	500Hz. to 1000 Hz.
7.0	Operating time	50 minutes (Minimum)
8.0	Material of housing.	M.S. 18 Gauge
9.0	Colour	FIRE RED
10.0	Marking	FIRE ALARM.

<u>DATA SHEET FOR GLOBE VALVE.</u>		
1.0	Nominal size in mm.	15 TO 40
2.0	Make	POWERGRID approved make
3.0	Type	Globe
4.0	Number	As per approved system drawings.
5.0	Material of construction	
5.1	Body	Bronze to IS 318 Grade LTB 2
5.2	Hand wheel	Grey cast iron, grade FG200 of IS 210.
5.3	Bonnet & Bonnet Wedge	Bronze to IS 318 Grade LTB 2
5.4	Trim	Bronze to IS 318 Grade LTB 2
6.0	End connection	Screwed
7.0	Standard	IS:778
8.0	Rating	PN 1.6
9.0	Hydrostatic test pressure	
9.1	Body	24 kg/cm ²
9.2	Seat	16 kg/cm ²

<u>DATA SHEET FOR GUN METAL GATE/ SLUICE VALVE.</u>			
1.0	Nominal size in mm.	15 to 40	50 to 300
2.0	Make	POWERGRID Approved make	
3.0	Type	Gate/Sluice	
4.0	Number	As per approved system drawings.	
5.0	Material of construction		
5.1	Body	Bronze to IS 318 Grade LTB 2	Grey cast iron, grade FG200 of IS 210.
5.2	Hand wheel	Grey cast iron, grade FG200 of IS 210.	
5.3	Bonnet & Wedge	Bronze to IS 318 Gr.LTB 2	Grey cast iron, grade FG200 of IS 210.
5.4	Stem	High tensile brass, grade HT1 or HT2 of IS:320	Stainless steel
6.0	End connection	Screwed	Flanged
7.0	Standard	IS:778	IS:14846
8.0	Rating	PN 1.6	
9.0	Hydrostatic test pressure		
9.1	Body	24 kg/cm ²	
9.2	Seat	16 kg/cm ²	

<u>DATA SHEET FOR FLOAT OPERATED VALVE</u>		
1.0	Manufacturer	POWERGRID Approved make
2.0	Type	Float operated valve
3.0	Size	100 MM
4.0	Quantity	2 nos.
5.0	Material of construction	
5.1	Body	Cast Iron (IS:210 FG:200)
5.2	Seat Ring	Gun Metal (IS:318, LTB-2)
5.3	Disc Ring	Gun Metal (IS:318, LTB-2)
5.4.	Spindle	13% Cr. Stainless steel
5.5	Piston	Cast Iron (IS:210, FG:200)
5.6	Lever	Mild Steel (IS:226)
5.7	Float	Tin Coated Copper
5.8	Fulcrum	Mild Steel (IS:226)
5.9	Pilot Valve	Stainless Steel (AISI-304)
5.10	Gland Packing	Graphited Asbestos Rope
5.11	Bonnet	Cast Iron (IS:210, FG:200)
6.0	Hydrostatic test pressure	
6.1	Body	15 kg / cm ²
6.2	Seat	10 kg / cm ²
7.0	End connection	Flanged connection

<u>DATA SHEET FOR CHECK VALVES (NON-RETURN VALVES)</u>		
1.0.0	Make	POWERGRID Approved make
1.1.0	Type	Swing Check Type
1.2.0	Standard followed	IS:5312
1.3.0	Rating	PN 1.6
1.4.0	Material of construction, Dimensions.	As per IS;5312
1.5.0	Inlet Outlet details	Flanged
1.6.0	Hydraulic test pressure, kg/cm ²	
1.6.1	Body	24
1.6.2	Seat	16

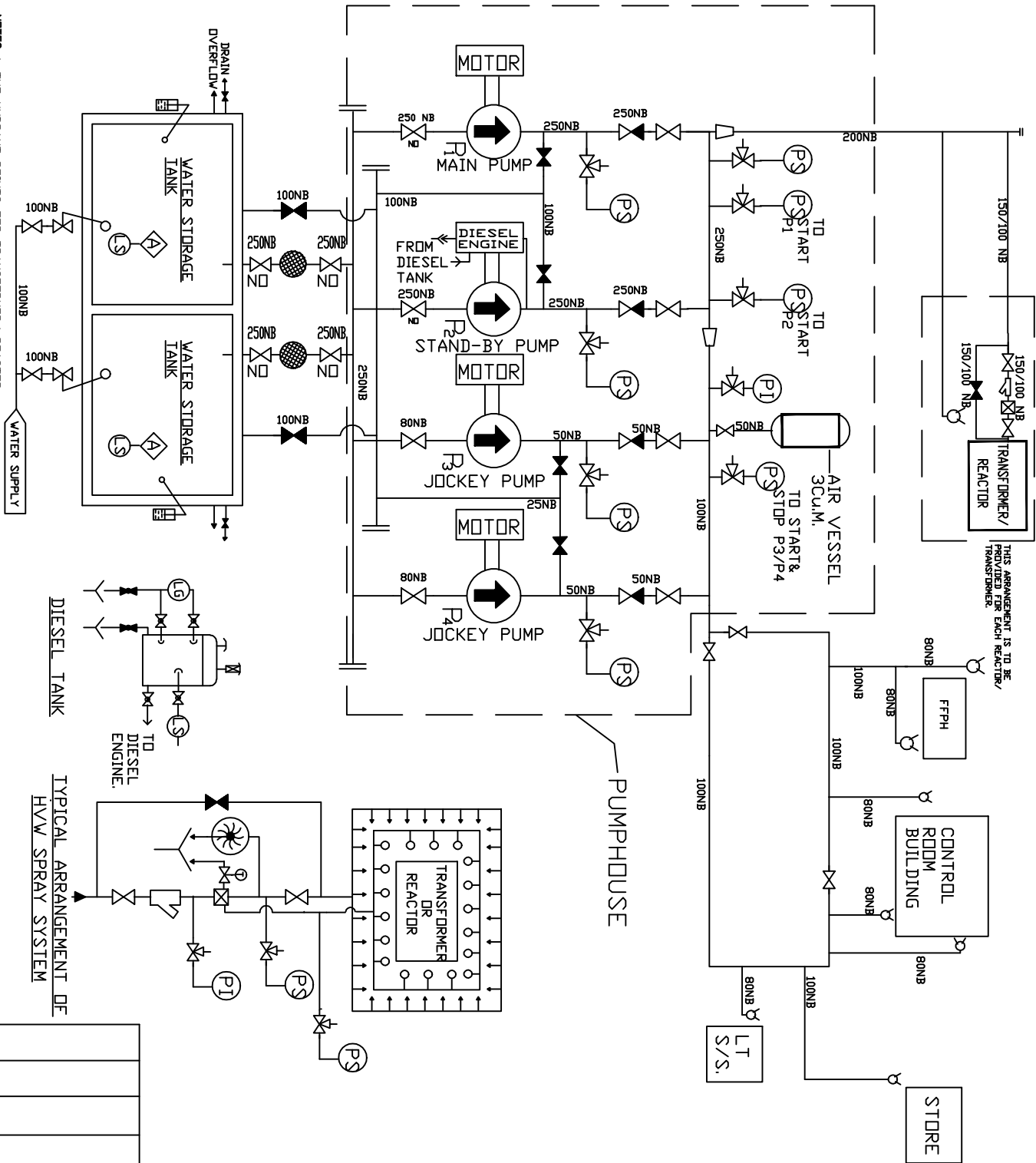
VENDOR LIST FOR FIRE PROTECTION PACKAGE

S.No.	Equipment/Material	Make
1.	Pumps (Horizontal Centrifugal)	KBL/M&P/B&C
2.	Motors (L.T.)	RAJENDRA ELECT.IND./GEC SIEMENS/ ABB/CROMPTON
3.	Diesel Engine	Ruston & Hornsby (Greaves)/ KIRLOSKAR OIL ENGINE LTD
4.	Air Compressor	KGK/ELGI/INGERSOL RAND
5.	Batteries	EXIDE/AMCO/AMARA RAJA
6.	M.S./G.I Pipes	JINDAL/PRAKASH/ SAIL/ LLOYD METALS & ENGINEERS LTD.
7.	C. I. Valves (Gate & Check)	H. Sarkar/Venus/Kalpana
8.	Gun Metal Valves (Globe)	Leader
9.	Float operated Gate Valve	Levcon/Sigma
10.	Deluge Valve	ACE Turnkey/H.D. Fire
11.	Strainer (Y-Type & Basket Type)	Grandprix/Jaypee/Multitex/ Gujarat Otofilt
12.	Hume pipe	Indian Hume Pipe/Pargate Concrete Udyog Delhi
13.	H. V. Spray Nozzles	H.D. Fire/ACE Turnkey
14.	Q. B. Detectors	H.D Fire/ACE Turnkey
15.	Pressure Gauge	H. Guru/General Instrument
16.	Pressure Switches	Indfos/Switzer/Verma Trafag
17.	Level Switches	Levcon/Sigma
18.	Level Indicator	Levcon/Sigma

S.No.	Equipment/Material	Make
19.	Level Gauge	Levcon/Sigma
20.	Hydrant Valves & Accessories	Sukan/Shah Bhogilal
21.	Hoses (Flax Canvas)	Jayshree Calcutta/Newage
22.	Solenoid Valves	AVCON/ROTEX
23.	Heat & Smoke Detectors	Apollo, U.K. /Pyrotonics / System Sensor/ Nittan
24.	Cables	Polycab/PRWE/GEMSCAB/ KEI/PARAMOUNT
25.	Fire Extinguishers	Nitin/Vijay Fire/Lightex/ Zenith/ Minimax
26.	Fire alarm Panels	ECD
27.	Annunciators	Peacon/Piri/Procon
28.	Dished Ends	Anoop Engg./Motilal/Kanara
29.	Local control panels & Annunciation panels.	Suchitra/ Vikas Engg./UNILEC/JASPER/ MIKA/ Bose corporation.
30.	Response Indicators/Hooters Break Glass Units	M.C. Engineering Delhi/ Maths, Bombay/ Mehta & Associates, Ahmedabad.

LEGEND

- ALARM
- GATE VALVE NORMALLY OPEN
- GATE VALVE NORMALLY CLOSED
- NON-RETURN VALVE
- GLOBE VALVE NORMALLY OPEN
- GLOBE VALVE NORMALLY CLOSED
- FLOAT OPERATED GATE VALVE
- TEST VALVE
- P1 PRESSURE GAUGE
- P2 PRESSURE SWITCH
- G1 LEVEL GAUGE
- G2 LEVEL GAUGE
- S1 LEVEL SWITCH
- BASKET STRAINER
- FLOAT OPERATED LEVEL GAUGE
- Y-TYPE STRAINER
- WATER MOTOR GONG
- REDUCER
- THREE WAY COCK/ VALVE
- VENT
- DRAIN
- OUT DOOR HYDRANT
- QUARTZOID BULB DETECTOR
- HVW SPRAY NOZZLE
- PUMP
- WATER LINE
- DELUGE VALVE



NOTES: 1. THE HYDRANT POINTS FOR TRANSFORMER/ REACTOR SHALL BE LOCATED AT LEAST 20M AWAY FROM THEM.

2. AS SAFETY MEASURE, A WARNING PLATE SHALL BE PLACED NEAR HYDRANT POINTS FOR TRANSFORMER/ REACTOR TO CLEARLY INDICATE THAT WATER SHALL BE SPRAYED ONLY AFTER ENSURING THAT THE POWER TO THE TRANSFORMER/ REACTOR WHICH IS ON FIRE IS SWITCHED OFF AND THERE ARE NO LIVE PART WITHIN 20 M. DISTANCE OF THE PERSONNEL USING THE HYDRANT.

FOR TENDER PURPOSE ONLY

POWER GRID CORPORATION
OF INDIA LIMITED

GOVERNMENT OF INDIA ENTERPRISES



PROJECT:

220KV AND 132KV SUBSTATION

TITLE: PIPING & INSTRUMENTATION DIAGRAM FOR HYDRANT & HVW SPRAY SYSTEM

DATE DRAWN: 21.09.2012

DRAWN BY: HIMANSHU

CHECKED BY: A.P. GANGADHARAN

RECOMMENDED

Sheet 1 of 1

SECTION-3

SECTION -PROJECT

<u>CLAUSE NO.</u>	<u>PARTICULARS</u>	<u>PAGE NO.</u>
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9.0	SPECIAL TOOLS AND TACKLES	16
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ANNEXURE –II	NTAMC SCADA SYSTEM	
ANNEXURE –III	DESCRIPTION OF ITEMS OF BPS GIVEN IN SHORT	

1.0 GENERAL

1.1 Preamble:

1.1.1 Power Grid Corporation of India Ltd. (POWERGRID), a Govt. of India Enterprise is responsible for bulk Power transmission of electrical energy from various Central Govt. Power Projects to various utilities/beneficiaries and interconnecting regional grids, operating and maintaining the National electrical grid of India. It is established with mandate of "We will become a Global Transmission Company with Dominant Leadership in Emerging Power Markets with World Class Capabilities by:

1. World Class: Setting superior standards in capital project management and operations for the industry and ourselves.
2. Global: Leveraging capabilities to consistently generate maximum value for all stakeholders in India and in emerging and growing economies.
3. Inspiring, nurturing and empowering the next generation of professionals.
4. Achieving continuous improvements through innovation and state of the art technology.
5. Committing to highest standards in health, safety, security and environment." as its mission.

1.1.2 POWERGRID is extending 400kV Biharshariff S/S, 400kV Jamshedpur S/S, 400kV Gazuwaka S/S, 400kV Rengali S/S, 400kV Rourkela S/S, 400kV Durgapur S/S, 400kV Gorakhpur S/S, under ERSS-IX.

2.0 SCOPE

2.1 The scope of this specification covers the following:-

Under ERSS-IX

- Installation of 1x125MVAR, 420kV Bus Reactor at 400kV Rourkela substation (one 125MVAR Bus Reactor would be installed by replacing existing 50MVAR Bus Reactor).
- Installation of 1x125MVAR, 420kV Bus Reactor at 400kV Gazuwaka (ER Bus) substation.
- Installation of 1x125MVAR, 420kV Bus Reactor at 400kV Biharshariff substation (one 125MVAR Bus Reactor would be installed in parallel with existing 50MVAR Bus Reactor).
- Installation of 2x125MVAR, 420kV Bus Reactors at 400kV Rengali substation.
- Installation of 2x125MVAR, 420kV Bus Reactors at 400kV Jamshedpur substation (one 125MVAR Bus Reactor would be installed by replacing existing 50MVAR Bus Reactor and other 125MVAR Bus Reactor would be installed in parallel with existing 50MVAR Bus Reactor).
- Installation of 2x125MVAR, 420kV Bus Reactors at 400kV Durgapur Substations (One no. 125MVAR Bus Reactor would be installed in parallel with existing 50MVAR Bus Reactor).
- Converting existing 2x80MVAR Non-switchable (fixed) Line Reactor at Gorakhpur end of 400kV Barh-II-Gorakhpur D/c line to 2x80MVAR Switchable Line Reactors.

2.2 The detailed scope of work is brought out in subsequent clauses of this section.

2.3 Extension of 400kV Rourkela substation

2.3.1 Design, engineering, manufacture, testing, supply on FOR destination site basis, including transportation & insurance, storage, erection, testing and commissioning of the following equipments/items complete in all respects.

- a) 1 no. 420kV, 125MVAR Bus Reactor replacing the existing 50MVAR (3x16.67MVAR) Bus Reactor.
- b) Relay and protection system for 400kV bays under present scope. Existing control and relay panel of 50MVAR Bus Reactor shall be utilized for 125MVAR Bus Reactor under present scope. Necessary AC/DC wiring /cabling required in this regard shall be done by contractor.
- c) Tertiary loading of the existing 315MVA, 400/220 kV Auto Transformer including supply of 630kVA, 33/0.433kV LT transformer and connectivity of 415V AC supply from the 630kVA LT transformer (using double run of 1.1kV 630sqmm XLPE Power cable along with accessories) with existing 415V Main switch board are under present scope.
- d) 72.5kV Circuit Breakers, Isolators, Current Transformers & Potential transformers along with equipment support structures (Pipe) as per Employer's standard drawings enclosed
- e) All analog & digital inputs as per Annexure-II shall be hardwired upto NTAMC SCADA system. However integration with NTAMC SCADA is considered under a separate package.
- f) Control switching device for 400kV main and tie Circuit Breaker associated with 125Mvar Bus reactor under present scope as per BPS.
- g) Fire protection system (HFW spray system & hydrant system) for 125MVAR Bus Reactor. The existing piping (for fire protection system of existing 50MVAR Reactor to be replaced) shall further be extended for this purpose. Existing HFW spray system including deluge valve of 420kV, 50MVAR Bus Reactor shall be dismantled & stored at Rourkela substation as per instruction of site in-charge.
- h) 1.1 kV grade Power & Control cables along with complete accessories.
- i) Lattice pipe structure for 72.5kV equipment's as per employers drawing.
- j) Bus Post Insulators, clamps & connectors, Conductors including requirement for Bus Reactor, Aluminum tubes, earthing materials, spacers, PVC pipes for cabling etc.
- k) The main earthmat already exists in the extension area under present scope. All the equipments, Bus Reactor etc. shall be earthed by connecting them to the main earthmat by the contractor.

