

25kV SUBS
PRIMARY CIRCUIT BREAKER (OLD SUBS - ELECT MECH RELAYS)

SUBSTATION: _____ REFERENCE No: _____

PANEL No: _____ CB No: _____ DESIGNATION: _____

CURRENT TRANSFORMER

CT DATA

	MAKE	RATIO	VA	CLASS
REF PRI.	GEC	300/1		X
REF SEC.	GEC	800/1		X
WINDING TEMP.	GEC	800/5	15	5
I.D.M.T.				

CT MAGNETISATION CHARACTERISTICS

REF PRI.			REF SEC.			WINDING TEMP.		I.D.M.T.	
V	I(1AS1-2)	I(2AS1-2)	V	I(1aS1-2)	I(3aS1-2)	V	I	V	I
200			300			5		400	
250			350			10		450	
300			400			15		500	
350			450			20		550	

RELAY

RELAY TYPE: CDG _____ SER. No: _____

RATING: 1AMP PMS: _____ TMS: _____

RELAY CALIBRATED: 2 x _____ = _____ A

OPERATING TIME: _____ SEC

CT CONNECTED IN _____ PH.

AMMETER: 1A/ _____

MULTIPLE OF P.S.	O/L	
	AMPS	mSEC

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25 kV SUBSTATIONS

REF RELAYS

PRIMARY
SECONDARY

SERIAL No.	SETTING	OPERATING VOLTAGE

VOLTAGE ON RELAY WITH FAULT CONDITION: YES / NO STABILITY TEST: YES / NO

POLE DISAGREEMENT RELAY (VIT) SER. No: _____ TIME SETTING: _____

OPERATION: _____

FLAG OPERATION OF RELAYS: _____ CB TRIPS VCB: YES / NO

OPERATION OF MAIN AND BACKUP TRIP CIRCUIT (REF & O/C) : YES / NO

OPERATION OF UTR (VAJ) FROM MAIN TRIP CIRCUIT: YES / NO

OCB TRIP COUNTER OPERATION : YES / NO READING _____

TRANSFORMER IMAGE COIL: INJECT 5A TO CHECK OPERATION : YES / NO

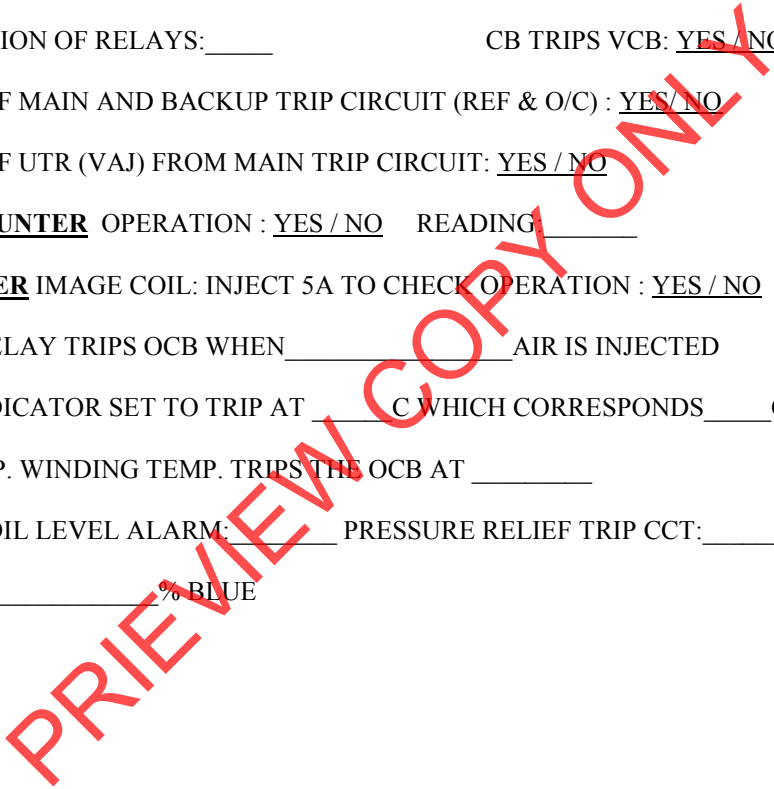
BUCHOLTZ RELAY TRIPS OCB WHEN _____ AIR IS INJECTED

