

LOT 10: HV SWITCHING EQUIPMENT

Technical Specification and Detail Drawings

COMPUTER ORIGINAL

P.O.NO.	3491101413 DTD.30.04.2018
CONTROL VOLTAGE CLOSE & TRIP	110 VDC.
SPRING DRIVE MOTOR VOLTAGE	240 VAC.
HEATER VOLTAGE	240 VAC.
ABB.S.O.NO.	4201687049.
LINE ITEM	40.
QTY.	02 NOS.

GENERAL ARRANGEMENT	1HYB905318-1
SCHEMATIC DIAGRAM	1HYB906311-3
RATING PLATE	1HYB906633-0009
ELECTRICAL LAYOUT (MASTER)	1HYB906311-14
ELECTRICAL LAYOUT (SLAVE)	1HYB906311-13

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 General Manager
 Transmission Department
 Bhutan Power Corporation Ltd.
 Thimphu : Bhutan

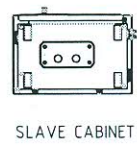
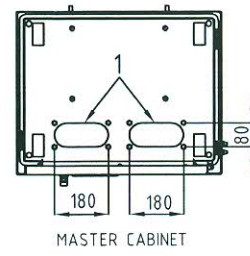
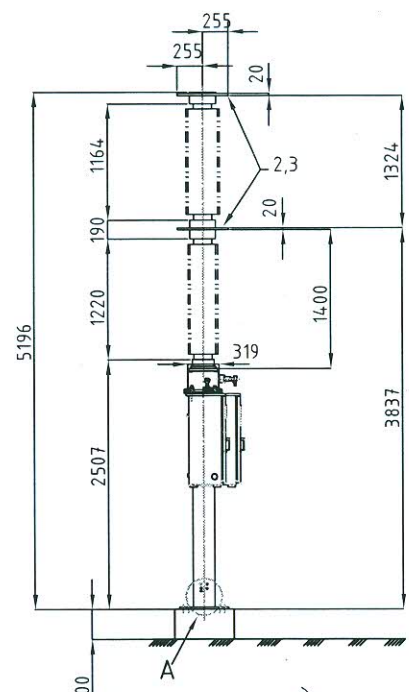
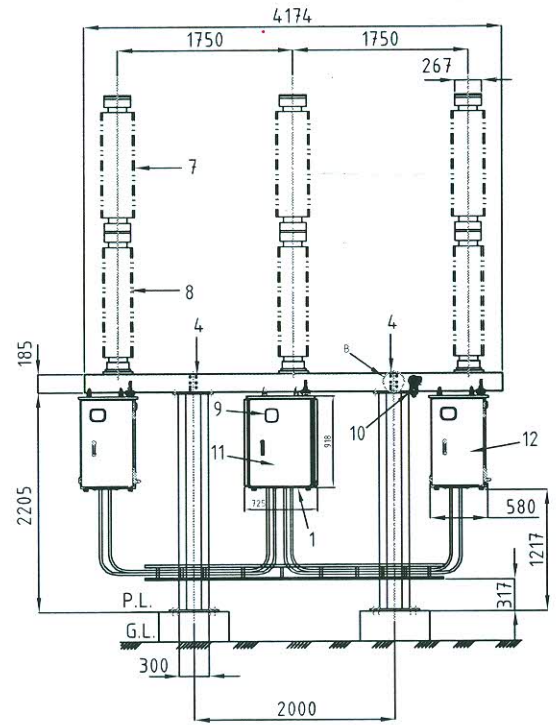
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Revision Details:
 @ REVISED AS PER CLIENT COMMENT

Revision		COVER SHEET FOR 145KV SF6 CIRCUIT BREAKER TYPE LTB145D1/B WITH FSA1 (SP0)	DRAWN: MB	CHECKED: TT	APPRD. UP	1HYB906633-0100	TOTAL SH. 1
B	20180509		ABB India Limited				Sh. NO. 1

COMPUTER ORIGINAL

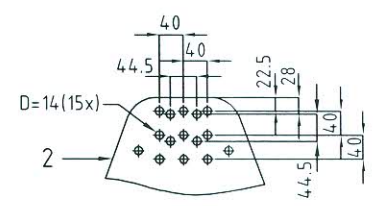
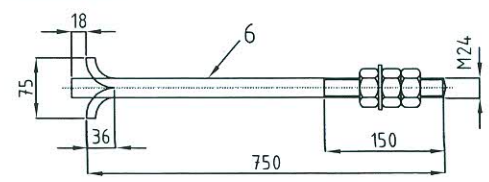
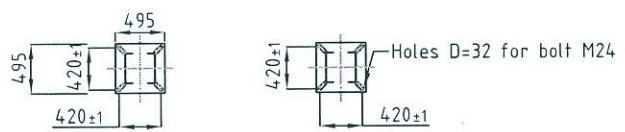
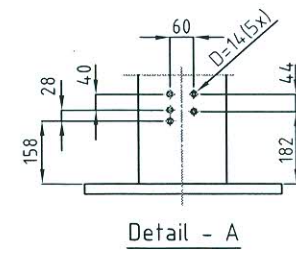
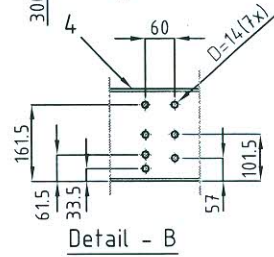
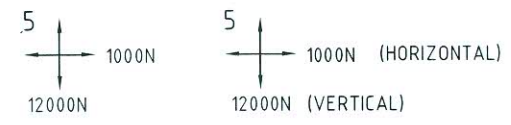
MASS IN KG				
BREAKER POLES	STRUCTURE	OPERATING MECHANISM	SF6 GAS	TOTAL MASS
272x3	160x2+105	170+160x2	7	1738 APPROX.



- 1 CABINET INLET
- 2 TERMINAL OF ALUMINIUM
- 3 TERMINAL LOAD MAX.1500 N STATIC / 3000 N DYNAMIC IN ANY DIRECTION
- 4 HOLES FOR EARTHING CLAMP
- 5 DYNAMIC FORCE DURING OPERATION
- 6 FOUNDATION BOLT
- 7 ARC CHAMBER INSULATOR
- 8 SUPPORT INSULATOR
- 9 OPEN/CLOSE INDICATOR
- 10 DENSITY MONITOR
- 11 MASTER CUBICLE
- 12 SLAVE CUBICLES

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Revision	
B	20170317

GENERAL ARRANGEMENT (SPO) FOR SF6 CIRCUIT BREAKER TYPE LTB145D1/B WITH OPERATING MECHANISM FSA1

DRAWN: NS CHECKED: KD APPRD: KD
ABB India Limited

1HYB905318-1

TOTAL SH.	1
Sh. NO.	1

1 2 3 4 5 6 7 8

A

B

C

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E

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DIAGRAM BASED ON IEC 617.
LOCAL REMOTE SWITCH IN REMOTE POSITION.
CIRCUIT BREAKER IN " OFF " POSITION.
AUXILIARY CIRCUIT " OFF ".
DRAWN WITHOUT PRESSURE.
SPRING UNCHARGED.

TERMINAL GROUP :-

OPERATING MECHANISM-B :-

- X01 :- TERMINAL FOR DENSITY MONITOR CONNECTION.
- X1 :- TERMINAL FOR SUPPLY CONNECTION.
- X2, X2-A :- TERMINAL FOR CUSTOMER CONNECTION/INTERNAL USE.
- X-A :- TERMINAL FROM OM-B TO RESPECTIVE OM-A.
- X-C :- TERMINAL FROM OM-B TO RESPECTIVE OM-C.

OPERATING MECHANISM A & C:-

- X1-A, X1-A :- TERMINAL FROM OM-A TO OM-B.
- X2-C, X2-C :- TERMINAL FROM OM-C TO OM-B.

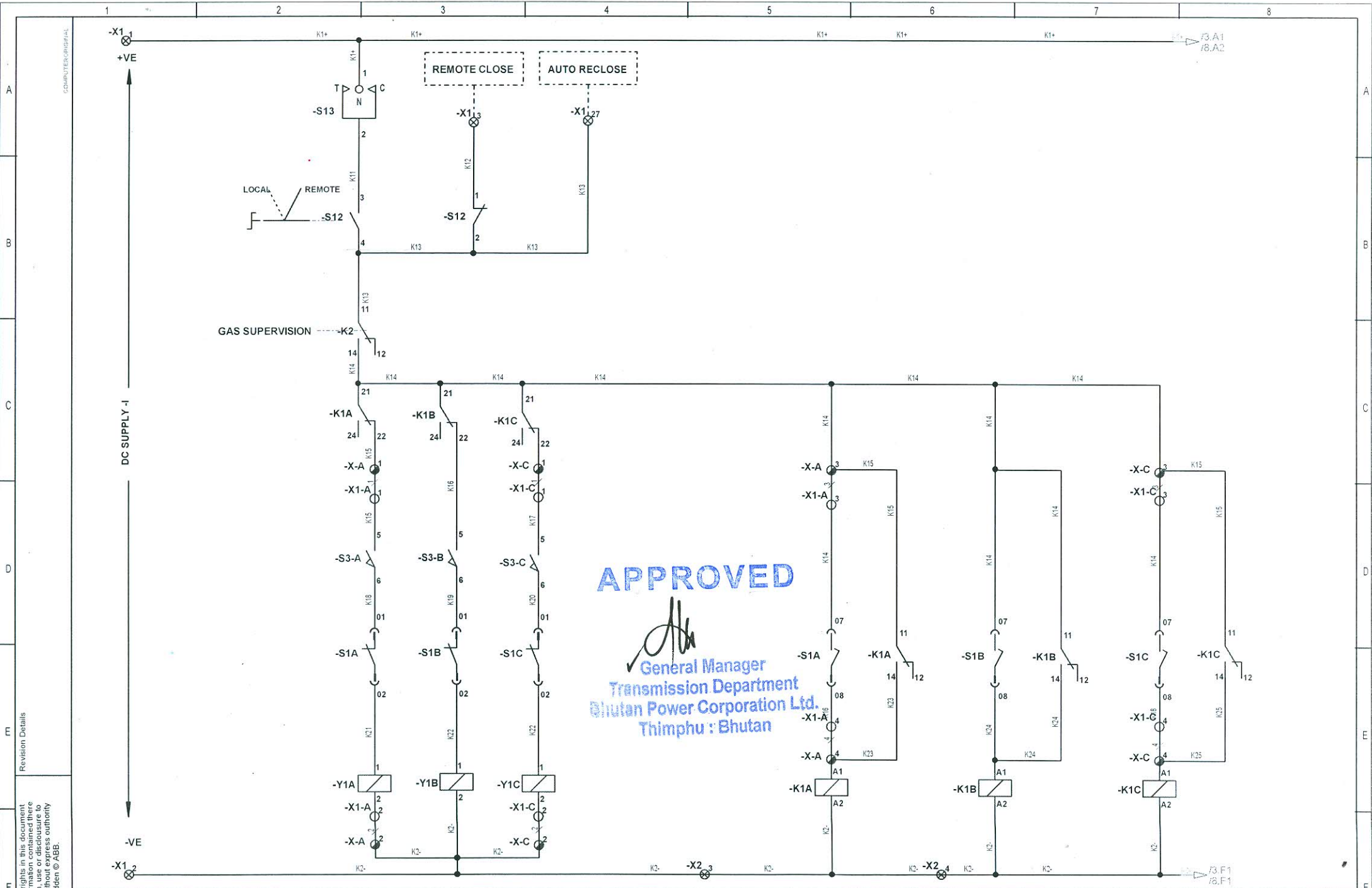
NOTE :- WIRING TO BE DONE WITH CU.WIRE (GREY FOR DC CKT.
BLACK FOR AC CKT. , GREEN + YELLOW FOR EARTHING.)
1:- 1.5 SQ. MM. FOR CONTROL CKT.
2:- 2.5 SQ. MM. FOR MOTOR CKT.
3:- 4.0 SQ. MM. FOR DOOR & PANEL EARTHING .

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Revision		SCHEMATIC DIAGRAM FOR 145 kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1(SPO)	DRAWN. TT	CHECKED. UP	APPRD. NS	REF. DRG.NO.: 1HYB906311-3	TOTAL SH. 13
A	20171117		ABB ABB India Limited			1HYB906311-3	SH. NO. 1

