SOP FOR PRE – COMMISSIONING OF GAS INSULATED SUBSTATIONS (145 Kv & ABOVE)

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ERECTION GUIDELINES AND CHECKLIST

OBJECTIVE

On site Erection of Gas Insulated Substation needs be considered as an extension of manufacturing process and same level of quality standards must be adhered during site erection so that assembled Gas Insulated Substation complies all the criteria considered while designing. Any "Short cuts" taken during site erection may lead to adverse effect on Gas Insulated Substation. Long term reliability of finally assembled Gas Insulated Substation depends significantly on the level of cleanliness and adherence to standard processes during erection. A comprehensive checklist has been given below which needs to be followed by site during installation & erection and maintained by site as installation record of GIS.

GENERAL GUDIELINES & CHECKLISTS

S.N.	GIS work activity and precaution to be taken	Compliance (OK/Not OK)	Remarks (if any)
1.	**Completion of Civil Works & Cleaning**		
a.	GIS Hall Civil works must be complete in all respects prior to commencement of erection works of Gas Insulated Substation.		
b.	Thorough cleaning of GIS Hall to be ensured before start of GIS Erection.		
c.	It should be ensured that dust and dirt are not present in GIS Hall.		
2.	**Laying of Earth Mat**		
	Laying of earth mat for GIS (indoor/outdoor) is to be carried out as per approved drawing before laying of GIS Hall floor. It should be ensured that risers (connected to the main earth-mat/grid) per bay and for associated support structures are available on locations as per drawing. Necessary record shall be kept for verification by the commissioning team.		

3.	**GIS Hall Sealing**		
a.	GIS Hall must be properly sealed and all the openings including Bus Duct entry from GIS wall, Windows, Roof, Fixed glasses in GIS walls must be fixed & should be in close condition.		
b.	The work of GIS hall rolling shutter, entry doors etc should also be complete to control the opening.		
c.	Bus duct exit in the GIS hall wall shall be kept covered by suitable means (metal sheet/ ply board) until permanent cover is provided after installation of bus ducts so as to make it properly sealed and should be able to withstand high wind and rains coming inside of GIS hall.		
4.	**GIS Hall Floor Finish**		
a.	GIS Hall floor must be compact & firm and Poly Urethane (P.U.) paint must be applied on floor before starting erection works.		
5.	**No simultaneous Work**		
a.	During the period of GIS module assembly and erection work, any other work in the GIS (like civil works, AHU ducts, cable laying & termination, illumination system cabling etc) should not be undertaken which can affect cleanliness or create any sort of particle, dust etc.		

b.	Walls and ceiling shall be in a condition so that neither dirt nor plaster might fall or rub off and formation of condensation water on ceiling/ walls shall be prevented under any circumstances.		
6.	**Restricted Entry in GIS Hall**		
a.	At the time of GIS erection work maintaining cleaning is top most requirement. Entry to only authorised persons must be allowed. Entry door of GIS Hall must have automatic closing facility.		
7.	**Regular Cleaning of Assembly and Erection Area**		
a.	Cleanliness must be maintained in GIS Hall throughout erection process.		
b.	Cleaning to be carried out in GIS Hall working area by vacuum cleaner at regular intervals.		
8.	**Storage Area**		
a.	On arrival of GIS modules in packed condition from manufacturer's facility, the packing should be stored in identified area only as decided by BSPTCL.		
b.	The storage area should be sufficiently raised above FGL such that under no circumstances during the entire storage period there should be no waterlogging in storage area and any part of packing should not be submerged due to accumulation of water.		
c.	Regular clearing of weeds and bushes must be ensured in storagearea to avoid damage to packing.		
9.	**Unpacking and shifting of modules**		
a.	GIS modules stored in storage area which needs to be shifted to GIS Hall for erection must be unpacked immediately before installation.		
b.	Unpacking of GIS modules shall not be done inside the GIS hall to maintain cleanliness of GIS assembly area as packing contains lot of dirt and unwanted material.		

