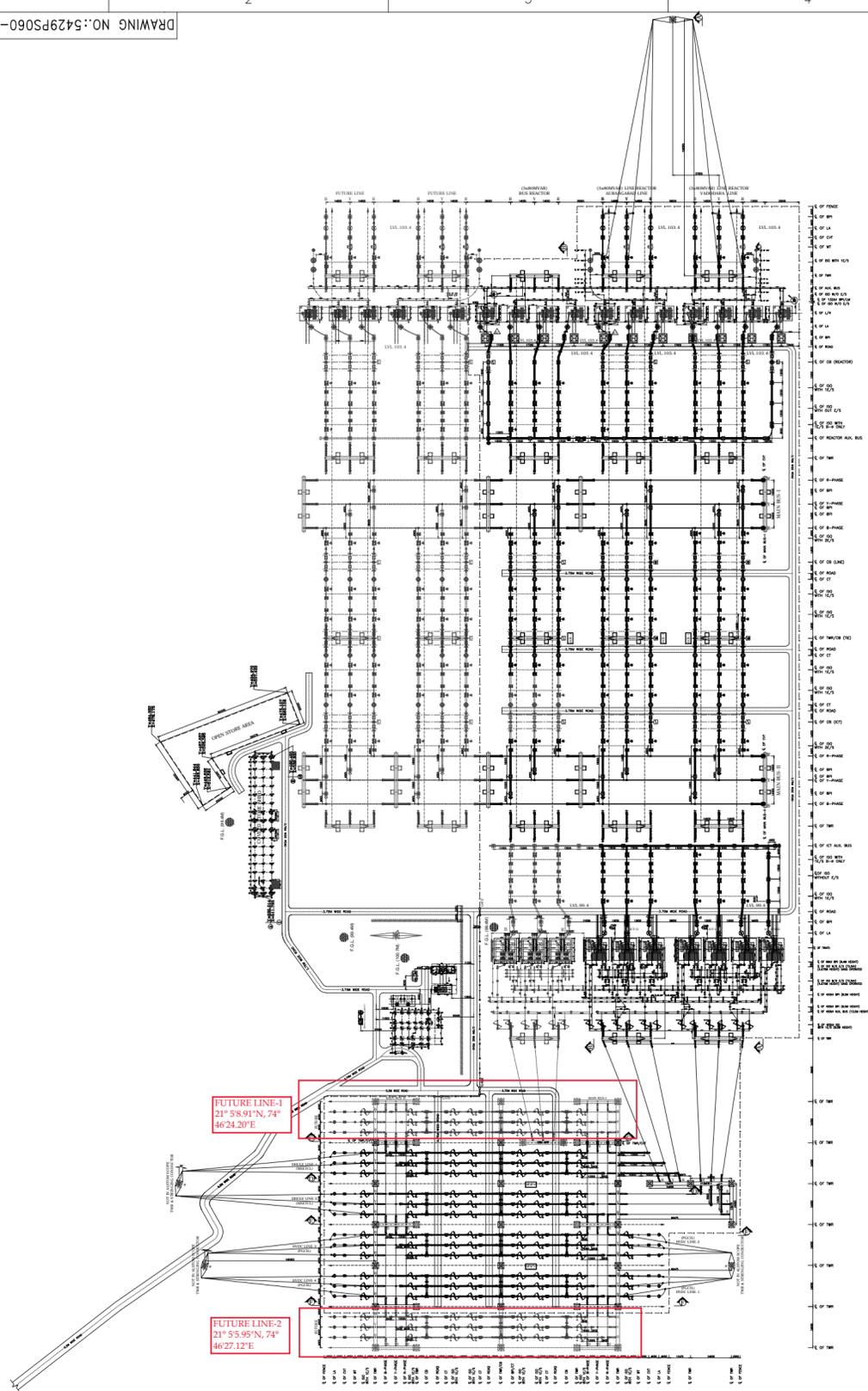
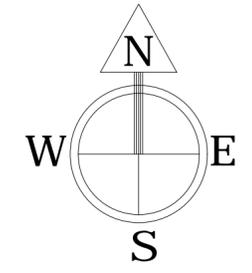