- l) Dismantling of existing 50 MVAR (3x16.67MVAR) Bus Reactor alongwith all accessories and storing at a suitable location at Rourkela substation as per POWERGRID site in-charge.
 - m) Lighting and illumination for the switchyard.
 - n) Any other equipment/material required to complete the specified scope.
- 2.3.2 Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares.
- 2.3.3 Civil works - The scope of work shall include but shall not be limited to civil works for the following based on owner supplied drawings –
- (a) Foundation for 72.5kV Equipment support structure.
 - (b) Foundation of 630kVA, 33/0.433kV LT Transformer.
 - (c) Modification of existing 420kV, 50MVAR (3x16.67MVAR) Bus Reactor foundation to suit 420kV 125MVAR Bus Reactor along with jacking pads, rail track, pylon supports under present scope.
 - (d) i) Stone has already been laid in the switchyard area under present scope. Removal, cleaning and washing of existing stone and re-spreading after doing anti-weed treatment & PCC as per Section-Civil Works is in the scope of the contractor.
 - ii) In the area under present scope where stone spreading does not exist, the same shall be provided along with anti-weed treatment & PCC as per Section-Civil Works.

2.4 Extension of 400kV Gazuwaka substation

- 2.4.1 Design, engineering, manufacture, testing, supply on FOR destination site basis, including transportation & insurance, storage, erection, testing and commissioning of the following equipments/items complete in all respects.
- a) 1 no.420kV, 125MVAR Bus Reactor.
 - b) 400 kV Circuit Breakers, Isolators, Current Transformers and Surge Arresters.
 - c) i) Complete relay and protection system for 400kV bays under present scope as per Section-Control & Relay Panels.
 - ii) Bus Bar Protection scheme: The existing 400kV bus bar protection scheme at Gazuwaka S/S is ABB make MAC Software (duplicate bus-bar protection scheme for each bus). Necessary integration with existing Busbar protection and providing trip relays & auxiliary relays alongwith AC & DC wiring for the bays under present scope shall be provided by Contractor.
 - d) Bay Control Units (BCU) as per BPS for NTAMC SCADA requirement & integration of these BCUs with NTAMC in line with technical specification for NTAMC SCADA system enclosed at ANEXURE-II.
 - e) Control switching device for 400kV main and tie Circuit Breaker associated with 125Mvar Bus reactor under present scope as per BPS .

- f) Fire protection system (HVW spray system & hydrant system) for 125MVAR Bus Reactor. The existing piping (for fire protection system of line Reactor of Jeypore-I line bay) shall further be extended for this purpose.
 - g) 1.1 kV grade Power & Control cables along with complete accessories.
 - h) Lattice and pipe structures (galvanized) – Towers, Beams & Equipment support structures except Circuit Breaker support structure, shall be provided as per Employer's drawing. Circuit Breaker support structure shall be as per Circuit Breaker manufacturer's design.
 - i) Bus Post Insulators, insulator strings and hardware, clamps & connectors including requirement for Bus Reactor, Aluminum tubes, conductors, Bus bar and earthing materials, Bay marshalling box, spacers, cable supporting angles/channels, cable trays & covers, Junction box, buried cable trenches, PVC pipes for cabling etc.
 - j) Existing Earthmat is to be extended in area under present scope . All the equipments, Bus Reactor, cable trenches, auxiliary earthmat for isolators etc. shall be earthed by connecting them to the main earthmat by the contractor.
 - k) Any other equipment/material required to complete the specified scope.
- 2.4.2 Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares
- 2.4.3 Civil works - The scope of work shall include but shall not be limited to civil works for the following based on owner supplied drawings –
- a) Foundation of 125MVAR Bus Reactor along with jacking pads, rail track, pylon supports.
 - b) Foundations for Towers & Equipment support structures.
 - c) Cable trenches along with covers and sump pits.
 - d) Cable trench crossings with roads, rail tracks, culverts etc.
 - e) i) Stone has already been laid in some portion of the switchyard area under present scope. Removal, cleaning and washing of existing stone and re-spreading after doing anti-weed treatment & PCC as per Section-Civil Works is in the scope of the contractor.
 ii) In the area under present scope where stone spreading does not exist, the same shall be provided along with anti-weed treatment & PCC as per Section-Civil Works.
 - f) All Roads as shown in General Arrangement Drawing including culverts. All roads shall be concrete roads
 - g) Construction of drains.
 - h) Switchyard fencing.
 - i) Dismantling of existing fence as shown in GA drawing (Drg. No. C/ENGG/ER-II/GZK/GA/01, Rev 00) enclosed with tender drawing.

2.5 Extension of 400kV Biharsharif substation

2.5.1 Design, engineering, manufacture, testing, supply on FOR destination site basis, including transportation & insurance, storage, erection, testing and commissioning of the following equipments/items complete in all respects.

- a) 1 no.420kV, 125MVAR Bus Reactor in parallel with the existing 420kV, 50MVAR (3x16.67MVAR) Bus Reactor.
- b) 400 kV Isolators, current transformers and Surge Arresters.
- c) i) Complete relay and protection system for 400kV bays under present scope as per Section-Control & Relay Panels. Augmentation of existing control panel (such as mounting of Isolator control switch, indication lamp, Remote winding temperature indicator, Mvar meter etc.) for diameter associated with 50MVAR bus reactor mentioned above.

ii) TEED protection wiring to be extended to the 125MVAR Bus Reactor.
- d) All analog & digital inputs as per Annexure-II shall be hardwired upto NTAMC SCADA system. However integration with NTAMC SCADA is considered under a separate package
- e) Control switching device for 400kV main and tie Circuit Breaker associated with 125Mvar Bus reactor under present scope as per BPS.
- f) Fire protection system (HVW spray system & hydrant system) for Bus Reactor. The existing piping (for fire protection system near 50MVAR Bus Reactor in parallel with the 125MVAR Bus reactor under present scope) shall be further extended for this purpose. However both the fire fighting system shall operate independently for the reactor.
- g) 1.1 kV grade Power & Control cables along with complete accessories.
- h) Lattice and pipe structures (galvanized) – Towers, Beams & Equipment support structures, except Circuit Breaker support structure, shall be provided as per Employer's drawings. Circuit Breaker support structure shall be as per Circuit Breaker manufacturer's design.
- i) Bus Post Insulators, insulator strings and hardware, clamps & connectors including requirement for Bus Reactor, Aluminum tubes, conductors, Bus bar and earthing materials, Bay marshalling box, spacers, cable supporting angles/channels, cable trays & covers, Junction box, PVC pipes for cabling etc.
- j) The main earthmat already exists in the extension area under present scope. All the equipments, Bus Reactor, cable trenches etc. shall be earthed by connecting them to the main earthmat by the contractor.
- k) **LT switchgear (AC/DC Distribution boards).**

Extension of existing LT A.C. system

Supply, mounting & wiring of following AC feeders in the existing ACDB panels is in present scope:

- a) 100 A, 4 pole MCCB module (Type E) - 2 nos.
- b) 63 A, 4 pole MCCB module (Type E) – 5 nos.

Extension of existing 220V DC system

Supply, mounting & wiring of following DC feeders in the existing DCDB panels is in present scope:

- a) 32 A double pole MCB Module – 12 nos.
 - l) Lighting and illumination for the switchyard.
 - m) Any other equipment/material required to complete the specified scope.
- 2.5.2 Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares
- 2.5.3 Civil works – The scope of work shall include but shall not be limited to civil works for the following based on owner supplied drawings –
- a) Foundation of 125MVAR Bus Reactor along with jacking pads, rail track, pylon supports and fire resistant wall.
 - b) Foundations for Towers & Equipment support structures
 - c) Cable trenches along with covers and sump pits.
 - d) Cable trench crossings with roads, rail tracks, culverts etc.
 - e) i) Stone has already been laid in some portion of the switchyard area under present scope. Removal, cleaning and washing of existing stone and re-spreading after doing anti-weed treatment & PCC as per Section-Civil Works is in the scope of the contractor.

ii) In the area under present scope where stone spreading does not exist, the same shall be provided along with anti-weed treatment & PCC as per Section-Civil Works.

2.6 Extension of 400kV Rengali substation

- 2.6.1 Design, engineering, manufacture, testing, supply on FOR destination site basis, including transportation & insurance, storage, erection, testing and commissioning of the following equipments/items complete in all respects.
- a) Installation of 2 nos. 420kV, 125MVAR Bus Reactors.
 - b) 400 kV Circuit Breakers, Isolators, Current Transformers and Surge Arresters.
 - c) i) Complete relay and protection system for 400kV bays under present scope as per Section- Control & Relay Panels. Augmentation of existing control panel for the 400kV diameter associated with Bus Reactor#1as per single line diagram is under present scope.

ii)Bus bar protection scheme: The existing 400kV bus bar protection scheme at Rengali substation is English Electric make BPDCB (single bus-bar protection scheme for each bus). Augmentation of existing Busbar protection including necessary trip relays & auxiliary relays along with AC & DC wiring for the bays under present scope shall be provided by Contractor.

- d) Bay Control Units (BCU) as per BPS for NTAMC SCADA requirement & integration of these BCUs with NTAMC in line with technical specification for NTAMC SCADA system enclosed at ANEXURE-II.
 - e) Control switching device for 400kV main and tie Circuit Breaker associated with 125Mvar Bus reactor under present scope as per BPS.
 - f) Fire protection system (HVV spray system & hydrant system) for 2 no. 420kV 125MVAR Bus Reactors. The existing piping (for fire protection system of 63MVAR line reactor of Indravati line bay) shall be further extended for this purpose.
 - g) 1.1 kV grade Power & Control cables along with complete accessories.
 - h) Lattice and pipe structures (galvanized) – Towers, Beams & Equipment support structures, except Circuit Breaker support structure, shall be provided as per Employer's drawings. Circuit Breaker support structure shall be as per Circuit Breaker manufacturer's design. Necessary modification in standard lattice structures to suit the existing Towers shall be under present scope.
 - i) Bus Post Insulators, insulator strings and hardware, clamps & connectors including requirement for Bus Reactor, Aluminum tubes, conductors, Bus bar and earthing materials, Bay marshalling box, spacers, cable supporting angles/channels, cable trays & covers, Junction box, buried cable trenches, PVC pipes for cabling etc.
 - j) The main earthmat already exists in the extension area under present scope. All the equipments, Bus Reactor, cable trenches, auxiliary earthmat for isolators etc. shall be earthed by connecting them to the main earthmat by the contractor.
 - k) Lighting and illumination for the switchyard.
 - l) Any other equipment/material required to complete the specified scope.
- 2.6.2 Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares
- 2.6.3 Civil works - The scope of work shall include but shall not be limited to civil works for the following based on owner supplied drawings –
- a) Foundation of 2No. 420kV, 125MVAR Bus Reactors along with jacking pads, rail track, pylon supports and fire resistant wall.
 - b) Foundations for Towers & Equipment support structures.
 - c) Cable trenches along with covers and sump pits.
 - d) Cable trench crossings with roads, rail tracks, culverts etc.
 - e) i) Stone has already been laid in some portion of the switchyard area under present scope. Removal, cleaning and washing of existing stone and re-spreading after doing anti-weed treatment & PCC as per Section-Civil Works is in the scope of the contractor.
 - ii) In the area under present scope where stone spreading does not exist, the same shall be provided along with anti-weed treatment & PCC as per Section-Civil Works.

- f) All Roads as shown in General Arrangement drawing including culverts. All roads shall be concrete roads.
- g) Construction of drains.

2.7 Extension of 400kV Jamshedpur substation

2.7.1 Design, engineering, manufacture, testing, supply on FOR destination site basis, including transportation & insurance, storage, erection, testing and commissioning of the following equipments/items complete in all respects.

- a) 1 no.420kV, 125MVAR Bus Reactor#3 in parallel with the existing 420kV, 50MVAR (3x16.67MVAR) Bus Reactor#1 and 1No. 420kV, 125MVAR Bus Reactor#2 replacing existing 50MVAR (3x16.67MVAR) Bus Reactor.
- b) 400 kV Isolators and Surge Arresters.
- c) Complete relay and protection system for 400kV bays under present scope as per Section- Control & Relay Panels. Augmentation of existing two nos. control panels (such as mounting of Isolator control switch, indication lamp, Remote winding temperature indicator, Mvar meter etc.) for the 400kV diameters associated with Bus Reactors#1&2 as per single line diagram is under present scope.
- d) All analog & digital inputs as per Annexure-II shall be hardwired upto NTAMC SCADA system. However integration with NTAMC SCADA is considered under a separate package
- e) Control switching device for 400kV main and tie Circuit Breaker associated with 125Mvar Bus reactor under present scope as per BPS
- f) Fire protection system (HVW spray system & hydrant system) for 2 no. Bus Reactor. The existing adjacent piping (for fire protection system of existing 50MVAR Bus Reactor-1& 2) shall further be extended for this purpose. Existing fire protection system of existing Bus Reactor-2 along with deluge valve is to be dismantled and handover to the store as per instruction of site incharge.
- g) 1.1 kV grade Power & Control cables along with complete accessories.
- h) Lattice and pipe structures (galvanized) - Equipment support structures, except Circuit Breaker support structure, shall be provided as per Employer's drawings. Circuit Breaker support structure shall be as per Circuit Breaker manufacturer's design.
- i) Bus Post Insulators, clamps & connectors including requirement for Bus Reactor, Aluminum tubes, conductors, earthing materials, Bay marshalling box, spacers, cable supporting angles/channels, cable trays & covers, Junction box, buried cable trenches, PVC pipes for cabling etc.
- j) The main earthmat already exists in the extension area under present scope. All the equipments, Bus Reactors, cable trenches, auxiliary earthmat for isolators etc. shall be earthed by connecting them to the main earthmat by the contractor.
- k) Dismantling of existing 50 MVAR (3x16.67MVAR) Bus Reactor#2 along with all accessories and storing at a suitable location at Jamshedpur substation as per POWERGRID site in-charge.

- l) Lighting and illumination for the switchyard.
 - m) Any other equipment/material required to complete the specified scope.
- 2.7.2 Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares
- 2.7.3 Civil works - The scope of work shall include but shall not be limited to civil works for the following based on owner supplied drawings –
- a) Foundation of 1No. 125MVAR Bus Reactor along with jacking pads, rail track, pylon supports and fire resistant wall.
 - b) Modification of existing 1No. 400kV 50MVAR (3x16.67MVAR) Bus Reactor foundation to suit 1No. 400kV 125MVAR Bus Reactor along with jacking pads, rail track, pylon supports and fire resistant wall under present scope.
 - c) Foundations for Equipment support structures.
 - d) Cable trenches along with covers and sump pits.
 - e) Cable trench crossings with roads, rail tracks, culverts etc.
 - f) i) Stone has already been laid in some portion of the switchyard area under present scope. Removal, cleaning and washing of existing stone and re-spreading after doing anti-weed treatment & PCC as per Section-Civil Works is in the scope of the contractor.
 ii) In the area under present scope where stone spreading does not exist, the same shall be provided along with anti-weed treatment & PCC as per Section-Civil Works.
 - g) All Roads as shown in General Arrangement Drawing including culverts. All roads shall be concrete roads
 - h) Construction of drain.

2.8 Extension of 400kV Durgapur substation

- 2.8.1 Design, engineering, manufacture, testing, supply on FOR destination site basis, including transportation & insurance, storage, erection, testing and commissioning of the following equipments/items complete in all respects.
- a) 1 no.420kV, 125MVAR Bus Reactor#2 in parallel with the existing 420kV, 50MVAR (3x16.67MVAR) Bus Reactor#1 and installation of owner supplied 1 no. 420kV, 125MVAR Bus Reactor#3. The above said 420kV 50MVAR (3x16.67MVAR) Bus Reactor#1 is being dismantled & re-erected at the location shown in tender drawing under a separate package.
 - b) 400 kV Circuit Breakers, Isolators, Current Transformers and Surge Arresters.
 - c) i) Complete relay and protection system for 400kV bays under present scope as per Section- Control & Relay Panels. Augmentation of existing one no. control panel (such as mounting of Isolator control switch, indication lamp, Remote winding

temperature indicator, Mvar meter etc.) for the 400kV diameter associated with Bus Reactors#1 as per single line diagram is under present scope.

ii) Bus bar protection scheme: The existing 400kV bus bar protection scheme at 400kV Durgapur substation is RADHA (Single busbar protection scheme for each bus with check zone. Differential relay of high Impedance type) of M/s ABB make. Necessary AC & DC wiring for the bays under present scope shall be provided by Contractor.

- d) Control switching device for 400kV main and tie Circuit Breaker associated with 125Mvar Bus reactor under present scope as per BPS.
- e) Fire protection system (HVW spray system & hydrant system) for 2 no. 420kV 125MVAR Bus Reactors. The existing adjacent piping (for fire protection system of existing 50MVAR Bus Reactor with Jamshedpur line diameter and existing 315MVA ICT#2) shall further be extended for this purpose
- f) 1.1 kV grade Power & Control cables along with complete accessories.
- g) Lattice and pipe structures (galvanized) – Towers, Beams & Equipment support structures, except Circuit Breaker support structure, shall be provided as per Employer's drawings. Circuit Breaker support structure shall be as per Circuit Breaker manufacturer's design.
- h) Bus Post Insulators, insulator strings and hardware, clamps & connectors including requirement for Bus Reactors, Aluminum tubes, Conductors, Bus bar and earthing materials, spacers, cable supporting angles/channels, cable trays & covers, Junction box, buried cable trenches, PVC pipes for cabling etc.
- i) The main earthmat already exists in the extension area under present scope. All the equipments, Bus Reactor, cable trenches, auxiliary earthmat for isolators etc. shall be earthed by connecting them to the main earthmat by the contractor.

j) LT switchgear (AC/DC Distribution boards).