OIL TEMP. INDICATOR SET TO TRIP AT _____ C WHICH CORRESPONDS _____ C

ACTUAL TEMP. WINDING TEMP. TRIPS THE OCB AT _____

CHECK LOW OIL LEVEL ALARM: _____ PRESSURE RELIEF TRIP CCT: _____

SILICA GEL: _____ % BLUE



TESTED BY: _____ SIGNATURE: _____ DATE: _____

25kV SUBS
PRIMARY CIRCUIT BREAKER (NEW SUBS - ELECTRONIC RELAYS)

SUBSTATION _____

PANEL NO. _____ CB NO. _____ DESIGNATION _____

CT. DATA:

<u>HV. O/C</u> <u>1A2S1-1A2S2</u>		<u>HV. DIFF.</u> <u>1A1S1-1A1S2</u>		<u>Lv.DIFF.</u> <u>1a1S1-1a1S2</u>		<u>HV. REF.</u> <u>2A1S1-2A1S2</u>		<u>HV REF.</u> <u>2A2S1-2A2S2</u>	
RATIO:		RATIO:		RATIO:		RATIO:		RATIO:	
CLASS:		CLASS:		CLASS:		CLASS:		CLASS:	
V	I	V	I	V	I	V	I	V	I

<u>LV REF.</u> <u>2a1S1-2a1S2</u>		<u>LV REF.</u> <u>1a9S1-1a9S2</u>		<u>WIND. TEMP</u> <u>2a9S1-2a9S2</u>	
RATIO:		RATIO:		RATIO:	
CLASS:		CLASS:		CLASS:	
V	I	V	I	V	I

RELAY: TYPE: _____ SER. NO. _____ PURPOSE: _____

RELAY: TYPE: _____ SER. NO. _____ PURPOSE: _____

FLAG OPERATION OF RELAYS: _____

OPERATION OF MAIN AND BACKUP TRIP CIRCUIT (DIFF, REF & O/C): _____

OPERATION OF UTR FROM MAIN TRIP CIRCUIT: _____

CB TRIP COUNTER: OPERATION: _____ READING: _____

TRANSFORMER:

BUCHOLTZ RELAY TRIPS CB WHEN: _____

OIL TEMP. INDICATOR SET TO TRIP AT _____ °C WHICH CORRESPONDS _____ °C ACTUAL TEMP.

WINDING TEMP. TRIPS CB AT _____ °C CHECK: LOW OIL LEVEL ALARM: _____

PRESSURE RELIEF TRIP CB: _____ SILICA GEL COLOUR: _____ (±% BLUE)

TESTED BY: _____ SIGNATURE: _____ DATE: _____

25kV INCOMER

SUBSTATION: _____ REFERENCE No: 40/0/6/ _____

PANEL No: _____ CB No: _____ DESIGNATION: _____

CURRENT TRANSFORMER

CT DATA

	MAKE	RATIO	VA	CLASS
I.D.M.T.				
MAX DEMAND				

CT MAGNETISATION CHARACTERISTICS

I.D.M.T.

MAX DEMAND

MAX DEMAND TO BE CHECKED WITH CONTROL

V	I
250	
300	
350	
400	
450	

V	I
3	
4	
5	
6	

I CT	I HT	I CONT	V VT	V HT	V CONT

RELAY

TYPE:CDG _____
RMS: _____

SER. No: _____
TMS: _____

RATING:1 AMP

MULTIPLE OF P.S	O/L	
	AMPS	mSEC
2		
4		
6		
8		
10		

RELAY CALIBRATED : 2 x _____ = _____ A

OPERATING TIME : _____ SEC

REVERSE POWER RELAY (WDG)

