REV.	DATE	ALTERED / CHECKED / APPD	REV.	DATE	ALTERED / CHECKED / APPD	REV.	DATE	ALTERED / CHECKED / APPD

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DEVELOPMENT CONSULTANTS PRIVATE LIMITED

Reviewed only for general conformance with contract drawings and specifications.
Contractor to be responsible for any errors and for fulfillment of detailed requirements of contract documents.

ACTION : 3 DATE : 27.09.16

DISTRIBUTED BY : SKB/BR

1	Distributed	4	Approved except as noted. Resubmission required.
2	Approved	5	Disapproved. See accompanying letter.
3	Approved except as noted. Forward final drawing.	6	For information and record only.

SEE COVERING LETTER

Letter Ref. No. Date :

GSECL

GUJARAT STATE ELECTRICITY CORPORATION LIMITED
VADODARA, GUJARAT
SWITCHYARD EXTENSION for
1x800 MW Wanakbori Thermal Power Station Extn. Unit-8
LOA NO. PP/SE(P.II)/WKB-8/683 DATED 26.09.14

DEVELOPMENT CONSULTANTS PVT. LTD.
CONSULTING ENGINEERS
KOLKATA · MUMBAI · CHENNAI · NEW DELHI

BHARAT HEAVY ELECTRICALS LTD.
P.O. NUMBER : 145P319 DTD 10/04/2016

TITLE :
TITLE SHEET FOR 420kV CIRCUIT BREAKER

Document No. TB-DS-375-316-401

	NAME	DATE
DRAWN	DLG	19.08.2016
CHECKED	KS	19.08.2016
APPROVED	KPB	19.08.2016
SHEET NO. 1 OF 1		REV. 0

Gujarat State Electricity Corporation Ltd
1 x 800 MW Supercritical Thermal Power Project
Standard GTP of 420 kV Circuit Breaker type GL316 with without PIR
Drawing No.-3271003612GTP316R01 Rev.-0

Indicate Application area

As per MOM between BHEL and GSECL ; Present requirement of line length & gazette of India guidelines PIR is not required for 2 lines mentioned in SLD. However , if the line length exceed as per statutory requirement during execution stage, BHEL shall provide PIR/CSD (Control Switching Device) for two lines without financial implications to GSECL. Hence BHEL has to confirm the provision for the same.

Sl.No	Parameters		Particulars
1	Name of the Manufacturer		: ALSTOM T&D INDIA LTD
2	Manufacturer's type designation		: GL316 without PIR
3	Standard applicable		: IEC 62271-100
4	Type		: SF6 Live Tank
5	Service		: Outdoor
6	Pole	Nos.	: 3
7	Rated voltage	kV rms	: 420
8	Frequency	Hz	: 50
9	Insulation level		
9.1	Switching impulse withstand	kVp	: 1050
9.2	Impulse withstand	kVp	: 1425
9.3	One minute power frequency withstand	kV rms	: 610
10	Rated nominal current Amps at ambient temp	°C	: 2000A at 40°C
11	Derating factor for specified ambient temparature and site conditions (if any)		
12	Temperature rise above 50°C ambient		: As per IEC
12.1	Rated current		: 2000A
12.2	Short time current		: 40kA for 1 sec
13	Rated operating duty		: O – 0.3 sec – CO – 3 min – CO
14	Rated breaking capacity on rated operating duty		:
14.1	Symmetrical	kA rms	: 40
14.2	D.C. Component	%	: 50
14.3	Asymmetrical	kA rms	: 49
15	Re-striking voltage % Rated capacity		
15.1	Amplitude factor		: 1.4
15.2	Phase factor		: 1.3
15.3	Natural frequency	kHz	: As per IEC
15.4	Rate of rise of re-striking voltage V/µS.		: 2
16	Rated making capacity	kA peak	: 100
17	Rated short time current for 3s	kA rms	: 40
18	Breaking capacity under phase opposition condition	kA rms	: 10
19	Capacitive current breaking		
19.1	Capacitive current	Amps	: 400
19.2	Over voltage		: As per IEC
20	Inductive current breaking		
20.1	Inductive current	Amps	: 0 – 10A < 2.3 P.V
20.2	Over voltage		: As per IEC
21	Total break time measured from the instant of trip circuit energisation		
21.1	At 10% breaking capacity	mS	: 37
21.2	At 100% breaking capacity	mS	: 42.7

