

LEGENDS :

765 kV GIS EQUIPMENTS						
SYMBOL	DESCRIPTION	ACTUAL QTY	LOA QTY	SYMBOL	DESCRIPTION	ACTUAL QTY
	CIRCUIT BREAKER WITH PIR, WITHOUT CSD (3 PHASE), 3150 A, 50 KA FOR 1 Sec. CONTROL DC220V/MOTOR AC220V.	2	2		MAINTENANCE EARTHING SWITCH WITH 10 kV, 1000A FOR 10min. INSULATION (1-PHASE) CONTROL DC220V/MOTOR DC220V.	13
	CIRCUIT BREAKER WITH CSD, WITHOUT PIR (3 PHASE), 3150 A, 50 KA FOR 1 Sec. CONTROL DC220V/MOTOR AC220V.	4	4		HIGH SPEED EARTHING SWITCH WITH 10 kV, 1000A FOR 10min. INSULATION (3-PHASE) CONTROL DC220V/MOTOR DC220V.	2
	CIRCUIT BREAKER WITH PIR & CSD (3 PHASE), 3150 A, 50 KA FOR 1 Sec. CONTROL DC220V/MOTOR AC220V.	2	2		CURRENT TRANSFORMER, 3 CORES, 1 PHASE	24
	DISCONNECTOR (3 PHASE), 3150 A, 50 KA FOR 1 Sec. CONTROL DC220V/MOTOR DC220V.	16	16		CURRENT TRANSFORMER, 2 CORES, 1 PHASE	12
	DISCONNECTOR (1 PHASE), 3150 A, 50 KA FOR 1 Sec. WITHSTAND PHASE - PHASE INSULATION CONTROL DC220V/MOTOR DC220V.	12	12		INDUCTIVE POTENTIAL TRANSFORMER, 1 PHASE (MISSIN MAKE)	0
	DISCONNECTOR (1 PHASE), 3150 A, 50 KA FOR 1 Sec. CONTROL DC220V/MOTOR DC220V.	12	12		SF6 AIR BUSHING (1 PHASE)	12
	MAINTENANCE EARTHING SWITCH WITH 10 kV, 1000A FOR 10 min. INSULATION (3 PHASE) CONTROL DC220V/MOTOR DC220V.	18	18		INTERFACE MODULE WITH ISOLATING LINK FOR FUTURE EXTN.	14

765 kV AIS EQUIPMENTS						
SYMBOL	DESCRIPTION	ACTUAL QTY	LOA QTY	SYMBOL	DESCRIPTION	ACTUAL QTY
	624 kV, 1PH SURGE ARRESTOR	12	12		3150 A, 50 KA (50/1 Sec) 1 PH 1 PH LINE TRAP	4
	765 kV, 8000 pF, 1 PH CAPACITIVE VOLTAGE TRANSFORMER	6	6			

SYSTEM PARAMETER :

SL. NO.	DESCRIPTION OF PARAMETERS	765 kV SYSTEM
1	SYSTEM OPERATING VOLTAGE	765 kV
2	MAXIMUM OPERATING VOLTAGE OF THE SYSTEM (r.m.s.)	800 kV
3	RATED FREQUENCY	50 Hz
4	NO. OF PHASE	3
5	RATED INSULATION LEVELS	
5.1	FULL WAVE PULSE WITHSTAND VOLTAGE (1.250 increase)	2100 kVp
5.2	SWITCHING IMPULSE WITHSTAND VOLTAGE (100/250 increase) DRY AND WET	1550 kVp
5.3	ONE MINUTE POWER FREQUENCY DRY WITHSTAND VOLTAGE (r.m.s.)	830 kV
5.4	ONE MINUTE POWER FREQUENCY DRY AND WET WITHSTAND VOLTAGE (r.m.s.)	--
6	CORONA EXTINCTION VOLTAGE	508 kV
7	MAXIMUM RADIO INTERFERENCE VOLTAGE FOR FREQUENCY BETWEEN 0.5 MHz AND 2 MHz AT 206 kv r.m.s.	2500 microvolt
8	MINIMUM CLEARANCE DISTANCE (31 mm/kV)	24800 mm
9	MINIMUM CLEARANCES	
9.1	PHASE TO PHASE	7600 mm (FOR CONDUCTOR - CONDUCTOR CONFIGURATION) 8400 mm FOR ROD - CONDUCTOR CONFIGURATION
9.2	PHASE TO EARTH	4900 mm (FOR CONDUCTOR - STRUCTURE CONFIGURATION) 4900 mm FOR ROD - STRUCTURE CONFIGURATION
10	SECTIONAL CLEARANCES	10300 mm
11	RATED SHORT CIRCUIT CURRENT FOR 1 sec. DURATION	40 kA
12	SYSTEM NEUTRAL EARTHING	EFFECTIVELY EARTHED

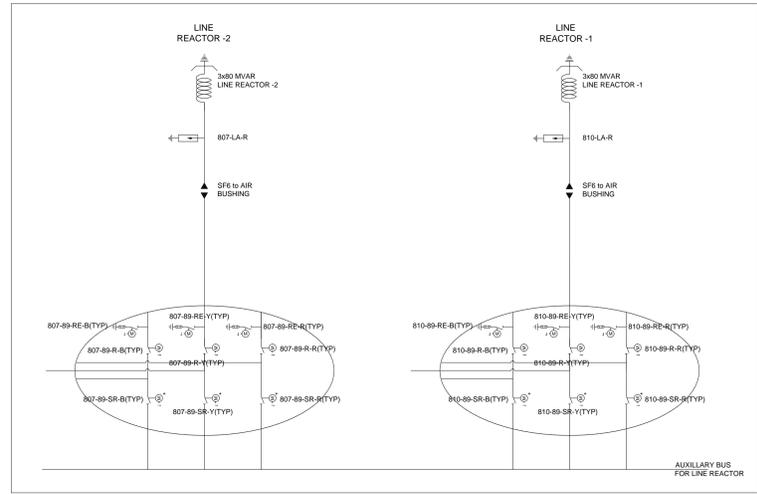
765 kV VOLTAGE TRANSFORMER :

Designation	Windings	Ratio	Class	Application	Burden (VA)
- PT1	Primary	765 kV / √3			
- PT2	Secondary 1	110 V / √3	3P	Protection	50 VA
	Secondary 2	110 V / √3	3P	Protection	50 VA
	Secondary 3	110 V / √3	0.2	Metering	50 VA

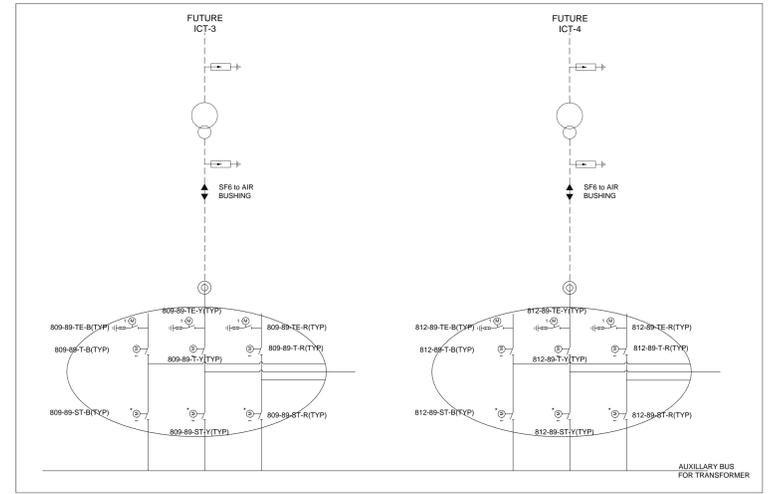
765 kV CURRENT TRANSFORMER :

DESIGNATION	CORE-NO.	RATIO	CLASS	APPLICATION	BURDEN (VA)	Min Knee pt.Voltage V _k (V)	Max CT Sec. Wdg Resistance (Ohm)	Max Excitation current at V _k (Amp)
CT-1A & CT-3A	Core-1	3000-2000-500/1A	TPS	Feeder Protection		3000-2000-500	12/8/2	20 on 3000/1tap 30 on 2000/1tap 120 on 500/1tap
CT-2TA & CT-2TB	Core-2	3000-2000-500/1A	TPS	Feeder Protection		3000-2000-500	12/8/2	20 on 3000/1tap 30 on 2000/1tap 120 on 500/1tap
	Core-3	3000-2000-500/1A	0.2S	METERING	20VA			FOR METERING CORE 1000/1 RATIO SHALL BE ACHIEVED BY TAKING TAP FROM 3000 AND 2000 POINT
CT-1B & CT-3B	Core-1	3000-2000-500/1A	TPS	Busbar Differential Protection		3000-2000-500	12/8/2	20 on 3000/1tap 30 on 2000/1tap 120 on 500/1tap
	Core-2	3000-2000-500/1A	TPS	Busbar Differential Protection		3000-2000-500	12/8/2	20 on 3000/1tap 30 on 2000/1tap 120 on 500/1tap

EQUIPMENT NUMBERING SCHEME :