Extension of existing LT A.C. system

Supply, mounting & wiring of following AC feeders in the existing ACDB panels is in present scope:

- a) 100 A, 4 pole MCCB module (Type E) - 2 nos.
- b) 63 A, 4 pole MCCB module (Type E) – 5 nos.

Extension of existing 220V DC system

Supply, mounting & wiring of following DC feeders in the existing DCDB panels is in present scope:

- a) 32 A double pole MCB Module – 12 nos.

- k) Lighting and illumination for the switchyard under present scope of work.
- l) Any other equipment/material required to complete the specified scope.

2.8.2 Design, engineering, manufacture, testing, supply on FOR destination site basis including transportation & insurance, storage at site of mandatory spares

2.8.3 Civil works - The scope of work shall include but shall not be limited to civil works for the following based on owner supplied drawings –

- a) Foundation of 2No. 125MVAR Bus Reactor along with jacking pads, rail track, pylon supports and fire resistant wall
- b) Foundations for Tower & equipment support structures.
- c) Cable trenches along with covers and sump pits.
- d) Cable trench crossings with roads, rail tracks, culverts etc.
- e) i) Stone has already been laid in some portion of the switchyard area under present scope. Removal, cleaning and washing of existing stone and re-spreading after doing anti-weed treatment & PCC as per Section-Civil Works is in the scope of the contractor.
 ii) In the area under present scope where stone spreading does not exist, the same shall be provided along with anti-weed treatment & PCC as per Section-Civil Works.
- f) All Roads as shown in General Arrangement Drawing including culverts. All roads shall be concrete roads.
- g) Construction of drain.

2.9 Extension of 400/220kV Gorakhpur Substation

2.9.1 Design, engineering, manufacture, testing, supply on FOR destination site basis, including transportation & insurance, storage, erection, testing and commissioning of the following equipments/items complete in all respects.

- a) 400kV Circuit Breakers with controlled switching device.
- b) Complete relay and protection system for 400kV Circuit breakers under present scope as per Section- Control & Relay Panels. The present scope includes:
 - i) Circuit Breaker relay panels along with necessary wiring modification to augment it with existing line and reactor protection. The circuit breaker relay panels shall be placed in existing switchyard panel room.
 - ii) Augmentation of existing control panel located in Control Room for the 400kV diameter associated with 400kV Barh D/C lines with reactors as per single line diagram.
 - iii) Augmentations of existing RTU & LDMS for bays under present scope. The existing RTU is of ABB make, model RTU-232 and SCADA software being used is of Siemens, type SICAM PAS. The hardware for bays under present scope along with necessary modification in software displays database etc is also in scope of Contractor. The control function using DO card is needed at Gorakhpur substation to control the circuit breakers under present scope. However, interfacing, cabling and updation of software to integrate the bays under scope with NRLDC & LDMS shall also be in Contractor's scope.
- c) 1.1 kV grade Power & Control cables along with complete accessories.
- d) Circuit Breaker support structure shall be as per Circuit Breaker manufacturer's design.

- e) Clamps & connectors, conductors, earthing materials, spacers, cable supporting angles/channels, cable trays & covers, PVC pipes for cabling etc.
 - f) The main earthmat already exists in the extension area under present scope. Circuit Breakers shall be earthed by connecting them to the main earthmat by the contractor.
 - g) Any other equipment/material required to complete the specified scope.
- 2.9.2 Dismantling of existing 6 Nos. BPIs along with connectors, structures and handing over to site shall be under contractor's scope.
- 2.9.3 Civil works - The scope of work shall include but shall not be limited to civil works for the following based on owner supplied drawings -
- (a) Foundations for Circuit Breaker support structures.
 - (b) Cable trenches along with covers and sump pits.
 - (c) Cable trench crossings with roads, rail tracks, culverts etc.
 - (d) Stone has already been laid in some portion of the switchyard area under present scope. Removal, cleaning and washing of existing stone and re-spreading after doing anti-weed treatment shall be under present scope. Extra matching stone and antiweed treatment, if required, for completion of the scope of work shall also be in the contractor's scope.
- 2.10 Foundation of lighting poles, Bay Marshalling Box, Panels & Control cubicles of equipment, wherever required shall be as per contractor drawing.
- 2.11 Before proceeding with the construction work of existing substation, the Contractor shall fully familiarize himself with the site conditions and General arrangements & scheme etc. Though the Employer shall endeavor to provide the information, it shall not be binding for the Employer to provide the same. The bidders are advised to visit the substation sites and acquaint themselves with the topography, infrastructure and also the design philosophy. The bidder shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the construction and successful commissioning, operation & maintenance of the substation in all respects. All materials required for the Civil and construction/installation work shall be supplied by the Contractor. The cement and steel shall also be supplied by the Contractor.
The complete design **(unless specified otherwise in specification elsewhere)** and detailed engineering shall be done by the Contractor based on conceptual tender drawings.
- 2.12 The Contractor shall also be responsible for the overall co-ordination with internal/external agencies, project management, training of Employer's manpower, loading, unloading, handling, moving to final destination for successful erection, testing and commissioning of the substation/switchyard.
- 2.13 Design of substation and its associated electrical & mechanical auxiliaries systems includes preparation of foundation & cable trench layouts, erection key diagrams, and electrical and physical clearance diagrams, control and protection schematics, wiring and termination schedules, design of fire fighting system, outdoor lighting/illumination and

other relevant drawings & documents required for engineering of all facilities within the fencing to be provided under this contract, are covered under the scope of the Contractor.

- 2.14 Employer has standardized its technical specification for various equipments and works for different voltage levels. Items, which are not applicable for the scope of this package as per schedule of quantities described in BPS, the technical specification for the items should not be referred to.
- 2.15 The layout of the existing control, relay & protection panels and necessary interface schematics shall be provided to the successful bidder during detailed Engineering.
- 2.16 The lighting fixtures for the switchyard lighting may be mounted on Lightning masts or on Gantry structures to be provided by the contractor.
- 2.17 Any other items not specifically mentioned in the specification but which are required for erection, testing and commissioning and satisfactory operation of the substation are deemed to be included in the scope of the specification unless specifically excluded.

3.0 SPECIFIC EXCLUSIONS

The following items of work are specifically excluded from the scope of the specifications substation

- a) Soil investigation including soil resistivity measurement.
- b) Contouring and substation leveling.

4.0 PHYSICAL AND OTHER PARAMETERS

- 4.1 **Location of the Substation** - The location of substation is indicated below:

S. No.	Name of Substation	Name of State	Nearest Rail Head
1.	Rourkela	Orissa	Rourkela
2.	Rengali	Orissa	Talcher Road
3.	Jamshedpur	Jharkhand	Jamshedpur
4.	Gazuwaka	Andhra Pradesh	Vizag
5.	Durgapur	West BEngal	Durgapur
6.	Biharsharif	Bihar	Biharsharif
7.	Gorakhpur	Uttar Pradesh	gorakhpur

4.2 Meteorological data

The meteorological data of the substations shall be furnished to successful bidder. However, for design purposes, ambient temperature should be considered as 50 degree centigrade.

5.0 SCHEDULE OF QUANTITIES

The requirement of various items/equipments and civil works are indicated in Bid price Schedules.

All equipments/items and civil works for which bill of quantity has been indicated in BPS (Bid price Schedules) shall be payable on unit rate basis. During actual execution, any variation in such quantities shall be paid based on the unit rate under each item incorporated in Letter of award.

Wherever the quantities of items/works are not indicated, the bidder is required to estimate the quantity required for entire execution and completion of works and incorporate their price in respective Bid price schedules. For erection hardware items, Bidders shall estimate the total requirement of the works and indicate module-wise lump sum price bay wise and include the same in relevant Bid price schedules. For module identification, Bidder may refer typical drawings enclosed with the specifications. Any material/works for the modules not specifically mentioned in the description in BPS, as may be required shall be deemed to be included in the module itself.

Bidder should include all such items in the bid proposal sheets, which are not specifically mentioned but are essential for the execution of the contract. Item which explicitly may not appear in various schedules and required for successful commissioning of substation shall be included in the bid price and shall be provided at no extra cost to Employer.

6.0 BASIC REFERENCE DRAWINGS

- 6.1 400kV Biharshariff S/S, 400kV Jamshedpur S/S, 400kV Gazuwaka S/S, 400kV Rengali S/S, 400kV Rourkela S/S and 400kV Durgapur S/S are existing substations where breaker and half switching scheme with D-type layout arrangement has been used further Gorakhpur S/S is having breaker and half switching scheme with I type Layout .
- 6.2 The reference drawings, which form a part of the specifications, are given at Annexure-I. The bidder shall maintain the phase to earth clearance, phase to phase clearance and sectional clearances, clearances between buses, bus heights but may alter the locations of equipment to obtain the statutory electrical clearances required for the substation.

The enclosed drawings give the basic scheme, layout of substation, substation buildings, associated services etc. In case of any discrepancy between the drawings and text of specification, the requirements of text shall prevail in general. However, the Bidder is advised to get these clarified from Employer.

7.0 DIFFERENT SECTIONS OF TECHNICAL SPECIFICATION

For the purpose of present scope of work, technical specification (Vol. II) shall consist of following sections and they should be read in conjunction with each other.

- | | |
|---|--|
| 1) Section-Project | (Rev-00) |
| 2) Section-General Technical Requirement (GTR) | (Rev-13) |
| 3) Section- Transformer upto 220kV Class | (Rev 01) |
| 4) Section- Shunt Reactor, NGR & Surge Arrester | (Rev-07) |
| 5) Section-Switchgear | [Rev-10 (Except for Chapter CB)
Rev-10A (for Chapter CB)] |
| 6) Section-Power and Control Cables | (Rev-06) |

7) Section-Lighting System	(Rev-05)
8) Section-Fire Protection System	(Rev-06)
09) Section-Switchyard Erection	(Rev-08)
10) Section- Structures	(Rev.05)
11) Section-Civil Works	(Rev-07)
12) Section-Control and Relay Panels	(Rev-08)
13) Section-Substation Automation System	(Rev-03)
14) Section – LT Transformer	(Rev-04)

In case of any discrepancy between Section-PROJECT and Section-GTR and other technical specifications on scope of works, Section-PROJECT shall prevail over all other sections.

In case of any discrepancy between Section-GTR and individual sections for various equipments, requirement of individual equipment section shall prevail.

8.0 SPARES

Mandatory Spares

The Mandatory Spares shall be included in the bid proposal by the bidder. The prices of these spares shall be given by the Bidder in the relevant schedule of BPS and shall be considered for evaluation of bid. It shall not be binding on the Employer to procure all of these mandatory spares.

The bidder is clarified that no mandatory spares shall be used during the commissioning of the equipment. Any spares required for commissioning purpose shall be arranged by the Contractor. The unutilized spares if any brought for commissioning purpose shall be taken back by the contract.

9.0 SPECIAL TOOLS AND TACKLES

The bidder shall include in his proposal the deployment of all special tools and tackles required for erection, testing, commissioning and maintenance of equipment. The special tools and tackles shall only cover items which are specifically required for the equipment offered and are proprietary in nature. However a list of all such devices should be indicated in the relevant schedule provided in the BPS. In addition to this the Contractor shall also furnish a list of special tools and tackles for the various equipment in a manner to be referred by the Employer during the operation of these equipment. The scope of special tools and tackles are to be decided during detail engineering and the list of special tools and tackles, if any shall be finalized.

10.0 FACILITIES TO BE PROVIDED BY THE EMPLOYER

- 10.1 Employer shall make available the auxiliary LT supplies at the existing substation. The prevailing energy rates of the state shall be applicable. All further distribution from the same for construction and permanent auxiliary supply shall be made by the contractor. However, in case of failure of power due to any unavoidable circumstances, the

contractor shall make his own necessary arrangements like diesel generator sets etc. at his own cost so that progress of work is not affected and Owner shall in no case be responsible for any delay in works because of non-availability of power.

- 10.2 Employer shall make available construction water supply at a single point in the substation. All further distribution for the same shall be made by the Contractor. In case of non-availability or inadequate availability of water for construction work, the contractor shall make his own arrangement at his own cost and the Employer shall in no case be responsible for any delay in works because of non-availability or inadequate availability of water.

11.0 SPECIFIC REQUIREMENT

- a) The Bidders are advised to visit Sub-station site and acquaint themselves with the topography, infrastructure, etc.
- b) The bidder shall be responsible for safety of human and equipment during the working. It will be the responsibility of the Contractor to co-ordinate and obtain Electrical Inspector's clearance before commissioning. Any additional items, modification due to observation of such statutory authorities shall be provided by the Contractor at no extra cost to the Employer.
- c) All Isolators for all substations shall be Double-break type only.
- d) The bidder is required to quote the price of isolator(s) with the insulator as an integral part of the isolator(s). In case, the price of insulators and metallics for the isolator(s) are quoted separately by the bidder, the total price quoted by the bidder for such insulators shall be considered as the lump sum price of insulators required for the specified quantity of isolator(s) under the subject package. In such an event, the quantity of insulators indicated by the bidder shall be treated as the quantity estimated by the bidder.
- e) All RCC shall be of 1:1.5:3(nominal mix) confirming to IS-456. All reinforcement shall be of Fe 500 grade irrespective of grade mentioned in Technical specification.
- f) Layout/drawings of cable trenches, Roads and Drainage shall be prepared by the contractor and shall be submitted for approval by the employer.
- g) The Contractor shall be responsible to select and verify the route, mode of transportation and make all necessary arrangement with the appropriate authorities for the transportation of the equipment. The dimension of the equipment shall be such that when packed for transportation, it will comply with the requirements of loading and clearance restrictions for the selected route. It shall be the responsibility of the contractor to coordinate the arrangement for transportation of the transformers for all the stages from the manufacturer's work to site.

The conditions of roads, capacity of bridges, culverts etc. in the route shall also be assessed by the bidders. The scope of any necessary modification/ extension/ improvement to existing road, bridges, culverts etc. shall be included in the scope of the bidder. The contractor shall carry out the route survey along with the transporter and submit the detail proposal and methodology for transportation of transformer for approval of Purchaser within three months from the date of award

- h) In Section - Shunt Reactor, NGR & SA (Rev 07), clause no. 3.4.3 is amended as follows.

At manufacturer's works the oil used for first filling, testing and impregnation of active parts shall be same type of oil which shall be supplied at site and shall meet parameters as mentioned below

1. Break Down voltage (BDV): 70kV (min.)
2. Moisture content: 10ppm (max.)
3. Tan-delta at 90°C: 0.008 (max)
4. Interfacial tension: 0.035 N/m (min)
5. Resistivity 10X10¹² ohm-cm (Min)

The oil test results shall form part of equipment test report. Oil sample shall be drawn before and after heat run test and shall be tested for dissolved gas analysis, however intermediate samples may be taken by the manufacturer and same shall be part of the test plan. Oil sampling to be done 2 hours prior to commencement of temperature rise test and last sample shall not be taken earlier than 2 hours after shutdown. The acceptance norms with reference to various gas generation rates shall be as per IEC 61181.