1 2 3 4 5 6 7 8

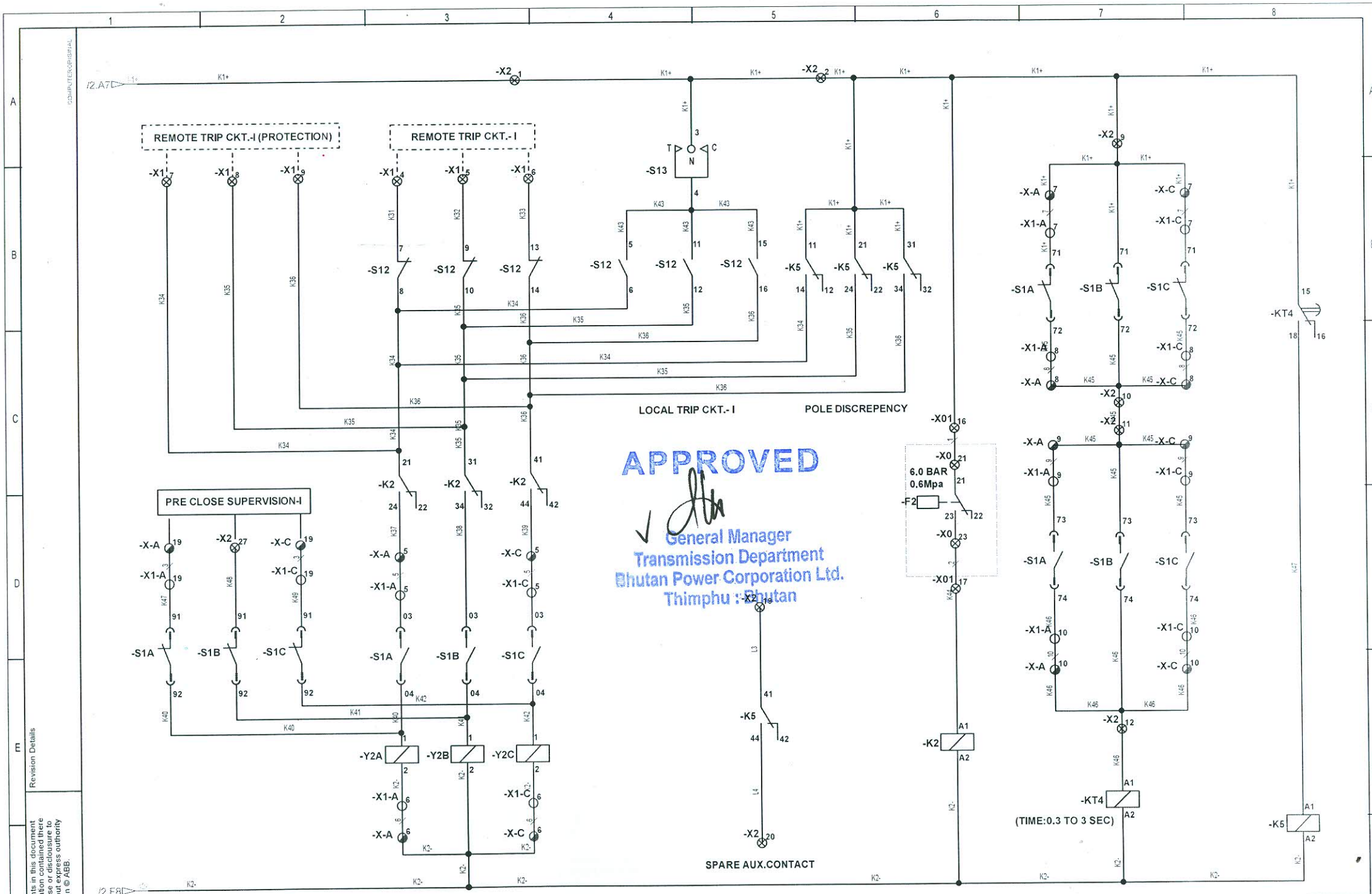


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Revision		SCHEMATIC DIAGRAM FOR 145 kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1(SPO)	DRAWN: TT	CHECKED: UP	APPRD: NS	REF. DRG. NO.: 1HYB906311-3	TOTAL SH 13
A	20171117		ABB ABB India Limited			1HYB906311-3	SH. NO. 2



Revision Details

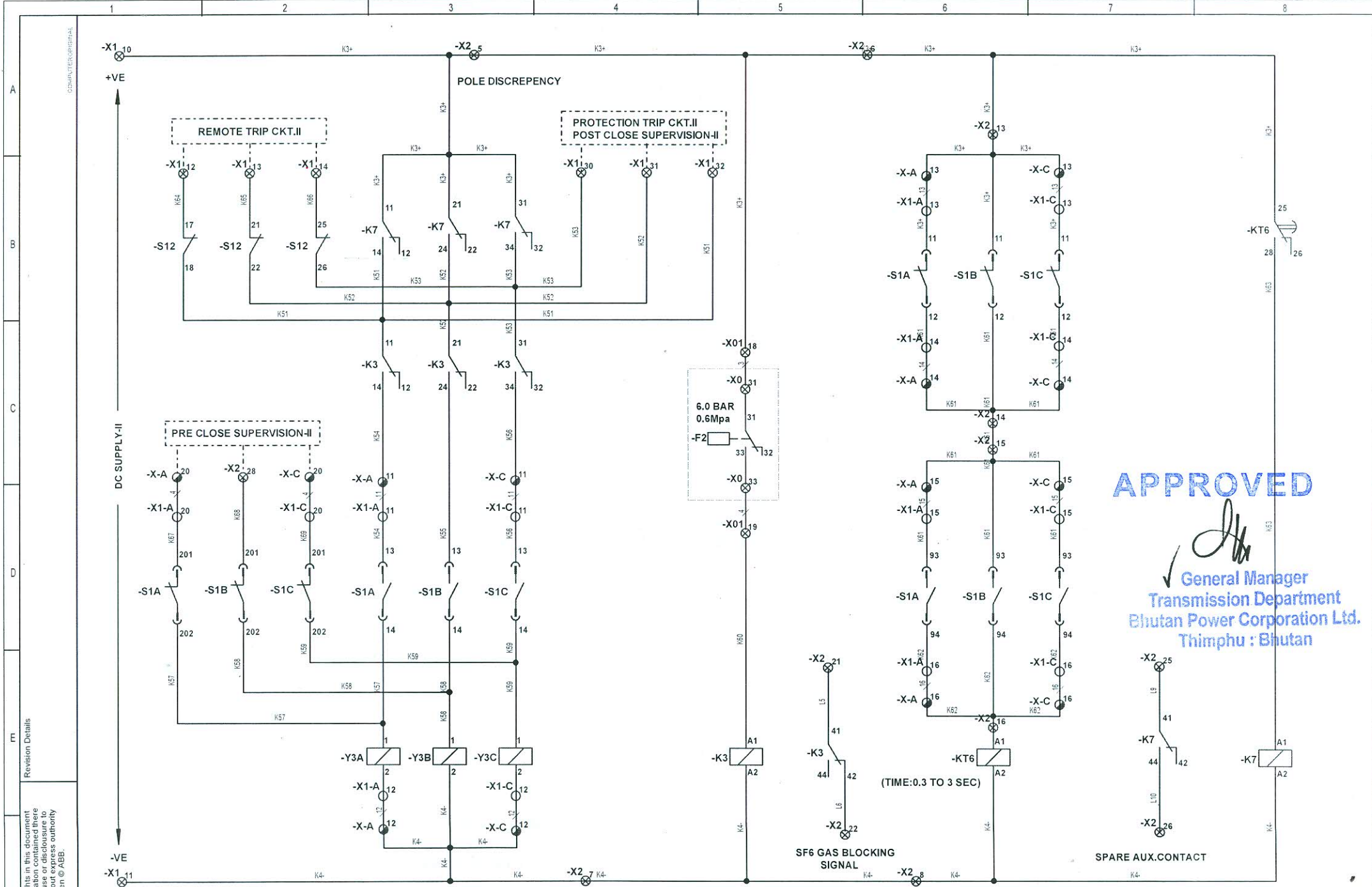
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TRIP CKT.-I		ALARM		GAS SUPERVISION		POLE DISCREPANCY	
Revision		SCHEMATIC DIAGRAM FOR 145 kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1(SPO)		DRAWN: TT	CHECKED: UP	APPRD: NS	REF. DRG.NO.: 1HYB906311-3
A	20171117			ABB India Limited		1HYB906311-3	
						TOTAL SH 13	
						SH. NO. 3	

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(TIME:0.3 TO 3 SEC)



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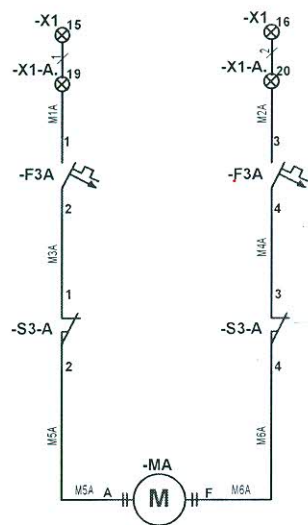
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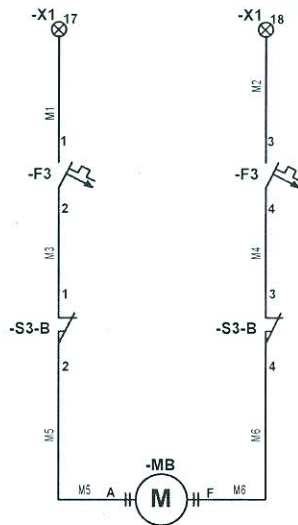
Revision Details

Revision		TRIP CKT.-II		GAS SUPERVISION		ALARM		POLE DISCREPENCY	
A	20171117								
SCHEMATIC DIAGRAM FOR 145 kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1(SPO)				DRAWN: TT		CHECKED: UP		APPRD: NS	
ABB India Limited				REF. DRG.NO.: 1HYB906311-3		TOTAL SH: 13		SH. NO.: 4	
				1HYB906311-3					

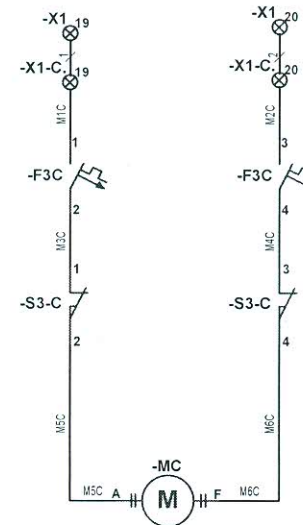
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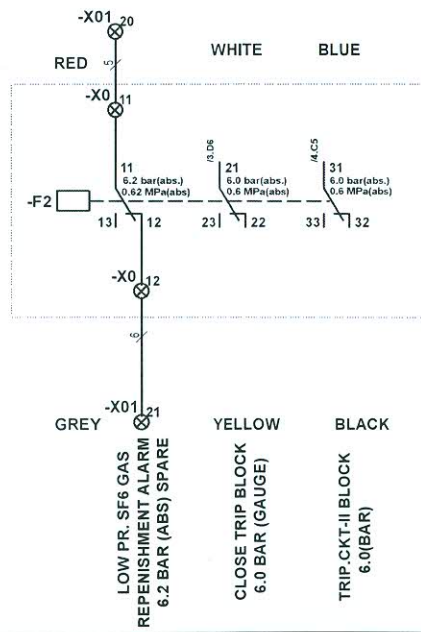
MOTOR CIRCUIT -(A)



MOTOR CIRCUIT -(B)



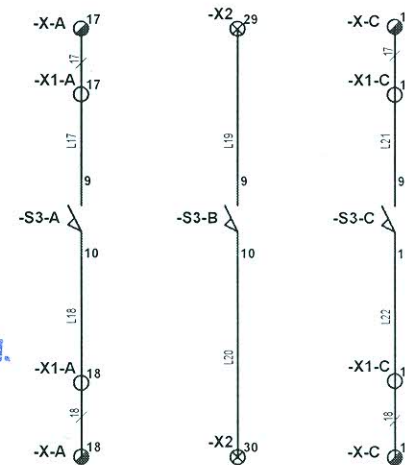
MOTOR CIRCUIT -(C)



SF6 GAS SUPERVISION

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SPRING CHARGED INDICATION

ALARM CONTACT

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Revision Details

Revision		
A	20171117	

SCHEMATIC DIAGRAM FOR
145 kV SF6 CIRCUIT BREAKER
TYPE LTB 145D1/B WITH FSA1(SPO)