DETAILS FOR REACTOR BAY



DETAILS FOR ICT BAY

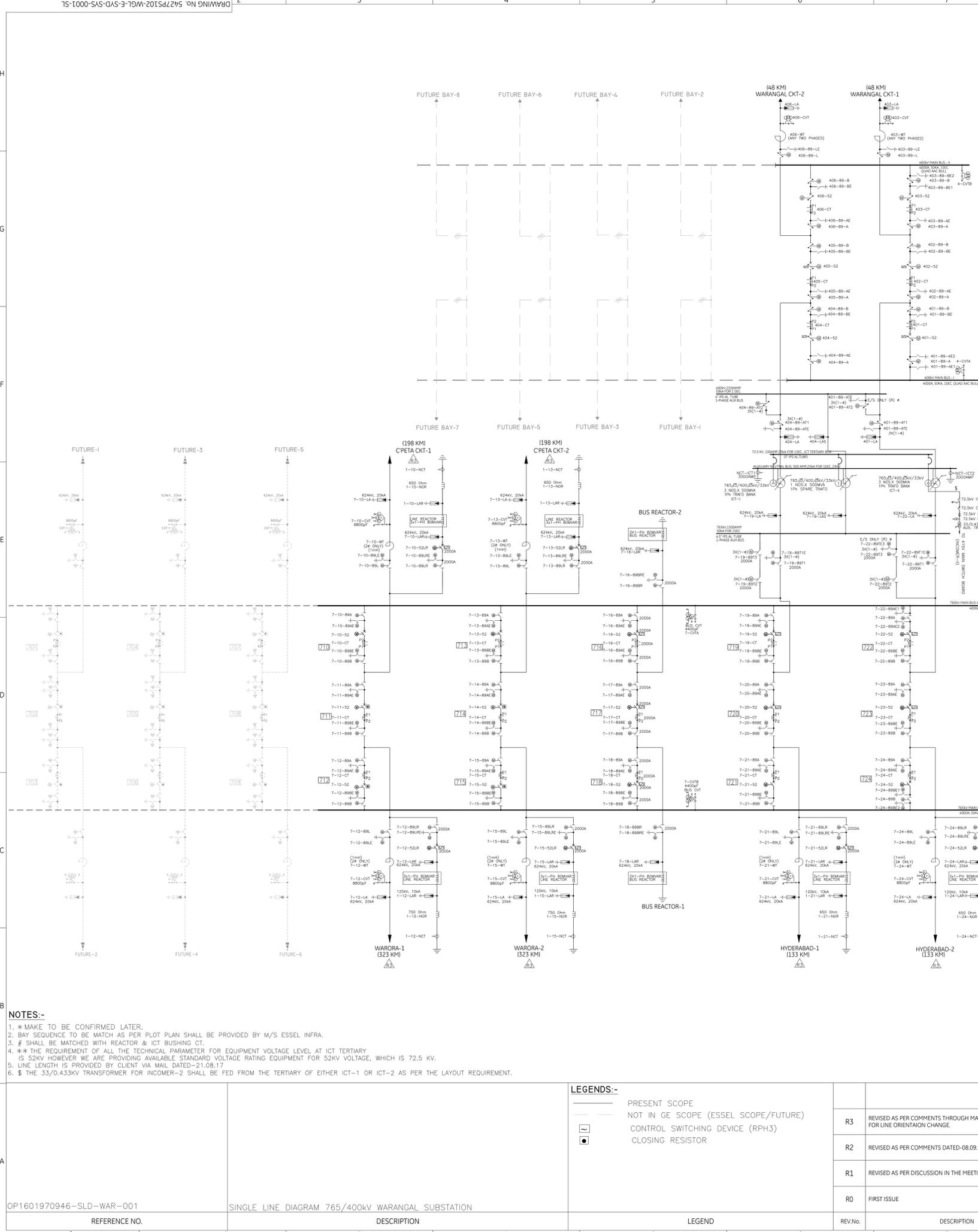
SCOPE OF WORK :
 --- PRESENT SCOPE
 - - - - - FUTURE
 - - - - - EXISTING

REFERENCE DRAWING:
 1. Tender SLD Drawing - C/ENG/SS/STS/765 SLD Rev1
 2. Tender GA Drawing - C/ENG/SS/SR/765 kV SRIKAKULAM EXTN/A1 Rev1

REV.	DESCRIPTION	PREP.	CHKD.	APPD.	DATE	
3	FOURTH SUBMISSION	S.D.	U.S.	I.S.	P.K.M.	15.04.16
2	THIRD SUBMISSION (As per PGCIL comment on 19.03.15)	S.D.	U.S.	I.S.	P.K.M.	22.03.15
1	SECOND SUBMISSION	S.D.	U.S.	I.S.	P.K.M.	21.01.15
0	FIRST SUBMISSION	S.D.	U.S.	I.S.	P.K.M.	17.01.15

CUSTOMER	Power Grid Corporation of India Limited (A Government of India Enterprise)
CONTRACTOR	NHVS New North East Electric Group High Voltage Switchgear Co. Ltd. No.38, Jangling North Street, Taxi District, Shenyang, 110025, P.R. CHINA
NOA NO.	SUPPLY CC-CS446-SR1/GIS-2338/3/GS/NOA-III/5151 Date: 18.12.2014
PROJECT	SERVICE 765/400kV Vemagiri (GIS) Substation (New) and (i) 765kV Sriakulam (GIS) Substation Extension under system strengthening in Southern Region for import of power from Eastern Region
SUBSTATION	765/400kV SRIKAKULAM (Extn.) GIS Sub-station
DRG. TITLE	SINGLE LINE DIAGRAM (765 kV)
DRG. NO. :	NHVS-EMC-SRKL-E-LAY-DRG-001 ZF15-800(50-9)SKBJ.449.704
SCALE	N.T.S.
JOB NO.	
SHEET	1 OF 1

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BILL OF QUANTITY OF 400KV EQUIPMENTS:-

S.No.	DESCRIPTION	MAKE	LOCATION	ENGG. QTY.	UNIT	SYMBOL
1.	420KV,3150A,50KA FOR 1sec,SP6,3-PHASE CIRCUIT BREAKER WITHOUT CLOSING RESISTOR,WITHOUT CONTROL SWITCHING	GE	406-52,403-52	02	NOS	
2.	420KV,3150A,50KA FOR 1sec,SP6,3-PHASE CIRCUIT BREAKER WITHOUT CLOSING RESISTOR,WITH CONTROL SWITCHING	GE	401-52,402-52 404-52,405-52	04	NOS	
3.	420KV,3150A,50KA FOR 1sec, 3-PHASE HORIZONTAL DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH.	S&S	401-89-B,402-89-A,402-89-B 403-89-A,403-89-B,404-89-A 404-89-B,405-89-A,405-89-B 406-89-A,406-89-B,406-89-L	12	SET	
4.	420KV,3150A,50KA FOR 1sec,3-PHASE HORIZONTAL DOUBLE BREAK ISOLATOR WITH TWO EARTH SWITCH.	S&S	401-89-A, 403-89-B	02	SET	
5.	420KV,3150A,50KA FOR 1sec,1-PHASE HORIZONTAL DOUBLE BREAK ISOLATOR WITH ONE EARTH SWITCH.	S&S	401-89-AT1-R,401-89-AT1-Y, 401-89-AT1-B,404-89-AT1-Y, 404-89-AT1-B,404-89-AT1-Y 404-89-AT1-R,404-89-AT1-R 404-89-AT1-R,404-89-AT1-R	07	SET	
6.	420KV,3150A,50KA FOR 1sec,1-PHASE HORIZONTAL DOUBLE BREAK ISOLATOR WITHOUT EARTH SWITCH.	S&S	404-89-AT2-R,404-89-AT2-Y, 404-89-AT2-B,401-89-AT2-B	05	SET	
7.	420KV,50KA FOR 1SEC, 1-PH, CURRENT TRANSFORMER (LIVE TANK TYPE) 3000A (6 CORE)	GE	401-CT,402-CT,403-CT,404-CT 405-CT,406-CT	18	NOS	
8.	420KV, 50KA FOR 1 SEC, 1-PH CVT (4400pF) (3 WINDINGS IN SECONDARY)	GE	403-CVT,406-CVT 4-CVT,4-CVTB	12	NOS	
9.	420KV, 300KA,50KA FOR 1 SEC, 0.5 MH (1-#) WAVE TRAP (IN TWO PHASES ONLY) PEDESTAL MOUNTED	GE	403-WT,406-WT 404-LAS,406-LA	04	NOS	
10.	350KV,10KA, 1-PH LIGHTNING ARRESTER	*	401-LA,403-LA,404-LA 404-LAS,406-LA	13	NOS	

SYSTEM PARAMETERS-(I)

S.No.	DESCRIPTION OF PARAMETER	765KV SYSTEM	400KV SYSTEM
1	SYSTEM OPERATING VOLTAGE	765KV	400KV
2	MAX. OPERATING VOLTAGE OF THE SYSTEM (rms)	800KV	420KV
3	RATED FREQUENCY	50Hz	50Hz
4	N.O. OF PHASES	3	3
5	RATED INSULATION LEVELS		
i) IMPULSE WITHSTAND VOLTAGE (1.2/50microsec.)			
- TRANSFORMER AND REACTORS			
- FOR OTHER EQUIPMENT			
		1950kVp	1300kVp
		2100kVp	1425kVp
		1550kVp	1050kVp
			INSULATOR STRING
ii) SWITCHING IMPULSE WITHSTAND VOLTAGE (250/250microsec.) DRY & WET			
		830kVp	650kVp
iii) ONE MINUTE POWER FREQUENCY DRY WITHSTAND VOLTAGE (rms)			
		-	-
iv) ONE MINUTE POWER FREQUENCY DRY & WET WITHSTAND VOLTAGE (rms)			
		-	-
6	CORONA EXTINGUISHING VOLTAGE	508kV	320kV
7	MAX. RADIO INTERFERENCE VOLTAGE FOR FREQUENCY BETWEEN 0.5 MHZ AND 2 MHZ	micro volts at 3K(1-#)	micro volts at 2K(1-#)
8	MINIMUM CREEPAGE DISTANCE (25MM/KV)	2000mm	1050mm
9	MAX. FAULT CURRENT	50KA	50 KA
10	DURATION OF FAULT	1-1Sec	1-1Sec

SYSTEM PARAMETERS-(II)

S.No.	DESCRIPTION	DETAIL OF 33KV	DETAIL OF 52KV	DETAIL OF 72.5KV
a.	NOMINAL VOLTAGE	33kv	52kv	66kv
b.	HIGHEST SYSTEM VOLTAGE	36kv	52kv	72.5kv
c.	ONE MIN. POWER FREQUENCY WITHSTAND VOLTAGE (RMS)	70kv	95kv	140kv
d.	BASIC IMPULSE WITHSTAND VOLTAGE (PEAK)	170kVp	250kVp	325kVp
e.	SWITCHING IMPULSE WITHSTAND VOLTAGE DRY AND WET	-	-	-
f.	SHORT CIRCUIT LEVEL (KA)	25	25	25
g.	MIN. CREEPAGE DISTANCE	900mm	1300mm	1815mm