- i) **In Section - Shunt Reactor, NGR & SA (Rev 07), clause no. 3.4.2 i) is amended as follows.**
Prior to filling in main tank at site and shall be tested for
1. Break Down voltage (BDV): 70kV (min.)
 2. Moisture content: 05ppm (max.)
 3. Tan-delta at 90°C: 0.0025 (Max)
 4. Interfacial tension: More than 0.04 N/m
- j) **In Section - Shunt Reactor, NGR & SA (Rev 07), clause no. 3.8.1.1 is amended as follows.**
The radiator bank of the shunt reactor shall be either tank mounted or separately mounted based on manufacturer's standard practice. For separate cooler bank arrangement the main tank shall have provision such that cooler banks can be placed on either side. Further POWERGRID has standardized the foundation layout (for main tank and cooler bank) and shall be provided during the design review to the successful bidder.
- k) **For each 420kV Reactor the following accessories shall be provided.**
- a. On-line insulating oil drying system (except thermo-siphon filter).
 - b. On-line dissolved hydrogen and moisture monitor.
 - c. Flow sensitive conservator isolation valve.
- l) **New clause no. 16.28 "Cable Sealing System" for Section Switchyard Erection Rev 08 as:**
Cable sealing system: Modular multi-diameter cable sealing system consisting of frames, blocks and accessories shall be installed where the underground and over ground cables enter or leave concrete bay kiosks/switchyard panel room & control rooms in the substations. Cable sealing system shall consist of multi-diameter type peel-able blocks of different sizes to suit the various cables. It should be simple, easy and quick to assemble & re-assemble the cable sealing system. Solid blocks shall not be used on frame. Frames & stay-plate material shall be of galvanized steel and for compression, single piece wedge with galvanized steel bolts shall be used. 30% spare blocks on the frame shall be provided for expansion in future. Cable sealing system should have been tested for fire/water/smoke tightness.

m) **Section Switchyard Erection (Rev 08) Clause 1.0 is amended as**

“The detailed scope of work includes design, engineering, manufacture, testing at works, supply at site basis, insurance, handling, storage erection testing and commissioning of various items and works as details herein”

- n) The foundation layout of the reactors shall depend on the substation layout arrangement and therefore same shall be finalized during detailed engineering. The position of cooler banks of reactors shall be decided based on substation layout requirement.
- o) The layout of the existing control, relay & protection panels and necessary interface schematics shall be provided to the successful bidder during detailed Engineering.
- p) The lighting fixtures for the switchyard lighting may be mounted on Lightning masts or on Gantry structures to be provided by the contractor.
- q) Repair of roads, cable trenches & drains damaged (excluding normal wear and tear) during removal of gravel and construction works shall also be in bidder's scope.
- r) The supplier shall impart necessary training to Employer's personnel (Two persons) on design, operation, maintenance and commissioning aspect of following items at manufacturer's/supplier's works. However, the traveling and living expenses of Employer's personnel, if any, shall be borne by the Employer.

i) Reactor	3 days
ii) Control & Protection	5 days
iii) Circuit Breaker (Control switching Device)	2 days

- s) Erection, Testing and Commissioning of Reactor , Circuit breakers, Isolators, Relay & protection panels, sub-station automation system and PLCC shall be done by the contractor under the supervision of respective equipment manufacturers. Such supervision charges shall be included by the bidder in the erection charges for the respective equipment in the BPS.
- t) **Qualification requirement of substation erection contractor**

The substation extension works shall be done by bidder himself/contractor who have erected, tested and commissioned as a prime contractor under a single contract, at least two (2) nos. Circuit Breaker equipped bays of 220kV or above voltage level in one substation or switchyard during last seven (7) years as on the originally scheduled date of bid opening and these bays must be in operation as on the originally scheduled date of bid opening.
- u) The short description has been used in the bid price schedule. The details of all such short description are given in Annexure-III of this section project. The bidder shall refer these detailed descriptions for clarity.
- v) The frequency range of earthquake spectra shall be as per IEC-62271-300
- w) The contractor shall be fully responsible for providing all equipment, materials, system and services specified or otherwise which are required to complete the successful erection, testing and commissioning of the equipments in all respects. The Contractor shall arrange all T&P (such as necessary supports, cranes, ladders, platforms etc.) for erection, testing & commissioning of the system at his own cost. Further, all consumables, wastage and damages shall be to the account of contractor.

- x) Clause 24.5(ii).a.(ii) of Section GTR (rev 13) is amended as:

“(ii) a confirmation letter from the parent company or collaborator in the event of award stating that parent company or collaborator shall furnish performance guarantee for an amount of 10 % of the ex-work cost of such equipment (s). This performance guarantee shall be in addition to Contract Performance Guarantee to be submitted by the Bidder.”

- y) Clause 24.6. (ii) (d) of Section GTR (rev 13) is amended as:

“(d) Furnishes a confirmation letter from the parent company or collaborator in the event of award stating that parent company or collaborator shall furnish performance guarantee for an amount of 10% of the cost of such equipment(s). This performance guarantee shall be in addition to contract performance guarantee to be submitted by the Bidder.”

- z) Clause 24.7. (ii) (d) of Section GTR (rev 13) is amended as:

“(d) Furnishes a confirmation letter from the parent company or collaborator in the event of award stating that parent company or collaborator shall furnish performance guarantee for an amount of 10% of the cost of such equipment(s). This performance guarantee shall be in addition to contract performance guarantee to be submitted by the Bidder.”

- aa) Clause 24.8. (ii) (d) of Section GTR (rev 13) is amended as:

“(d) Furnishes a confirmation letter from the parent company or collaborator in the event of award stating that parent company or collaborator shall furnish performance guarantee for an amount of 10% of the cost of such equipment(s). This performance guarantee shall be in addition to contract performance guarantee to be submitted by the Bidder.”

- bb) Section-Switchyard Erection (Rev -08) Clause 1.0 is amended as:

“The detailed Scope of work includes design, engineering , manufacture, testing at works, supply at site basis, insurance, handling, storage erection, testing and commissioning of various items and works as details herein”.

- cc) Insulating oil for all rating of Reactors shall be delivered at respective sites not before 90 days from the date of commissioning, which will be informed by the Employer.
- dd) The fault level of all the equipments to be supplied under present scope shall be as indicated below:

S.No.	Name of S/S	400kV
1.	Rourkela	40kA for 1sec

2.	Rengali	40kA for 1sec
3.	Jamshedpur	40kA for 1sec
4.	Gazuwaka	40kA for 1sec
5.	Durgapur	40kA for 1sec
6.	Biharsharif	40kA for 1sec
7.	Gorakhpur	40kA for 1sec

- ee) Dimension and color of C&R panels at all the existing switchyards shall match with existing panels.
- ff) Electrical type test reports for all rating of Bus Post Insulators are required to be submitted for one sample only instead of two no. of sample as per relevant IS
- gg) Clause 5.0 of Section Structure (Rev 05) stands deleted.
- hh) The successful bidder shall have to supply tower, beams and equipment support Structures as per fabrication drawing and bill of material. Sample structures may be trial assemble in fabrication shop in order to ensure fitments of various members and to avoid problems during erection. Inspection shall be carried out based upon fabrication drawing and bill of material issued to the successful bidder. No proto corrected drawing need to be submitted for approval.
- ii) Section Structure (Rev 05) Clause 16.0 is amended as
The measurement of the standard lattice and pipe structures for towers, beams, equipment support structure etc. shall be made in numbers for each type of structures. This will include foundation bolts and nuts and therefore no separate payment shall be made for the same. Nothing extra shall be payable for substitution necessitated due to non-availability of sections indicated in the standard drawing. Nothing extra shall be payable for modifications or steel added to suit the equipment fixing arrangements for accessories etc.
- jj) For Nonstandard structure (Gantry structure and Equipment support structure), the fasteners and step bolts (Nuts, Bolts and washers) shall be measured under one head and structural steel members & foundation bolts (Bolts, nuts, washers & welded MS plate of foundation bolts) shall be measured under another head as details in BPS.

12.0 PRE-COMMISSIONING, COMMISSIONING, TRIAL-RUN & COMPLETION

As soon as the Facilities covered by these specifications are physically completed in all respects, the pre-commissioning, Commissioning, Trial-run and Completion of the Facilities, as mentioned below, shall be attained in accordance with the procedure given in the Conditions of Contract, Vol.-I of the Bidding Documents.

(i) Pre commissioning: As per relevant Sections

(ii) Commissioning : Charging of the Facilities at rated voltage

Further, wherever appearing in these specifications, the words – ‘commissioning checks’, ‘installation checks’, ‘site tests’, ‘performance guarantee tests for fire protection system’, are to be considered as ‘pre commissioning checks’.

(iii) Trial-run : Operation of the Facilities or any part thereof by the Contractor immediately after the Commissioning for a continuous period of 72(Seventy two) hours continuously. In case of interruption due to problem / failure in the respective equipment, the contractor shall rectify the problem and after rectification, continuous 72(Seventy two) hours period start after such rectification.

(iv) Completion : Upon successful completion of Trial-run.

‘Guarantee Test(s)’ and/or ‘Functional Guarantees’ are applicable only for Substation Automation System as specified in Section-‘Substation Automation System.’

13.0 In Sec-GTR and other technical specifications, the term ‘Owner’ and/or ‘Purchaser’ may be read as Employer.

14.0 All steel works used for grating and support in Reactor foundation shall be painted with Zinc phosphate primer (two packs) conforming to IS: 13238-1991 instead of steel primer and anticorrosive bitumastic paint/synthetic enamel paint mentioned in para 11.6 of section-civil-Rev. 07 of technical specification

Project	Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX	TB-370-522-01 Rev 00	
System	FIRE FIGHTING SYSTEM		
Owner	POWERGRID CORPORATION OF INDIA LTD.		
Purchaser	BHARAT HEAVY ELECTRICALS LTD (Transmission Business Group)		

SECTION 4 GUARANTEED TECHNICAL PARTICULARS

Bidder should refer only latest approved Powergrid's standard GTPs for applicable items of fire fighting system. However some GTP's are given in section-2 (Powergrid specification for reference and tender purpose only.

Project	Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX	TB-370-522-01 Rev 00	
System	FIRE FIGHTING SYSTEM		
Owner	POWERGRID CORPORATION OF INDIA LTD.		
Purchaser	BHARAT HEAVY ELECTRICALS LTD (Transmission Business Group)		

SECTION- 5

ENCLOSURES TO SPECIFICATION

SCHEDULES TO BE FILLED UP BY THE BIDDER

- Schedule 1 **Schedule of makes of Equipments**
 - Schedule 2 **Schedule of Deviations**
 - Schedule 3 **Format for Field Quality Plan**
 - Schedule 4 **Schedule of past experience and qualifying requirements**
 - Schedule 5 **Schedule of performance certificates**
 - Schedule 6 **Schedule of type test and special tests**
 - Schedule 7 **Details of contact persons (technical & commercial)**
 - Schedule 8 **Enclosures to Specification**
- a) List of PGCIL approved makes (APPENDIX-V)**
 - b) Drawings**

Project Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX

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System FIRE FIGHTING SYSTEM
Owner POWERGRID CORPORATION OF INDIA LTD.
Purchaser BHARAT HEAVY ELECTRICALS LTD
(Transmission Business Group)

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

Signature of the authorized representative of Bidder

Name -----

Date

Designation-----

Company seal-----

Project	Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX	TB-370-522-01 Rev 00	
System	FIRE FIGHTING SYSTEM		
Owner	POWERGRID CORPORATION OF INDIA LTD.		
Purchaser	BHARAT HEAVY ELECTRICALS LTD (Transmission Business Group)		

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 is 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

Signature of the authorized representative of Bidder

Name -----

Date

Designation-----

Company seal-----

Project	Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX	TB-370-522-01 Rev 00	
System	FIRE FIGHTING SYSTEM		
Owner	POWERGRID CORPORATION OF INDIA LTD.		
Purchaser	BHARAT HEAVY ELECTRICALS LTD (Transmission Business Group)		

SCHEDULE-3

FORMAT FOR FIELD QUALITY PLAN

	Name of contract Equipment / Items	FIELD QUALITY PLAN FOR _____ SUB SYSTEM _____			MATERIAL-RECEIPT STORAGE / PRE-ERECTION / ERECTION / PRE-COMMISSIONING / COMMISSIONING / POST-COMMISSIONING (DELETE WHICH EVER IS NOT APPLICABLE)			QP No. _____
	Package No. _____ CONTRACTOR _____							Rev No. _____
								Date _____
SL. No.	Characteristics/ Items	Type of Check	Instrument	Class	Quantum / Frequency Of Check	Reference Documents And Acceptance Standard	Format Of Records	Remarks
1	2	3	4	5	6	7	8	9

Place

Signature of the authorized representative of Bidder

Name -----

Date

Designation-----

Company seal -----

Project	Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX	TB-370-522-01 Rev 00	
System	FIRE FIGHTING SYSTEM		
Owner	POWERGRID CORPORATION OF INDIA LTD.		
Purchaser	BHARAT HEAVY ELECTRICALS LTD (Transmission Business Group)		

SCHEDULE – 4

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 _____ Signature of the authorized representative of Bidder

Date _____ 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.

Project	Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX	TB-370-522-01 Rev 00	
System	FIRE FIGHTING SYSTEM		
Owner	POWERGRID CORPORATION OF INDIA LTD.		
Purchaser	BHARAT HEAVY ELECTRICALS LTD (Transmission Business Group)		

SCHEDULE – 5

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 _____ Signature of the authorized representative of Bidder

Date _____ 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.

Project Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX

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System FIRE FIGHTING SYSTEM
Owner POWERGRID CORPORATION OF INDIA LTD.
Purchaser BHARAT HEAVY ELECTRICALS LTD
(Transmission Business Group)

SCHEDULE-6

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 be conducted free or on chargeable basis. Mention 'FREE' or '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-----

Project	Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX	TB-370-522-01 Rev 00	
System	FIRE FIGHTING SYSTEM		
Owner	POWERGRID CORPORATION OF INDIA LTD.		
Purchaser	BHARAT HEAVY ELECTRICALS LTD (Transmission Business Group)		

SCHEDULE-7

DETAILS OF CONTACT PERSON BOTH TECHNICAL AND COMMERCIAL

Name

Address for correspondence

Phone No.

Fax No.

Email

Place

Signature of the authorized representative of Bidder

Date

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.

Project	Sub Station package SS02 for (i) Extension of 400kv Bhiharsharif S/s (ii) Extension of 400kv Jamshedpur S/s (iii) Extension of 400kv Gazuwaka S/s (iv) Extension of 400kv Rengali S/s (v) Extension of 400kv Rourkela S/s (vi) Extension of 400kv Durgapur S/s (vii) Extension of 400kv Gorakhpur S/s under eastern region strengthening scheme-IX	TB-370-522-01 Rev 00	
System	FIRE FIGHTING SYSTEM		
Owner	POWERGRID CORPORATION OF INDIA LTD.		
Purchaser	BHARAT HEAVY ELECTRICALS LTD (Transmission Business Group)		

SCHEDULE –8

ENCLOSURES TO SPECIFICATION

a) List of PGCIL approved makes (APPENDIX-V of Powergrid's specification attached to section-2)

b) DRAWINGS

1. CABLE TRENCH LAYOUT FOR BIHARSHARIFF SUB-STATION EXTN.
DRG. NO. TB-0-370-316-017, REV-0
2. CABLE TRENCH FOR JAMSHEDPUR SUB-STATION EXTN.
DRG. NO. TB-0-370-316-019, REV-0
3. LAYOUT PLAN, TRENCH FOR 400KV GAZUWAKA SUB-STATION EXTN.
DRG. NO. TB-0-370-316-009, REV-0
4. CABLE TRENCH LAYOUT FOR 400KV RENGALI SUB-STATION EXTN.
DRG. NO. TB-0-370-316-018, REV-0
5. CABLE TRENCH LAYOUT FOR 400KV ROURKELA SUB-STATION EXTN.
DRG. NO. TB-0-370-316-015, REV-0
6. CABLE TRENCH LAYOUT FOR 400KV DURGAPUR SUB-STATION EXTN.
DRG. NO. TB-0-370-316-020, REV-0
7. OGA OF 125MVAR REACTOR
DRG. NO. 3-459-00-01389, REV-01



23. INDICATES BRICK WALL SHALL BE PROVIDED IN TRENCH WHERE FUTURE TRENCH/EQUIPMENT PIPE TERMINATED IN PRESENT SCOPE OF TRENCH.

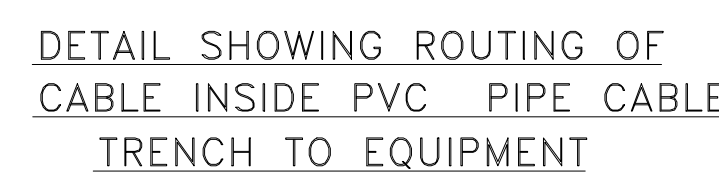
24. SUITABLE PULL OUT BOX SHALL BE PROVIDED IF REQUIRED WHERE CABLE SHALL BE LAID IN PVC PIPE.

25. LONGITUDINAL SLOPE IN CABLE TRENCH SHALL BE TYPICALLY 1:500.

26. RACK ASSEMBLIES FOR CABLE TRENCHES SHALL BE PROVIDED ON THE FACE OF TRENCH WALL MARKED THUS.

27. FOR ALL CIVIL WORKS EXECUTION POWER GRID APPROVED/RELEASED DRGS SHALL BE FOLLOWED.

28. INDICATE DIRECTION OF SLOPE.



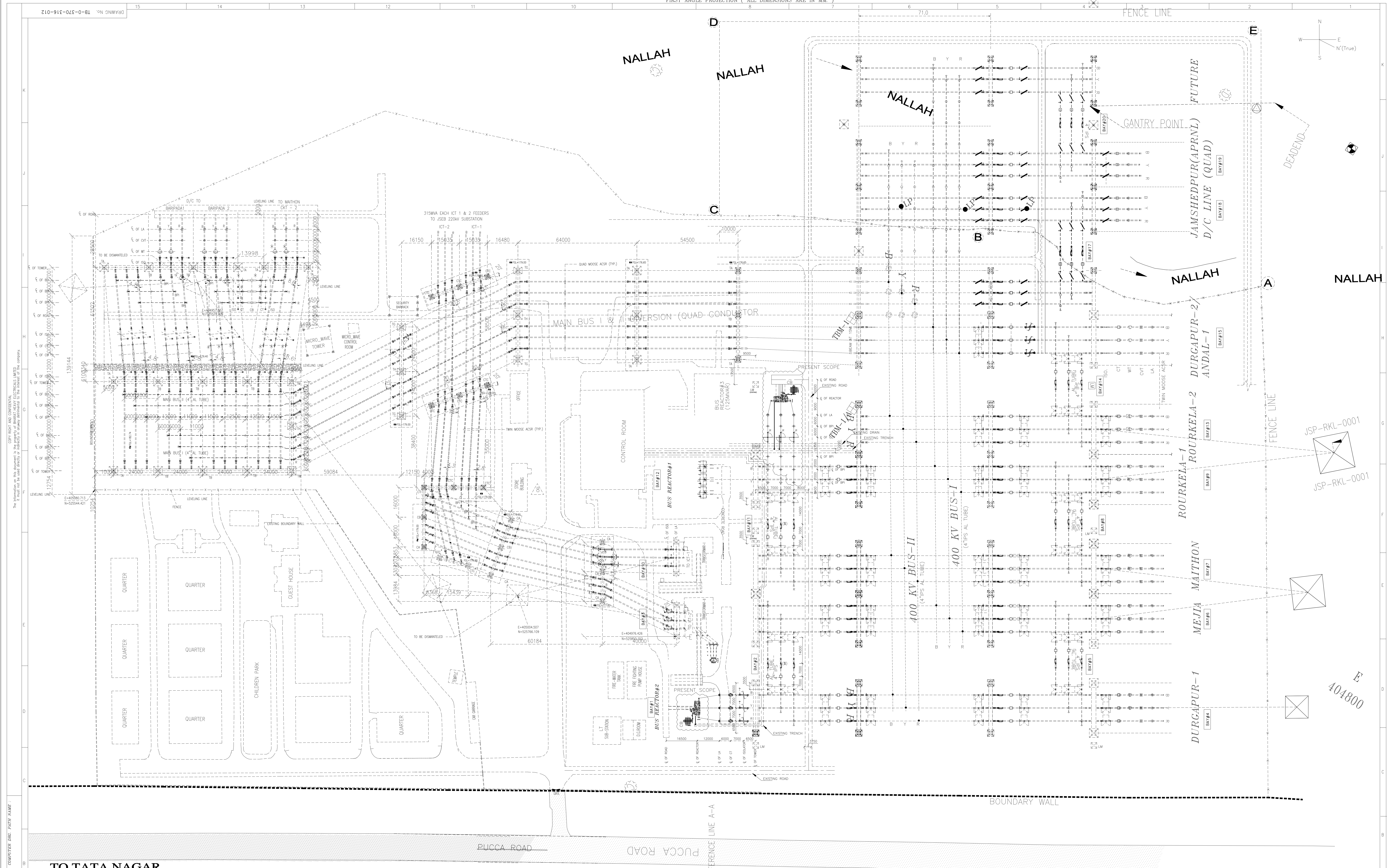
LEGEND TABLE :-

————	PRESENT SCOPE
- - - -	FUTURE/EXISTING

REFERENCE DWG :-

DWG. NO.	TITLE
TB-0-370-316-010	ELECTRICAL PLAN & SECTION LAYOUT FOR 400 KV BIHARSHARIFF S/S EXTN.
TB-3-370-316-003	SINGLE LINE DIAGRAM FOR 400KV BIHARSHARIFF S/S EXTN.