DRAWN: TT

CHECKED: UP

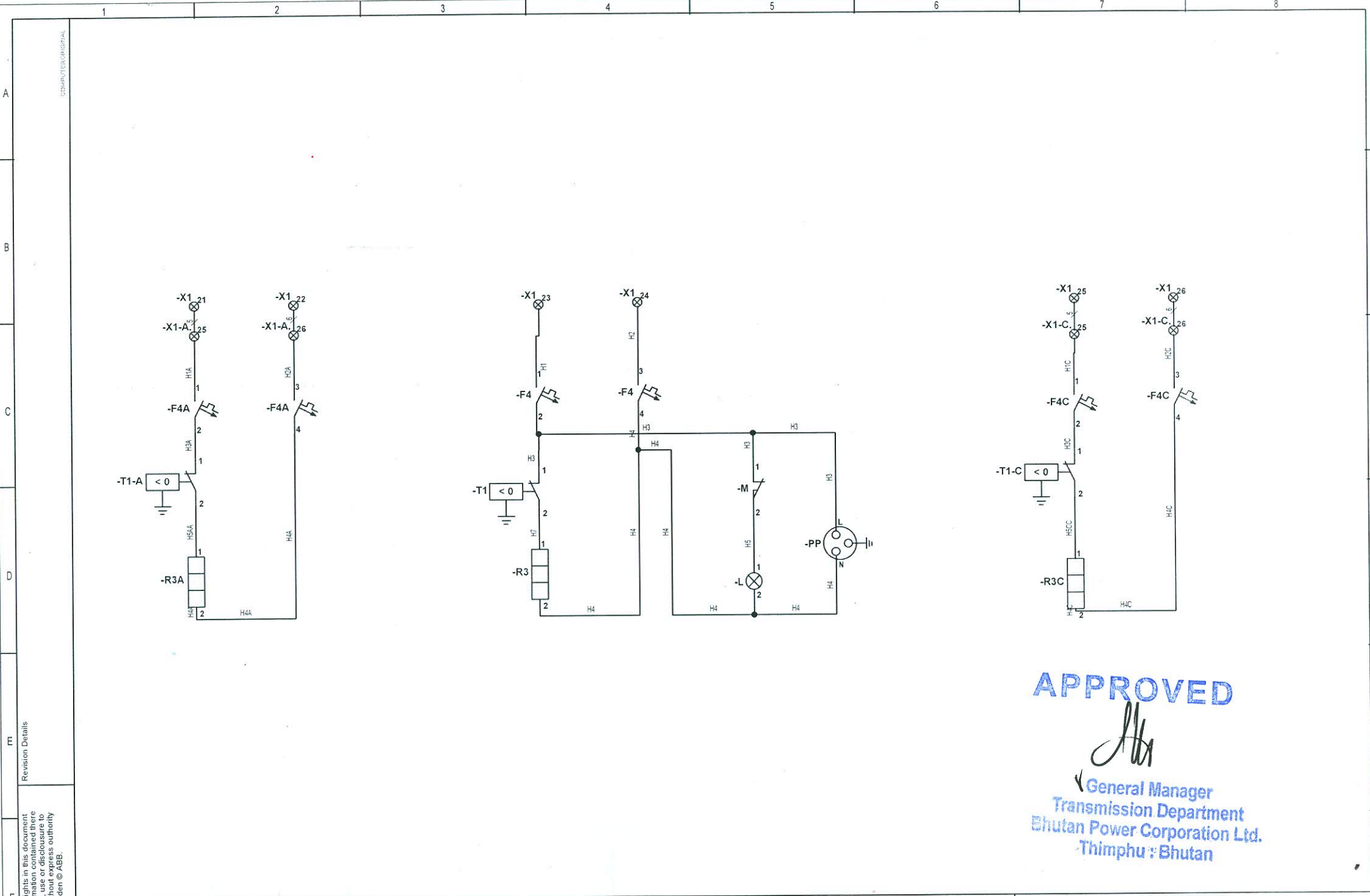
APPRD: NS

ABB ABB India Limited

REF. DRG.NO.: 1HYB906311-3

1HYB906311-3

TOTAL SH 13
SH. NO. 5



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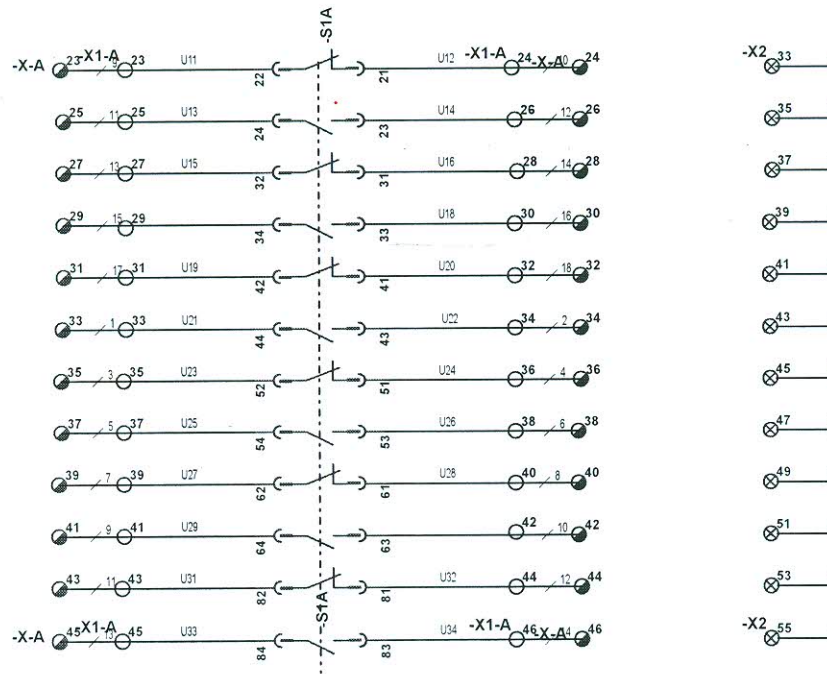
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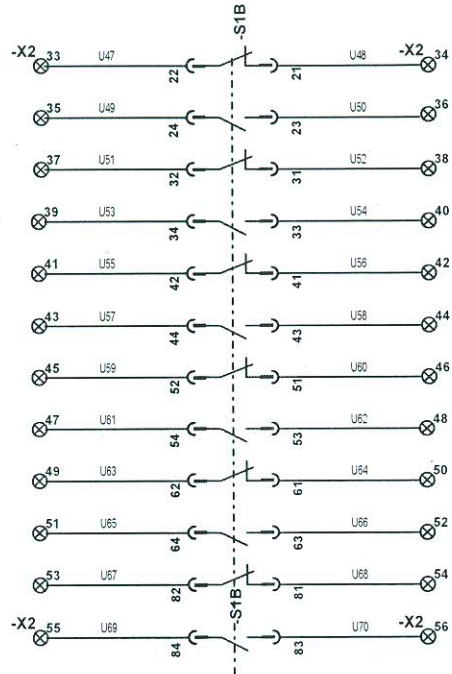
Revision Details

HEATER CKT.-(A)		HEATER , SOCKET(OUTLET),LAMP,DOOR LIMIT SW.-(B)			HEATER CKT.-(C)		
Revision		DRAWN. TT			CHECKED. UP		APPRD. NS
A 20171117		SCHEMATIC DIAGRAM FOR 145 kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1(SPO)			ABB India Limited		REF. DRG.NO.: 1HYB906311-3
							TOTAL SH 13
							SH. NO. 6

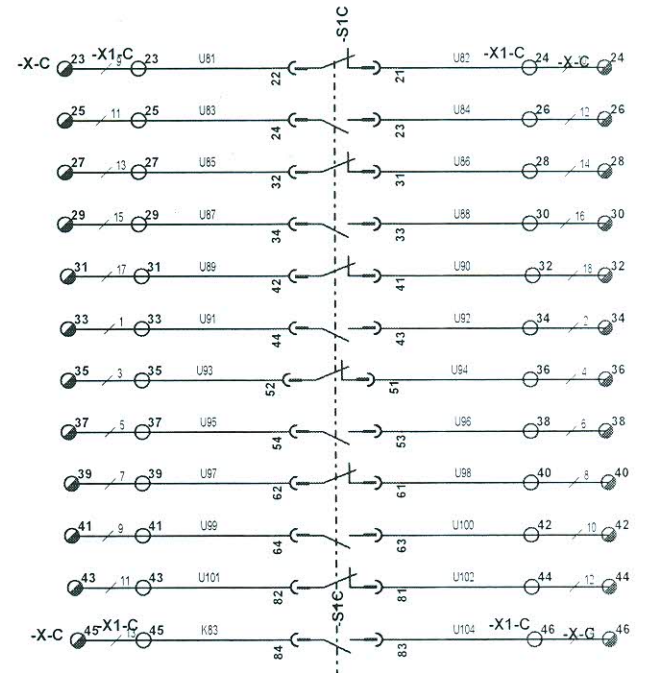
COMPUTER GENERATED



A PHASE
(6 NO +6 NC)



B PHASE
(6 NO +6 NC)



C PHASE
(6 NO +6 NC)

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SPARE AUXILIARY SWITCH CONTACTS PER PHASE

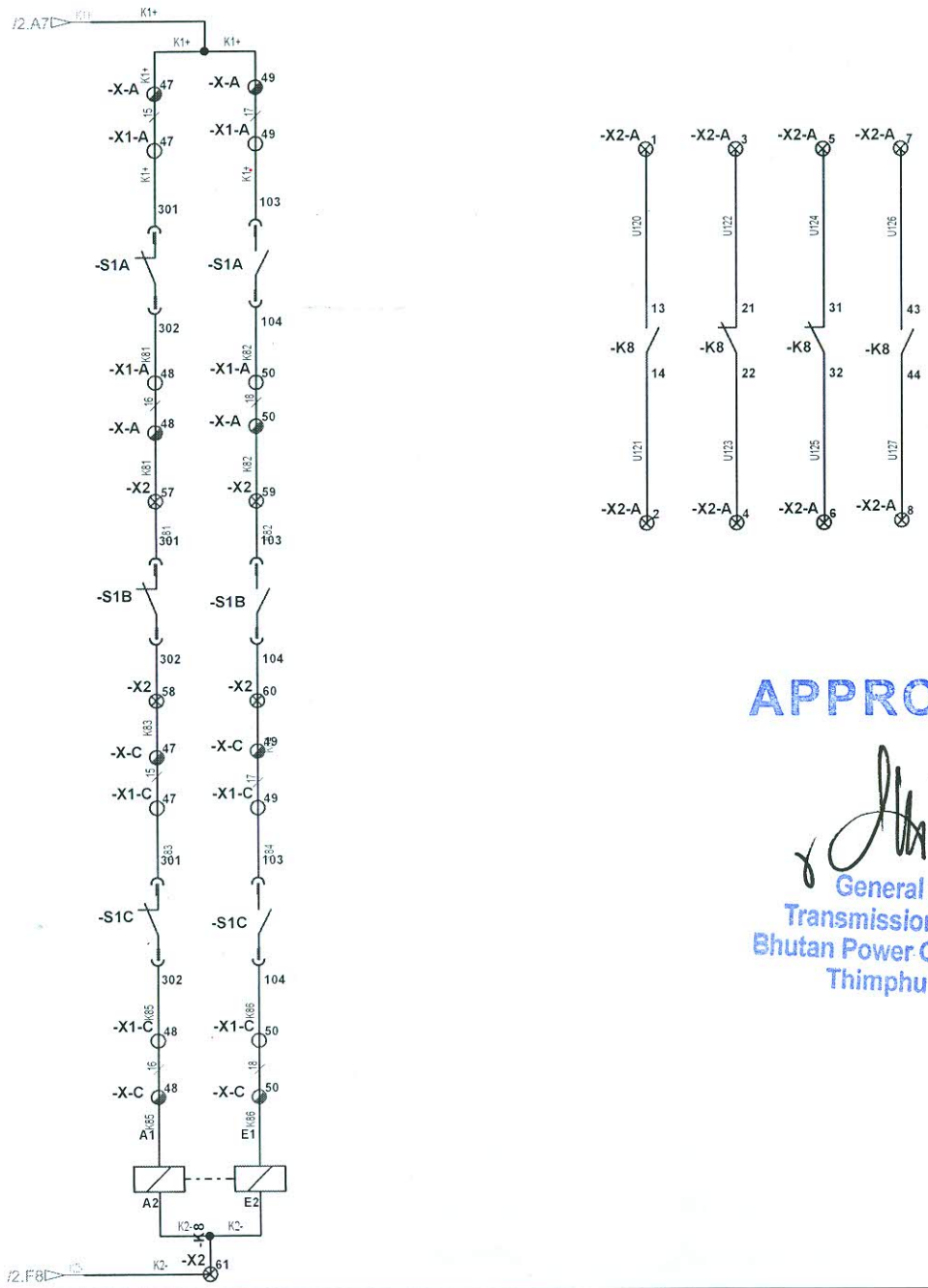
Revision		SCHEMATIC DIAGRAM FOR 145 kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1(SPO)	DRAWN. TT	CHECKED. UP	APPRD. NS	REF. DRG.NO.: 1HYB906311-3	TOTAL SH 13
A	20171117		ABB ABB India Limited			1HYB906311-3	SH. NO. 7

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SPARE CONTACT AUXILIARY SWITCH 6NO + 6NC + MULTIPLYING CONTACTS (2 NO +2 NC) TOTAL SPARE CONTACTS =8 NO+8 NC

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Revision	
A	20171117

SCHMATIC DIAGRAM FOR
 145 kV SF6 CIRCUIT BREAKER
 TYPE LTB 145D1/B WITH FSA1(SPO)

DRAWN: TT CHECKED: UP APPRD: NS
ABB ABB India Limited

REF. DRG.NO.: 1HYB906311-3 TOTAL SH 13
1HYB906311-3 SH. NO. 8

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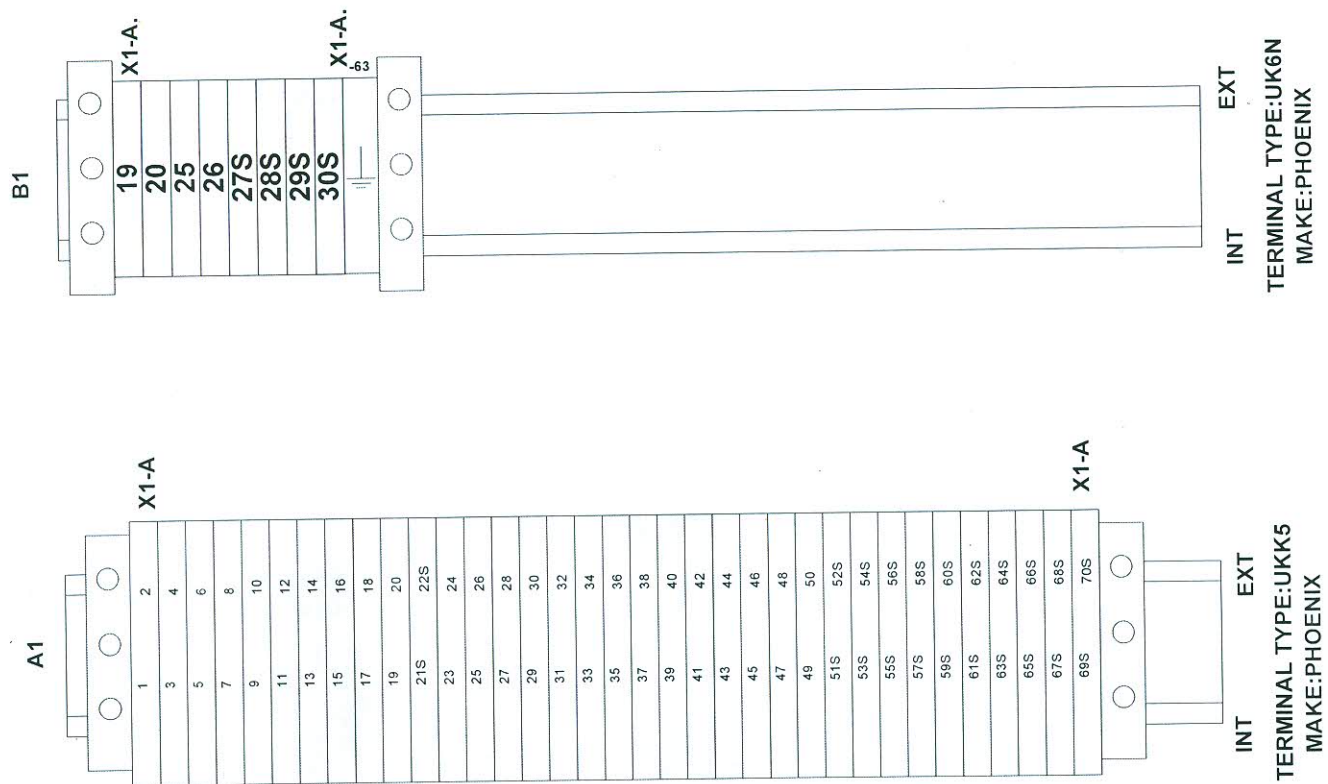
TERMINAL IN OPERATING MECHANISM-A

SCHEMATIC DIAGRAM FOR
145 KV SF6 CIRCUIT BREAKER
TYPE LTB 145D1/B WITH FSA1(SPO)