BILL OF QUANTITY OF 765KV EQUIPMENTS:-

S.No.	DESCRIPTION	MAKE	LOCATION	ENGG. QTY.	UNIT	SYMBOL
1.	765KV,3150A,50KA,1sec,SP6,3P CIRCUIT BREAKER W/O CONTROL SWITCHING WITH CLOSING RESISTOR	GE	7-11-52,7-12-52,7-14-52,7-15-52	04	NOS	
2.	765KV,3150A,50KA,1sec,SP6,3P CIRCUIT BREAKER W/O CONTROL SWITCHING W/O CLOSING RESISTOR	GE	7-10-52,7-13-52,7-21-52,7-24-52	04	NOS	
3.	765KV,2000A,50KA,1sec,SP6,3P CIRCUIT BREAKER WITH CONTROL SWITCHING W/O CLOSING RESISTOR	GE	7-10-52L,7-12-52L,7-13-52L,7-15-52L,7-16-52,7-17-52 7-18-52,7-21-52L,7-24-52L	09	NOS	
4.	765KV,3150A,50KA,1sec,SP6,3P CIRCUIT BREAKER WITH CONTROL SWITCHING W/O CLOSING RESISTOR	GE	7-19-52,7-20-52,7-22-52,7-23-52	04	NOS	
5.	765KV,3150A,50KA,1sec, 3-PHASE (KNEE TYPE) ISOLATOR WITH ONE EARTH SWITCH	S&S	7-10-89L,7-10-89A,7-10-89B,7-11-89A,7-11-89B,7-12-89A,7-12-89B,7-13-89A,7-13-89B,7-14-89A,7-14-89B,7-15-89A,7-15-89B,7-16-89A,7-16-89B,7-17-89A,7-17-89B,7-18-89A,7-18-89B,7-23-89A,7-23-89B,7-24-89A,7-24-89B	28	SET	
6.	765KV,2000A,50KA,1sec, 3-PHASE (KNEE TYPE) ISOLATOR WITH ONE EARTH SWITCH	S&S	7-10-89L,7-12-89L,7-13-89L,7-15-89L,7-16-89B,7-18-89B,7-18-89B,7-21-89L,7-21-89B,7-24-89L	14	SET	
7.	765KV,3150A,50KA,1sec, 3-PHASE (KNEE TYPE) ISOLATOR WITH TWO EARTH SWITCH	S&S	7-22-89A,7-24-89B	02	SET	
8.	765KV,2000A,50KA,1sec, 1-PHASE (KNEE TYPE) ISOLATOR WITH ONE EARTH SWITCH	S&S	7-19-89T1-R,7-19-89T1-Y,7-19-89T1-B,7-22-89T3-R 7-22-89T3-Y,7-22-89T3-B	07	SET	
9.	765KV,2000A,50KA,1sec, 1-PHASE (KNEE TYPE) ISOLATOR WITHOUT EARTH SWITCH	S&S	7-19-89T3-R,7-19-89T3-Y,7-19-89T3-B 7-22-89T2-R,7-22-89T2-Y,7-22-89T2-B 7-22-89T3-R,7-22-89T3-Y,7-22-89T3-B	11	NOS	
10.	765KV,1-PH CURRENT TRANSFORMER 3000A (6 CORE) 150KA-1 SEC 120% EXTENDED CURRENT RATING	GE	7-10-CT,7-11-CT,7-12-CT,7-13-CT,7-14-CT,7-15-CT,7-19-CT, 7-20-CT,7-21-CT,7-22-CT,7-23-CT,7-24-CT	36	NOS	
11.	765KV,1-PH CURRENT TRANSFORMER 2000A (6 CORE) 150KA-1 SEC 120% EXTENDED CURRENT RATING	GE	7-16-CT,7-17-CT,7-18-CT	09	NOS	
12.	765KV,1-PH CVT (8800pF)	GE	7-10-CVT,7-12-CVT,7-13-CVT 7-15-CVT,7-21-CVT,7-24-CVT	18	NOS	
13.	765KV,1-PH CVT (4400pF)	GE	7-CVT,7-CVTB	06	NOS	
14.	624KV,20KA LIGHTNING ARRESTER (1-#)	*	7-10-LA,7-10-LAR,7-12-LA,7-12-LAR,7-13-LA,7-13-LAR 7-15-LA,7-15-LAR,7-16-LA,7-16-LAR,7-19-LA,7-19-LAS, 7-21-LA,7-21-LAR,7-22-LA,7-22-LAR,7-24-LA,7-24-LAR	49	NOS	
15.	765KV, 3150A,50KA 1MH WAVE TRAP	GE	7-10-WT,7-12-WT,7-13-WT,7-15-WT,7-17-WT,7-21-WT,7-24-WT	12	NOS	

(765KV TRANSFORMER & REACTOR)

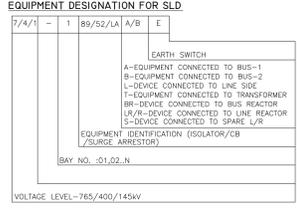
ITEM No.	DESCRIPTION	MAKE	LOCATION	ENGG. QTY.	UNIT	SYMBOL
1.	500 MVA AUTO TRANSFORMER 1-PH, 765/400KV	GE	-----	07	NOS.	
2.	765KV, 80 MVAR LINE REACTOR, 1-PHASE	GE	-----	18	NOS.	
3.	145KV, 650 Ohm NGR FOR 1 BANK OF 3-PHASE REACTOR	*	1-10-NGR,1-13-NGR, 1-21-NGR,1-24-NGR	04	NOS.	
4.	145KV, 750 Ohm NGR FOR 1 BANK OF 3-PHASE REACTOR	*	1-10-NGR,1-15-NGR	02	NOS.	
5.	120 KV LA FOR 1 BANK OF 3-PHASE REACTOR (1 Ph.)	*	1-10-LAR,1-12-LAR,1-13-LAR 1-15-LAR,1-21-LAR,1-24-LAR	06	NOS.	
6.	765KV, 80 MVAR BUS REACTOR, 1-PHASE	GE	-----	06	NOS.	
7.	#33KV,300-1 AMP NCT FOR 1 BANK OF 3-PH.	*	1-10-NCT,1-12-NCT,1-13-NCT 1-15-NCT,1-21-NCT,1-24-NCT	06	NOS.	
8.	#33KV,3000-1AMP NCT FOR 1 BANK OF 3-PH.	*	NCT-ICT1,NCT-ICT2	02	NOS.	

BILL OF QUANTITY OF 72.5KV EQUIPMENTS:-

S.No.	DESCRIPTION	MAKE	ENGG. QTY.	UNIT	SYMBOL
1.	72.5 kv,1250A,25 ka,1sec,SP6,3PH,CIRCUIT BREAKER	*	01	NOS	
2.	72.5 kv, 50/7-1A, 25ka-1 sec, 1PH, CURRENT TRANSFORMER WITH 120% EXTENDED CURRENT RATING	*	03	NOS	
3.	72.5 kv (15/15/15) 1PH, VOLTAGE TRANSFORMER	*	03	NOS	
4.	72.5 kv, 40KA, 25 KA-1 sec, HOB (3-Phase) ISOLATOR (MECHANICALLY GANGED) WITH ONE E/S	S&S	01	SET	
5.	800KVA 33/0.433KV 3 PH, 250KVP BL LT TRANSFORMER.	*	01	NOS	

BILL OF QUANTITY OF 33 KV EQUIPMENTS:-

S.No.	DESCRIPTION	MAKE	ENGG. QTY.	UNIT	SYMBOL
1.	33kv, DOUBLE BREAK ISOLATOR WITHOUT ES, 400A,25KA (3ph)	S&S	01	SET	
2.	33kv, HORN GAP FUSE (1 Ph.)	*	03	Nos.	
3.	30KV, SURGE ARRESTOR (1 Ph.)	*	03	Nos.	
4.	800KVA 33/0.433KV 3 PH, 170KVP BL LT TRANSFORMER	*	01	Nos.	



TRACTEBEL CONSULTING ENGINEERS, GURGAON, INDIA

TRACTEBEL ENGINEERING PVT. LTD.

M.010184: Warora - Kurnool 765 kv D/C

Transmission Line Project

APPROVAL STATUS:

A: APPROVED

B: APPROVED WITH COMMENT(RESUBMIT)

C: NOT APPROVED

D: FOR INFORMATION/REFERENCE

THIS APPROVAL STATUS SHALL NOT RELIEVE THE CONTRACTOR FROM ITS CONTRACTUAL OBLIGATIONS.

DEPARTMENT: T & D **DATE: 18.12.2017**

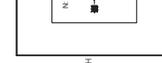
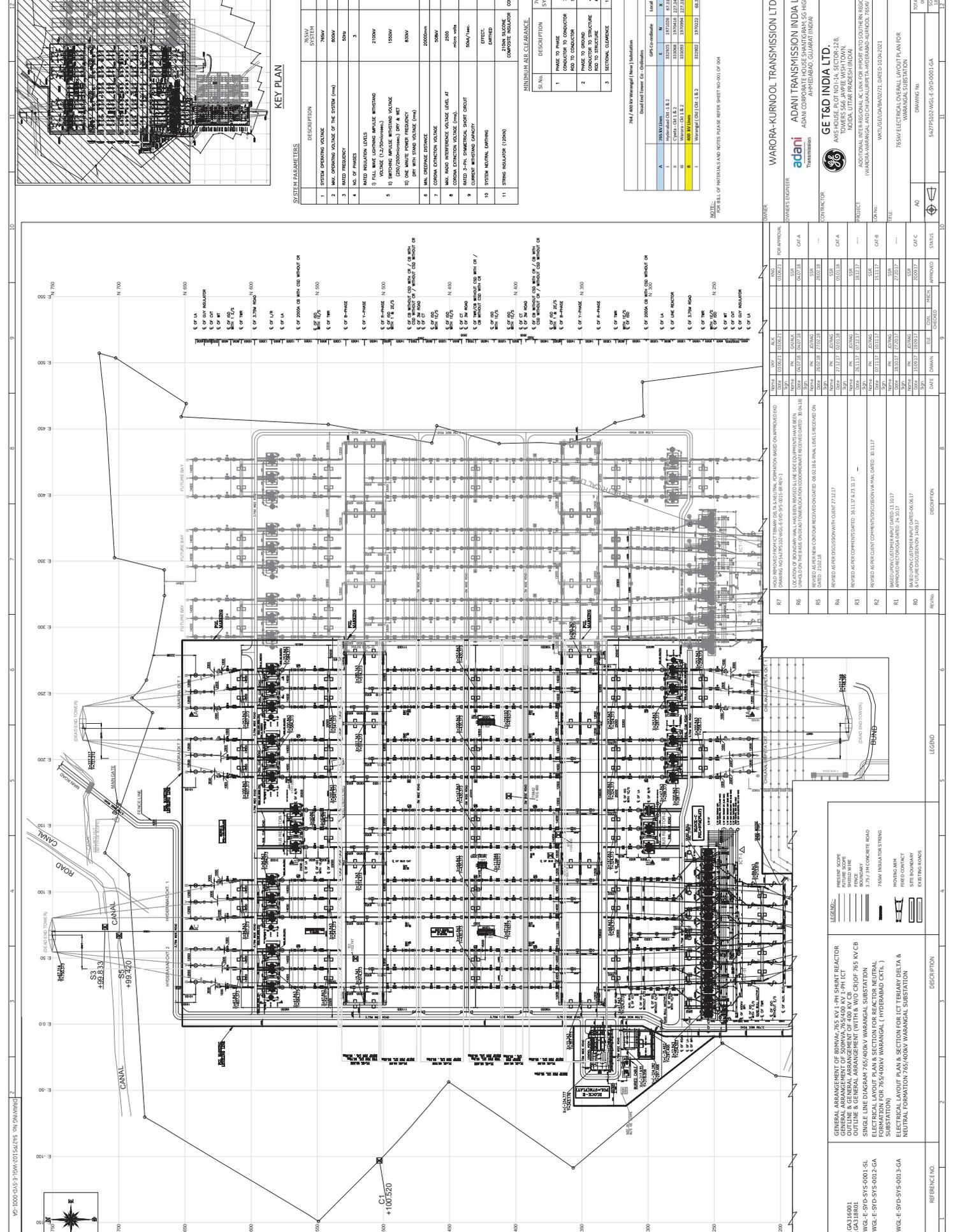
Project Manager **Transmittal No: M.010184/WKLT/SS/E/042**