SER No: _____ PMS: _____ W TMS: _____ OPERATION: _____

FLAG OPERATION OF RELAYS: _____

RELAY TRIPS CB: _____

CB TRIP COUNTER OPERATION: _____ READING: _____

AMMETER: 1A / _____ VOLTMETER: 110V/ _____

EARTHING REFERENCE: _____ SUBMODULE: _____

TESTED BY: _____ SIGNATURE: _____ DATE: _____

25kV TRACK BREAKER
YTG 14/ OPTIMHO & ARC

SUBSTATION: _____ REFERENCE No: _____

PANEL No: _____ CB No.: _____ DESIGNATION: _____

CURRENT TRANSFORMER

CT MAGNETISATION CHARACTERISTICS

V	I

CT DATA

MAKE: _____
VA: _____
RATIO: _____
CLASS: _____

RELAY

RELAY SERIAL No: _____

RELAY SETTINGS: K1=1 K2=3.5 K3=3.5 K4=1 K5=32 K8=1 &1
ANGLE 1 & 2 = 65 DEGREES T1 & T2 = MINIMUM

USING A ZERO TEST SET. THE RELAY WAS TESTED AND OPERATES AS SHOWN IN THE TABLE BELOW.:

ZONE	FAULT IMPEDENCE		CALCULATED OPERATING %	ACTUAL OPERATING %	RELAY OPERATING TIME (mSEC)	FLAGS
	X	R				
ZONE1	6	10	65 %			
ZONE2	6	14	85%			
ZONE3	6	14	85%			
Z3 REV.	6	14	2.4%			

MEMORY ACTION: _____ DIRECTIONAL ACTION: _____ INSTANT TRIP CCT: _____

AUTO RECLOSE RELAY: (VAR. 22) SERIAL No: _____

AUTO RECLOSE AND LOCKOUT OPERATION : _____

TRIP COUNTER OPERATION : _____ READING : _____

CB TRIP COUNTER OPERATION : _____ READING: _____

TESTED BY: _____ SIGNATURE: _____ DATE: _____

11kV INFEED
McGRAW-EDISON RECLOSERS

Procedure for Over current trip testing

- Inject current to the source side of two phases with their load side phases shorted. Monitor the value of trip current required (over current) and record it on the space provided below.
- Repeat the above for all the combination of source and load side phases and record the trip current values.
- Inject two (2) times the trip over current values to the source side of two phases with their load side phases shorted and record the trip times.
- Repeat the above for all the combination of source and load side phases and record the trip times on the spaces provided.
- Record the number of trips to lockout.

Procedure for Earth fault trip testing

- Inject current to each phase, individually, of the VCB and determine the trip current values and record in the spaces below.
- Inject two (2) times the trip earth fault current values to each phase and record the trip times.
- Record the number of trips to lockout.

Results:

Substation/Location: _____

	PHASES		
O/C	1+2	1+3	2+3
Trip Current – O/C (Amps)			
Trip time @ 2 X Trip Current – O/C (seconds)			
E/F	1	2	3
Trip Current – E/F (Amps)			
Trip time @ 2 X Trip Current – E/F (seconds)			
LOCKOUT			
Number of Trips to Lockout			

Testing of the two earth-spikes on either side of the H-mast:

- Resistance to test spike:(Less than 1000 Ω) _____ Ω
- Resistance to 1st earth-spike: _____ Ω
- Resistance to 2nd earth-spike: _____ Ω

Done by: _____ Signed: _____ Date: _____

25 kV TRACK BREAKER
THERMAL RELAY

SUBSTATION: _____ REFERENCE No.: _____

PANEL No: _____ CB No: _____ DESIGNATION : _____

CURRENT TRANSFORMER

CT MAGNETISATION CHARACTERISTICS

V	I
250	
300	
350	
400	
450	

CT DATA

MAKE: _____

VA: _____

RATIO: _____

CLASS: _____

RELAY

TYPE: _____ SERIAL No: _____ RATING: _____

TAP SELECTED: _____ % LOAD TO TRIP: _____ %

SET % LOAD TO TRIP AT 115% AND INJECT $2 \times I_r \times \frac{\% \text{ TAP}}{100} = 2 \text{ AMP}$

RELAY TRIPPING TIME: _____ SEC.