DRAWN: TT
CHECKED: UP
APPRD: NS
ABB ABB India Limited

REF. DRG.NO.: 1HYB906311-3
1HYB906311-3

TOTAL SH
13
SH. NO.
9



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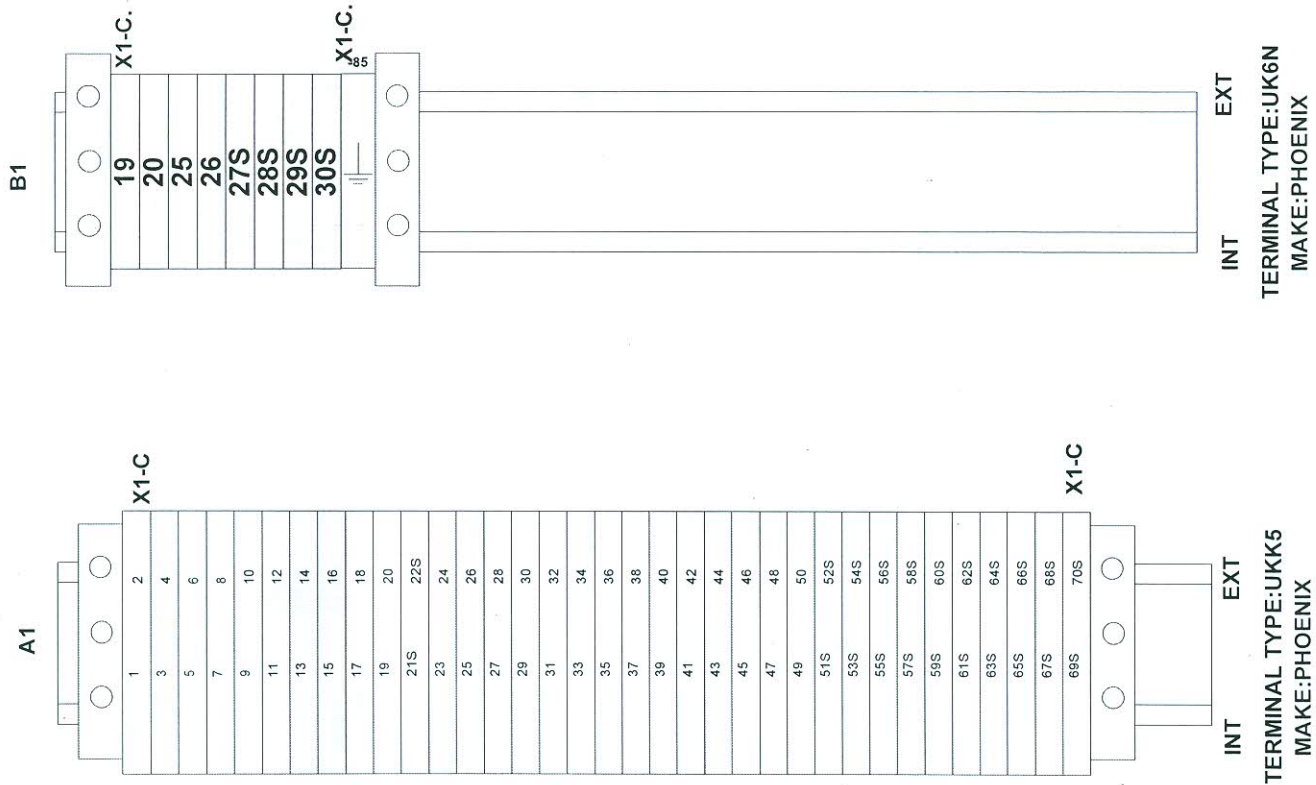
TERMINAL IN OPERATING MECHANISM-C

SCHEMATIC DIAGRAM FOR
145 KV SF6 CIRCUIT BREAKER
TYPE LTB 145D1/B WITH FSA1(SPO)

DRAWN. TT	CHECKED. UP	APPRD. NS
ABB ABB India Limited		

REF. DRG.NO.: 1HYB906311-3
1HYB906311-3

TOTAL SH	13
SH. NO.	10



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A	20171117	

SCHMATIC DIAGRAM FOR
145 kV SF6 CIRCUIT BREAKER
TYPE LTB 145D1/B WITH FSA1(SPO)

DRAWN: TT

CHECKED: UP

APPRD: NS

ABB ABB India Limited

REF. DRG.NO.: 1HYB906311-3

1HYB906311-3

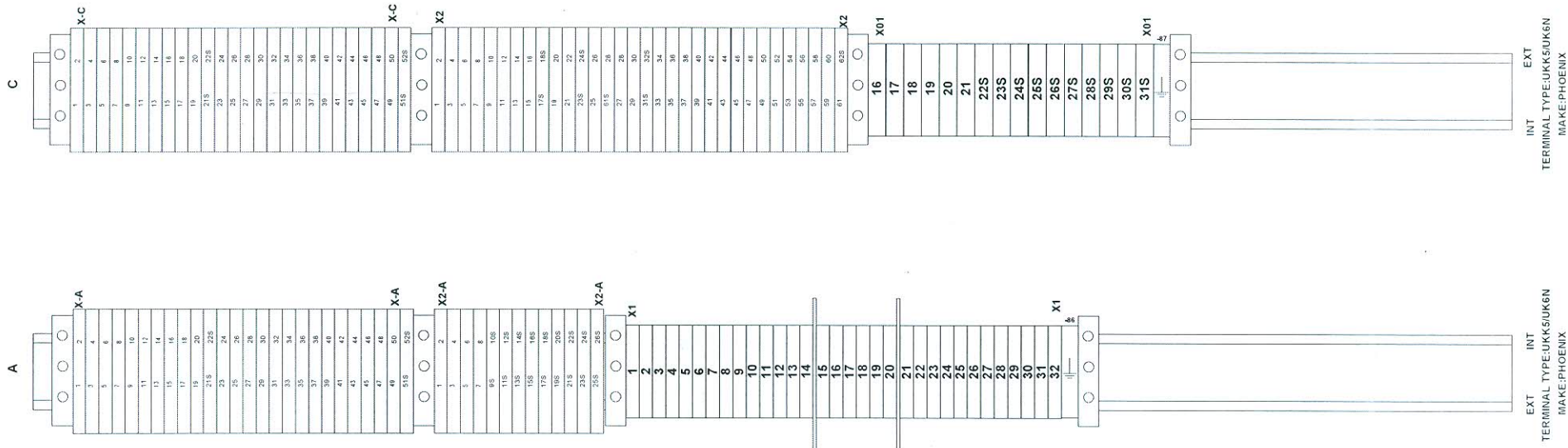
TOTAL SH

13

SH. NO.

11

TERMINAL IN OPERATING MECHANISM-B



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Bhutan Power Corporation Ltd.
Thimphu : Bhutan

Bill of Material

SL.	ITEM DESIGNATION	DESCRIPTION
1	+DM-F2	SF6 GAS DENSITY MONITOR
2	+DM-X0(6)	TERMINAL IN DM
3	+OM-A-F3A	2 POLE MCB-MOTOR-A DRIVE
4	+OM-A-F4A	2 POLE MCB-HEATER-A DRIVE
5	+OM-A-MA	MOTOR-A DRIVE
6	+OM-A-R3A	HEATER-A DRIVE
7	+OM-A-S1A	AUXILIARY SWITCH-A DRIVE
8	+OM-A-S3-A	MOTOR LIMIT SW.- A DRIVE
9	+OM-A-T1-A	THERMOSTAT
10	+OM-A-X1-A	TERMINAL OM UKK5
11	+OM-A-X1-A.	TERMINAL CC UK6N
12	+OM-A-Y1A	CLOSE COIL-A DRIVE
13	+OM-A-Y2A	TRIP-I COIL-A DRIVE
14	+OM-A-Y3A	TRIP-II COIL-A DRIVE
15	+OM-B-F3	2 POLE MCB-MOTOR-B DRIVE
16	+OM-B-F4	2 POLE MCB-HEATER
17	+OM-B-K1A	ANTIPUMPING RELAY
18	+OM-B-K1B	ANTIPUMPING RELAY
19	+OM-B-K1C	ANTIPUMPING RELAY
20	+OM-B-K2	GAS SUPERVISION RELAY
21	+OM-B-K3	GAS SUPERVISION RELAY
22	+OM-B-K5	POLE DISCREPANCY RELAY
23	+OM-B-K7	POLE DISCREPANCY RELAY
24	+OM-B-K8	MULTIPLYING CONTACTOR
25	+OM-B-KT4	TIMER
26	+OM-B-KT6	TIMER-POLE DISCREPENCY
27	+OM-B-L	ILLUMINATING LAMP
28	+OM-B-M	DOOR LIMIT SWITCH
29	+OM-B-MB	MOTOR-B DRIVE
30	+OM-B-PP	SOCKET (OUTLET)
31	+OM-B-R3	HEATER
32	+OM-B-S1B	AUXILIARY SWITCH-B DRIVE
33	+OM-B-S3-B	MOTOR LIMIT SW.- B DRIVE
34	+OM-B-S12	LOCAL REMOTE S/W
35	+OM-B-S13	CONTROL S/W TRIP CLOSE
36	+OM-B-T1	THERMOSTAT
37	+OM-B-X-A	TERMINAL MB UKK5
38	+OM-B-X-C	TERMINAL MB UKK5
39	+OM-B-X1	TERMINAL CC UK6N

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 General Manager
 Transmission Department
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 Bangalore

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Revision		BILL OF MATERIAL FOR 145 kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1(SPO)	DRAWN. TT	CHECKED. UP	APPRD. NS	TOTAL SH 13
A	20171117		ABB ABB India Limited		1HYB906311-3	SH. NO. 12

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Bill of Material

SL.	ITEM DESIGNATION	DESCRIPTION
40	+OM-B-X2-A	TERMINAL CC UKK5
41	+OM-B-X2	TERMINAL CC UKK5
42	+OM-B-X01	TERMINAL CC UK6N
43	+OM-B-Y1B	CLOSE COIL-B DRIVE
44	+OM-B-Y2B	TRIP-I COIL-B DRIVE
45	+OM-B-Y3B	TRIP-II COIL-B DRIVE
46	+OM-C-F3C	2 POLE MCB-MOTOR-C DRIVE
47	+OM-C-F4C	2 POLE MCB-HEATER-C DRIVE
48	+OM-C-MC	MOTOR-C DRIVE
49	+OM-C-R3C	HEATER-C DRIVE
50	+OM-C-S1C	AUXILIARY SWITCH-C DRIVE
51	+OM-C-S3-C	MOTOR LIMIT SW.- C DRIVE
52	+OM-C-T1-C	THERMOSTAT
53	+OM-C-X1-C	TERMINAL OM UKK5
54	+OM-C-X1-C.	TERMINAL CC UK6N
55	+OM-C-Y1C	CLOSE COIL-C DRIVE
56	+OM-C-Y2C	TRIP-I COIL-C DRIVE
57	+OM-C-Y3C	TRIP-II COIL-C DRIVE

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Revision									
A	20171117								
BILL OF MATERIAL FOR 145 kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1(SPO)				DRAWN. TT	CHECKED. UP	APPRD. NS	TOTAL SH 13		
				ABB ABB India Limited		1HYB906311-3		SH. NO. 13	

COMPUTER ORIGINAL

ABB		CE		MADE in ABB	
Circuit-breaker type	LTB145D1/B	Operating device type	FSA1 (SPO)		
No. (See note 1.)		No. (See note 2.)			
Order	4201687049	Order	4201687049		
Voltage	145 kV	Breaking current	40 kA		
Insulation level		DC-component	36 %		
lightning imp.with.voltage	650 kV	First-pole-to-clear-factor	1.5		
switching imp.with.voltage	- kV	Making current	100 kA		
power freq. with.voltage	275 kV	Short-time current	3 s 40 kA		
Frequency	50 Hz				
Normal current	3150 A	Line charging breaking current	50 A		
Gas pressure SF6	abs (+20°C)	Mass total	1738 kg		
Max. working pressure	0.9 MPa	Mass of gas	7 kg		
Filling	0.7 MPa	Rules	IEC 62271-100		
Signal	0.62 MPa	Operating sequence	0-0.3s-CO-3min-CO		
Blocking	0.6 MPa	Temperature class	-30 °C		
Volume per pole	50 l	Year of manufacture			

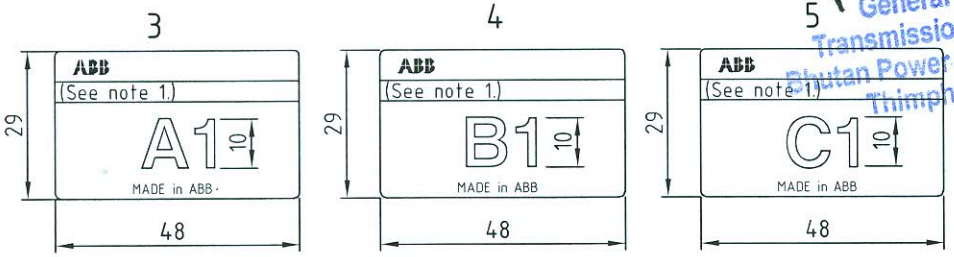
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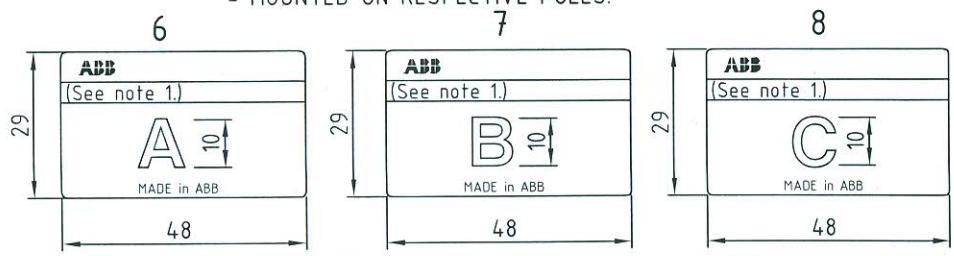
ABB		MADE in ABB	
Operating mechanism type FSA1 (SPO)			
Mass	** Kg No. (See note 2)		
Rated voltage	145 kV		
Coils	110 VDC	500W	
Motor	240 VAC	735W	
Heater	240 VAC	70W	

- For Item No. 2,3,4,5,6,7,8
- Letter height 2 & line 0.3 thk.
- Blank text is to be engraved at ABB.
- Text to be filled with Sun-Proof black ink.
- Language English
- ** 160 QTY 2 NOS,170 QTY 1 NO.
- For Item No. 1
- Engraved on natural background.
- Letter height 3.5 & line 0.3 thk.
- Blank text is to be engraved at ABB.
- Text to be filled with Sun-Proof black ink.
- General tolerance as per ISO 2768-c, '89.
- Language English

NOTE
1. CIRCUIT BREAKER SERIAL NO. NOTED IN THIS SPACE.
2. OPERATING MECHANISM SERIAL NO. NOTED IN THIS SPACE.