- NOTES:-**
- * MAKE TO BE CONFIRMED LATER.
 - BAY SEQUENCE TO BE MATCH AS PER PLOT PLAN SHALL BE PROVIDED BY M/S ESSEL INFRA.
 - # SHALL BE MATCHED WITH REACTOR & ICT BUSHING CT.
 - ** THE REQUIREMENT OF ALL THE TECHNICAL PARAMETER FOR EQUIPMENT VOLTAGE LEVEL AT ICT TERTIARY IS 52KV HOWEVER WE ARE PROVIDING AVAILABLE STANDARD VOLTAGE RATING EQUIPMENT FOR 52KV VOLTAGE, WHICH IS 72.5 KV.
 - LINE LENGTH IS PROVIDED BY CLIENT VIA MAIL DATED=21.08.17
 - \$ THE 33/0.433KV TRANSFORMER FOR INCOMER-2 SHALL BE FED FROM THE TERTIARY OF EITHER ICT-1 OR ICT-2 AS PER THE REQUIREMENT.

LEGENDS:-

	PRESENT SCOPE
	NOT IN GE SCOPE (ESSEL SCOPE/FUTURE)
	CONTROL SWITCHING DEVICE (RPH3)
	CLOSING RESISTOR

REV.No.	DESCRIPTION	Name	Date	Sign.	STATUS
R3	REVISED AS PER COMMENTS THROUGH MAIL DATED:16.11.17 FOR LINE ORIENTATION CHANGE.	PK	17.11.17	JD/RAG	SSR
R2	REVISED AS PER COMMENTS DATED-08.09.17	PK	08.09.17	JD/RAG	SSR
R1	REVISED AS PER DISCUSSION IN THE MEETING WITH CLIENT ON DATE-31.08.17	PK	31.08.17	JD/RAG	SSR
R0	FIRST ISSUE	PK	09.08.17	JD/RAG	SSR



VP: 1000-01-03-F-DW-2015-04-25 ON DN W/PROJ-2

101-2679
3271004371GA316001
3271004371GA318001
542775102-WGL-E-SYD-SY-0001-5L
542775102-WGL-E-SYD-SY-0012-GA
542775102-WGL-E-SYD-SY-0013-GA

GENERAL ARRANGEMENT OF BOWAY-765 KV 1-PH SHUNT REACTOR
OUTLINE & GENERAL ARRANGEMENT OF 400 KV CB
OUTLINE & GENERAL ARRANGEMENT (WITH & W/O CRDF 765 KV CB
SINGLE LINE DIAGRAM 765/400KV VARANGAL SUBSTATION
FOUNDATION FOR 765/400KV VARANGAL (HYDROBARD CTS.)
SUBSTATION)
ELECTRICAL LAYOUT PLAN & SECTION FOR ICT TERNARY DELTA &
NEUTRAL FORMATION 765/400KV VARANGAL SUBSTATION

LEGEND:
PRESENT SCOPE
EXISTING WIRE
SITE BOUNDARY
3.75% IN CONCRETE ROAD
765KV INSULATION STRING
ROUNDOFF
SITE BOUNDARY
EXISTING ROADS

DESCRIPTION

REFERENCE NO.

DATE
BY
CHECKED
FOR APPROVAL

REVISIONS

KEY PLAN

765KV SYSTEM	DESCRIPTION	765KV SYSTEM	765KV SYSTEM
1	SYSTEM OPERATING VOLTAGE	765KV	400KV
2	MAX. OPERATING VOLTAGE OF THE SYSTEM (mm)	800KV	500KV
3	RATED FREQUENCY	50Hz	50Hz
4	NO. OF PHASES	3	3
5	WINDING INSULATION LEVELS	2100KV	1420KV
6	1) FULL MARK LUSHING WINDING VOLTAGE (1.275xNominal)	1500KV	1000KV
7	2) WINDING WINDING WINDING VOLTAGE (1.275xNominal) PER A WIT (250/2500000000) PER A WIT	800KV	500KV
8	3) WINDING WINDING WINDING VOLTAGE (1.275xNominal) PER A WIT (250/2500000000) PER A WIT	2000mm	1500mm
9	4) MIN. CLEARANCE	1500mm	1000mm
10	5) CORONA EXTENSION VOLTAGE	1500mm	1000mm
11	6) MAX. ALLOWABLE INTERFERENCE VOLTAGE LEVEL AT 500m	1500mm	1000mm
12	7) CORONA EXTENSION VOLTAGE LEVEL AT 500m	1500mm	1000mm
13	8) CORONA EXTENSION VOLTAGE LEVEL AT 500m	1500mm	1000mm
14	9) RATED 3-PH. SWINGING SHORT CIRCUIT CURRENT WITHIN CAPACITY	50MVA/Year	50MVA/Year
15	10) SYSTEM NEUTRAL TAPPING EFFECT.	EFFECT.	EFFECT.
16	11) STRING INSULATOR (100KV)	210KV SILICONE COMPOSITE INSULATOR	150KV SILICONE COMPOSITE INSULATOR

MINIMUM AIR CLEARANCE

Sl.No.	DESCRIPTION	765KV SYSTEM	400KV SYSTEM
1	PHASE TO PHASE CONDUCTOR TO CONDUCTOR	7000	4000
2	PHASE TO GROUND	8400	4000
3	SECTIONAL CLEARANCE	10000	4000

Sl.No.	DESCRIPTION	765KV SYSTEM	400KV SYSTEM
1	PHASE TO PHASE CONDUCTOR TO CONDUCTOR	7000	4000
2	PHASE TO GROUND	8400	4000
3	SECTIONAL CLEARANCE	10000	4000

765/400KV Warangal (Near) Substation
Equal Foot Tower Co. Configuration

Sl.No.	DESCRIPTION	765KV SYSTEM	400KV SYSTEM
1	PHASE TO PHASE CONDUCTOR TO CONDUCTOR	7000	4000
2	PHASE TO GROUND	8400	4000
3	SECTIONAL CLEARANCE	10000	4000

765/400KV Warangal (Near) Substation
Equal Foot Tower Co. Configuration

Sl.No.	DESCRIPTION	765KV SYSTEM	400KV SYSTEM
1	PHASE TO PHASE CONDUCTOR TO CONDUCTOR	7000	4000
2	PHASE TO GROUND	8400	4000
3	SECTIONAL CLEARANCE	10000	4000

765/400KV Warangal (Near) Substation
Equal Foot Tower Co. Configuration

Sl.No.	DESCRIPTION	765KV SYSTEM	400KV SYSTEM
1	PHASE TO PHASE CONDUCTOR TO CONDUCTOR	7000	4000
2	PHASE TO GROUND	8400	4000
3	SECTIONAL CLEARANCE	10000	4000

765/400KV Warangal (Near) Substation
Equal Foot Tower Co. Configuration

WAROR-KURNOOL TRANSMISSION LTD.
ADANI TRANSMISSION INDIA LTD.
ADANI CORPORATION HOUSE-3RD FLOOR-15G HIGHWAY,
AMBUR-68, GUDURU, ANDHRA PRADESH, INDIA

GET&D INDIA LTD.
AMS HOUSE PLOT NO.10-A, SECTOR-12B,
ADANI CORPORATE TOWER-3RD FLOOR-15G HIGHWAY,
AMBUR-68, GUDURU, ANDHRA PRADESH, INDIA

PROJECT: ADDITIONAL INTER-REGIONAL LINK FOR POWER INTO SOUTHERN REGION
(WAROR-AMBURANGAL AND CHENNAI-BURSA-HOTHRAND-KURNOOL-765KV LINK)