Indicate Voltage & Frequency Variation

BHEL Also indicate following detail
a) between phase to earth : 1050
b) between phases : 1575
c) across isolating distance : 900 (+345) *

BHEL Also indicate following detail
a) between phase to earth : 1425
b) between phases to CB open : 1425
c) across isolating distance : 1425 (+240) *
(impulse on one terminal and other terminal earthed)

Rated one minute Power Frequency withstand voltage KVrms : (a) To earth & between poles

3 SEC

First pole to clear factor : 1.3

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Class

Mechanical Endurance Class : ---------- M1----------

Electrical Endurance Class : ---------- E1 ----------

Restrike Probability Class : ---------- C1 ----------

Electromagnetic Compatibility(EMC) : --- as per IS 12729 /IEC 60694 normal severity class

Noise level at base : Maximum 140dB at base of circuit breaker

Minimum Creepage distance (@31 mm/KV) : 13020 mm

22	Arcing time			
22.1	At 10% breaking capacity	mS	:	17.7
22.2	At 100% breaking capacity	mS	:	23.4
23	Total length of arc	mm		Arcing time measured as per IEC
24	Breaks per pole	No.	:	2
25	Length of break per pole	mm	:	125
26	Contact Travel	mm		
26.1	Length of travel	mm	:	180
26.2	Rate of travel	m/s	:	2.1 - 3.0 for closing , 4.7 - 5.7 for tripping.
27	Make time	mS	:	< 110ms
28	Spring charging time	Sec	:	< 15 sec
29	Reclosing time with rated control voltage applied and measure from the instant of trip coil energisation.			
29.1	Minimum dead time for first auto reclose	mS	:	300
29.2	Range of adjustment for single auto reclose	mS	:	No Adjustment
30	Type of devices, if any, to limit		:	No Adjustment
31	Short circuit type test certificate furnished?		:	Yes
31.1	Certificate No		:	8308
31.2	Oscillogram		:	Report attached
32	Contacts			
32.1	Type			
	a) Main		:	Finger
	b) Arcing		:	Tulip
32.2	Material			
	a) Main		:	CU
	b) Arcing		:	CU-w
32.3	Whether the contacts are silver plated Yes/No		:	Yes
32.4	Thickness of silver coating		:	12 microns
32.5	Contact pressure	kg/cm²	:	1.6kg/finger
33	Type of ARC control device		:	Self Blast
34	Whether main air column and interrupters are pressurised?		:	Yes
35	Maximum pressure developed in the arcing chamber at rated breaking capacity		:	ALSTOM internal design
36	Time limit for which the breaker can be kept open			No limit

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Phase to phase clearance : 7000 mm

Opening time : Not more than 40 miliseconds
Closing time : Not more than 100 miliseconds

RSenthilkumar 26/7/16

Auto reclosing : Single phase and 3 phase auto reclosing for line breakers.

Anti pumping : Required

37	Auxillary contacts		:	
37.1	Total nos of contacts furnished			
	a) Normally open	Nos.		16
	b) Normally closed	Nos.		16
	Spare contacts avilable for interlocks in addition to those			
37.2	required for breaker's own operation abd indication			
	a) Normally open	Nos.	:	10
	b) Normally closed	Nos.	:	10
37.3	Contacts type convertible or fixed?		:	Non convertible
37.4	Contact Rating at 220V DC/240V AC		:	
	a) Make and Continious		:	2
	b) Break (inductive)			10
38	Permissible variation of 220V DC			
38.1	Closing	Amps	:	85 - 110%
38.2	Tripping			70 - 110%
39	Permissible variation of working pressure of Breaker			
39.1	Closing		:	0.61 - 0.7 Mpa (abs) at 20°C
39.2	Tripping		:	0.61 - 0.7 Mpa (abs) at 20°C
40	Air consumption in litres (At NTP)		:	N.A
40.1	Duty Cycle (0-3' CO-3' CO)		:	N.A
40.2	Closing		:	N.A
40.3	Opening		:	N.A
40.4	Total scavenging & leakage		:	N.A
41	Minimum blocking air pressure			
41.1	Closing	Ata	:	NA
41.2	Tripping		:	NA
42	Minimum Clearance		:	
42.1	Phase to ground	mm	:	3830
42.2	Phase to Phase	mm		6000/7000
43	Arrangement provided for	mm	:	
43.1	Pole discrepency	mm	:	Yes
43.2	Trip free/ Fixed trip			Trip free
43.3	Anti pumping		:	Yes (Thru contactor)
44	Operating mechanism		:	Spring - Spring
45	Power requirement at 220V DC		:	
45.1	Closing coil		:	345 *3
45.2	Tripping coil			345 *3
45.3	Spring chanrging motor	Watt	:	700
46.1			:	-
46.2			:	-
46.3			:	-
46.4			:	-