- MOUNTED ON RESPECTIVE POLES.



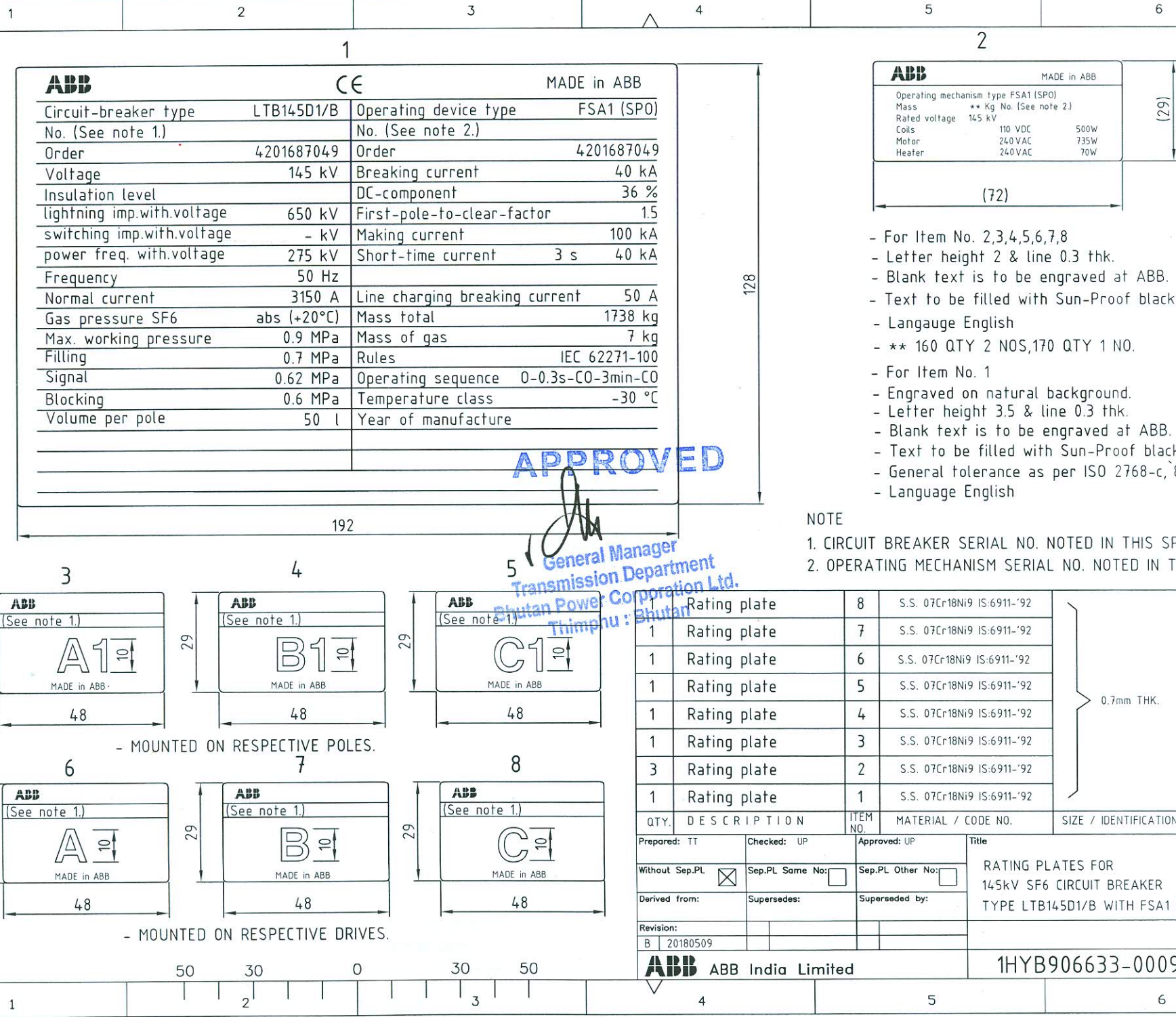
- MOUNTED ON RESPECTIVE DRIVES.

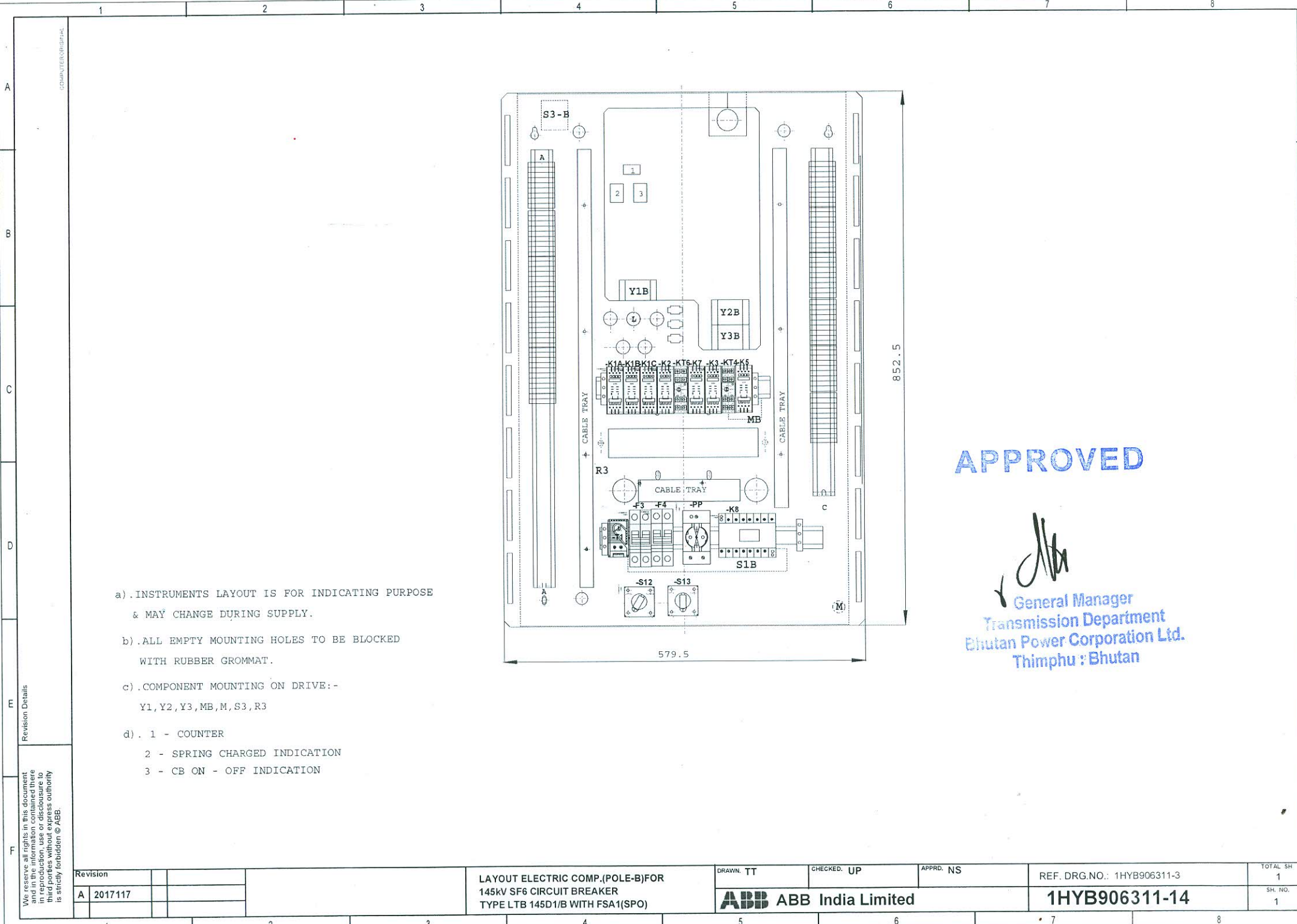
QTY.	DESCRIPTION	ITEM NO.	MATERIAL / CODE NO.	SIZE / IDENTIFICATION NO.	WT.
1	Rating plate	8	S.S. 07Cr18Ni9 IS:6911-'92	} 0.7mm THK.	
1	Rating plate	7	S.S. 07Cr18Ni9 IS:6911-'92		
1	Rating plate	6	S.S. 07Cr18Ni9 IS:6911-'92		
1	Rating plate	5	S.S. 07Cr18Ni9 IS:6911-'92		
1	Rating plate	4	S.S. 07Cr18Ni9 IS:6911-'92		
1	Rating plate	3	S.S. 07Cr18Ni9 IS:6911-'92		
3	Rating plate	2	S.S. 07Cr18Ni9 IS:6911-'92		
1	Rating plate	1	S.S. 07Cr18Ni9 IS:6911-'92		

Prepared: TT	Checked: UP	Approved: UP	Title
Without Sep.PL <input checked="" type="checkbox"/>	Sep.PL Same No: <input type="checkbox"/>	Sep.PL Other No: <input type="checkbox"/>	RATING PLATES FOR 145kV SF6 CIRCUIT BREAKER TYPE LTB145D1/B WITH FSA1 (SPO)
Derived from:	Supersedes:	Superseded by:	Scale -
Revision: B 20180509			Lang. E
ABB ABB India Limited			Total Sh. 1
1HYB906633-0009			Sheet 1

Revision Details:
① REVISED AS PER CLIENT COMMENT

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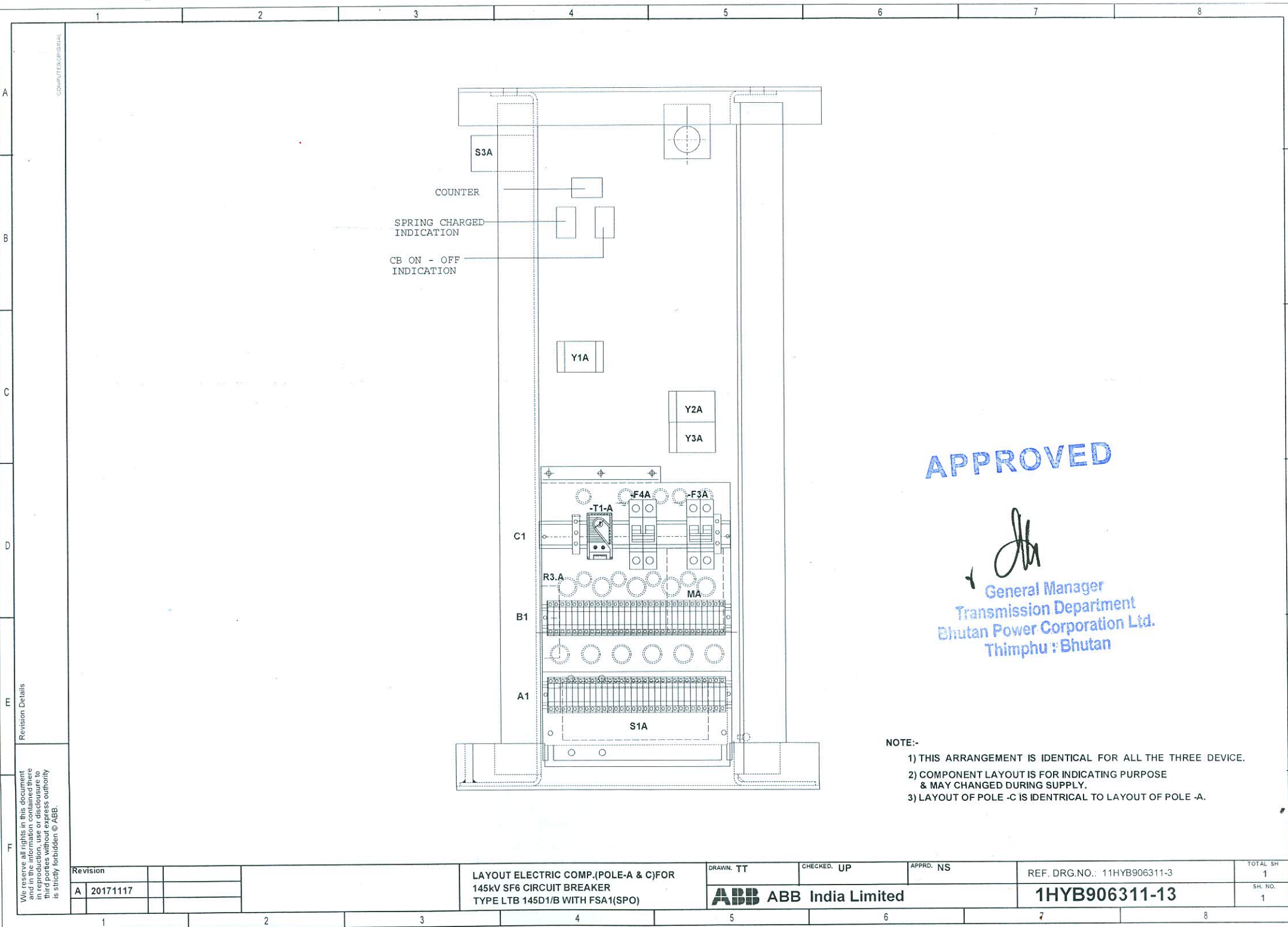
- a). INSTRUMENTS LAYOUT IS FOR INDICATING PURPOSE & MAY CHANGE DURING SUPPLY.
- b). ALL EMPTY MOUNTING HOLES TO BE BLOCKED WITH RUBBER GROMMAT.
- c). COMPONENT MOUNTING ON DRIVE :-
Y1, Y2, Y3, MB, M, S3, R3
- d). 1 - COUNTER
2 - SPRING CHARGED INDICATION
3 - CB ON - OFF INDICATION

APPROVED

[Signature]
General Manager
Transmission Department
Bhutan Power Corporation Ltd.
Thimphu : Bhutan

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Revision		LAYOUT ELECTRIC COMP.(POLE-B)FOR 145kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1(SPO)	DRAWN. TT	CHECKED. UP	APPRD. NS	REF. DRG.NO.: 1HYB906311-3	TOTAL SH 1
A	2017117		ABB ABB India Limited			1HYB906311-14	SH. NO. 1



APPROVED

[Signature]
 General Manager
 Transmission Department
 Bhutan Power Corporation Ltd.
 Thimphu : Bhutan

- NOTE:-
- 1) THIS ARRANGEMENT IS IDENTICAL FOR ALL THE THREE DEVICE.
 - 2) COMPONENT LAYOUT IS FOR INDICATING PURPOSE & MAY CHANGED DURING SUPPLY.
 - 3) LAYOUT OF POLE -C IS IDENTICAL TO LAYOUT OF POLE -A.