REV.	DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED	REV.	DATE	ALTERED CHECKED	REVISION LEFT PAGE CODE	 उजुपुन / SCALE 1 : 500	एच सी CARD CODE	drawings / 1 1			
ZONE		APPROVED	ZONE		APPROVED	ZONE		APPROVED	ZONE		APPROVED	मीटर/TITLE CABLE TRENCH LAYOUT FOR BIHARSHARIFF SUBSTATION EXTN.	दृष्टी, टा./DRAWING NO. TB-0-370-316-017 00	दृष्टी/REV. 00	005 00	005 00	005 00	005 00



TO TATA NAGAR

NOTES:-

1. ALL DIMENSIONS ARE IN MM.

2. EXISTING CABLE TRENCHES SHALL BE USED FOR LAYING OF NEW CABLES.

3. OPENINGS FOR TAKING OUT PVC PIPES TO EQUIPMENTS SHALL BE PROVIDED IN CABLE TRENCHES.

4. OPENING OF SIZE SUITABLE TO DIA. 50/110 PIPE SHALL BE PROVIDED BELOW TOP CABLE SUPPORT.

5. PVC PIPES DEPTH OF BURIAL SHALL BE 200MM BELOW FINISHED FORMATION LEVEL.

6. BMB = INDICATES BAY MARSHALLING BOX. SUPPLY FOR BMB SHALL BE TAKEN FROM EXISTING NEAREST BMB.

7. CABLES SHALL BE LAID IN MULTILAYER ON CABLE SUPPORT (ANGLES).

8. AUXILIARY POWER CABLES SHALL BE LAID IN TOP TIERS AND CONTROL CABLES IN BOTTOM TIERS, AS PER TECHNICAL SPECIFICATION.

9. BURIED CABLES SHALL BE DONE AS PER SPECIFICATION (INSTALLATION OF CABLES).

10. BURIED CABLES FOR LIGHTING PURPOSE SHALL BE AS PER LIGHTING LAYOUT.

11. CABLES CROSSING ROAD/RAIL TRACK SHALL BE LAID IN BOX CULVERT.

12. FOR POWER & CONTROL SEPARATE PIPES SHALL BE USED CONSIDERING 60% VOID FOR EACH PIPE I.E., 40% FILLING CRITERIA.

13. INDICATES CABLES LAID IN PVC PIPES OF 50/110mm OUTER DIA AT DEPTH OF 300mm (MAX).

14. CABLE FROM EQUIPMENT TO CABLE TRENCH SHALL RUN IN PVC PIPES.

15. MARKED THUS INDICATES CABLE ENTRY/EXIT FROM EQUIPMENT.

16. ALL OTHER DETAILS PERTAINING TO CIVIL WORKS SHALL BE REFLECTED IN THE RESPECTIVE CIVIL DRAWINGS.

14. PVC PIPES SHALL BE SECURELY FIXED AT BOTH ENDS, EITHER EMBEDDED IN CONCRETE OR PROPERLY CLAMPED.

15. AFTER LAYING THE CABLES THE ENDS OF PIPES SHALL BE FULLY SEALED TO PREVENT INGRESS OF WATER INSIDE THE PIPE.

16. CONTROL CABLES & POWER CABLES MUST BE LAID IN SEPARATE PVC PIPES.

17. THE PURPOSE OF TRENCH LAYOUT DRAWING IS FOR USE AS FOLLOWS:
FOR CABLE LAYING AND ROUTING AT SITE.

18. FOR ALL CIVIL WORKS EXECUTION POWER GRID APPROVED/RELEASED DRGS SHALL BE FOLLOWED.

19. PVC CONDUITS USED SHALL BE CLASS-4 AS PER IS-4985.

20. CABLE TRENCH/PVC CONDUITS NEAR ISOLATOR WILL BE ROUTED SUCH THAT LOCATION OF AUXILIARY EARTH-TALLS UNDER OPERATING MECHANISM BOX (MMB).

FOR 400KV EQUIPMENTS

FOR POWER CABLES

FOR CONTROL CABLES

FROM

TO

NO. OF CABLES

NO. OF PIPES

NO. OF TRENCHES

1. TRENCH

2. 400KV 50/110MM W" " "

3. 400KV 50/110MM W" " "

4. 400KV 50/110MM W" " "

5. TRENCH

1

1

1

1

1

1

1

1

1

1

LEGEND TABLE :-

PRESENT SCOPE

FUTURE/EXISTING

ISO AND E/S BOX

REFERENCE DWG :-

DRWG. NO.

C/ENGS/ER-11/MP/ERSS-IX/GA/01

TITLE

GENERAL ARRANGEMENT (TENDER DRG.)

DRWG. NO.

C/ENGS/ER-11/MP/ERSS-IX/PLAN/SECTION/01

TITLE

ELECTRICAL PLAN & SECTION LAYOUT FOR 400 KV JAMSHEDPUR S/S EXTN. (TENDER DRG.)

DRWG. NO.

TB-1-370-316-012

TITLE

ELECTRICAL LAYOUT PLAN & SECTION FOR 400 KV JAMSHEDPUR S/S EXTN.

DRWG. NO.

TB-3-370-316-005

TITLE

SINGLE LINE DIAGRAM FOR 400KV JAMSHEDPUR S/S EXTN.

REV. DATE

ALTERED

CHECKED

APPROVED

REV. DATE

ALTERED

CHECKED

APPROVED

REV. DATE

ALTERED

CHECKED

APPROVED

REV. DATE

ALTERED

CHECKED

APPROVED

ADDITIONAL INFORMATION

W.O. No.

STATUS OF DRAWING

DISTRIBUTION OF PRINTS

POWER GRID CORPORATION OF INDIA LTD.

SUBSTATION PACKAGE-3502 FOR EXTN. OF BHARATPUR, JAMSHEDPUR, CALKANA.

NAME OF CUSTOMER/PROJECT

REGULATORY, POWERCO, DURGAPUR AND DURGAPUR SUBSTATION UNDER ERSS-IX

CC-55/293-ER2/55-2356/3/06/NOA-1/4991, DATED 23.06.2014

BHARAT HEAVY ELECTRICALS LTD.

TRANSMISSION PROJECTS DIVISION

DRG. NO.

TB-1-370-316-019

DRG. REV.

00

DRG. NO./SHEET No.

01

DRG. NO./SHEET No.

02

TO KANDRA

TRENCH LAYOUT FOR

JAMSHEDPUR SUBSTATION EXTN.

300mm / SCALE

1 : 500

DRG. NO.

TB-1-370-316-019

DRG. REV.

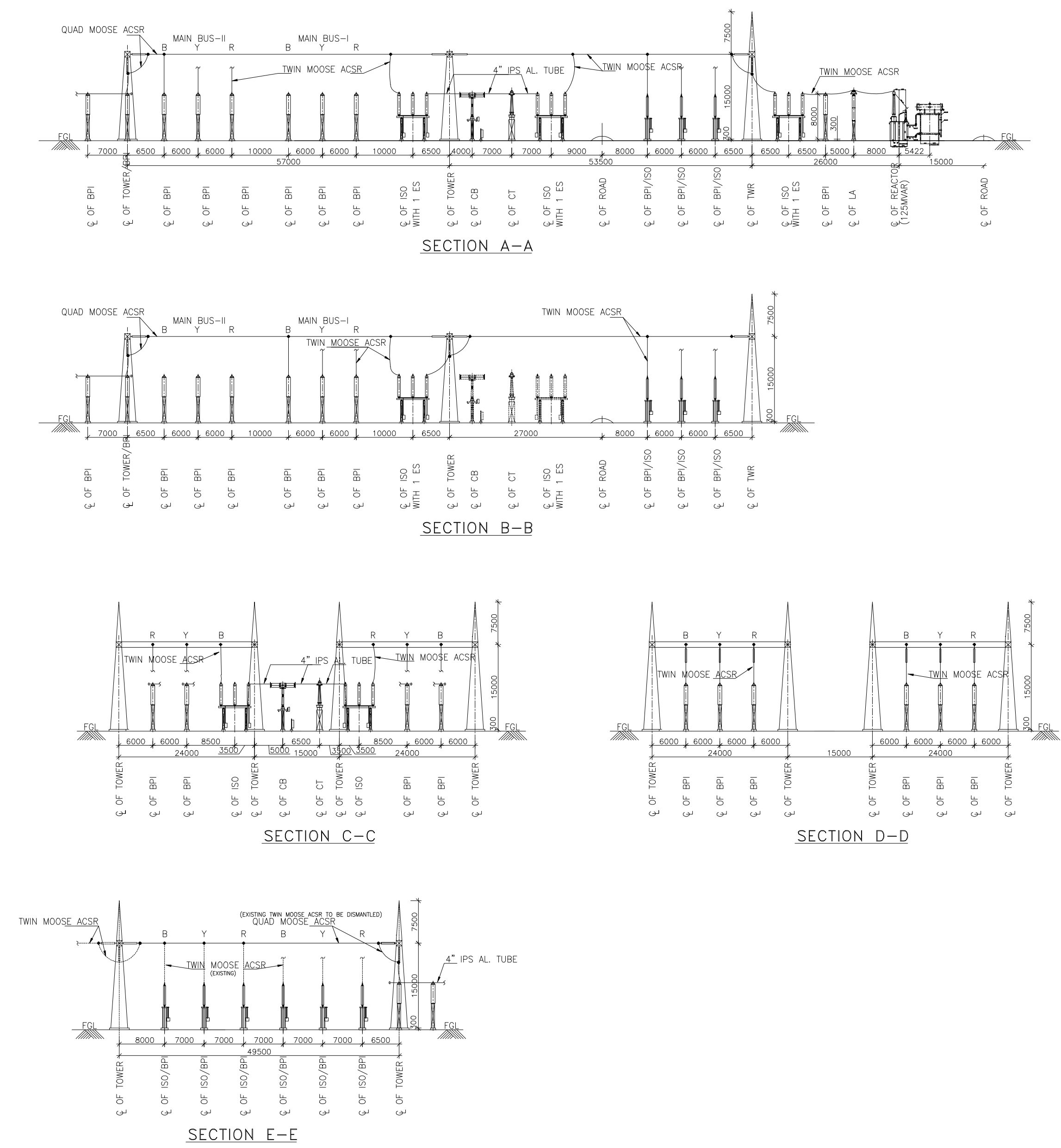
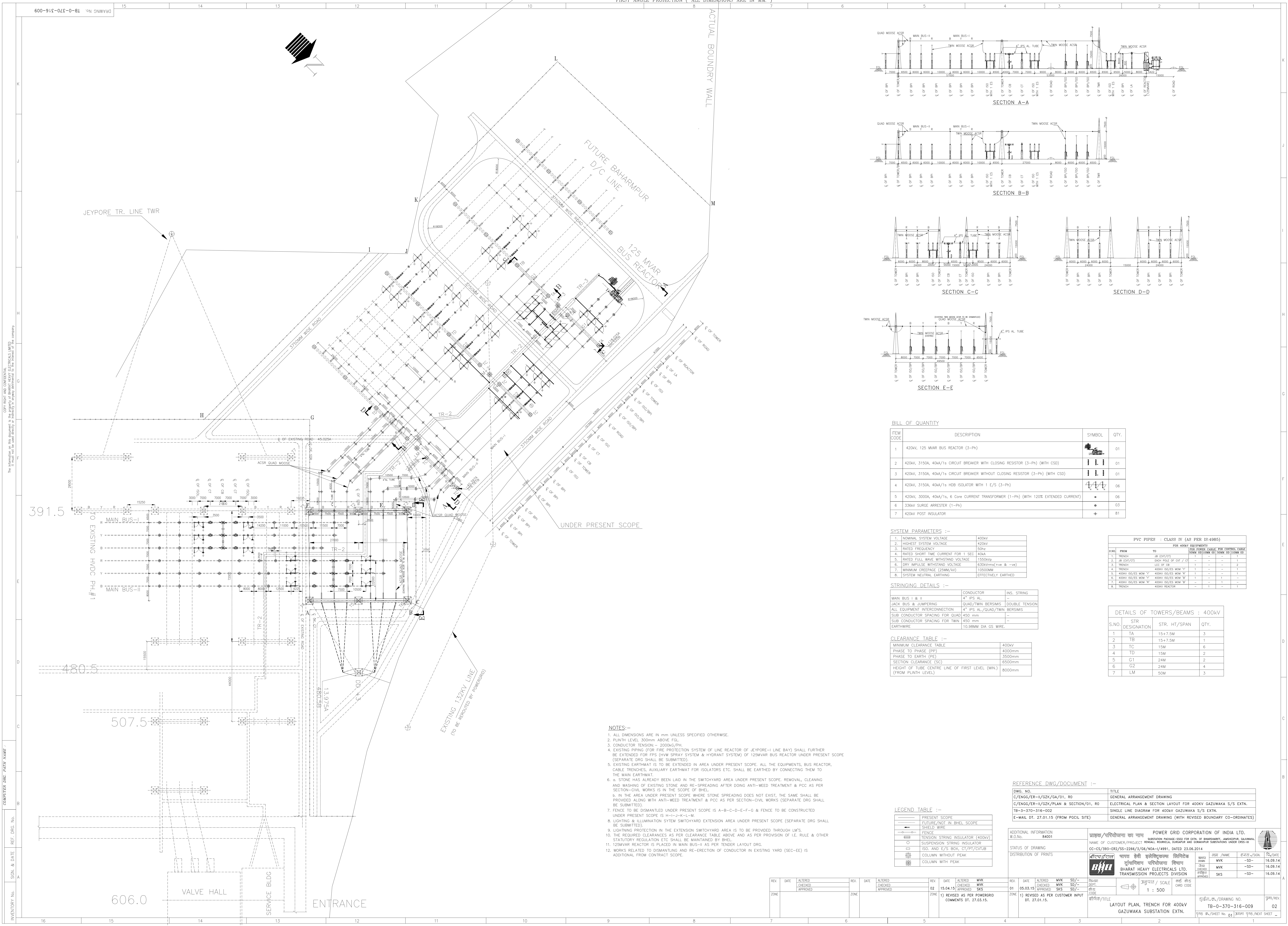
00

DRG. NO./SHEET No.

01

DRG. NO./SHEET No.