c.	Unpacking of GIS modules to be done outside of GIS hall and cleaned from outside before shifting the same to GIS hall**.**		
10.	**Shock Recorder/Indicator**		
a.	Manufacturer provides Impact Recorders in the packing of all major GIS equipments (CBs, VTs etc) from factory for monitoring of abnormal shocks during transport and handling. Mechanical Shock indicators are provided in smaller equipments and modules. Limits of shocks in all three directions to be provided by manufacturer. After unpacking material before erection, impact recorders are to be removed and recorded data to be downloaded for review of abnormal shocks.		
b.	Shock recorder data and report with analysis of recorded data to be submitted by manufacturer within 3 weeks of removal of impact recorders.		
c.	In case of shock exceeding the limits, manufacturer expert shall do joint internal inspection of affected GIS units and shall submit analysis report before giving clearance for erection.		
11.	**Checking of pre-filled N2 in GIS modules**		
a.	GIS equipment's are transported in sealed condition with transport cover and pre-filled with positive N2 pressure. At the time un- packing before erection of GIS, N2 pressure in all modules to be checked. (Checklist for checking of packing, shock and N2 pressure is given as Format - A)		
12.	**Uniform & Cleaning**		
a.	Persons entering the GIS Hall during the entire erection period must clean their shoes for that proper foot mat need to be kept at the entry door.		

b.	GIS erection team must wear working uniform which shall bemade of non-fluffy material.		
13.	**AHU Operation**		
a.	Prior to commencing erection, Air Handling Unit must be commissioned and made functional so that positive pressure can be maintained in GIS Hall to prevent entry of dust and foreign material from outside.		
14.	**Document Submission:** Prior to taking up erection works; manufacturer must submit following documents:		
a.	Method statement for carrying out erection works along with details about Material handling, Erection procedures, vacuuming & gas filling, precautions to be taken during erection.		
b.	List of T&Ps		
c.	List of consumables & cleaning agents		
d.	Reference documents to be used during erection		
15.	**List of Manufacturer's Certified Engineer & Supervisor**		
a.	List of engineers and supervisors certified/qualified to handle and supervise erection works of GIS as per the standard and procedures recommended by manufacturer to be submitted by the vendor prior to start of GIS erection.		
b.	Authorization Certificate for manufacturer's Engineer & Supervisor should come from competent level.		
16.	**GIS Drawings:** Following drawings should be available and displayed on the wall of GIS Hall during the entire GIS Erection period		
a.	Approved Single Line Diagram (SLD) of the project		
b.	SF6 Gas line diagram		
c.	General Arrangement drawing with details of module number of each bay.		

17.	**Instruction Manual**		
a.	Manufacturer's instruction manual for GIS Storage, Handling, Erection and O&M should be available at site before start of GIS erection work for reference of relevant procedures		
18.	**Unwanted storage of material**		
a.	Only T&P and consumables required for GIS erection shall be keptin GIS during erection.		
b.	GIS hall shall not be used as general-purpose store for any kind of material.		
c.	Only inventory required for immediate erection and associated T&P are allowed inside GIS at the time of GIS erection.		
19.	**Erection by EOT Crane**		
a.	Only EOT crane is allowed for indoor GIS erection for the qualityand safety of the work.		
b.	Under no circumstances Hydra or Crane to be used for indoor GIS erection in order to avoid dust & dirt and diesel fumes from the crane.		
20.	**Gas Insulated Bus Ducts (GIB)**		
a.	Gas Insulated Bus Duct (GIB) assembly should be done preferably in GIS hall and to be taken to outdoor for installation with proper cover on open sides.		
b.	If sufficient space is not available in GIS hall for GIB assembly, temporary outdoor shed with dust proof arrangement must be specially made for GIB assembly meeting all safety and cleaning requirements stated at earlier points.		
21.	**Gas Insulated Bus Ducts (GIB) Installation**		
a.	In case of outdoor installation of Gas Insulated Bus Duct (GIB) or of GIS compartment and components shall be duly protected from dust and moisture ingress using temporary covers. Outdoor GIS erection shall be done under supervision of OEM representative and in a clear weather condition and dust free environment to the extent possible.		

b.	It should be ensured that suitable canopy is provided for density monitor to prevent ingress of rain water for outdoor compartments. Additionally, the density monitor should be oriented in a manner that it prevents rain water from entering terminal box through the cable gland; keeping in mind the visibility of the density monitor gas levels from ground.		
c.	To ensure outdoor sections are protected from moisture ingress, manufacturers either provide water O-rings, or sealing compounds, or sometimes both in Flange-Barrier insulator arrangement. It should be ensured that above measures are implemented positively, based on manufacturer guidelines for outdoor erection and assembly.		
22.	**Cleaning of assembly parts**		
a.	Cleaning is of utmost importance and hence before assembly, all the loose metal parts, subassemblies, and all contact & sealing surfaces shall be cleaned before installation of components of GIS assembly.		
b.	Only recommended cleaning agents/material by manufacturer and as described in the instruction manual to be used.		
c.	Further, Prior to opening, gas compartment shall be thoroughly cleaned, and vacuum cleaning of the installation area shall also be done specially the immediate vicinity of the flanges to be connected. Dust disturbance in the area to be avoided.		
23.	**Pre-installation precautions**		
a.	Once the transport covers are removed, installation of flanges shall be done without any interruptions, if interruptions cannot be avoided open flanges are to be covered with clean plastic foil. Transport covers, O-rings and other packing material shall be taken out of GIS after immediately after removal.		