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Revision Details

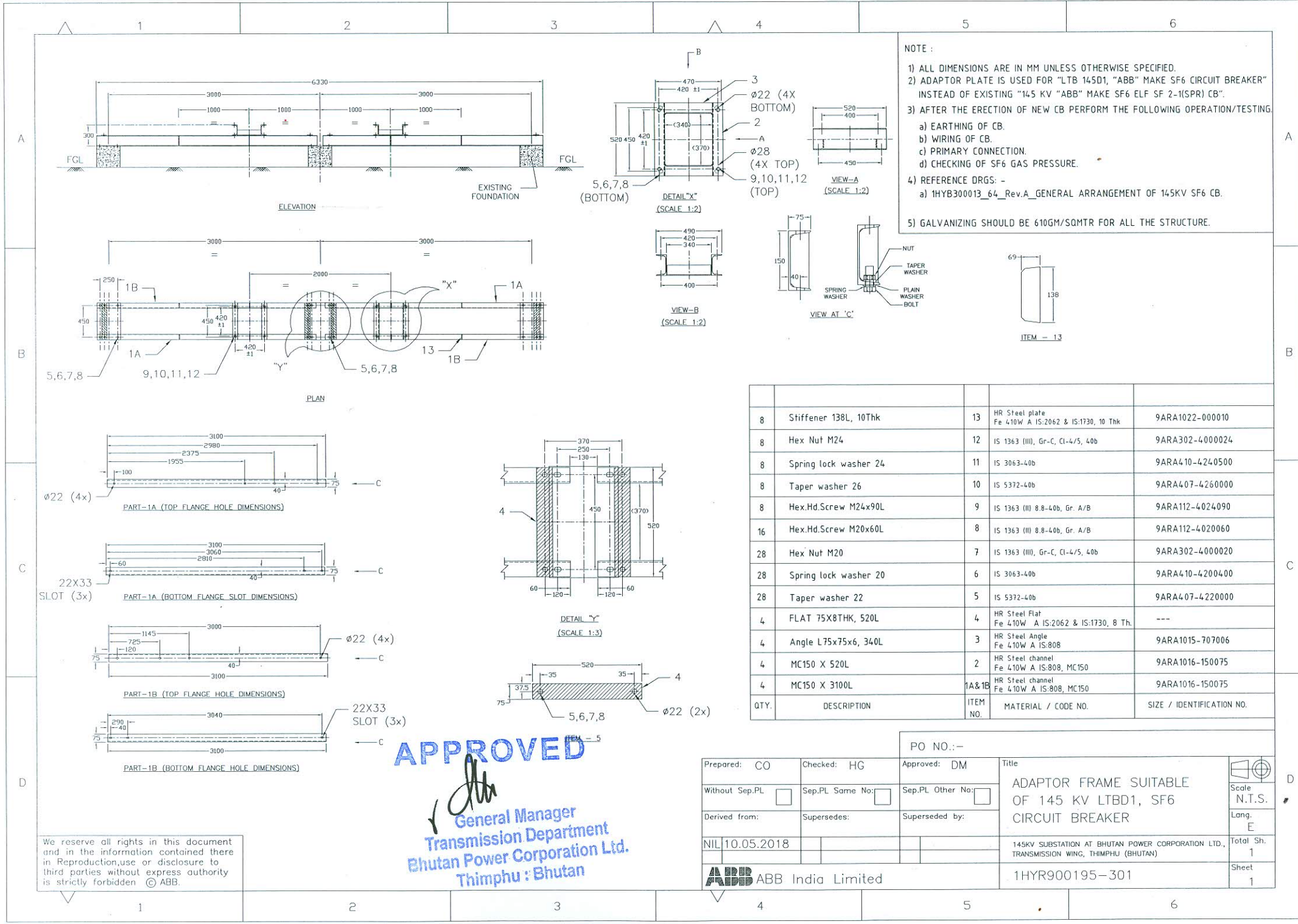
Revision		
A	20171117	

LAYOUT ELECTRIC COMP.(POLE-A & C)FOR
 145KV SF6 CIRCUIT BREAKER
 TYPE LTB 145D1/B WITH FSA1(SPO)

DRAWN. TT CHECKED. UP APPRD. NS
ABB India Limited

REF. DRG.NO.: 11HYB906311-3
1HYB906311-13

TOTAL SH	1
SH. NO.	1



NOTE :

- 1) ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
- 2) ADAPTOR PLATE IS USED FOR "LTB 145D1, "ABB" MAKE SF6 CIRCUIT BREAKER" INSTEAD OF EXISTING "145 KV "ABB" MAKE SF6 ELF SF 2-1(SPR) CB".
- 3) AFTER THE ERECTION OF NEW CB PERFORM THE FOLLOWING OPERATION/TESTING.
 - a) EARTHING OF CB.
 - b) WIRING OF CB.
 - c) PRIMARY CONNECTION.
 - d) CHECKING OF SF6 GAS PRESSURE.
- 4) REFERENCE DRGS : -
 - a) 1HYB300013_64_Rev.A_GENERAL ARRANGEMENT OF 145KV SF6 CB.
- 5) GALVANIZING SHOULD BE 610GM/SQMT FOR ALL THE STRUCTURE.

QTY.	DESCRIPTION	ITEM NO.	MATERIAL / CODE NO.	SIZE / IDENTIFICATION NO.
8	Stiffener 138L, 10Thk	13	HR Steel plate Fe 410W A IS:2062 & IS:1730, 10 Thk	9ARA1022-000010
8	Hex Nut M24	12	IS 1363 (III), Gr-C, Cl-4/5, 40b	9ARA302-4000024
8	Spring lock washer 24	11	IS 3063-40b	9ARA410-4240500
8	Taper washer 26	10	IS 5372-40b	9ARA407-4260000
8	Hex.Hd.Screw M24x90L	9	IS 1363 (III) 8.8-40b, Gr. A/B	9ARA112-4024090
16	Hex.Hd.Screw M20x60L	8	IS 1363 (III) 8.8-40b, Gr. A/B	9ARA112-4020060
28	Hex Nut M20	7	IS 1363 (III), Gr-C, Cl-4/5, 40b	9ARA302-4000020
28	Spring lock washer 20	6	IS 3063-40b	9ARA410-4200400
28	Taper washer 22	5	IS 5372-40b	9ARA407-4220000
4	FLAT 75X8THK, 520L	4	HR Steel Flat Fe 410W A IS:2062 & IS:1730, 8 Thk	---
4	Angle L75x75x6, 340L	3	HR Steel Angle Fe 410W A IS:808	9ARA1015-707006
4	MC150 X 520L	2	HR Steel channel Fe 410W A IS:808, MC150	9ARA1016-150075
4	MC150 X 3100L	1A&1B	HR Steel channel Fe 410W A IS:808, MC150	9ARA1016-150075

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[Signature]
 General Manager
 Transmission Department
 Bhutan Power Corporation Ltd.
 Thimphu : Bhutan

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Prepared: CO	Checked: HG	Approved: DM	PO NO.: -	 Scale N.T.S. Long E Total Sh. 1 Sheet 1
Without Sep.PL <input type="checkbox"/>	Sep.PL Same No. <input type="checkbox"/>	Sep.PL Other No. <input type="checkbox"/>	Title ADAPTOR FRAME SUITABLE OF 145 KV LTBD1, SF6 CIRCUIT BREAKER	
Derived from:	Supersedes:	Superseded by:	NIL 10.05.2018	145KV SUBSTATION AT BHUTAN POWER CORPORATION LTD., TRANSMISSION WING, THIMPHU (BHUTAN)
ABB India Limited			1HYR900195-301	

COMPUTER ORIGINAL

P.O.NO.	3491101413 DTD.30.04.2018
CONTROL VOLTAGE CLOSE & TRIP	110 VDC.
SPRING DRIVE MOTOR VOLTAGE	240 VAC.
HEATER VOLTAGE	240 VAC.
ABB.S.O.NO.	4201687049.
LINE ITEM	30.
QTY.	02 NOS.

GENERAL ARRANGEMENT	1HYB904723-1
SCHEMATIC DIAGRAM	1HYB906309-3
RATING PLATE	1HYB906632-0009
LAYOUT ELECTRIC COMPONENTS	1HYB906309-13

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 General Manager
 Transmission Department
 Bhutan Power Corporation Ltd.
 Thimphu : Bhutan

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Revision Details:
 ⊕ REVISED AS PER CLIENT COMMENT

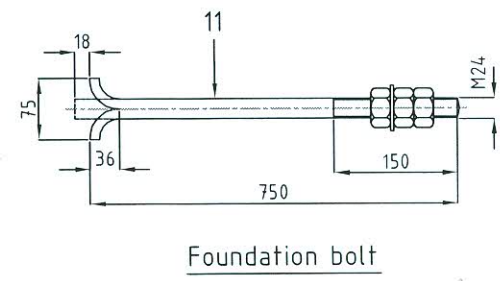
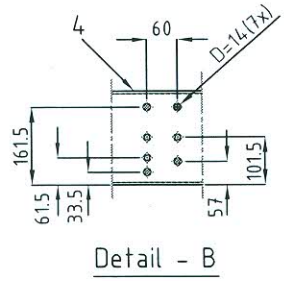
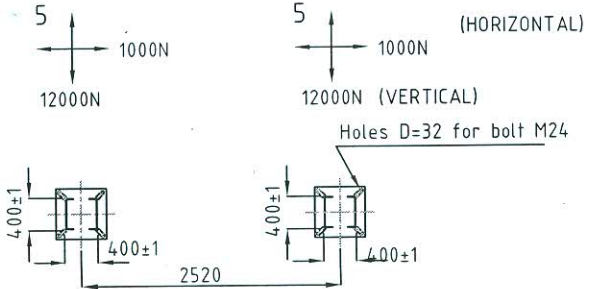
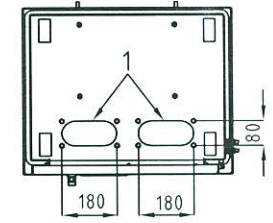
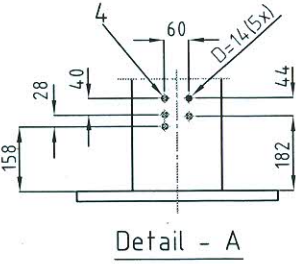
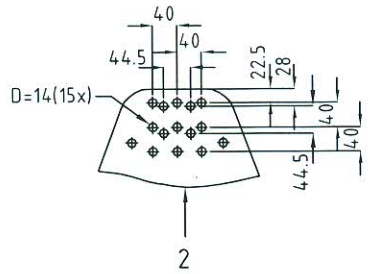
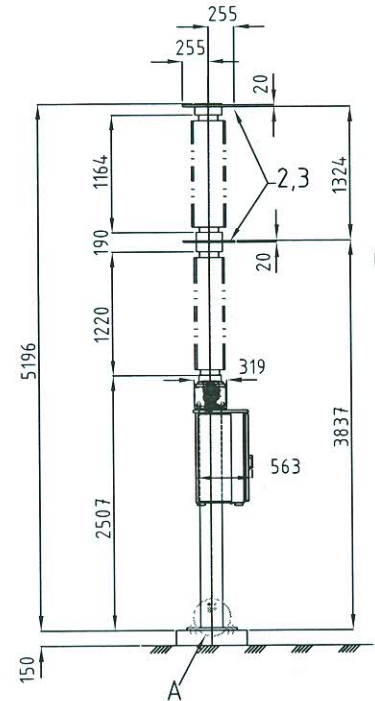
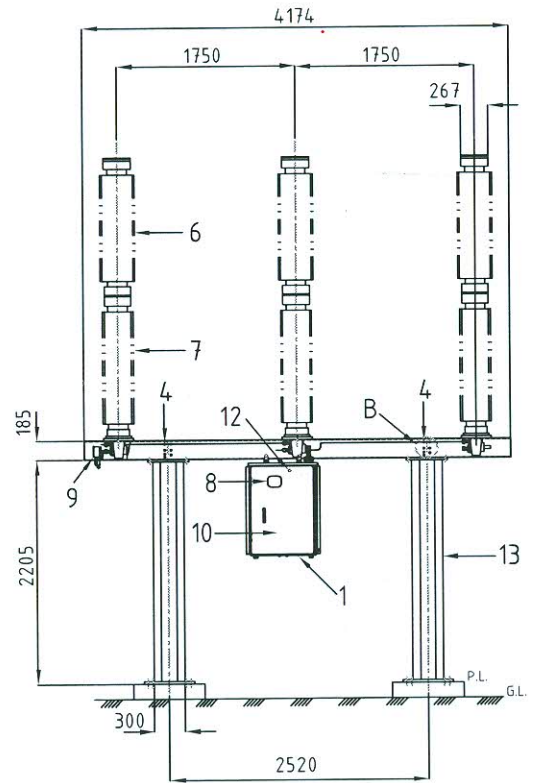
Revision		COVER SHEET FOR	DRAWN: MB	CHECKED: TT	APPRD. UP	TOTAL SH.
B	20180509	145 kV SF6 CIRCUIT BREAKER	ABB India Limited		1HYB906632-0100	1
		TYPE LTB145D1/B WITH FSA1				Sh. NO.
						1

COMPUTER ORIGINAL

MASS IN KG				
BREAKER POLES	FRAME/POLE BEAM, ETC.	OPERATING MECHANISM	SF6 GAS	TOTAL MASS
272x3	160x2+105	170	7	1418 APPROX.

SR. NO.	LEGEND
1	CABLE INLET
2	TERMINAL OF ALUMINIUM
3	TERMINAL LOAD MAX.1500 N STATIC / 3000 N DYNAMIC IN ANY DIRECTION
4	HOLES FOR EARTHING CLAMP
5	DYNAMIC FORCE DURING OPERATION
6	ARC CHAMBER INSULATOR
7	SUPPORT INSULATOR
8	OPEN/CLOSE INDICATOR
9	DENSITY MONITOR
10	OPERATING MECHANISM
11	FOUNDATION BOLT.
12	CHARGING POINT
13	BREAKER FRAME (SUPPORT STRUCTURE)

- ALL DIMENSION ARE IN mm.