02



BILL OF QUANTITY			
ITEM CODE	DESCRIPTION	SYMBOL	QTY.
1	420kV, 125 MVAR BUS REACTOR (3-Ph)		01
2	420kV, 3150A, 40kA/1s CIRCUIT BREAKER WITH CLOSING RESISTOR (3-Ph) (WITH CSD)		01
3	420kV, 3150A, 40kA/1s CIRCUIT BREAKER WITHOUT CLOSING RESISTOR (3-Ph) (WITH CSD)		01
4	420kV, 3150A, 40kA/1s HDB ISOLATOR WITH 1 E/S (3-Ph)		06
5	420kV, 3000A, 40kA/1s, 6 Core CURRENT TRANSFORMER (1-Ph) (WITH 120% EXTENDED CURRENT)		06
6	336kV SURGE ARRESTER (1-Ph)		03
7	420kV POST INSULATOR		81

SYSTEM PARAMETERS :-			
1.	NOMINAL SYSTEM VOLTAGE	400kV	
2.	HIGHEST SYSTEM VOLTAGE	420kV	
3.	RATED FREQUENCY	50Hz	
4.	RATED SHORT TIME CURRENT FOR 1 SEC	40kA	
5.	RATED FULL WAVE WITHSTAND VOLTAGE	1550kV	
6.	DRY IMPULSE WITHSTAND VOLTAGE	635kVrms(+ve & -ve)	
7.	MINIMUM CREEPAGE (25MM/1KV)	12000MM	
8.	SYSTEM NEUTRAL EARTHING	EFFECTIVELY EARTHED	

STRINGING DETAILS :-			
MAIN BUS I & II	CONDUCTOR	INS. STRING	
JACK BUS & JUMPING	4" IPS AL	QUAD/TWIN BERSIMIS	DOUBLE TENSION
ALL EQUIPMENT INTERCONNECTION	4" IPS AL/QUAD/TWIN BERSIMIS		
SUB CONDUCTOR SPACING FOR QUAD	450 mm		
SUB CONDUCTOR SPACING FOR TWIN	450 mm		
EARTHWIRE	10.98MM DIA GS WIRE.		

CLEARANCE TABLE :-	
MINIMUM CLEARANCE TABLE	400kV
PHASE TO PHASE (PP)	4000mm
PHASE TO EARTH (PE)	3500mm
SECTION CLEARANCE (SC)	6500mm
HEIGHT OF TUBE CENTRE LINE OF FIRST LEVEL (MIN.) (FROM PLINTH LEVEL)	8000mm

PVC PIPES : CLASS IV (AS PER IS:4085)			
FOR 400KV EQUIPMENTS			
S.NO.	FROM	TO	
1.	TRENCH	AT (CVT/CT)	1
2.	AT (CVT/CT)	EACH POLE OF CVT / CT	1
3.	TRENCH	LOC. OF CB	1
4.	TRENCH	400KV 50/525 MOW 'Y'	1
5.	400KV 50/525 MOW 'Y'	400KV 50/525 MOW 'Y'	1
6.	400KV 50/525 MOW 'Y'	400KV 50/525 MOW 'Y'	1
7.	400KV 50/525 MOW 'Y'	400KV 50/525 MOW 'Y'	1
8.	TRENCH	400KV REACTOR	1

DETAILS OF TOWERS/BEAMS : 400KV			
S.NO.	STR. DESIGNATION	STR. HT/SPAN	QTY.
1	TA	15+7.5M	3
2	TB	15+7.5M	1
3	TC	15M	6
4	TD	15M	2
5	G1	24M	2
6	G2	24M	4
7	LM	50M	3

- NOTES:-
- ALL DIMENSIONS ARE IN MM UNLESS SPECIFIED OTHERWISE.
 - PLINTH LEVEL 300mm ABOVE F.G.L.
 - CONDUCTOR TENSION:- 2000kg/PH.
 - EXISTING PIPING (FOR FIRE PROTECTION SYSTEM OF LINE REACTOR OF JEYPORE-I LINE BAY) SHALL FURTHER BE EXTENDED FOR IPS (H/W SPRAY SYSTEM & HYDRANT SYSTEM) OF 125MVAR BUS REACTOR UNDER PRESENT SCOPE (SEPARATE DRG SHALL BE SUBMITTED).
 - EXISTING EARTHMAT IS TO BE EXTENDED IN AREA UNDER PRESENT SCOPE. ALL THE EQUIPMENTS, BUS REACTOR, CABLE TRENCHES, AUXILIARY EARTHMAT FOR ISOLATORS ETC. SHALL BE EARTHED BY CONNECTING THEM TO THE MAIN EARTHMAT.
 - a. STONE HAS ALREADY BEEN LAID IN THE SWITCHYARD AREA UNDER PRESENT SCOPE. REMOVAL, CLEANING AND WASHING OF EXISTING STONE AND RE-Spreading AFTER DOING ANTI-WEED TREATMENT & PCC AS PER SECTION-CIVIL WORKS IS IN THE SCOPE OF BHEL.
b. IN THE AREA UNDER PRESENT SCOPE WHERE STONE SPREADING DOES NOT EXIST, THE SAME SHALL BE PROVIDED ALONG WITH ANTI-WEED TREATMENT & PCC AS PER SECTION-CIVIL WORKS (SEPARATE DRG SHALL BE SUBMITTED).
 - FENCE TO BE DISMANTLED UNDER PRESENT SCOPE IS A-B-C-D-E-F-G & FENCE TO BE CONSTRUCTED UNDER PRESENT SCOPE IS H-I-J-K-L-M.
 - LIGHTING & ILLUMINATION SYTEM SWITCHYARD EXTENSION AREA UNDER PRESENT SCOPE (SEPARATE DRG SHALL BE SUBMITTED).
 - LIGHTNING PROTECTION IN THE EXTENSION SWITCHYARD AREA IS TO BE PROVIDED THROUGH LWS.
 - THE REQUIRED CLEARANCES AS PER CLEARANCE TABLE ABOVE AND AS PER PROVISION OF I.E. RULE & OTHER STATUTORY REGULATION ETC SHALL BE MAINTAINED BY BHEL.
 - 125MVAR REACTOR IS PLACED IN MAIN BUS-II AS PER TENDER LAYOUT DRG.
 - WORKS RELATED TO DISMANTLING AND RE-ERECTION OF CONDUCTOR IN EXISTING YARD (SEC-EE) IS ADDITIONAL FROM CONTRACT SCOPE.

LEGEND TABLE :-			
	PRESENT SCOPE		
	FUTURE/NOT IN BHEL SCOPE		
	SHIELD WIRE		
	FENCE		
	TENSION STRING INSULATOR (400kV)		
	SUSPENSION STRING INSULATOR		
	ISO AND E/S BOX, CT/PT/CVT/UB		
	COLUMN WITHOUT PEAK		
	COLUMN WITH PEAK		

REFERENCE DWG/DOCUMENT :-	
DWG. NO.	TITLE
C/ENG6/ER-II/GZK/GA/01, R0	GENERAL ARRANGEMENT DRAWING
C/ENG6/ER-II/GZK/PLAN & SECTION/01, R0	ELECTRICAL PLAN & SECTION LAYOUT FOR 400KV GAZUWAKA S/S EXTN.
TB-3-370-316-002	SINGLE LINE DIAGRAM FOR 400KV GAZUWAKA S/S EXTN.
E-MAIL DT. 27.01.15 (FROM PGCL SITE)	GENERAL ARRANGEMENT DRAWING (WITH REVISED BOUNDARY CO-ORDINATES)

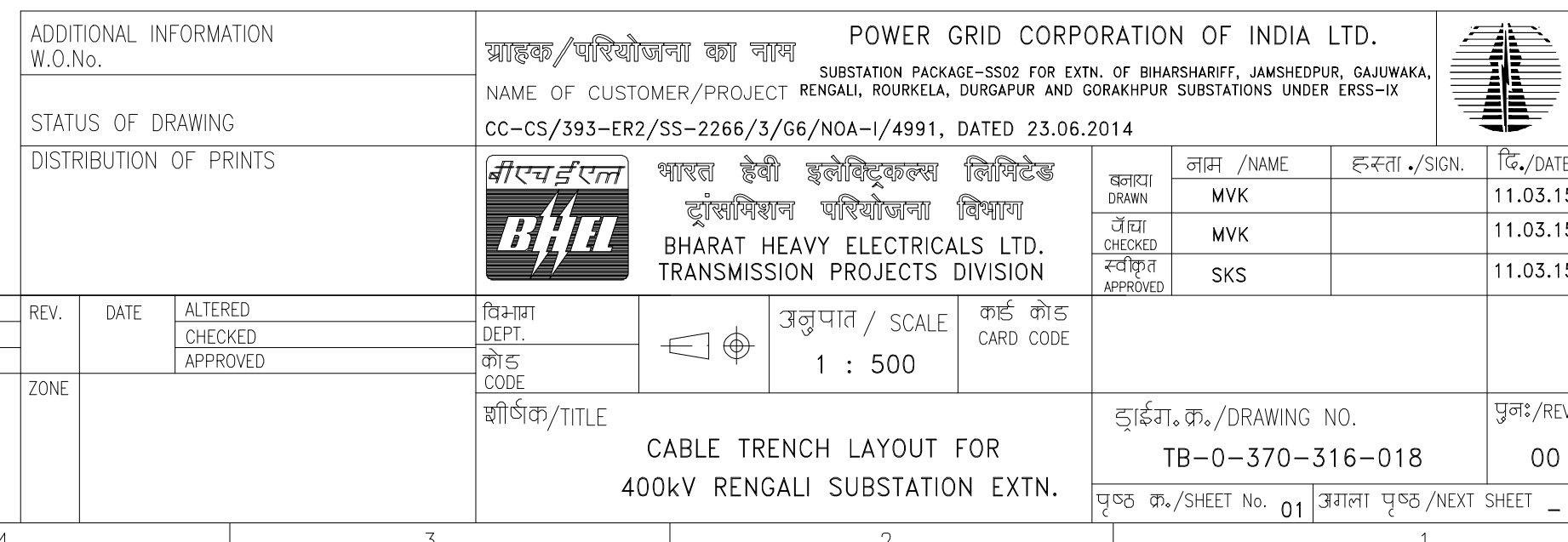
ADDITIONAL INFORMATION W.O.No. 84001				POWER GRID CORPORATION OF INDIA, LTD. SUBSTATION PACKAGE-3302 FOR EXTN. OF BAHARPUR, JAMSHEDPUR, GAZUWAKA. NAME OF CUSTOMER/PROJECT: RETAIL, ROURKELA, DURGAPUR AND UDHARPUR SUBSTATIONS UNDER ERG-S CC-CS/593-ER2/S-2266/3/06/NOA-V/4991, DATED 23.06.2014			
STATUS OF DRAWING				DISTRIBUTION OF PRINTS			
नीलम प्रकाश BPM				प्रायतः श्री इलेक्ट्रिकल्स लिमिटेड दुर्गपुरीवाला परिवर्तिका विभाग BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION DIVISIONS			
REV. DATE ALTERED WVK SD/- CHECKED SKS SD/- APPROVED SKS SD/-				जुगता / SCALE 1 : 500 सं. सं. सं. CARD CODE			
ZONE 1) REVISED AS PER CUSTOMER INPUT DT. 27.01.15.				ड्राईंग, क/ड्राइंग NO. TB-0-370-316-009			
ड्राईंग, क/ड्राईंग, TITLE LAYOUT PLAN, TRENCH FOR 400KV GAZUWAKA SUBSTATION EXTN.				पृष्ठ क/पृष्ठ सं. 01 कुल पृष्ठ सं.			

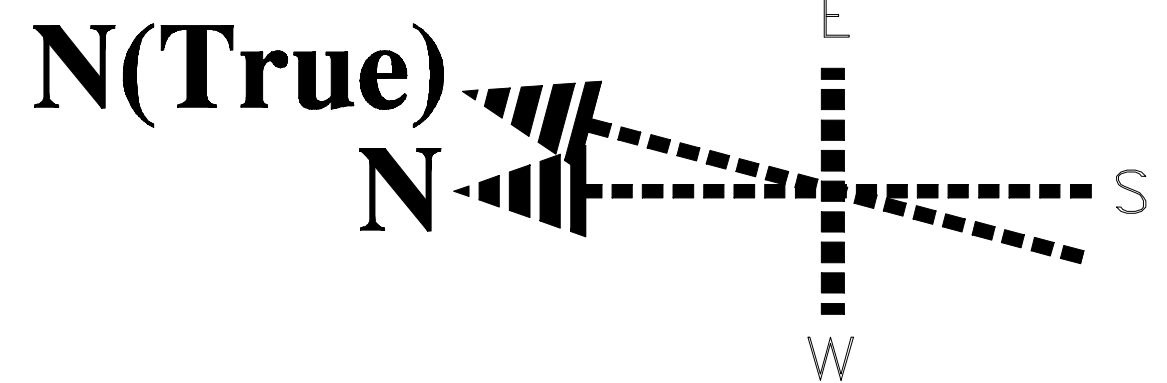
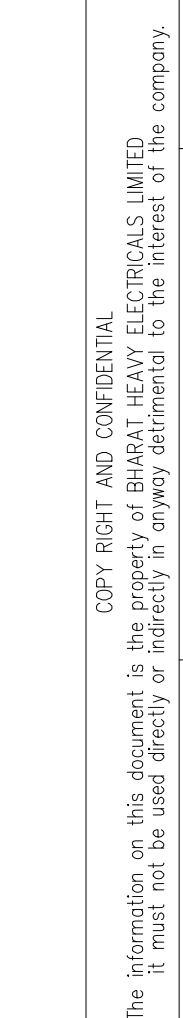
INVENTORY No. _____

DATE _____

REF. DRC. No. _____

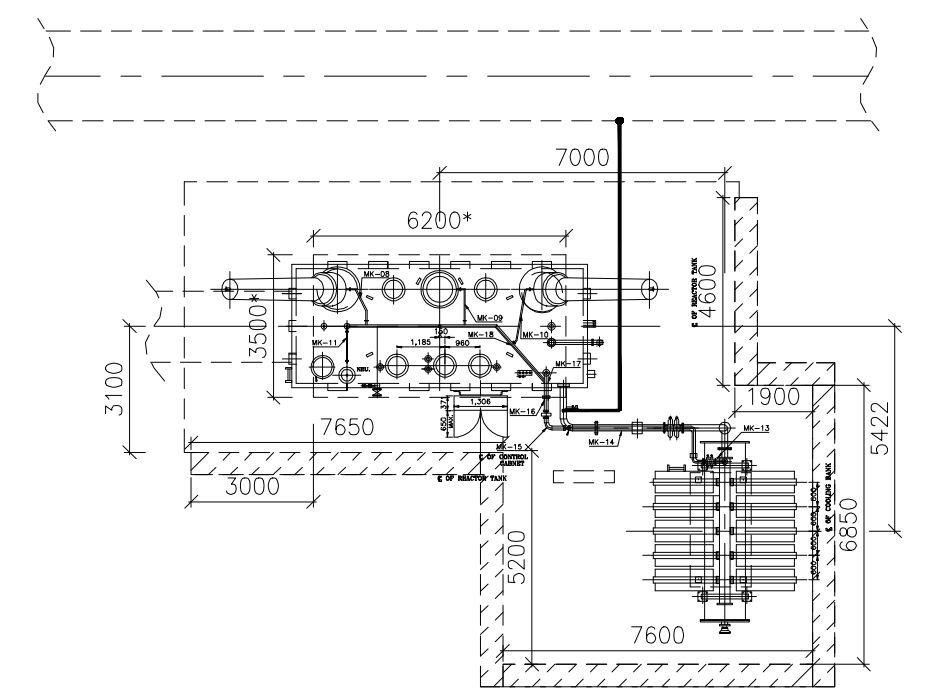
COUNTERSING. DATE NAME : _____





1. ALL DIMENSIONS ARE IN MM.
2. EXISTING CABLE TRENCHES SHALL BE USED FOR LAYING OF NEW CABLES.
3. OPENINGS FOR TAKING OUT PVC PIPES TO EQUIPMENTS SHALL BE PROVIDED IN CABLE TRENCHES OPENING OF SIZE SUITABLE TO DIA. 50/110 PIPE SHALL BE PROVIDED BELOW TOP CABLE SUPPORT.
4. BMB = INDICATES BAY MARSHALLING BOX. SUPPLY SHALL BE TAKEN FROM EXISTING BMB IN BAY#422.
5. CABLES SHALL BE LAID IN MULTILAYER ON CABLE SUPPORT (ANGLES)
6. AUXILIARY POWER CABLES SHALL BE LAID IN TOP TIERS AND CONTROL CABLES IN BOTTOM TIERS, AS PER TECHNICAL SPECIFICATION
7. FOR POWER & CONTROL, SEPARATE PIPES SHALL BE USED CONSIDERING 60% VOID FOR EACH PIPE I.E., 40% FILLING CRITERIA.
8. _____ INDICATES CABLES LAID IN PVC PIPES OF 50/110mm outer DIA AT DEPTH OF 300mm (MAX.) CABLE FROM EQUIPMENT TO CABLE TRENCH SHALL RUN IN PVC PIPES.
9. MARKED TUSH (●) INDICATES CABLE ENTRY/EXIT FROM EQUIPMENT.
10. ALL OTHER DETAILS PERTAINING TO CIVIL WORKS SHALL BE REFLECTED IN THE RESPECTIVE CIVIL DRAWINGS.
11. PVC PIPES SHALL BE SECURELY FIXED AT BOTH ENDS, EITHER EMBEDDED IN CONCRETE OR PROPERLY CLAMPED.
12. AFTER LAYING THE CABLES THE ENDS OF PIPES SHALL BE FULLY SEALED TO PREVENT INGRESS OF WATER INSIDE THE PIPE.
13. CONTROL CABLES & POWER CABLES MUST BE LAID IN SEPARATE PVC PIPES.
14. THE PURPOSE OF TRENCH LAYOUT DRAWING IS FOR USE AS FOLLOWS:
 - FOR CABLE LAYING AND ROUTING AT SITE.
15. FOR ALL CIVIL WORKS EXECUTION POWER GRID APPROVED/RELEASED DRGS SHALL BE FOLLOWED.