DRAWING NO.: 5429PS060-DHU-C-SYD-AAR-0001



**BILL OF QUANTITY OF 765KV EQUIPMENTS (TABLE-1)**

Sl.No.	SYMBOL	DESCRIPTION	MAKE	QTY.
1A	[Symbol]	765kV, 3150A, 40kA, 1sec, SF6, 3P CIRCUIT BREAKER WITH CONTROL SWITCHING ONLY	ALSTOM	04
1B	[Symbol]	765kV, 3150A, 40kA, 1sec, SF6, 3P CIRCUIT BREAKER WITH CLOSING RESISTOR & CONTROL SWITCHING	ALSTOM	02
1C	[Symbol]	765kV, 3150A, 40kA, 1sec, SF6, 3P CIRCUIT BREAKER WITH CLOSING RESISTOR ONLY	ALSTOM	02
1D	[Symbol]	765kV, 2000A, 40kA, 1sec, SF6, 1P CIRCUIT BREAKER WITH CONTROL SWITCHING ONLY (SUITABLE FOR 1 PHASE REACTOR SWITCHING)	ALSTOM	02
1E	[Symbol]	765kV, 2000A, 40kA, 1sec, SF6, 1P CIRCUIT BREAKER WITH CONTROL SWITCHING ONLY (SUITABLE FOR 1 PHASE REACTOR SWITCHING)	ALSTOM	02
2A	[Symbol]	ISOLATOR WITH 1 EARTH SWITCH, VERTICAL KNEE TYPE, 765kV, 3P, 3150A, 40kA FOR 1 sec, ELECTRICALLY GANGED	ALSTOM	17
2B	[Symbol]	ISOLATOR WITH 2 EARTH SWITCH, VERTICAL KNEE TYPE, 765kV, 3P, 3150A, 40kA FOR 1 sec, ELECTRICALLY GANGED	ALSTOM	02
2C	[Symbol]	ISOLATOR WITH 1 EARTH SWITCH, VERTICAL KNEE TYPE, 765kV, 1P, 2000A, 40kA FOR 1 sec, ELECTRICALLY GANGED (ALL MASTER)	ALSTOM	15
2D.1	[Symbol]	ISOLATOR WITHOUT EARTH SWITCH, VERTICAL KNEE TYPE, 765kV, 1P, 2000A, 40kA FOR 1 sec, ELECTRICALLY GANGED WITH SPECIAL OPERATING MECHANISM ACTING AS "MASTER" ABLE TO COMBINE THE SIGNALS COMING FROM THE TWO SEPARATE AND INDEPENDENT OPERATING MECHANISM.	ALSTOM	04
2D.2	[Symbol]	ISOLATOR WITH ONE EARTH SWITCH, VERTICAL KNEE TYPE, 765kV, 1P, 2000A, 40kA FOR 1 sec, ELECTRICALLY GANGED WITH SPECIAL OPERATING MECHANISM ACTING AS "SLAVE" ABLE TO COMBINE THE SIGNALS COMING FROM THE TWO SEPARATE AND INDEPENDENT OPERATING MECHANISM.	ALSTOM	04
2E.1	[Symbol]	ISOLATOR WITHOUT EARTH SWITCH, VERTICAL KNEE TYPE, 765kV, 1P, 2000A, 40kA FOR 1 sec, ELECTRICALLY GANGED WITH SPECIAL OPERATING MECHANISM ACTING AS "MASTER" ABLE TO COMBINE THE SIGNALS COMING FROM THE TWO SEPARATE AND INDEPENDENT OPERATING MECHANISM.	ALSTOM	13
2E.2	[Symbol]	ISOLATOR WITHOUT EARTH SWITCH, VERTICAL KNEE TYPE, 765kV, 1P, 2000A, 40kA FOR 1 sec, ELECTRICALLY GANGED WITH SPECIAL OPERATING MECHANISM ACTING AS "SLAVE" ABLE TO COMBINE THE SIGNALS COMING FROM THE TWO SEPARATE AND INDEPENDENT OPERATING MECHANISM.	ALSTOM	13
3A	[Symbol]	CURRENT TRANSFORMER 765kV 600R, 3000A 40kA for 1sec 120% EXTENDED CURRENT RATING	ALSTOM	12
3B	[Symbol]	CURRENT TRANSFORMER 765kV SCORE, 3000A 1-Ph, 40kA for 1sec 120% EXTENDED CURRENT RATING	ALSTOM	12
4A	[Symbol]	765kV, 1-Ph CVT (4400pF), 4 CORE, 3P/3P/0.2/0.2	ALSTOM	06
4B	[Symbol]	765kV, 1-Ph CVT (4400pF), 3 CORE, 3P/3P/0.2	ALSTOM	06
5	[Symbol]	624kV, LIGHTNING ARRESTER (1-#) DISCHARGE CURRENT 20kA	---	24
6	[Symbol]	765kV BUS POST INSULATOR	---	36