RELAY TRIPS CB: YES/NO FLAG OPERATION: YES/NO

REDUCE CURRENT TO $1 \times I_r \times \frac{\% \text{ TAP}}{100} = 1 \text{ AMP}$

RUNNING LOAD INDICATES: _____ % RESET RELAY TO: _____ %

CB TRIP COUNTER

OPERATION: _____ READING: _____

TESTED BY: _____ SIGNATURE: _____ DATE: _____

25kV BUSCOUPLER

SUBSTATION: _____ REFERENCE No: _____

PANEL No: _____ CB No: _____ DESIGNATION : _____

CURRENT TRANSFORMER

CT MAGNETISATION CHARACTERISTICS

V	I
250	
300	
350	
400	
450	

CT DATA

MAKE: _____

VA: _____

RATIO: _____

CLASS: _____

RELAY

RELAY TYPE : CAG _____ SERIAL No: _____

RATING:

PLUG MULTIPLE SETTING: _____ CURRENT MULTIPLIER: _____

PICKUP: _____ A (SEC. INJECTION INTO RELAY)

APPLY FAULT CURRENT TO RELAY AND ATTEMPT TO CLOSE THE CB.

RELAY TRIPS THE CB: YES/NO FLAG OPERATION: YES/NO

CHECK INTERLOCKING WITH BOTH INCOMMRS: _____

(VT's DE-ENERGISED, MANUALLY OPERATE CORRESPONDING VAG/VAA ELEMENTS)

VAA/ VAG RELAY SERIAL No: _____

CB TRIP COUNTER

OPERATION : _____ READING : _____

TESTED BY: _____ SIGNATURE: _____ DATE: _____

EARTHING OF 25kV SUBSTATIONS

Reference should be made to drawing number CEE-TBD-8 titled ‘*Earthing arrangement: 25kV AC traction substation*’.

Procedure:

- Take any corner of the security fence as a reference point and measure the earth resistance. If earth is still good, the resistance should be less than 5Ω.
- Record the result in the space provided on the attached sheet.
- Inject 200A AC between the reference point and other three corners, as well as between the reference and the other equipment and take voltmeter readings. The readings should be taken before and after 30 seconds have elapsed.
- Record the results in the columns provided. The list of equipment may be extended to capture equipment that is not listed on the test sheet.

Results: Substation: _____

Resistance of test spike (Ω): _____

Resistance of ref point _____
(Sub earth)

Inject 200A between reference point and	Initial Voltage	Voltage after 30 seconds	Current after 30 seconds
2 nd corner			
3 rd corner			
4 th corner			
Ring earth in building			
25kV isolator			
Substation portal with 25kV L.A's			
Earthing links			
Main transformer tank			
Circuit Breaker frame			
Lightning arrester frame			
Isolator frame			

TESTED BY: _____ SIGNATURE: _____ DATE: _____

25kV SUBSTATIONS VACUUM CIRCUIT BREAKERS

Substation: _____

VCB No.: _____

- The following tests should be done on the Vacuum Circuit Breaker and the measured values recorded on the space provided.

TEST	EXPECTED VALUES	MEASURED VALUES
Rod travel	25mm	
VCB gap	12mm	
AC Pressure Test – Bottle 1	50kV for 1 min	See Note
AC Pressure Test – Bottle 2	50kV for 1 min	See Note
Contact resistance with 100A DC – Bottle 1	Less than 60 $\mu\Omega$ (Volt drop < 6 mV)	
Contact resistance with 100A DC – Bottle 2	Less than 60 $\mu\Omega$ (Volt drop < 6 mV)	
Closing Speed	60 m sec	
Tripping Speed	35 m sec	

Note – Pressure Tests are not required for this contract.

TESTED BY: _____

SIGNATURE: _____

DATE: _____