PVC PIPES : CLASS IV (AS PER IS:4985)				
FOR 400KV EQUIPMENTS				
S.NO	FROM	TO	FOR POWER CABLE 50MM CO :110MM CO	FOR CONTROL CABLE 50MM CO :110MM CO
1.	TRENCH	400KV REACTOR	— 1	— 1

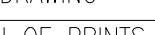


BLOW UP VIEW OF REACTOR AREA (NTS)
(*) EXISTING REACTOR TANK FDN. TO BE MODIFIED TO SUIT NEW REACTOR.

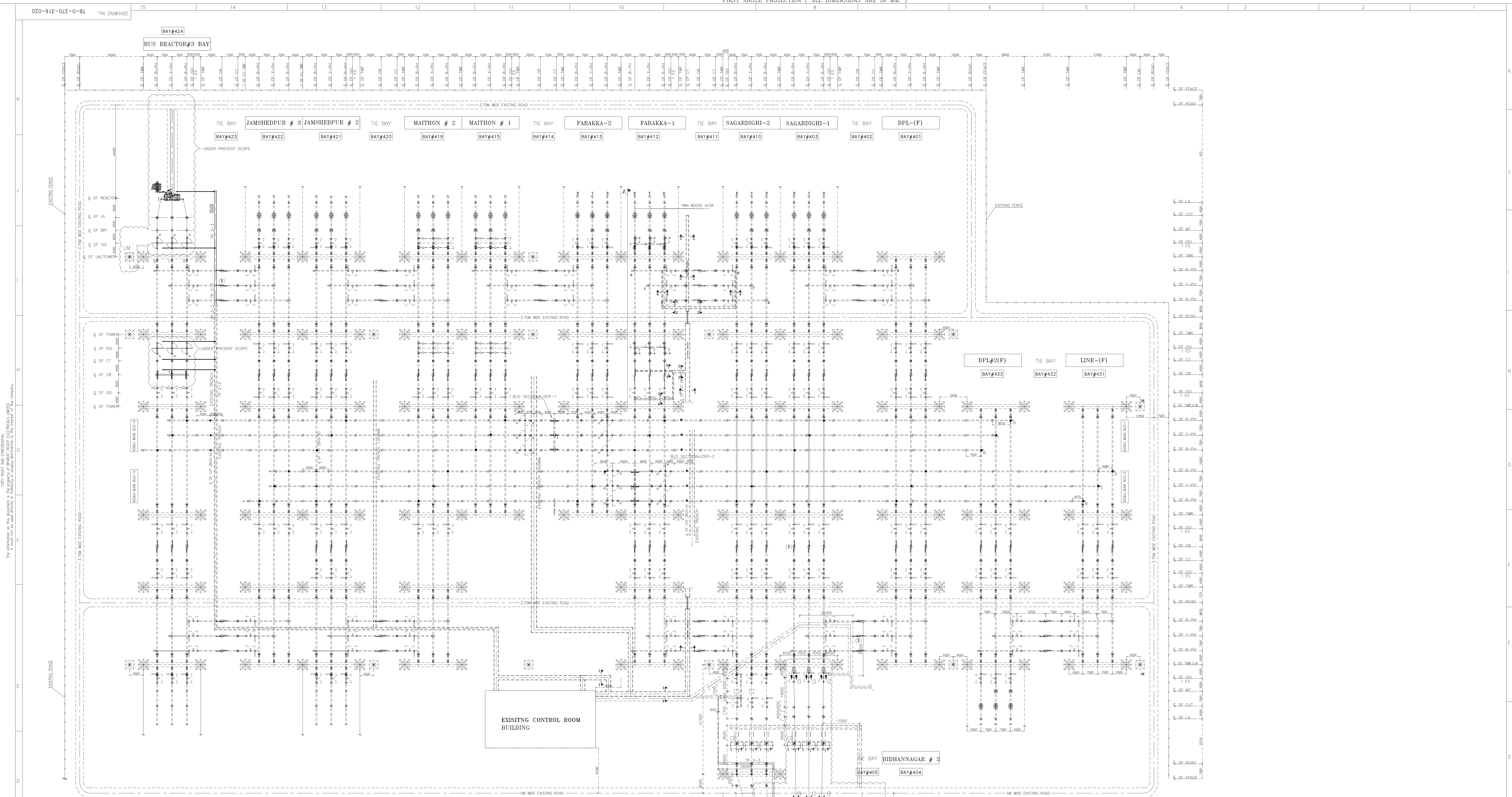
LEGEND TABLE :-

————	PRESENT SCOPE
- - -	FUTURE/EXISTING

REFERENCE DWG :-	
DWG. NO.	TITLE
TB-0-370-316-008	ELECTRICAL LAYOUT PLAN & SECTION FOR 400KV ROURKELA SUBSTATION EXTN.
TB-3-370-316-001	SINGLE LINE DIAGRAM FOR 400KV ROURKELA S/S EXTN.

ADDITIONAL INFORMATION W.No. 84001	POWER GRID CORPORATION OF INDIA LTD. SUBSTATION PAKGAD-507 FOR STN. OF BHADRABARTY, JAMSHEDPUR, GULMARGA, KENGAL ROUKELA, DURGAPUR AND GOKHARPUR SUBSTATIONS UNDER ESS-H	
NAME OF CUSTOMER/PROJECT CC-53 S91-E82-VS22-6/S/G/NOA-I/A/491, DATED 23.06.2014		
STATUS OF DRAWING:		
DISTRIBUTION OF PRINTS		
 भारत हेवी इलेक्ट्रिकल्स लिमिटेड भारतीय भारी विद्युत यंत्रणा BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PRODUCTS DIVISION नाम /NAME श्रेणी /CLASS चेखरा /SECTION मॉडल /MODEL आकार /SIZE एन्सा /SCALE दिनांक /DATE पृष्ठ सं./PAGE NO.		
REV.	DATE	ALTERED CHECKED APPROVED
ZONE		
 अनुपात / SCALE 1 : 500 शह कोट / SHEET CODE		
धर्तिक/TITLE CABLE TRENCH LAYOUT FOR 40KV ROURKELA SUBSTATION EXTN.		
ड्राईंग्स/DRWING NO. TB-1-370-516-015 पृष्ठ सं./SHEET NO. 01 कुल पृष्ठ/Total SHEET		

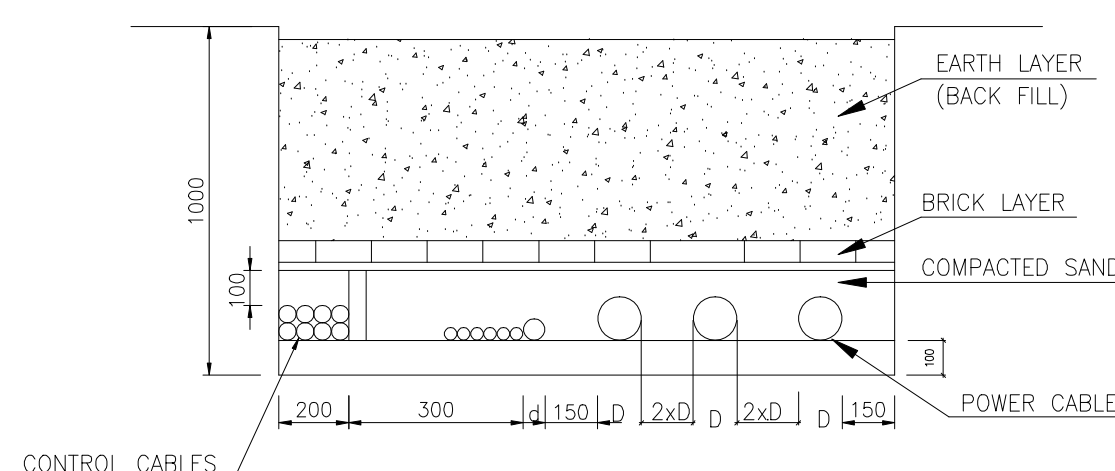
REV.	DATE	ALTERED CHECKED APPROVED	REV.	DATE	ALTERED CHECKED APPROVED	REV.	DATE	ALTERED CHECKED APPROVED
ZONE			ZONE			ZONE		
7			6			5		



400kV SUBSTATION OVERALL LAYOUT

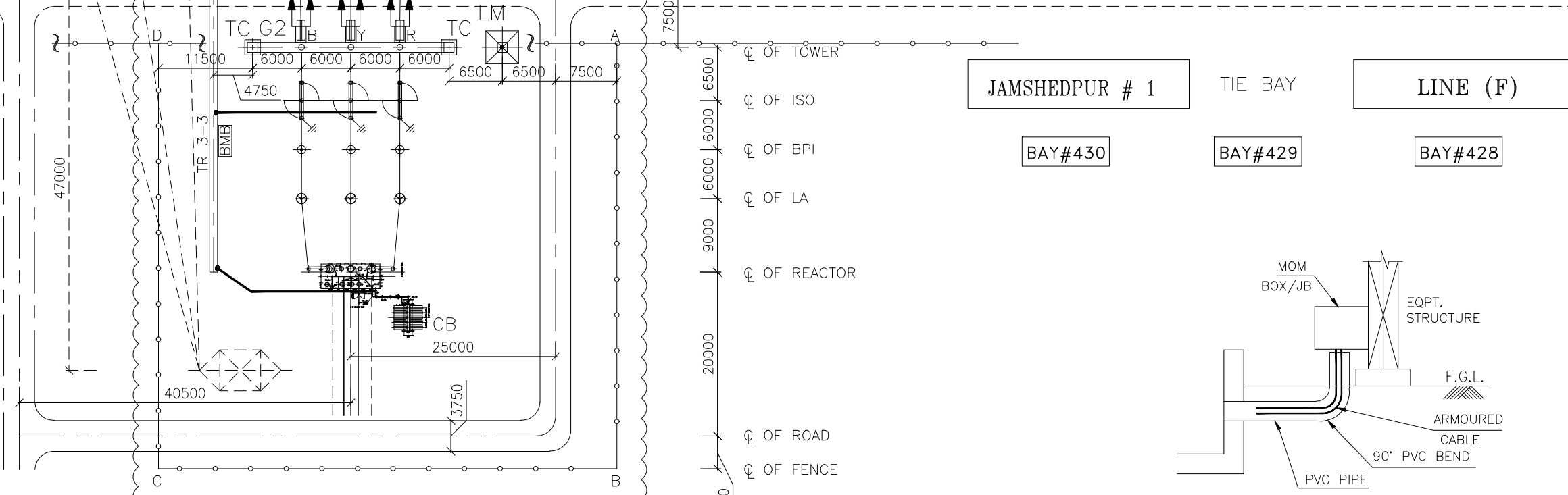
- NOTES:-

 - ALL DIMENSIONS ARE IN mm.
 - EXISTING CABLE TRENCHES SHALL BE EXTENDED FOR LAYING OF NEW CABLES UPTO 123MVAR BUS REACTOR BAY-3.
 - CABLES MARKED IN THE DWG MAY BE SLIGHTLY MODIFIED TO SUIT SITE CONDITIONS.
 - OPENINGS FOR TAKING OUT PVC PIPES TO EQUIPMENTS SHALL BE PROVIDED IN CABLE TRENCHES.
 - OPENING OF SIZE SUITABLE TO LAID 50/10 PIPE SHALL BE PROVIDED BELOW TOP CABLE SUPPORT.
 - PVC PIPES DEPTH OF BURIAL SHALL BE 250MM BELOW FINISHED FLOORING LEVEL.
 - BMB = INDICATES BAY MARSHALLING BOX. SUPPLY FOR BMB SHALL BE TAKEN FROM EXISTING BMB IN BAY#2.
 - CABLES SHALL BE LAID IN MULTILAYER ON CABLE SUPPORT (ANGLES).
 - CABLE SUPPORT SHALL BE PROVIDED AT EVERY 0.75m INTERVAL.
 - CABLES SHALL BE EMBEDDED AT EVERY 0.75m INTERVAL FOR TYPING CABLE SUPPORT.
 - AUXILIARY POWER CABLES SHALL BE LAID IN TOP TERS AND CONTROL CABLES IN BOTTOM TERS, AS PER TECHNICAL SPECIFICATION.
 - BURIED CABLEDING SHALL BE DONE AS PER SPECIFICATION (INSTALLATION OF CABLES).
 - BURIED CABLES FOR LIGHTING PURPOSE SHALL BE AS PER LIGHTING LAYOUT.
 - EARTH CONDUIT 50x6 MM FLAT TO BE WELDED ON THE CABLE SUPPORT BEFORE INSTALLATION OF CABLES.
 - CABLES CROSSING ROAD/RAIL TRACK SHALL BE LAID IN BOX CULVERT.
 - FOR POWER & CONTROL SEPARATE PIPES SHALL BE USED CONSIDERING 60% VOID FOR EACH PIPE I.E., 40% FILLING CRITERIA.
 - INDICATES CABLES LAID IN PVC PIPES OF 50/10mm OUTER DIA AT DEPTH OF 300mm (MAX.).
 - CABLE FROM EQUIPMENT TO CABLE TRENCH SHALL RUN IN PVC PIPES.
 - MARKED TUSH INDICATES CABLE ENTRY/EXIT FROM EQUIPMENT.
 - ALL OTHER DETAILS PERTAINING TO CIVIL WORKS SHALL BE REFLECTED IN THE RESPECTIVE CIVIL DRAWINGS.
 - PVC PIPES SHALL BE SECURELY FIXED AT BOTH ENDS, EITHER EMBEDDED IN CONCRETE OR PROPERLY CLAMPED.
 - AFTER LAYING THE CABLES THE ENDS OF PIPES SHALL BE FULLY SEALED TO PREVENT INGRESS OF WATER INTO THE PIPE.
 - CONTROL CABLES & POWER CABLES MUST BE LAID IN SEPARATE PVC PIPES.
 - CABLE TRENCH SHALL BE PROVIDED ON MARSHALLING BOX SIDE OF EQUIPMENT.
 - THE PURPOSE OF TRENCH LAYOUT DRAWING IS FOR USE AS FOLLOWS:
 - TO BE USED AS CIVIL INPUT FOR CABLE TRENCHES.
 - FOR ERECTION OF CABLE RACKS AT SITE.
 - FOR CABLE LAYING AND ROUTING AT SITE.
 - RAILINGS AND SUPPORTS SHALL BE PAINTED AFTER INSTALLATION WITH 2 COATS OF METAL PRIMER (COMPRISING OF RED OXIDE & ZINC CHROMATE IN A SYNTHETIC MEDIUM) FOLLOWED BY TWO FINISHING COAT OF ALUMINIUM PAINT.
 - INDICATES BRICK WALL SHALL BE PROVIDED IN TRENCH WHERE FUTURE TRENCH/EQUIPMENT PIPE TERMINATED IN PRESENT SCOPE OF TRENCH.
 - SUITABLE PULL OUT BOX SHALL BE PROVIDED IF REQUIRED WHERE CABLE SHALL BE LAID IN PVC PIPE.
 - LONGITUDINAL SLOPE IN CABLE TRENCH SHALL BE TYPICALLY 1:1000.
 - RACK ASSEMBLIES FOR CABLE TRENCHES SHALL BE PROVIDED ON THE FACE OF TRENCH WALL MARKED TUSH.
 - FOR ALL CIVIL WORKS EXECUTION POWER GRID APPROVED/RELEASED DRGS SHALL BE FOLLOWED.
 - INDICATE DIRECTION OF SLOPE.
 - PVC CONDUITS USED SHALL BE CLASS-4 AS PER IS-4985.
 - TRENCH WALL SHALL CLEAR THE EQUIPMENT FOUNDATION BY SUITABLE GAP.
 - CABLE TRENCH/CHAMBERS NEAR ISOLATOR SHALL BE ROUTED SUCH THAT LOCATION OF AUXILIARY EARTH MAT FALLS UNDER OPERATING MECHANISM BOX (NOM).



TYPICAL BURIED CABLE TRENCH

* WIDTH OF BURIED CABLE TRENCH WILL DEPEND ON THE NO. OF CABLES FINALISED AS PER CABLE SCHEDULE.



DETAIL SHOWING ROUTING OF
CABLE INSIDE PVC PIPE CABLE
TRENCH TO EQUIPMENT

PVC PIPES : CLASS IV (AS PER IS:4965)				
FOR 400KJ REACTORS				
S.NO.	FROM	TO	FOR POWER CABLE	FOR CONTROL CABLE
			50MM OD 110MM OD	50MM OD 110MM OD
1.	TRENCH	EAH (CVT/CT)	1	—
2.	(CVT/CT)	EACH JOINT OF CVT / CT	—	1
3.	TRENCH	LCC OF BOP	1	—
4.	TRENCH	400KJ ISO/SES MOM "Y"	1	—
5.	400KJ ISO/SES MOM "Y"	400KJ ISO/SES MOM "R"	1	—
6.	400KJ ISO/SES MOM "Y"	400KJ ISO/SES MOM "B"	1	—
7.	400KJ ISO/SES MOM "Y"	400KJ ISO/SES MOM "B"	—	1
8.	TRENCH	400KJ REACTOR	—	1

REV.	DATE	ALTERED CHECKED APPROVED	REV.	DATE	ALTERED CHECKED APPROVED	REV.	DATE	ALTERED CHECKED APPROVED
ZONE			ZONE			ZONE		

LEGEND TABLE :-

_____	PRESENT SCOPE
- - - -	FUTURE/EXISTING

REFERENCE DWG :-

DWG. NO.	TITLE
TB-0-370-316-013	ELECTRICAL PLAN & SECTION LAYOUT FOR 400 KV DURGAPUR S/S EXTN.
TB-3-370-316-006	SINGLE LINE DIAGRAM FOR 400KV DURGAPUR S/S EXTN.