**BILL OF QUANTITY OF 400KV EQUIPMENTS (TABLE-2)**

Sl.No.	SYMBOL	DESCRIPTION	MAKE	QTY.
7	[Symbol]	CIRCUIT BREAKER, 400kV, 3150A, 50kA FOR 1 sec, SF6, 3P, WITHOUT CONTROLLED SWITCHING	ALSTOM	12
8A	[Symbol]	400kV, 3150A, 50kA, 1sec, 3-PHASE HDB TYPE ISOLATOR WITH ONE EARTH SWITCH (WITH MASTER SLAVE OPERATION)	ALSTOM	28
8B	[Symbol]	400kV, 3150A, 50kA, 1sec, 3-PHASE HDB TYPE ISOLATOR WITH TWO EARTH SWITCH (WITH MASTER SLAVE OPERATION)	ALSTOM	02
8C	[Symbol]	ISOLATOR WITH 1 EARTH SWITCH HDB TYPE, 400kV, 1P, 3150A, 50kA FOR 1 sec, ELECTRICALLY GANGED (ALL MASTER)	ALSTOM	07
8D	[Symbol]	ISOLATOR WITHOUT EARTH SWITCH, HDB TYPE, 400kV, 1P, 3150A, 50kA FOR 1 sec, ELECTRICALLY GANGED (ALL MASTER)	ALSTOM	05
9	[Symbol]	CURRENT TRANSFORMER (1-#) 400kV 600R, 3000A 50kA for 1sec 120% EXTENDED CURRENT RATING	ALSTOM	36
9A	[Symbol]	CURRENT TRANSFORMER (1-#) 400kV SCORE, 3000A 50kA for 1sec 120% EXTENDED CURRENT RATING	ALSTOM	06
10	[Symbol]	400kV, 50kA, 1 Sec 1-Ph CVT (4400pF) 4CORE 3P/3P/0.2/0.2	ALSTOM	18
10A	[Symbol]	400kV, 50kA, 1 Sec 1-Ph CVT (4400pF) 3CORE 3P/3P/0.2	ALSTOM	06
11	[Symbol]	336kV LIGHTNING ARRESTER (1-#) DISCHARGE CURRENT 20kA	---	25
12	[Symbol]	400kV BUS POST INSULATOR	---	36

**BILL OF QUANTITY OF 145KV EQUIPMENTS (TABLE-3)**

Sl.No.	SYMBOL	DESCRIPTION	MAKE	QTY.
13	[Symbol]	145kV HDB 1P ISOLATOR WITHOUT E/S	---	14

**BILL OF QUANTITY OF 33KV EQUIPMENTS (INSULATION LEVEL OF 72.5kV CLASS) (TABLE-4)**

Sl.No.	SYMBOL	DESCRIPTION	MAKE	QTY.
14	[Symbol]	72.5kV HDB 2P, 400A, ISOLATOR WITHOUT E/S MOTOR OPERATED	---	12

**BILL OF QUANTITY OF 33KV EQUIPMENTS (TABLE-5)**

Sl.No.	SYMBOL	DESCRIPTION	MAKE	QTY.
15	[Symbol]	33kV HDB 1P, 400A ISOLATOR W/O E/S MOTOR OPERATED	---	02
16	[Symbol]	33kV HDB 1P, 400A ISOLATOR W/O E/S MANUAL OPERATED	---	06
17	[Symbol]	33kV NEUTRAL CT 400/1A	---	02