CONTRACTOR: WTKL&C/AMBUR/DELTA/002/10/2/301

765KV ELECTRICAL OVERALL LAYOUT PLAN FOR
WARANGAL SUBSTATION

DRAWING NO. 542775102-WGL-E-SYD-0013-GA

SCALE 1:500

TOTAL SHEETS 100

SHEET NO. 001

DATE 15/03/17

BY 15/03/17

CHECKED 15/03/17

FOR APPROVAL 15/03/17

DATE 15/03/17

BY 15/03/17

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DATE 15/03/17

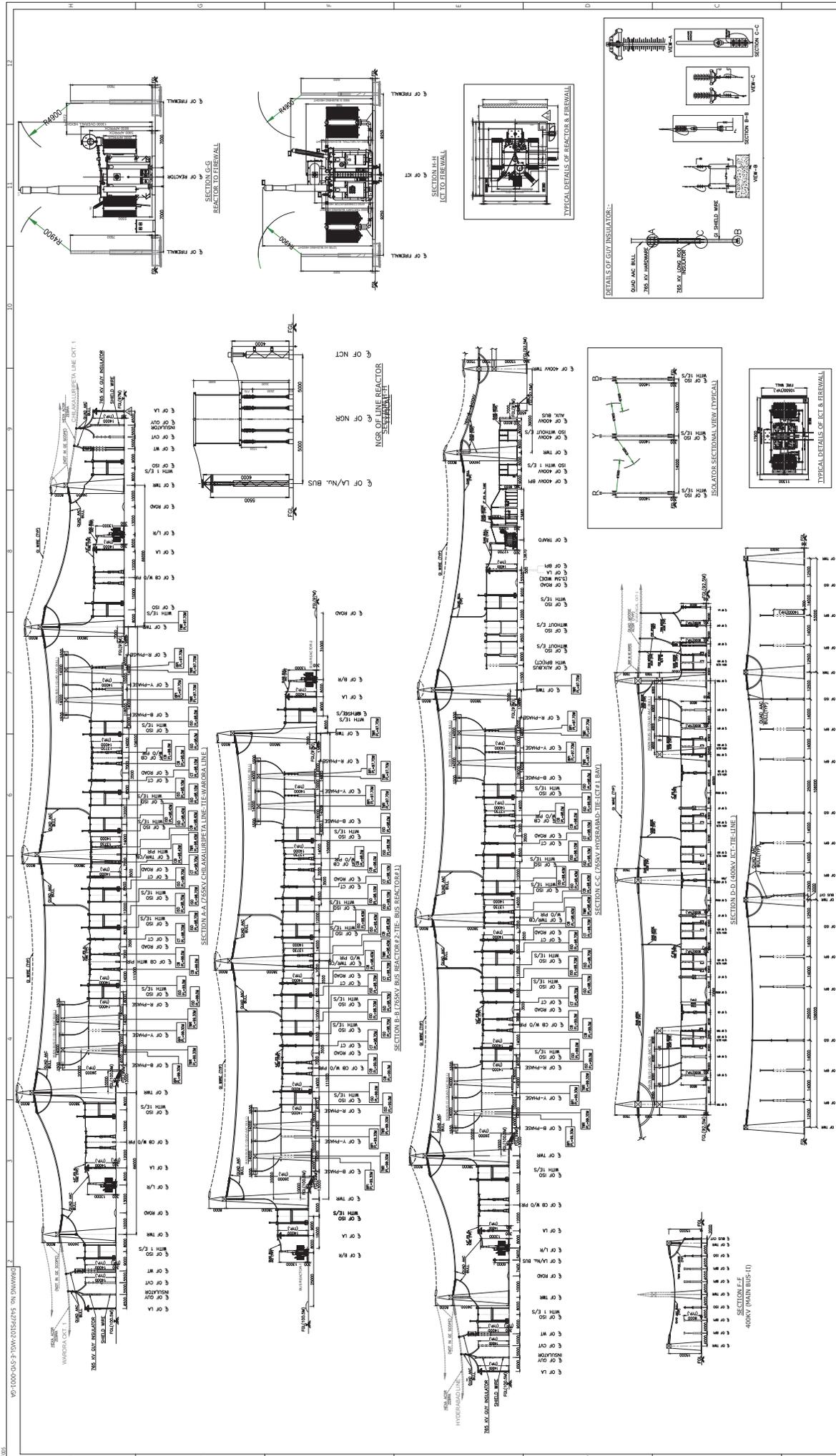
BY 15/03/17

CHECKED 15/03/17

FOR APPROVAL 15/03/17

DATE 15/03/17

BY 15/03/17



NOTES:-

1. ALL DIMENSIONS ARE IN MM.
2. TO BE CHECKED FOR CONFLICTS WITH ALL DRAWINGS IN THE SET.
3. TO BE CHECKED FOR CONFLICTS WITH ALL DRAWINGS IN THE SET.
4. FINAL PARTS LEVELS ARE TO BE CONFIRMED BY THE CLIENT AFTER APPROVAL.
5. PARTS LEVEL OF ALL THE TOWERS SHALL BE SAME.

GENERAL ARRANGEMENT OF 765KV/230KV/110KV SHUNT REACTOR
 OUTLINE & GENERAL ARRANGEMENT OF 400KV/230KV/110KV SHUNT REACTOR
 SINGLE LINE DIAGRAM 765/400KV VARANAGAL SUBSTATION
 765/400KV VARANAGAL SUBSTATION PLAN LAYOUT

SECTION E-E
765KV (MAIN BUS-1)

SECTION D-D (400KV CT LINE)

SECTION C-C (230KV HYDRODAMPER)

SECTION B-B (LINE REACTOR)

SECTION A-A (REACTOR)

DETAILS OF GUY INSULATOR:-

TYPICAL DETAILS OF ICT & FIREWALL

ISOLATOR SECTIONAL VIEW (TYPICAL)

NO.	DATE	BY	CHKD	APPD	DESCRIPTION
R0	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R1	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R2	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R3	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R4	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R5	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R6	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R7	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R8	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R9	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R10	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R11	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R12	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R13	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R14	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R15	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R16	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R17	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R18	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R19	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R20	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0

WARORA-KURNOL TRANSMISSION LTD.

ADANI TRANSMISSION INDIA LTD.
 ADANI CORPORATE HOUSE SHANTIGRAM, 565 HIGHWAY,
 AHMEDABAD, GUJARAT (INDIA)

GE T&D INDIA LTD.
 ANS HOUSE, PLOT NO.14A, SECTOR-128,
 TOWERS 556-JAWAHEER NAGAR,
 NOIDA, UTTAR PRADESH (INDIA)

PROJECT: VARANAGAL SUBSTATION
 (VARANAGAL AND CALAVALURTA, HYDRABAD, GUJARAT, INDIA)

DRAWING NO: 54277PS102-WGL-E-STD-SY6-0001-GA

DATE: 02.03.21

SCALE: AS SHOWN

REVISIONS:

NO.	DATE	BY	CHKD	APPD	DESCRIPTION
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R2	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R3	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R4	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R5	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R6	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R7	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R8	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R9	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R10	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R11	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R12	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R13	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R14	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R15	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R16	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R17	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R18	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R19	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0
R20	02.03.21	AK	AK	AK	REVISED AS PER LAYOUT REV-0

LEGEND:

PRESENT SCOPE

EXISTING/PRIOR/NOT IN SCOPE

PL - PARTS LEVEL

REFERENCE NO:

LD1-2679
 3271004376A316001
 54277PS102-WGL-E-STD-SY6-0001-SL
 54277PS102-WGL-E-STD-SY6-0001-GA

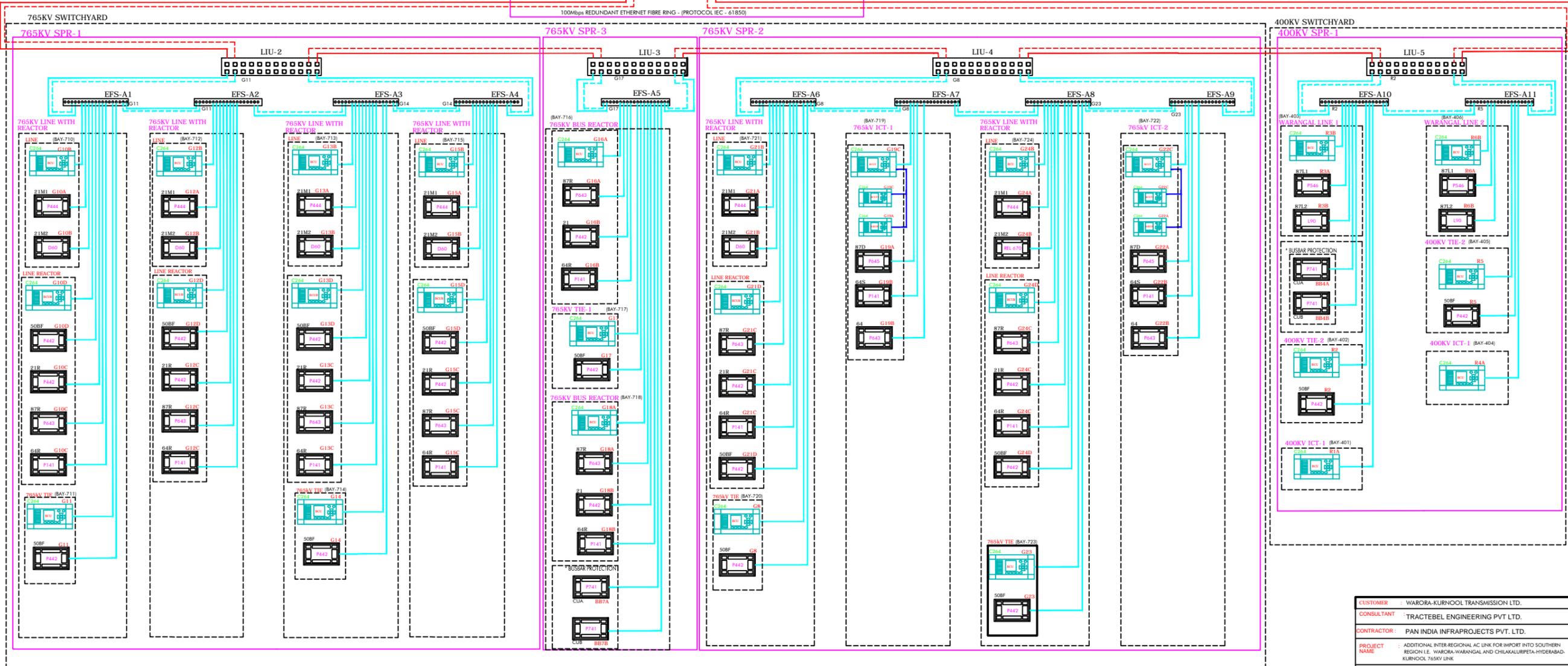
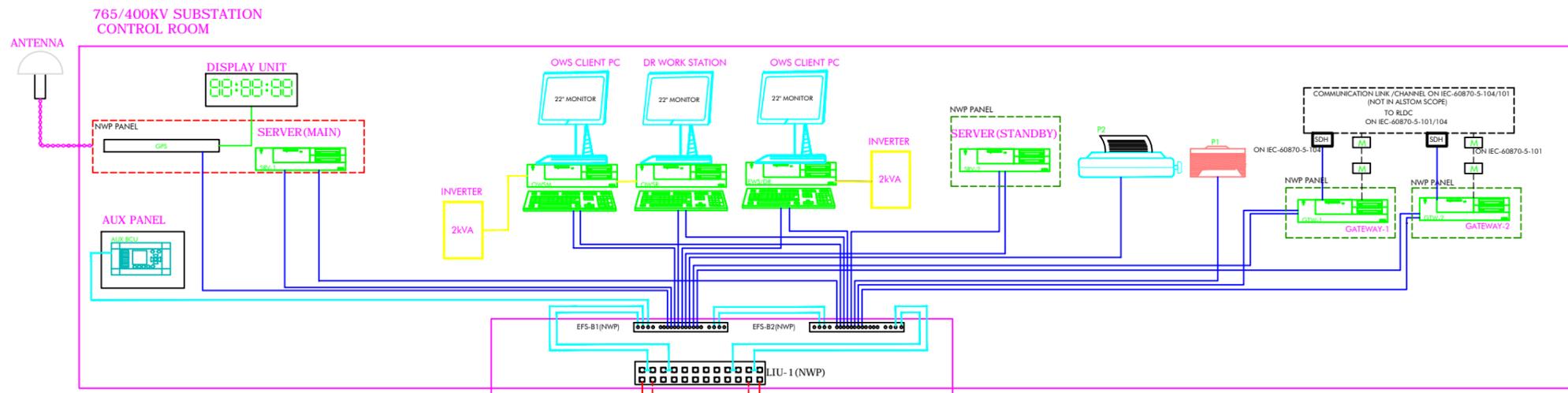
THIS DRAWING AND DESIGN IS THE PROPERTY OF GE AND MUST NOT BE COPIED OR LENT WITHOUT PRIOR PERMISSION IN WRITING