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R Sent Vikram 26/7/16

47	Accessories			
47.1	Furnished as per Annexure? Yes/No		:	Yes
47.2	If not, Deviation sheet dully filled up? Yes/No.		:	
48	Bushings		:	
48.1	Make		:	FUSHUN/ABIL/MIL/IEC/SARAVANA
48.2	Type		:	Hollow
48.3	Reference standard		:	IEC 62155
48.4	Voltage Class		:	245kV
48.5	Momentry dry withstand voltage kV		:	NA
48.6	Visible discharge voltage		:	NA
48.7	One minute dry power frequency withstand kV		:	460 kV
48.8	One minute wet power frequency withstand kV		:	460 kV
48.9	Impulse withstand voltage kV peak		:	1050 kVp
48.10.	Under oil puncture voltage kV		:	NA
48.11	Creepage distance, total / protected mm		:	6740 Shall be accordingly 31 mm/KV.
48.12	Height required to remove the bushings mm		:	12000
48.13	Permissible safe cantilever loading on bushings mm		:	3500 daNm(at bottom of support insulator)
49	Nature of insulating medium of bushings		:	SF6
50	Volume of insulating medium of bushings		:	250 litres/pole
51	Overall dimension of the circuit breaker complete with bushings, mechanism box etc		:	5500 (W) * 8400 (H) * 1000 (D)
52	Circuit Breaker Weight		:	5430 kg
52.1	Total weight		:	5160 Approx.
52.2	Impact of foundation design to include dead load plus impact impact value on opening max. interrupting rating in dead load.	mm	:	3290
53	Shipping dimension of the largest package (L*B*H)	kg	:	6000 (L)*1800 (W)*1000(H)
54	Shipping weight of heaviest package		:	4200
55	The safety boundaries during breaking operation of circuit breaker with an external exhaust for ionising gases or flames in respect of air blast circuit breakers.		:	NA
56	First filling of oil furnished?		:	NA
57	10% excess oil in sealed non returnable container furnished? If so, indicate the total quantity		:	NA
58	Spare quantity of SF6 gas furnished: if so indicate the total quantity			20%
59	Number of openings, the circuit breaker is capable of performing without inspection, replacement of contacts or other main parts.		:	

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R Senthilkumar 26/7/16

59.1	At 50% rated current		:	3000
59.2	At 100% rated current		:	3000
59.3	At 50% rated breaking capacity		:	50
59.4	At 100% rated breaking capacity		:	9
60	Number of openings the circuit breaker is capable of performing without replacing / re-conditioning of oil		:	NA
60.1	At 50% rated current		:	NA
60.2	At 100% rated current		:	NA
60.3	At 50% rated breaking capacity		:	NA
60.4	At 100% rated breaking capacity		:	NA
61	Air compressor		:	NA
61.1	Type		:	NA
61.2	Make		:	NA
61.3	Capacity		:	NA
61.4	Rated Pressure		:	NA
62	Compressor Motor		:	NA
62.1	Type		:	NA
62.2	Make		:	NA
62.3	Rating	KW	:	NA
62.4	Voltage	Volt	:	NA
62.5	Phase	Nos	:	NA
62.6	Frequency	HZ	:	NA
62.7	Insulation class		:	NA
62.8	Temperature rise above 45°C ambient temparature °C		:	NA
63	Control and Measuring panel		:	NA
63.1	Make		:	NA
63.2	Type of control		:	NA
63.3	Mounting		:	NA
63.4	Type and make DOL motor starter with fuse switch		:	NA
63.5	Schematic diagram enclosed?		:	NA

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Indeicate the following

(1) Radio interface
(2) Circuit breaker Fittings and Accessories as per Annexure B of VII-F1/S-XV :5

R Sen Gupta Verma
26/7/16