**EQUIPMENT TO BE SUPPLIED BY CUSTOMER (NOT IN ALSTOM SCOPE) (TABLE-6)**

Sl.No.	SYMBOL	DESCRIPTION	MAKE	QTY.
18	[Symbol]	INTERCONNECTING TRANSFORMER, 500MVA (SINGLE PHASE) 765/400kV	HYUNDAI	6+1(SPARE)
19	[Symbol]	LINE SHUNT REACTOR, 80MVAR (SINGLE PHASE) 765kV	BTW	6+1(SPARE)
20	[Symbol]	BUS SHUNT REACTOR, 80MVAR (SINGLE PHASE) 765kV	BTW	3+1(SPARE)
21	[Symbol]	NEUTRAL GROUNDING REACTOR 145kV, 1200 KVAR (WITH BCT)	---	02
22	[Symbol]	120kV LIGHTNING ARRESTER (1-#) DISCHARGE CURRENT 20kA	---	02

**SYSTEM PARAMETERS (TABLE-8)**

Sl.No.	DESCRIPTION	765kV SYSTEM	400kV SYSTEM	132kV SYSTEM	33kV INSULATION LEVEL OF 72.5kV
1	SYSTEM OPERATING VOLTAGE	765kV	400kV	132kV	33kV
2	MAX. OPERATING VOLTAGE OF THE SYSTEM (rms)	800kV	420kV	145kV	36kV
3	RATED FREQUENCY	50Hz	50Hz	50Hz	50Hz
4	NO. OF PHASES	3	3	3	3
5	RATED INSULATION LEVELS				
5.1	FULL WAVE LIGHTNING IMPULSE WITHSTAND VOLTAGE (1.2/50microsec.)	2100kV	1425kVp	650kVp	325kV
5.2	SWITCHING IMPULSE WITHSTAND VOLTAGE (250/2500microsec.) DRY & WET	1550kV	1050kV	-	-
5.3	ONE MINUTE POWER FREQUENCY DRY & WET WITH STAND VOLTAGE (rms)	830kV	630kV	275kV	140kV
6	MIN. CREEPAGE DISTANCE	20000mm	10500mm	3625mm	1813mm
7	CORONA EXTINCTION VOLTAGE	508kV	320kV	-	-
8	MAX. RADIO INTERFERENCE VOLTAGE LEVEL AT CORONA EXTINCTION VOLTAGE (rms)	2500 micro volts	1000 micro volts	-	-
9	RATED 3-Ph. SYMMETRICAL SHORT CIRCUIT CURRENT WITHSTAND CAPACITY	40kA/1sec	50kA/1sec	40kA/1sec	25kA/1sec.
10	SYSTEM NEUTRAL EARTHING	EFFECT. EARTHED	EFFECT. EARTHED	EFFECT. EARTHED	UN-EARTHED

**MINIMUM AIR CLEARANCE (TABLE-9)**

Sl.No.	DESCRIPTION	765kV SYSTEM	400kV SYSTEM	132kV SYSTEM	33kV SYSTEM
1	PHASE TO PHASE CONDUCTOR TO CONDUCTOR	7600	4000	1100	480
2	PHASE TO GROUND CONDUCTOR TO STRUCTURE	4800	3500	1100	480
3	SECTIONAL CLEARANCE	10300	6400	3700	3100

**CONDUCTOR DETAIL OF SWITCHYARD (TABLE-7)**

VOLTAGE LEVEL	765kV
MAIN BUS-1 & MAIN BUS-II	QUAD BULL A/C CONDUCTOR
JACK BUS/STRINGING CONNECTION	QUAD BULL A/C CONDUCTOR
DROPPERS/JAMPERS	QUAD BULL A/C CONDUCTOR
EQUIPMENT INTERCONNECTION	5" IPS AL TUBE
SHIELD WIRE	7/3.66mm GI WIRE (10.98mm DIA)
VOLTAGE LEVEL 400kV	
MAIN BUS-1 & BUS-II	QUAD MOOSE ACSR CONDUCTOR
JACK BUS/STRINGING CONNECTION	QUAD MOOSE ACSR CONDUCTOR
DROPPERS/JAMPERS	TWIN MOOSE ACSR CONDUCTOR FOR LA, CVT QUAD MOOSE ACSR CONDUCTOR FOR OTHERS
EQUIPMENT INTERCONNECTION	5" IPS AL TUBE
SHIELD WIRE	7/3.66mm GI WIRE (10.98mm DIA)
RCT TERTIARY FORMATION	3" IPS AL TUBE