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*General Manager
Transmission Department
Bhutan Power Corporation Ltd.
Thimphu - Bhutan*

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Revision	
A	20141124

GENERAL ARRANGEMENT FOR
145kV SF6 CIRCUIT BREAKER
TYPE LTB145D1/B WITH FSA1

DRAWN: NS CHECKED: KD APPRD: KD
ABB India Limited

REF. STD. DRG. NO. 1HYB300013-51
1HYB904723-1

TOTAL SH. 1
Sh. NO. 1

CONFIDENTIAL

A

B

C

D

E

F

A

B

C

D

E

F

ITEM ABBREVIATIONS :-

- DM:- DENSITY MONITOR
- OM:- OPERATING MECHANISM.

DIAGRAM BASED ON IEC 617.
 LOCAL REMOTE SWITCH IN REMOTE POSITION.
 CIRCUIT BREAKER IN " OFF " POSITION.
 AUXILIARY CIRCUIT " OFF " .
 DRAWN WITHOUT GAS PRESSURE.
 SPRING DISCHARGED.

NOTE :-

- WIRING TO BE DONE WITH TINNED CU.WIRE (GREY FOR DC CKT. BLACK FOR AC CKT. , GREEN + YELLOW FOR EARTHING.)
- 1:- 1.5 SQ. MM. FOR CONTROL CKT.
- 2:- 2.5 SQ. MM. FOR MOTOR CKT.
- 3:- 4.0 SQ. MM. FOR DOOR & PANEL EARTHING .
- 4:- ALL EMPTY MOUNTING HOLES TO BE BLOCKED WITH RUBBER GROMMAT.
- ⊗ TERMINAL FOR CUSTOMER CONNECTION.
- QUANTITY OF EACH COMPONENT IN BILL OF MATERIAL IS 1 NO.
- S FOR :- SPARE TERMINAL.
- TERMINAL ARRANGEMENT IS FOR INDICATING PURPOSE & MAY CHANGED DURING SUPPLY.

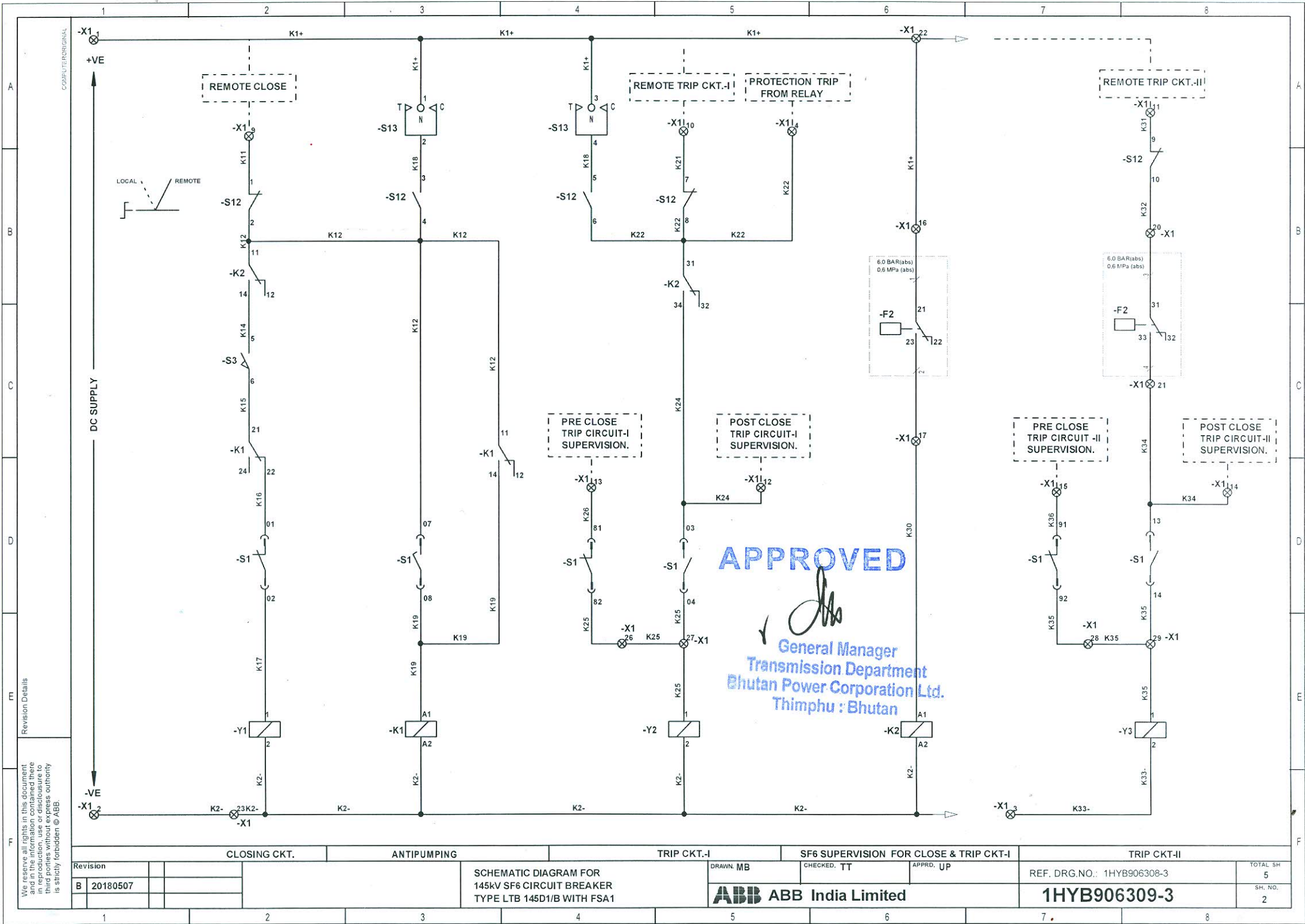
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[Signature]
 General Manager
 Transmission Department
 Bhutan Power Corporation Ltd.
 Thimphu : Bhutan

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Revision Details
 (B) EARTHING TERMINAL ADDED.

Revision		SCHEMATIC DIAGRAM FOR 145kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1	DRAWN: MB	CHECKED: TT	APPRD: UP	REF. DRG.NO.: 1HYB906308-3	TOTAL SH
B	20180507						5
ABB India Limited			1HYB906309-3		SH. NO. 1		



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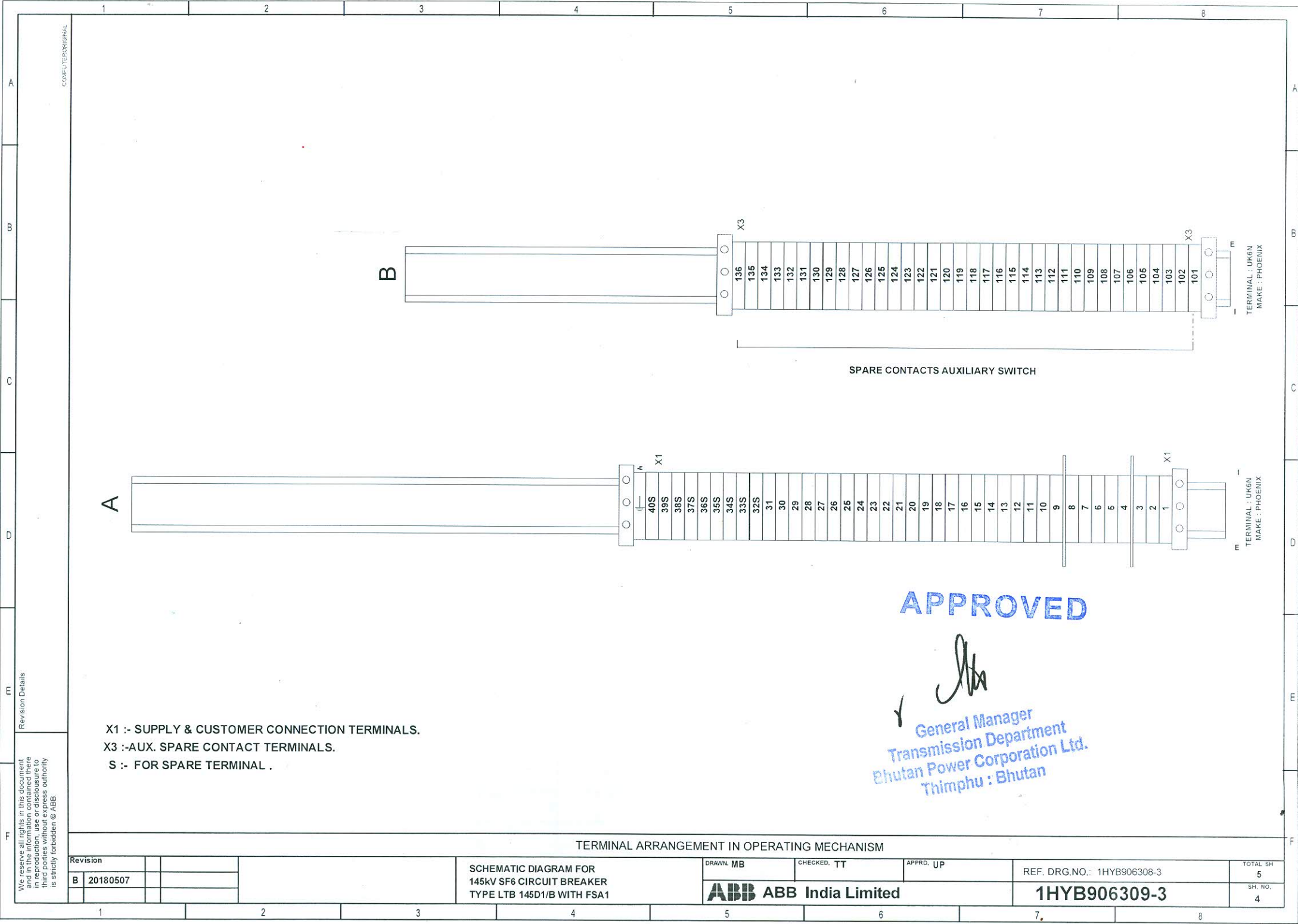
[Signature]
 General Manager
 Transmission Department
 Bhutan Power Corporation Ltd.
 Thimphu : Bhutan

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Revision Details

Revision		CLOSING CKT.		ANTIPUMPING		TRIP CKT.-I		SF6 SUPERVISION FOR CLOSE & TRIP CKT.-I		TRIP CKT.-II	
B	20180507										
SCHEMATIC DIAGRAM FOR 145kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1						DRAWN: MB		CHECKED: TT		APPRD: UP	
ABB India Limited										REF. DRG. NO.: 1HYB906308-3	
										TOTAL SH 5	
										SH. NO. 2	

1HYB906309-3



TERMINAL : UK6N
MAKE : PHOENIX

TERMINAL : UK6N
MAKE : PHOENIX

SPARE CONTACTS AUXILIARY SWITCH

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[Signature]
General Manager
Transmission Department
Bhutan Power Corporation Ltd.
Thimphu : Bhutan

X1 :- SUPPLY & CUSTOMER CONNECTION TERMINALS.
X3 :-AUX. SPARE CONTACT TERMINALS.
S :- FOR SPARE TERMINAL .

TERMINAL ARRANGEMENT IN OPERATING MECHANISM

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Revision Details

Revision		SCHEMATIC DIAGRAM FOR 145kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1	DRAWN: MB	CHECKED: TT	APPRD: UP	REF. DRG.NO.: 1HYB906308-3	TOTAL SH 5
B	20180507		ABB India Limited			1HYB906309-3	SH. NO. 4

COPY/TYPE ORIGINAL

Bill of Material

SL.	ITEM DESIGNATION	DESCRIPTION
1	+DM-F2	SF6 GAS DENSITY MONITOR
2	+OM-F3	2 POLE MCB-MOTOR
3	+OM-F4	1 POLE MCB-HEATER
4	+OM-F5	1 POLE MCB-SUPPLY SOCKET
5	+OM-K1	ANTI PUMPING RELAY
6	+OM-K2	GAS SUPERVISION RELAY
7	+OM-L	ILLUMINATION LAMP
8	+OM-M	DOOR LIMIT SWITCH
9	+OM-M1	SPRING CHARGING MOTOR
10	+OM-PP	SOCKET(OUTLET)
11	+OM-R3	HEATER
12	+OM-S1	AUXILIARY CONTACT
13	+OM-S3	MOTOR LIMIT SWITCH
14	+OM-S12	LOCAL REMOTE SWITCH
15	+OM-S13	CONTROL S/W TRIP CLOSE
16	+OM-S121	LOCAL REMOTE NAME PLATE IN - ENGLISH
17	+OM-S131	CLOSE TRIP NAME PLATE IN - ENGLISH
18	+OM-T1	THERMOSTAT EXPORT
19	+OM-X1	TERMINAL CC UK6N
20	+OM-X3	TERMINAL CC UK6N
21	+OM-Y1	CLOSE COIL
22	+OM-Y2	TRIP-I COIL
23	+OM-Y3	TRIP-II COIL

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 General Manager
 Transmission Department
 Bhutan Power Corporation Ltd.
 Thimphu : Bhutan

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Revision Details

Revision		APPARATUS LIST FOR	DRAWN MB	CHECKED TT	APPRD. UP	TOTAL SH
B	20180507	145kV SF6 CIRCUIT BREAKER TYPE LTB 145D1/B WITH FSA1	ABB ABB India Limited		1HYB906309-3	5
						SH. NO. 5

COMPUTER ORIGINAL

ABB		CE		MADE in ABB	
Circuit-breaker type	LTB145D1/B	Operating device type	FSA1		
No. (See note 1.)		No. (See note 2.)			
Order	4201687049	Order	4201687049		
Voltage	145 kV	Breaking current	40 kA		
Insulation level		DC-component	36 %		
lightning imp.with.voltage	650 kV	First-pole-to-clear-factor	1.5		
switching imp.with.voltage	- kV	Making current	100 kA		
power frequency with.voltage	275 kV	Short-time current	3 s 40 kA		
Frequency	50 Hz				
Normal current	3150 A	Line charging breaking current	50 A		
Gas pressure SF6	abs (+20°C)	Mass total	1418 kg		
Max. working pressure	0.9 MPa	Mass of gas	7 kg		
Filling	0.7 MPa	Rules	IEC 62271-100		
Signal	0.62 MPa	Operating sequence	0-0.3s-CO-3min-CO		
Blocking	0.6 MPa	Temperature class	-30 °C		
Volume per pole	50 l	Year of manufacture			

ABB		MADE in ABB	
Operating mechanism type FSA1			
Mass	170 Kg	No. (See note 2.)	
Rated voltage	145 kV		
Coils	110 VDC	500W	
Motor	240 VAC	735W	
Heater	240 VAC	70W	

- Letter height 2 & line 0.3 thk.
- Blank text is to be engraved at ABB.
- Text to be filled with Sun-Proof black ink.
- Language English.