SL	DRAWING	DRAWING NO	REV
1	SUBSTATION AUTOMATION SYSTEM (SAS) - ARCHITECTURE DRAWING - 765/400kv WARANGAL SUBSTATION	KXH3-SA3	A.14.05.18

REV.	DESCRIPTION	DRAWN	SIGN.	CHECKED	SIGN.	APPROVED	SIGN.
A	FIRST ISSUE	Name: MP Date: 14.05.18		Name: VS Date: 14.05.18		Name: SSS Date: 14.05.18	

OWNER :	WARORA-KURNOOL TRANSMISSION LTD.
EPC CONTRACTOR:	PAN INDIA INFRAPROJECTS PVT. LTD.
EPC SUB CONTRACTOR:	MUMBAI WTR PRIVATE LIMITED
OWNER'S ENGINEER:	TRACTEBEL ENGINEERING PRIVATE LIMITED
PROJECT :	765/400KV SUBSTATION AT WARANGAL (NEW) & EXTENSION WORKS FOR 765KV WARORA & CHILKALURIPETA SUBSTATION.
LOA NO :	WTR/LOA/GE/WKTL/SUBSTATION/19/17; DATED: 13TH JUNE 2017
TITLE :	SUBSTATION AUTOMATION SYSTEM (SAS)- ARCHITECTURE DRAWING - 765/400KV WARANGAL SUBSTATION

 <p>GE T & D INDIA LIMITED (FORMERLY ALSTOM T&D INDIA LIMITED) A 7, SECTOR-65 Noida NOIDA - 201 301</p>	<p>DOCUMENT NO.</p> <p>5427PS0102-WGL-U-SYD-SAS-0013-AR</p>	TOTAL SH.	SH. No.	REV.
		SCALE		
		NTS		



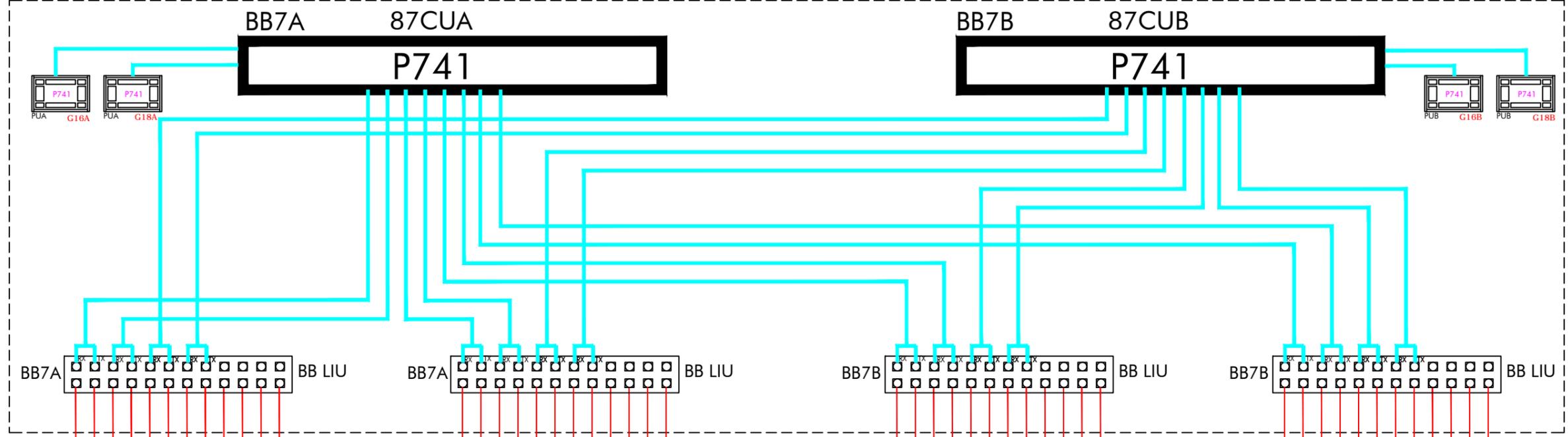
LEGEND:-

	100 MBPS ARMOUR. FIBER OPTIC TCP/IP RING (MULTI MODE)
	RJ45 ETHERNET CABLE
	100 MBPS MULTI MODE FIBER OPTIC PATCH CABLE
	100 MBPS MULTI MODE FIBER OPTIC PATCH CABLE (ARMOURED)
	COAXIAL CABLE (GPS LINK)

REV	DESCRIPTION	DATE
A	FIRST ISSUE	14.05.2018

CUSTOMER	: WARORA-KURNOOL TRANSMISSION LTD.
CONSULTANT	: TRACTEBEL ENGINEERING PVT LTD.
CONTRACTOR	: PAN INDIA INFRAPROJECTS PVT. LTD.
PROJECT NAME	: ADDITIONAL INTER-REGIONAL AC LINK FOR IMPORT INTO SOUTHERN REGION I.E. WARORA-WARANGAL AND CHELAKALURPETA-HYDERABAD-KURNOOL 765KV LINK
LOA NO. :	WTR/LOA/GE/WKTL/SUBSTATION/19/17
DATED	: 13.06.2017
SYSTEM ARCHITECTURE DRAWING	
TITLE	: 765/400KV WARANGAL SUBSTATION
 GE T&D India Ltd. (Formerly Alstom T&D India Ltd.) Grid Automation-Pallavaram India	
ENGG. REF. NO. :	KXHS-SA3
SCH. REF. :	-
SALES ORDER NO. :	-
FILE :	KXHS-SA3
PREPARED BY :	MP
CHECKED BY :	V.V.S
APPROVED BY :	V.V.S
SCALE :	-
DRG. REF. :	KXHS-SA3 (F)
DATE :	14.05.2018
REV :	A

765KV BUSBAR PANEL(SCR-3)

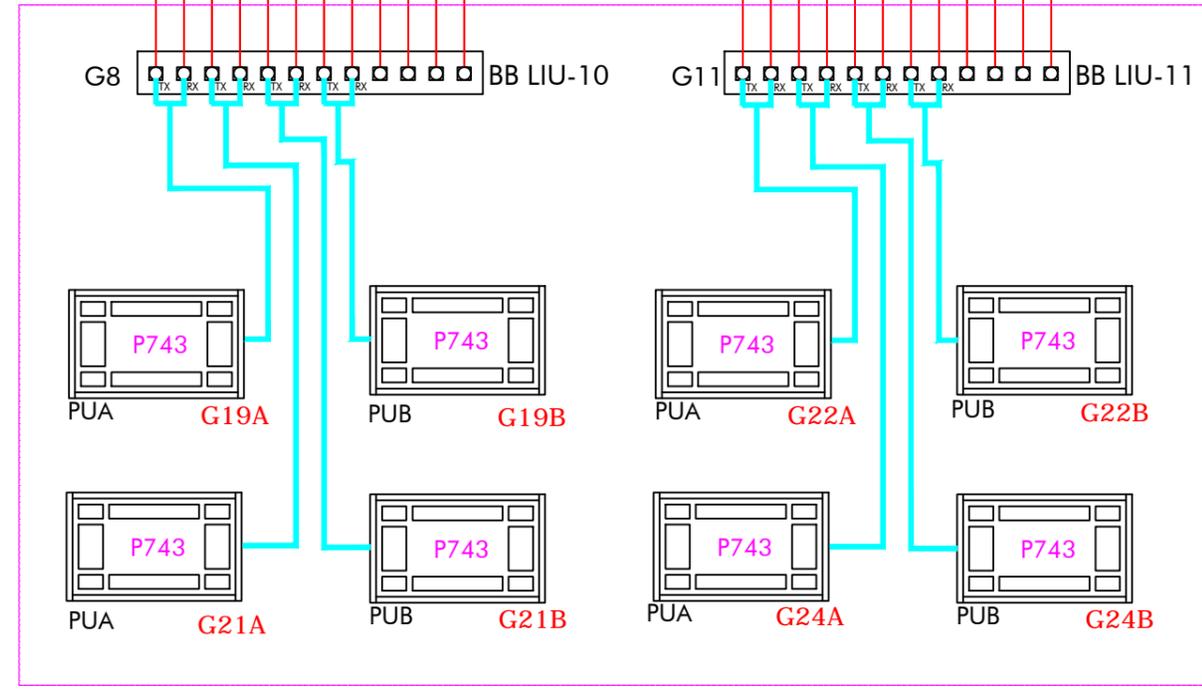
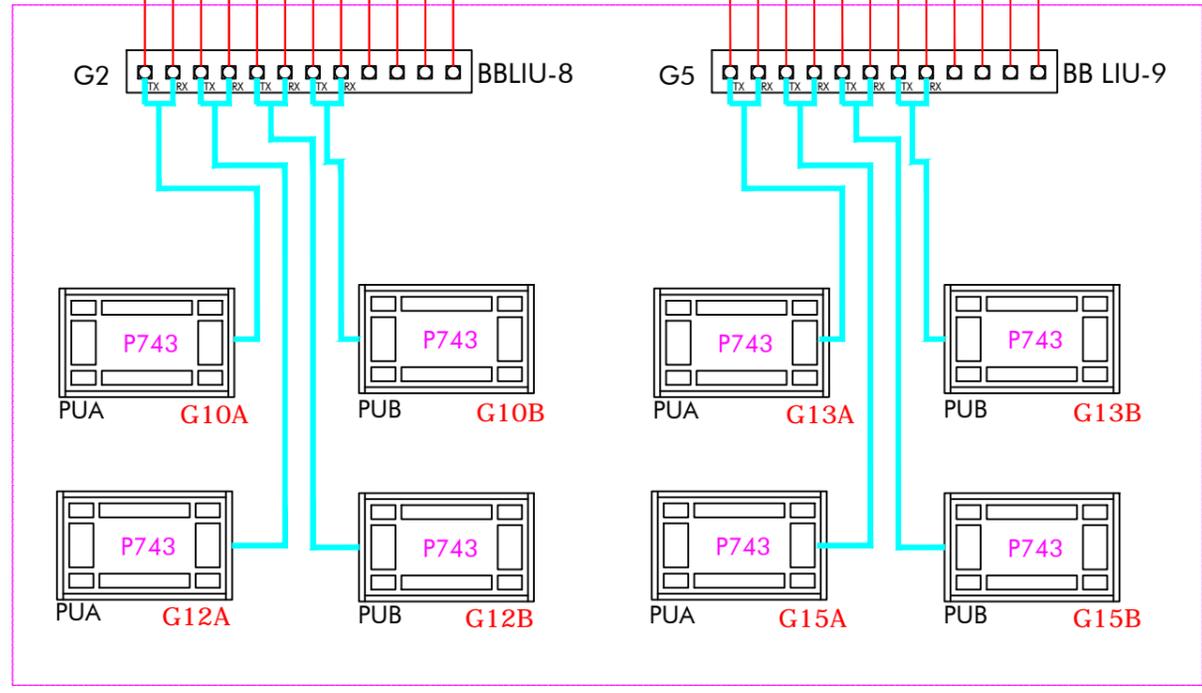