**AS-BUILT**

REV.	DESCRIPTION	DRAWN	ELECT.	FW	CHECKED	APPROVED	STATUS
R7	REVISED AS PER CUSTOMER COMMENTS	Normal	JGS	DPK		PTK	FOR APPROVAL
R6	REVISED AS PER INTERNAL UPDATION	Normal	JGS	DPK		PTK	FOR APPROVAL
R5	REVISED AS PER CUSTOMER COMMENTS	Normal	KSV	DPK		PTK	FOR APPROVAL
R4	REVISED AS PER CUSTOMER COMMENTS	Normal	KSV	DPK		PTK	FOR APPROVAL
R3	REVISED AS PER CUSTOMER COMMENTS	Normal	KSV	DPK		PTK	FOR APPROVAL
R2	REVISED AS PER CUSTOMER COMMENTS	Normal	KSV	DPK		PTK	FOR APPROVAL
R1	REVISED AS PER CUSTOMER COMMENTS	Normal	KSV	DPK		PTK	FOR APPROVAL
R0	FIRST ISSUE	Normal	KSV	DPK		PTK	FOR APPROVAL

CUSTOMER: **BHOPAL DHULE TRANSMISSION COMPANY LTD**  
 OWNER'S ENGINEER: **KNR ENGINEERS (INDIA) PVT. LTD.**

PROJECT: **SYSTEM STRENGTHENING SCHEME OF WR.**  
 CONTRACT: **LOI NO. BDTCL/2011-12/LOA-SUBSTATIONS/004 DATED 28-07-2011**  
 TITLE: **765/400kV LAYOUT PLAN & SECTION FOR DHULE SUBSTATION**

SCALE: **1:1150**  
 ALSTOM T&D INDIA LTD. (Formerly ALSTOM I&D INDIA LTD) A-7, SECTOR-65, Noida - 201301, UTTAR PRADESH (INDIA).  
 DRAWING NO.: **5429PS060-DHU-C-SYD-AAR-0001**  
 SHEET NO: **001/001**

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**NOTES:**

- ALL DIMENSION ARE IN MM & COORDINATES ARE IN METERS.
- LEVELS FOR SUBSTATION ARE MARKED IN SECTION LAYOUT.
- LVA & OTHER EQUIPMENTS GOING IN WITHDRAWAL DIRECTION OF TRANSFORMER & REACTOR SHALL HAVE REMOVABLE TYPE SUPPORT STRUCTURE.
- SUPPLY TRAFFIC & REACTOR ARE NOT IN ALSTOM SCOPE.
- LOCATION OF LINE EQUIPMENTS SHOWN ARE CONSIDERING TOWER WITHOUT ANY DEVIATION SEE MAY CHANGE.
- THE LINE EQUIPMENT POSITION DEPENDS UPON THE DEAD END TOWER LOCATION (AS PER ACTUAL).
- LOCATION OF DEAD END GANTRY TO BE FINALIZED BY CUSTOMER.
- DEAD END TOWER ERECTION AND OUTGOING STRINGING OF LINE CONDUCTOR, INSULATOR, STRING HARDWARE, & SHIELD WIRE, TENSION CLAMP NOT IN ALSTOM SCOPE BUT LINE EQUIPMENT CONNECTION SHALL BE DONE BY ALSTOM.

REFR. DRG. NO.	DESCRIPTION
5429PS060-DHU-C-SYD-AAR-1000	GENERAL ARRANGEMENT PLOT PLAN FOR 765/400kV DHULE SUBSTATION
PRE-13100138-DHU-LAY(S)-001	765/400kV LAYOUT PLAN (TENDER)
5429PS060-DHU-E-DYD-SLD-0401	SINGLE LINE DIAGRAM FOR 765/400kV DHULE SUBSTATION