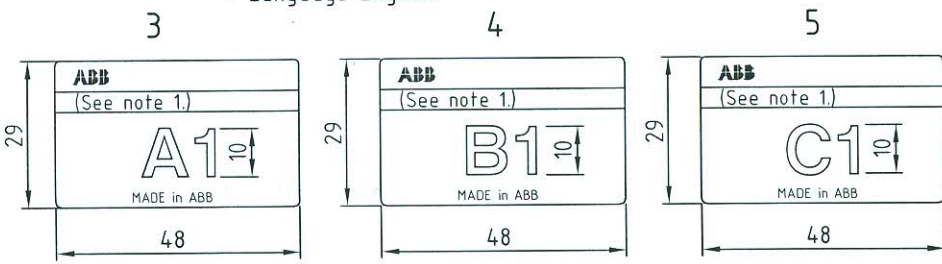
NOTE

1. CIRCUIT BREAKER SERIAL NO. NOTED IN THIS SPACE.
2. OPERATING MECHANISM SERIAL NO. NOTED IN THIS SPACE.

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[Signature]
General Manager
Transmission Department
Bhutan Power Corporation Ltd.
Thimphu : Bhutan

- Engraved on natural background.
- Letter height 3.5 & line 0.3 thk.
- Blank text is to be engraved at ABB.
- Text to be filled with Sun-Proof black ink.
- General tolerance as per ISO 2768-c, '89.
- Language English.

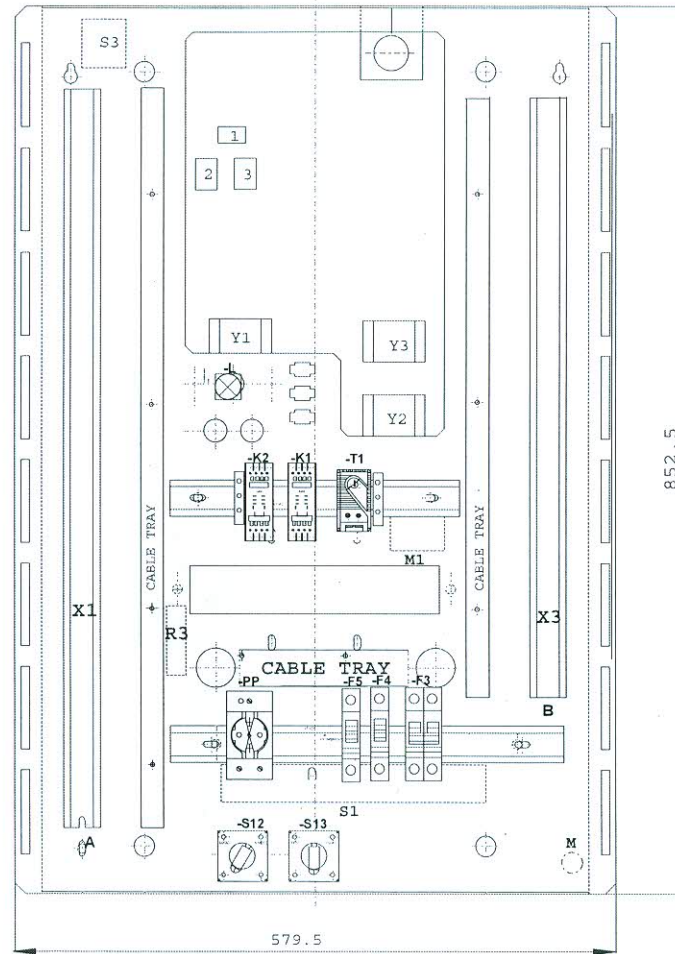


- MOUNTED ON RESPECTIVE POLES.

1	Rating plate	5	S.S. 07Cr18Ni9 IS:6911-'92	} 1HYB700001-A	
1	Rating plate	4	S.S. 07Cr18Ni9 IS:6911-'92		
1	Rating plate	3	S.S. 07Cr18Ni9 IS:6911-'92		
1	Rating plate	2	S.S. 07Cr18Ni9 IS:6911-'92		
1	Rating plate	1	S.S. 07Cr18Ni9 IS:6911-'92		
QTY.	DESCRIPTION	ITEM NO.	MATERIAL / CODE NO.	SIZE / IDENTIFICATION NO.	WT.
Prepared: TT	Checked: UP	Approved: UP	Title		
Without Sep.PL <input checked="" type="checkbox"/>	Sep.PL Same No: <input type="checkbox"/>	Sep.PL Other No: <input type="checkbox"/>	RATING PLATES FOR		
Derived from:	Supersedes:	Superseded by:	145kV SF6 CIRCUIT BREAKER		
Revision:			TYPE LTB145D1/B WITH FSA1		
B	20180509		1HYB906632-0009		
ABB ABB India Limited					

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Revision Details:
 © REVISED AS PER CLIENT COMMENT



NOTE: -

- a). INSTRUMENTS LAYOUT IS FOR INDICATING PURPOSE & MAY CHANGED DURING SUPPLY.
- b). ALL EMPTY MOUNTING HOLES TO BE BLOCKED WITH RUBBER GROMMET.
- c). COMPONENT MOUNTING ON DRIVE: -
Y1, Y2, Y3, S3, S1, M, M1, R3
- d). 1 - COUNTER
2 - SPRING CHARGED INDICATION
3 - CB ON - OFF INDICATION

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[Signature]
 General Manager
 Transmission Department
 Bhutan Power Corporation Ltd.
 Thimphu : Bhutan

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Revision Details

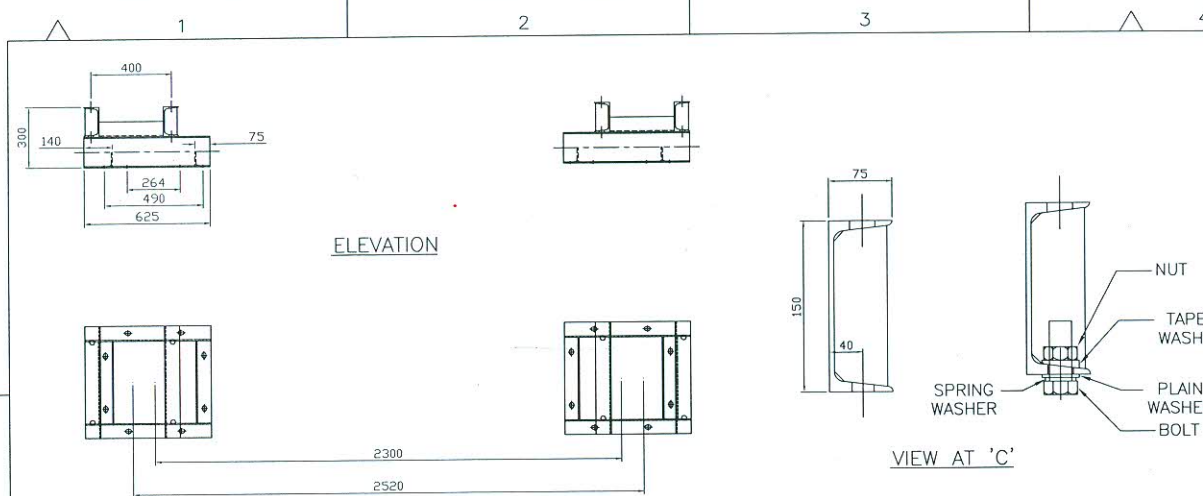
Revision		
A	20171117	

LAYOUT ELECTRICAL COMPONENTS FOR
 72.5kV SF6 CIRCUIT BREAKER
 TYPE LTB72.5D1/B WITH FSA1

DRAWN: TT
 CHECKED: UP
 APPRD: NS
ABB India Limited

REF. DRG. NO.: 1HYB906309-3
1HYB906309-13

TOTAL SH
1
SH. NO.
1



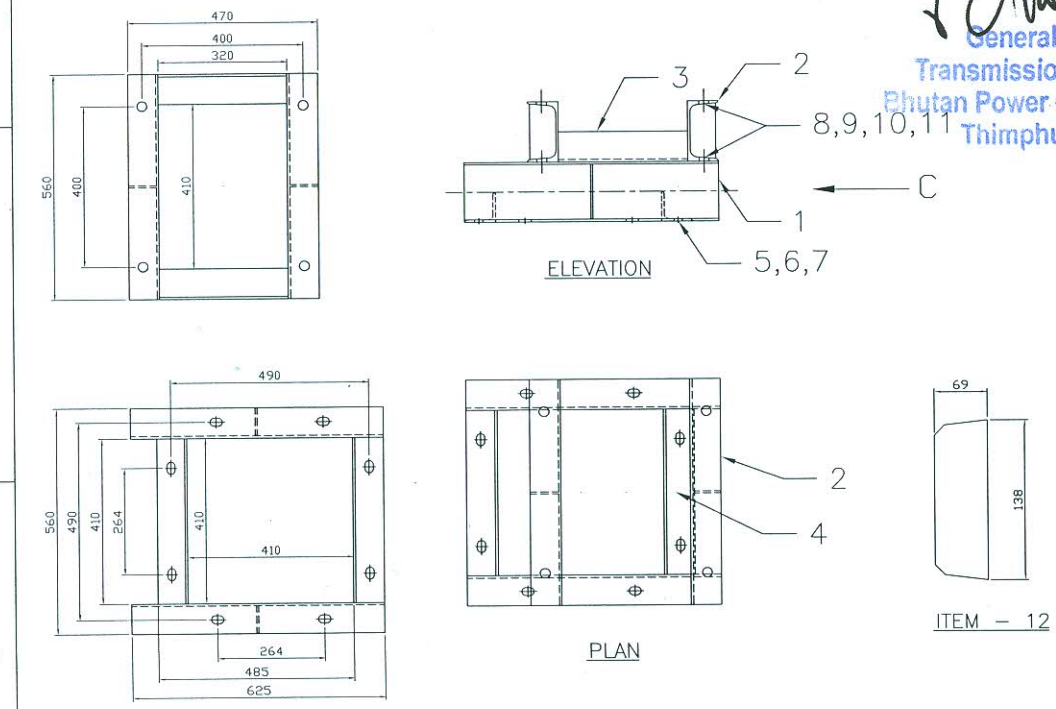
NOTE :

- 1) ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
- 2) ADAPTOR PLATE IS USED FOR "LTB 145D1, "ABB" MAKE SF6 CIRCUIT BREAKER" INSTEAD OF EXISTING "145 KV "ABB" MAKE SF6 ELF SF 2-1(r) CB".
- 3) AFTER THE ERECTION OF NEW CB PERFORM THE FOLLOWING OPERATION/TESTING.
 - a) EARTHING OF CB.
 - b) WIRING OF CB.
 - c) PRIMARY CONNECTION.
 - d) CHECKING OF SF6 GAS PRESSURE.
- 4) REFERENCE DRGS: -
 - a) 1HYB990086-1A_GENERAL ARRANGEMENT OF 145KV SF6 CB.
- 5) GALVANIZING SHOULD BE 610GM/SQMTR FOR ALL THE STRUCTURE.

APPROVED

General Manager
Transmission Department
Bhutan Power Corporation Ltd.
Thimphu : Bhutan

CONSIDER THIS BOM FOR 1NO. OF COMPLETED CIRCUIT BREAKER



QTY.	DESCRIPTION	ITEM NO.	MATERIAL / CODE NO.	SIZE / IDENTIFICATION NO.
8	Stiffener 138L, 10Thk	12	HR Steel plate Fe 410W A IS:2062 & IS:1730, 10 Thk	9ARA1022-000010
16	Hex Nut M24	11	IS 1363 (III), Gr-C, Cl-4/5, 40b	9ARA302-4000024
16	Spring lock washer 24	10	IS 3063-40b	9ARA410-4240500
16	Taper washer 26	9	IS 5372-40b	9ARA407-4260000
16	Hex.Hd.Screw M24x90L	8	IS 1363 (III) 8.8-40b, Gr. A/B	9ARA112-4024090
16	Hex Nut M20	7	IS 1363 (III), Gr-C, Cl-4/5, 40b	9ARA302-4000020
16	Spring lock washer 20	6	IS 3063-40b	9ARA410-4200400
16	Taper washer 22	5	IS 5372-40b	9ARA407-4220000
4	Angle L75x75x6, 410L	4	HR Steel Angle Fe 410W A IS:808	9ARA1015-707006
4	Angle L75x75x6, 320L	3	HR Steel Angle Fe 410W A IS:808	9ARA1015-707006
4	MC150 X 560L	2	HR Steel channel Fe 410W A IS:808, MC150	9ARA1016-150075
4	MC150 X 625L	1A&1B	HR Steel channel Fe 410W A IS:808, MC150	9ARA1016-150075

PO NO.:- 51/TD/BPC/2011/VOL-3/311 DTD: 31.05.2011

Prepared: KMS	Checked: KMS	Approved: NOG	Title	Scale N.T.S. Lang. E Total Sh. 1 Sheet 1
Without Sep.PL <input type="checkbox"/>	Sep.PL Same No. <input type="checkbox"/>	Sep.PL Other No. <input type="checkbox"/>	ADAPTOR FRAME SUITABLE OF 145 KV LTBD1, SF6 CIRCUIT BREAKER	
Derived from:	Supersedes:	Superseded by:	145KV SUBSTATION AT BHUTAN POWER CORPORATION LTD., TRANSMISSION WING, THIMPHU (BHUTAN)	
A 20.05.2013			3PHVS11R08S001	
ABB Limited				

TOTAL QUANTITY OF CIRCUIT BREAKER - 4 NOS.

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