6 CORE MUTIMODE FIBER OPTIC CABLE SPR-1

6 CORE MUTIMODE FIBER OPTIC CABLE

6 CORE MUTIMODE FIBER OPTIC CABLE SPR-2

6 CORE MUTIMODE FIBER OPTIC CABLE



LEGEND:-

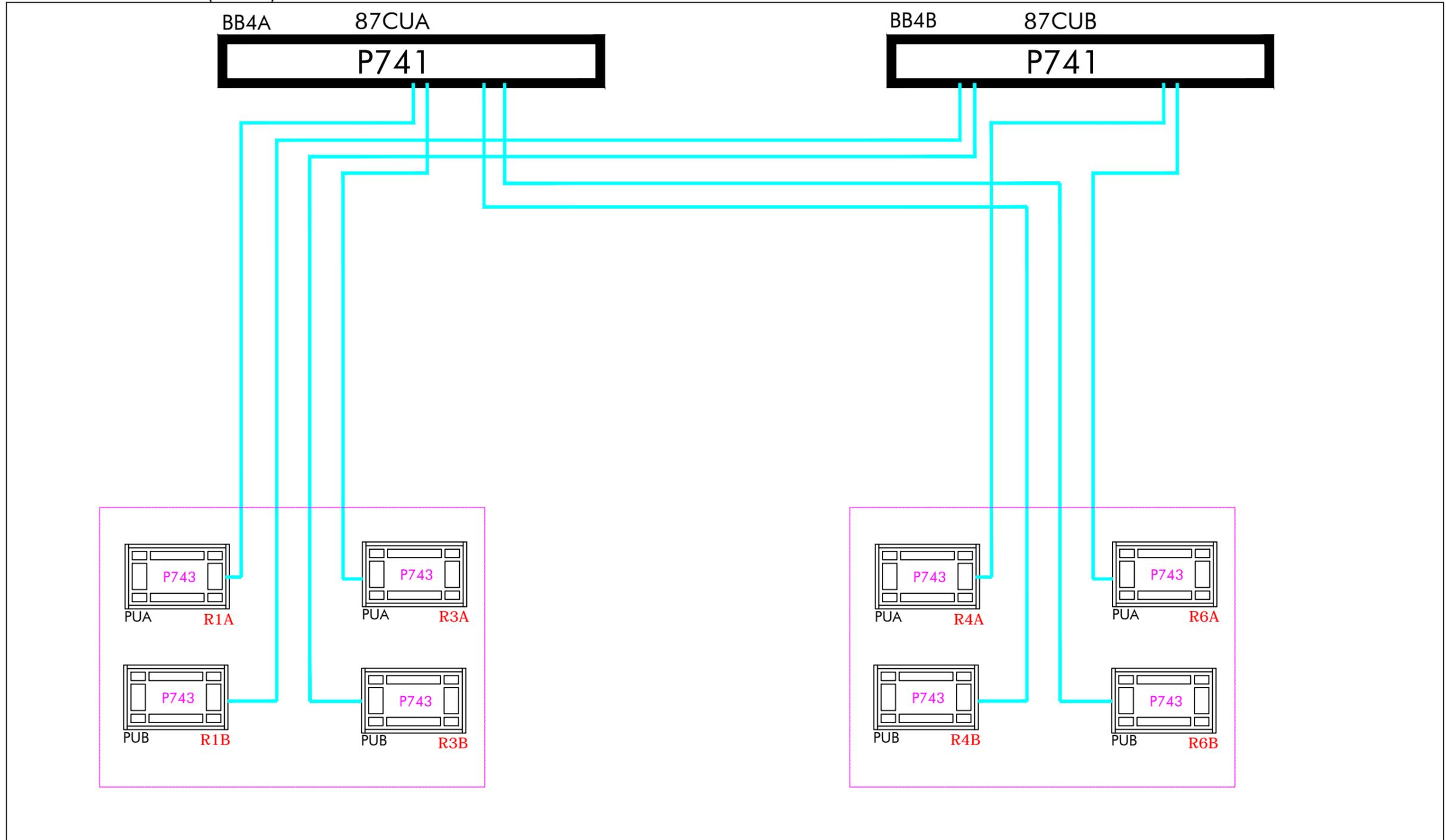
- 100 MBPS ARMOUR FIBER OPTIC TCP/IP RING (MULTI MODE)
- RJ45 ETHERNET CABLE
- 100 MBPS MULTI MODE FIBER OPTIC PATCH CABLE
- 100 MBPS MULTI MODE FIBER OPTIC PATCH CABLE (ARMOURED)
- COAXIAL CABLE (GPS LINK)

EQUIPMENT	HARDWARE DESCRIPTION
BB LIU	24 ST PORTS
BB LIU 1,2,3&4	12 ST PORTS

NOTE:-
1. SUPPLY OF ARMOURED FO CABLE IS UNDER GE SCOPE.

CUSTOMER : WARORA-KURNOOL TRANSMISSION LTD.											
CONSULTANT : TRACTEBEL ENGINEERING PVT LTD.											
CONTRACTOR : PAN INDIA INFRAPROJECTS PVT. LTD.											
PROJECT NAME : ADDITIONAL INTER-REGIONAL AC LINK FOR IMPORT INTO SOUTHERN REGION I.E. WARORA-WARANGAL AND CHELAKALURPETA-HYDERABAD-KURNOOL 765KV LINK											
LOA NO. :	WTR/LOA/GE/WKTL/SUBSTATION/19/17										
DATED :	13.06.2017										
SYSTEM ARCHITECTURE DRAWING											
TITLE : 765/400KV WARANGAL SUBSTATION											
<table border="1"> <tr> <td>A</td> <td>FIRST ISSUE</td> <td>14.05.2018</td> </tr> <tr> <td>REV</td> <td>DESCRIPTION</td> <td>DATE</td> </tr> </table>		A	FIRST ISSUE	14.05.2018	REV	DESCRIPTION	DATE				
A	FIRST ISSUE	14.05.2018									
REV	DESCRIPTION	DATE									
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ENGG. REF. NO. : KXH3-SA3	SCH. REF. : -	PREPARED BY : MP	SCALE : -	DRG. REF. : KXH3SA3 (F)							
SALES ORDER NO. : -	FILE : KXH3-SA3	CHECKED BY : V.V.S	APPROVED BY : V.V.S	(F) SHT 1 OF 4							
<p>GE T&D India Ltd. (Formerly Alstom T&D India Ltd.) Grid Automation-Pallavaram India</p>											
<p>DATE: 14.05.2018 REV: A</p>											

400KV SIDE(SCR-1)



LEGEND:-

	100 MBPS ARMOUR FIBER OPTIC TCP/IP RING (MULTI MODE)
	RJ45 ETHERNET CABLE
	100 MBPS MULTI MODE FIBER OPTIC PATCH CABLE
	100 MBPS MULTI MODE FIBER OPTIC PATCH CABLE (ARMOURED)
	COAXIAL CABLE (GPS LINK)

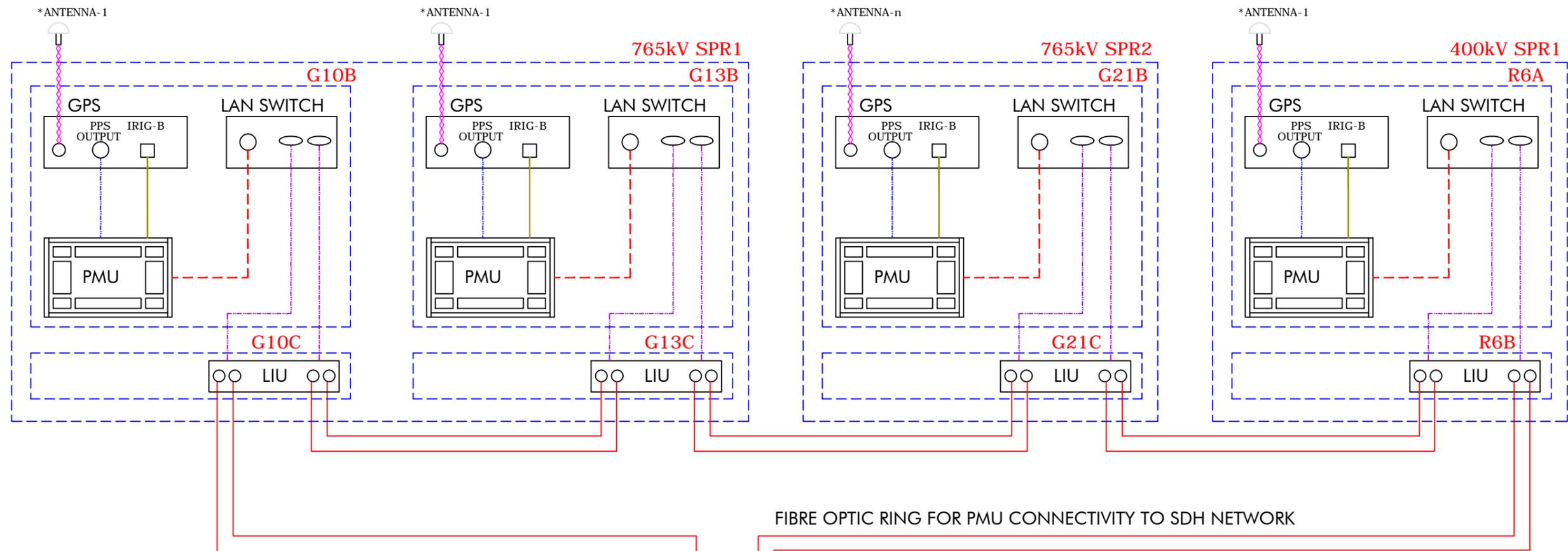
EQUIPMENT	HARDWARE DESCRIPTION
BBJU	24 ST PORTS
BBJU 1,2,3&4	12 ST PORTS

NOTE:-
1. SUPPLY OF ARMOURED FO CABLE IS UNDER GE SCOPE.