ADDITIONAL INFORMATION W.O.No. 84001	प्राइमर/परियोजना का नाम POWER GRID CORPORATION OF INDIA LTD. SUBSTATION PACKAGE TEND FOR EXT. OF SHIMLAHAT, MUMBAI, CHHARKA	
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STATUS OF DRAWING	NAME OF CUSTOMER/PROJECT		BENGAL, KOLKATA, DURGAPUR AND GADKAPUR SUBSTATIONS UNDER ERSS-IX		
	DC-C/393-CR2/SS-2266/3/06/MOA-I/4991, DATED 23.06.2014				
DISTRIBUTION OF PRINTS					

	भारत भारती इलेक्ट्रिकल्स लिमिटेड	खरपड़ा	MVK	17.0
	भारतीय भारती इलेक्ट्रिकल्स लिमिटेड BHARAT HEAVY ELECTRICALS LTD.		MVK	17.0

REV.	DATE	ALTERED CHECKED	प्रभाग DEPT.	अनुपात / SCALE	कार्ड नंबर CARD CODE	अनुमोदित APPROVED	SKS	17.0
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ZONE	APPROVED	කිසි CODE		1 : 500		
		නම/අංක/TITLE			ප්‍රස්.ක./DRAWING NO.	ප්‍ර.න.

CABLE TRENCH LAYOUT FOR 400kV DURGAPUR SUBSTATION EXTN.		TB-0-370-316-020	
পাত No./SHEET No.	০১	কমলা পাত/NEXT SHEET	

NOTES:-

1. WHEN REFERRING THIS DRAWING PLEASE QUOTE MVAR & W.D. NO.
2. 320 DIA. TWIN BI-DIRECTIONAL ROLLERS MOUNTED AT 1676 mm RAIL GAUGE IN BOTH DIRECTION ARE PROVIDED FOR MOVEMENT OF REACTOR AT SITE AND ROLLERS ARE TO BE REMOVED BEFORE ERECTION
3. PAINTING SHALL BE AS PER POWER GRID SPECIFICATION.
4. WIRING FROM INSTRUMENT CTS. ETC. ARE NOT SHOWN FOR CLARITY.
5. FOUNDATION BOLTS ARE IN THE SCOPE OF BHEL SUPPLY.
6. FOR PART LIST OF OGA REFER DRAWING NO. 3 469 00 01390.
7. DIMNS. SHOWN THUS  ARE OVERALL SHIPPING DIMENSIONS EXCLUSIVE OF PACKING.
8. DIMENSIONS SHOWN ARE WITH REF. TO PLINTH LEVEL. PLEASE NOTE THAT PLINTH LEVEL IS 450 MM ABOVE THE GROUND LEVEL.
9. FOR TANK COVER BOLTING REFER DETAIL 'B' SHT. NO. 04.
10. REACTOR DRAWING IS MADE BASED ON POWER GRID TECHNICAL SPECIFICATION (REV.07).
11. FOUNDATION OF THE REACTOR (BOLTED) SHALL EXACTLY MATCHED WITH EARLIER APPROVED REACTOR.

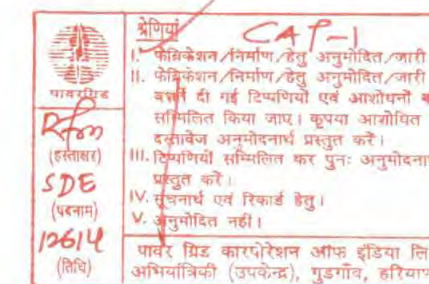
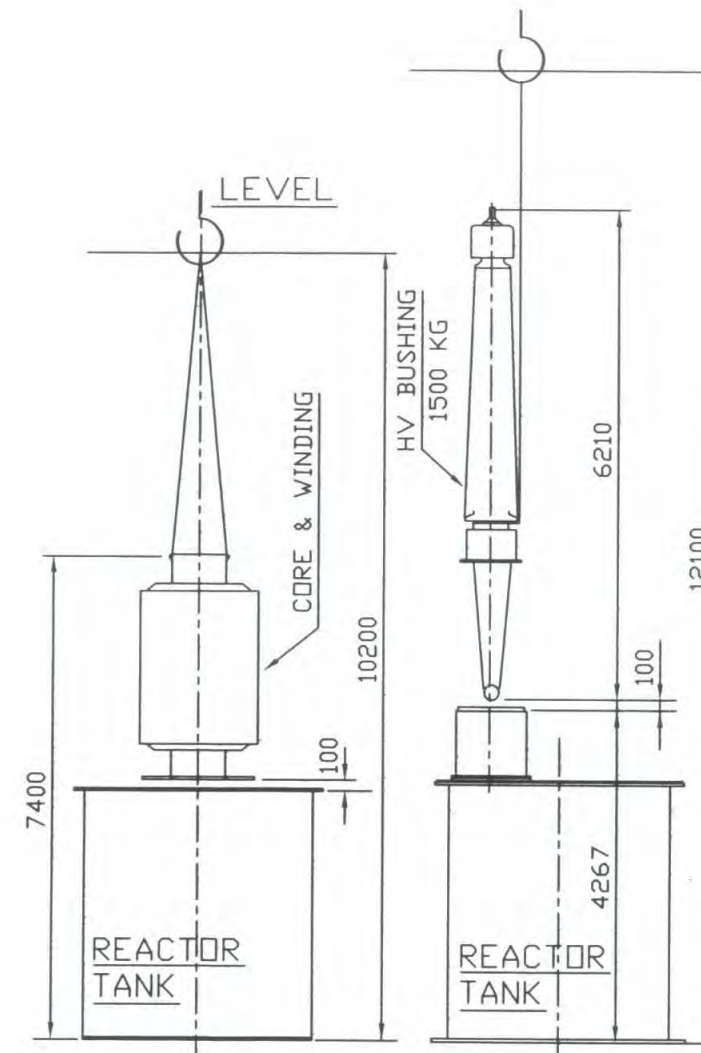
IMPORTANT NOTE:-

1. THE DESIGN FEATURES SHOWN ON THIS DRAWING (GENERALLY INLINE WITH IEC : 60076-6 APPLICABLE STANDARD & AGREED CUSTOMER SPECIFICATION) MEETS THE STATUTORY, REGULATORY & SAFETY REQUIREMENTS WITH RESPECT TO EARTHING ARRANGEMENT, DANGER & OTHER LABELS, CLEARANCES IN AIR PROVISION FOR PRESSURE RELIEF DEVICE, GAS ACTUATED RELAY AND ANTI-EARTHQUAKE CLAMPING ARRANGEMENT.

MIN. AIR CLEARANCES		
	420 KV	145 KV
	4000	NA
PHASE TO EARTH	3500	1050

TABLE

SUB ASSY. MK NOS.																								
SUB ASSY	MK02	MK03	MK04	MK05	MK06	MK07	MK08	MK09	MK10	MK11	MK12	MK13	MK14	MK15	MK16	MK17	MK18	MK19	MK20	MK21	MK22	MK23	MK24	MK25
QTY.	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	001	002



STANDARD DRAWING

TYPE OF PRODUCT	125 MVAR, 420 KV, 3-PH., ONAN COOLED SHUNT REACTOR		
NAME OF CUSTOMER/ STANDARD	M/S POWERGRID CORPORATION OF INDIA LTD.		
ADDITIONAL INFORMATION	भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल	NAME	SIGN DATE
STANDARD	BHARAT HEAVY ELECTRICALS LTD. BHOPAL	DRN. PARVEEN	-SD/- 10.04.14
STATUS OF DRAWING 'U'	DEPT	CODE WEIGHT(kg)	SCALE
DISTRIBUTION OF PRINTS	TRE	406	SCALE-
TRE-1,TRM-3	TITLE	OUTLINE GENERAL ARRGT. (125 MVAR SHUNT REACTOR)	
	DRG. NO. 3 469 00 01389	REV.	01
	SHEET 01 OF 04		

THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

REF.DRG.NO.

SIGN.DATE

INVENTORY NO.

FIRST ANGLE PROJECTION

201

202

203

204

205

206

207

208 (ALL DIMENSIONS ARE IN mm)

DRG. NO. 3 469 00 01389

HV SIDE

14300±100

5183

5183

4000 MIN.

4000 MIN.

3500 MIN.

3500 MIN.

28°

28°

BOLTING ARRGT.
SEE DETAIL B.

5510±50

3700

3440

157
SEE
DETAIL
C4
SEE
DETAIL
A

13

109

14

19

28

101

24

24

34

2a

021

022

815

1,161

871.5

871.5

C OF REACTOR TANK

2870

JACKING POINT

2870

JACKING POINT

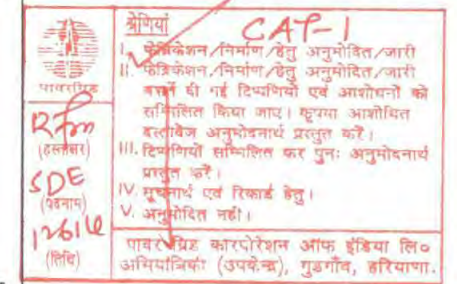
7,000

NEUTRAL SIDE

SEE FOUNDATION PLAN
DRG.34690000836

C OF COOLING BANK

STANDARD DRAWING



TYPE OF PRODUCT		125 MVAR, 420 KV, 3-PH., ONAN COOLED SHUNT REACTOR							
NAME OF CUSTOMER/ PRODUCT		M/S POWERGRID CORPORATION OF INDIA LTD.,							
ADDITIONAL INFORMATION		भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल		NAME		SIGN	DATE		
STANDARD		BHARAT HEAVY ELECTRICALS LTD. BHOPAL		DRN.	PARVEEN	-SD/-	10.04.14		
STATUS OF DRAWING 'U'	DEPT	CODE	WEIGHT(kg)	SCALE		CHD.	KD/GK	-SD/-	15.04.14
DISTRIBUTION OF PRINTS	TRE	406	----	SCALE-		APPD.	AKP/MK	-SD/-	20.04.14
TRE-1,TRM-3	TITLE	OUTLINE GENERAL ARRGT.			DRG. NO.		3 469 00 01389	REV.	
		ELEVATION			SHEET		02 OF 04		01

201

202

203

204

205

206

207

208

FIRST ANGLE PROJECTION

301

302

303

304

305

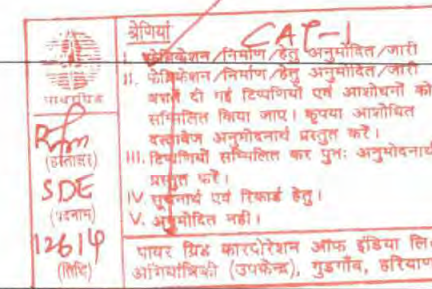
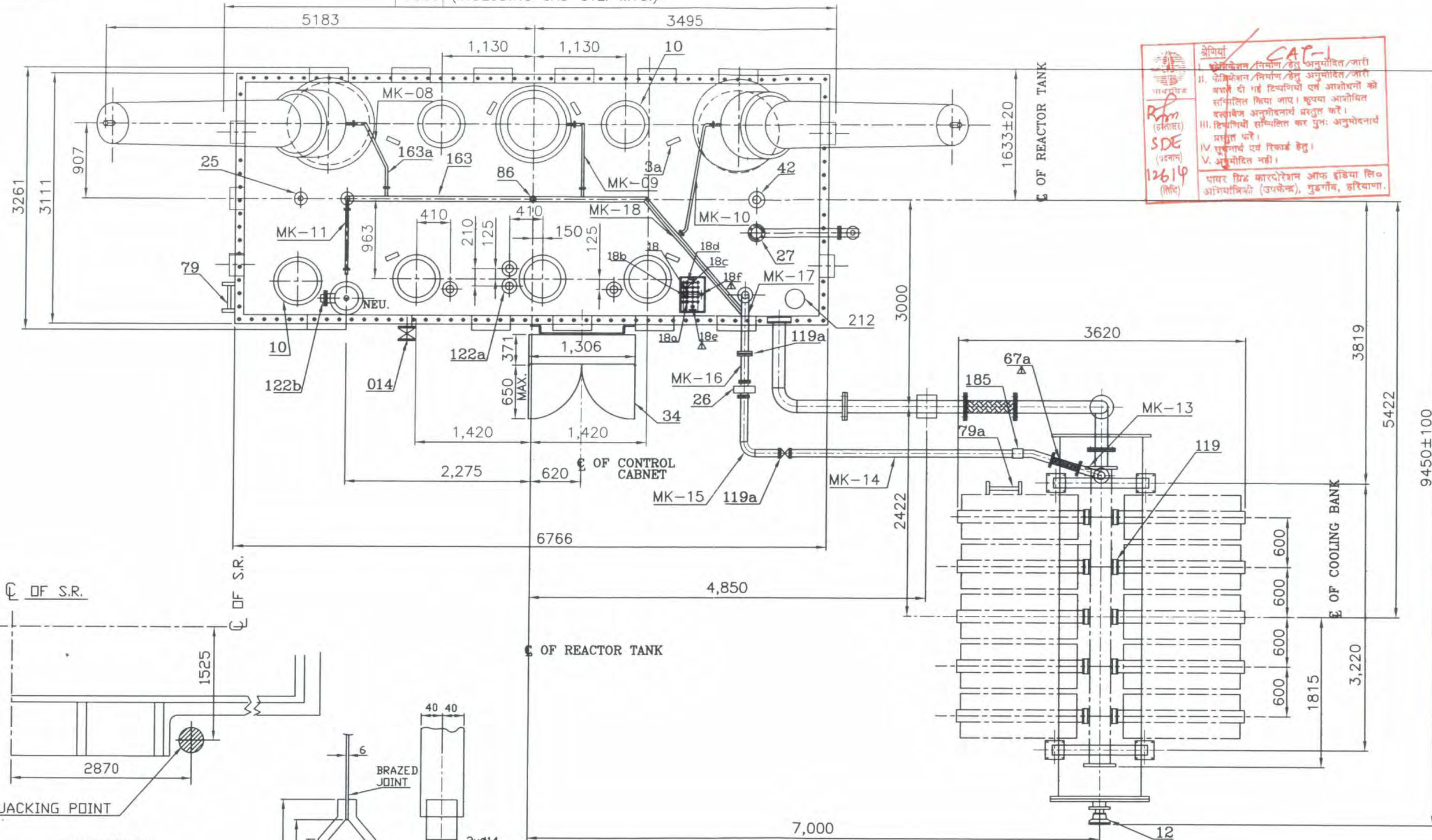
306

307

308 (ALL DIMENSIONS ARE IN mm)

68E10 00 697 E D11

7500 (INCLUDING GAS CYL. MTG.)



C OF S.R.

C OF S.R.

C OF REACTOR TANK

C OF COOLING BANK

JACKING POINT

TANK COVER

RIM

DETAIL - 'B'

DETAIL - C
NEUTRAL GROUNDING
ARRGTDETAIL - A
EARTHING ARRG
(DETAIL OF IT. 4)
SUITABLE FOR 12 X 75 FLAT

STANDARD DRAWING

TYPE OF PRODUCT	125 MVAR, 420 KV, 3-PH., ONAN COOLED SHUNT REACTOR
NAME OF CUSTOMER/ PRODUCT	M/S POWERGRID CORPORATION OF INDIA LTD.,
ADDITIONAL INFORMATION	भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
STANDARD	DRN. PARVEEN
STATUS OF DRAWING 'U'	DEPT. CODE WEIGHT(kg) SCALE
DISTRIBUTION OF PRINTS	TRE 406 SCALE-
TRE-1, TRM-3	TITLE OUTLINE GENERAL ARRG.
	PLAN
	DRG. NO. 3 469 00 01389 REV.
	SHEET 03 OF 04 01

REF.DRG.NO.

SIGN. DATE

INVENTORY NO.

REV

DATE

ALT

CKD

APPD

REV

DATE

ALT

CKD

APPD

REV

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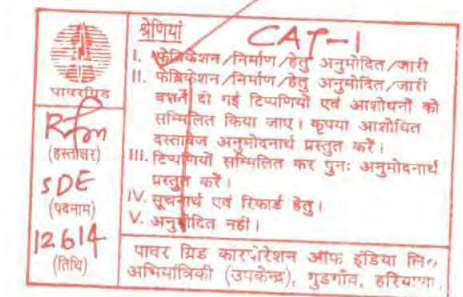
REV

DATE

ALT

CKD

APPD



TYPE OF PRODUCT		125 MVAR, 420 KV, 3-PH., ONAN COOLED SHUNT REACTOR								
NAME OF CUSTOMER/ STANDARD		M/S POWERGRID CORPORATION OF INDIA LTD.								
ADDITIONAL INFORMATION		भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल BHARAT HEAVY ELECTRICALS LTD. BHOPAL		NAME		SIGN	DATE			
STANDARD				DRN.	PARVEEN	-SD/-	10.04.14			
STATUS OF DRAWING 'U'	DEPT	CODE	WEIGHT(kg)	SCALE		CHD.	KD/KG	-SD/-	15.04.14	
DISTRIBUTION OF PRINTS	TRE	406	-----	SCALE-		APPD.	AKP/MK	-SD/-	20.04.14	
TRE-1, TRM-3		TITLE				OUTLINE GENERAL ARRGT.		DRG. NO.	3 469 00 01389	REV.
						SIDE VIEW		SHEET	04	OF 04
										01