REV	DESCRIPTION	DATE
A	FIRST ISSUE	14.05.2018

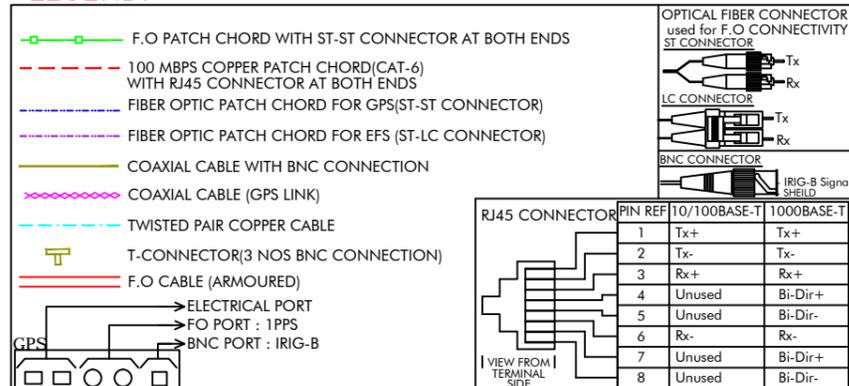
CUSTOMER	: WARORA-KURNOOL TRANSMISSION LTD.
CONSULTANT	: TRACTEBEL ENGINEERING PVT LTD.
CONTRACTOR	: PAN INDIA INFRAPROJECTS PVT. LTD.
PROJECT NAME	: ADDITIONAL INTER-REGIONAL AC LINK FOR IMPORT INTO SOUTHERN REGION I.E. WARORA-WARANGAL AND CHELAKALURPETA-HYDERABAD-KURNOOL 765KV LINK
LOA NO.	: WTR/LOA/GE/WKTL/SUBSTATION/19/17
DATED	: 13.06.2017
SYSTEM ARCHITECTURE DRAWING	
TITLE	: 765/400KV WARANGAL SUBSTATION
 GE T&D India Ltd. (Formerly Alstom T&D India Ltd.) Grid Automation-Pallavaram India	
ENGG. REF. NO.	: KXH3-SA3
SCH. REF.	: -
SALES ORDER NO.	: -
FILE	: KXH3-SA3
PREPARED BY	: MP
CHECKED BY	: V.V.S
APPROVED BY	: V.V.S
SCALE	: -
DRG. REF.	: KXH3SA3 (F)
(P) SHT 1 OF 4	
DATE	: 14.05.2018
REV	: A

PMU CONNECTIVITY ARCHITECTURE



FIBRE OPTIC RING FOR PMU CONNECTIVITY TO SDH NETWORK

LEGEND:-

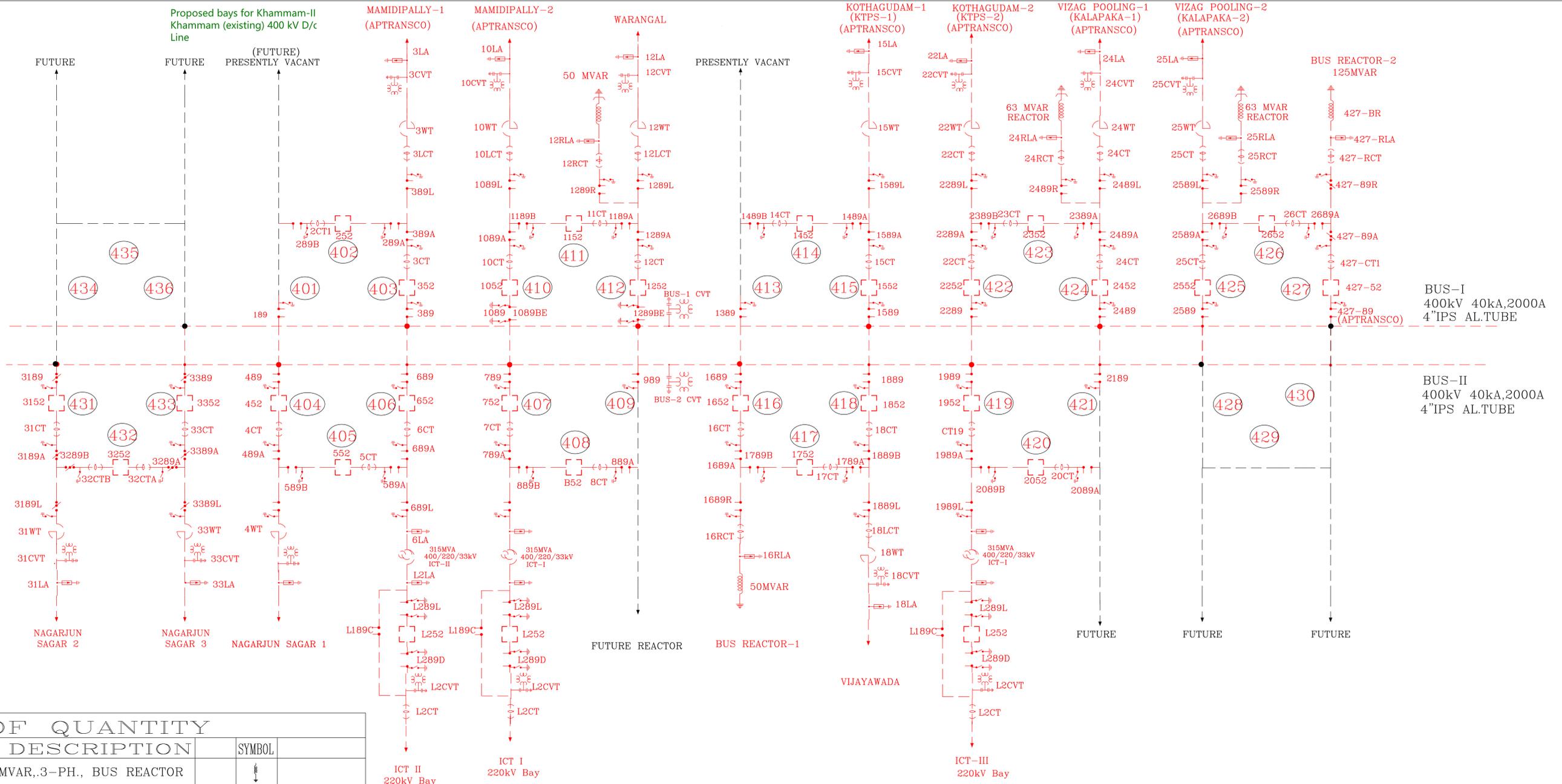


NOTE:

PMU,GPS,EFS,LIU MATERIAL DETAILS ARE SHOWN IN THE RESPECTIVE LINE PANEL BOQ ALSO.
 * THE POSITIONING OF ANTENNA AT SITE SHALL BE AS PER IEEE C37.242.2013 INCLUDING ANTENNA OPEN TO GPS SATELLITES SHALL HAVE A CLEAR SKY VIEW ABOUT 10deg ELEVATION THE ANTENNA MUST BE MOUNTED WITH A CLEAR VIEW TO THE SOUTH.

LOCATION	DEVICE REF.	APPLICATION
R6A	PMU	400kV LINE BAY 403 & 406
G10B	PMU	765kV LINE BAY 710 & 712
G13B	PMU	765kV LINE BAY 713 & 715
G21B	PMU	765kV LINE BAY 721 & 724

CUSTOMER	WARORA-KURNOOL TRANSMISSION LTD.		
CONSULTANT	TRACTEBEL ENGINEERING PVT LTD.		
CONTRACTOR	PAN INDIA INFRAPROJECTS PVT. LTD.		
PROJECT NAME	ADDITIONAL INTER-REGIONAL AC LINK FOR IMPORT INTO SOUTHERN REGION I.E. WARORA-WARANGAL AND CHELAKALURPETA-HYDERABAD-KURNOOL 765KV LINK		
LOA NO. :	WTR/LOA/GE/WKTL/SUBSTATION/19/17		
DATED	13.06.2017		
SYSTEM ARCHITECTURE DRAWING	TITLE : 765/400KV WARANGAL SUBSTATION		
REV	DESCRIPTION	DATE	
A	FIRST ISSUE	14.05.2018	
GE T&D India Ltd. (Formerly Alstom T&D India Ltd.) Grid Automation-Pallavaram India			
ENGG. REF. NO. :	KXH3-SA3	SCH. REF. :	
SALES ORDER NO. :		FILE :	KXH3-SA3
PREPARED BY :	MP	CHECKED BY :	V.V.S
APPROVED BY :	V.V.S	DATE :	14.05.2018
SCALE :		DRG. REF. :	KXH3SA3 (F)
		(F) SHT 1 OF 4	REV : A



BILL OF QUANTITY			
SL	ITEM DESCRIPTION	SYMBOL	
1	420kV, 125MVAR, 3-PH., BUS REACTOR		
2	400kV, 2000A, 1-PH., CT, 40kA		
3	CIRCUIT BREAKER WITHOUT CR & WITH CSD (2000 A, 3-PH, 40kA)		
4	ISOLATOR WITH ONE EARTH SWITCH (3-PH) 420kV, 2000A, DBR, 40kA/1Sec		
5	336kV SURGE ARRESTER (1-PH)		
6	420kV CVT		

LEGEND:

- EXISTING SCOPE
- FUTURE SCOPE

FOR TENDER PURPOSE ONLY

POWER GRID CORPORATION OF INDIA LIMITED
 (A Government of India Enterprise)

PROJECT:

TITLE : SINGLE LINE DIAGRAM – EXTENSION OF 400kV KHAMMAM SUBSTATION

DRAWING NO. C/ENGG/KHAMMAM_EXTN/SLD REV.0