b.	O-rings used for temporary transport packing to be scraped after opening of transport cover and removed from GIS erection area to avoid any mixing with new O-rings to be used for erection purpose.		
c.	O Rings shall be properly stored and taken out only before installation. O-Rings are also to be cleaned before use with manufacturer authorized cleaning agent.		
d.	At all points of time during installation authorized personnel shall use disposable gloves to avoid contamination		
24.	**Cable termination work**		
a.	Cable termination at GIS equipment's and LCC panels shall commence only after completion of GIS equipment as during GIS installation period laying and termination of cables interferes with the GIS erection work and affects cleanliness due to spreading of metal particles generated from gland plate cutting/ grinding, cable armour/screen cuttings etc.		
25.	**Field Quality Plan**		
a.	Approved Field Quality Plan shall be followed strictly during sitework.		

PRE-COMMISSIONING TESTS/ CHECKS ON DIFFERENT EQUIPMENTS / MATERIALS

1. PRE COMMISSIONING CHEKS ON EOT CRANE

Before start of the erection work load Test to be conducted on EOT Crane as per the load specified and as per IS 3177:1999 (Reaffirmed 2004.

2. PRE-COMMISSIONING CHECKS ON SF6 GAS

I. Quality Checks on SF6 Gas

Bay Details: Ambient Temperature:

Reference Drawing Number:

Sl. No	Gas Compartment	Moisture Content at atmospheric pressure (in ppmv)			Dew point at atmospheric pressure			Pressure			% Purity		
		R	Y	B	R	Y	B	R	Y	B	R	Y	B

Kit Details

Make: **Model:** **Calibration Validity date:**

Permissible limit: Moisture Content (200 ppmv), Dew point (- 36 deg C) & Purity (99%)

Note:

a) Dew point of SF6 gas to be measured after at least 120 hours of gas filling (as per IEC-62271- 203 Clause No: 10.2.101.6)

b) Gas pressure reading to be monitored and recorded by the executing agency after every two weeks till energization for identification of leakage in gas compartment if any and rectification.

c) Gas quality test to be done only by using testing kit which has the pump back facility so that after measurement of gas quality, SF6 gas is not wasted and sent back to GIS compartment.

II. Checks on SF6 Density Monitor

Bay Details:

Ambient Temperature:

Density Monitor Details:

(Make & type)

SN	Gas Compartment	Phase	Loss of SF6(Stage I)			Lockout/trip Alarm (Stage 2A)		
			Rated/ Design Value	Factory test value	Actual Value	Rated/ Design Value	Factory Test value	Actual Value
		R						
		Y						
		B						
		R						
		Y						
		B						

III. SF6 Leakage test

Bay Details:

Sl. No	Gas Compartment	Phase	Initial filling pressure	Pressure after 24 hrs	Pressure after 7 days
		R			
		Y			
		B			
		R			
		Y			
		B			
		R			
		Y			

		B			
		R			
		Y			
		B			
		R			
		Y			
		B			

3.PRE-COMMISSIONING CHECKS ON CIRCUIT BREAKERS

I. General Details

DETAILS	
Region:	**Sub-Station:**
Bay Name:	**LOA No:**
Make:	**Year of Manufacturer:**
Equipment Details:	**Type:**
Sr. No:	**Rated Breaking Capacity (kA):**
Rating:	**Control Voltage (DC):**
Operating Voltage:	**Date of Erection:**
Date of Receipt at Site:	**Date of Energization:**

6	Auto reclosing lockout (oil) Pressure contact _____make/break			
7	Closing lockout (oil) pressure Contact _____make/break			
8	Trip-1 lockout (oil) Pressure contact _____make/break			
9	Trip-2 lockout (oil) Pressure contact _____make/break			

II. Trip/ Close Coil Resistance Measurement

COIL DETAILS	MEASURED VALUE IN Ohm		
	R – Ø	Y - Ø	B - Ø
TRIP COIL - I			
TRIP COIL – II			
CLOSE COIL			

III. Circuitry and Operational Checks

Sl No	Circuit Reference	Operational Check	
		Local	Remote
A	Tripping Through TC-I		
B	Tripping Through TC-II		
C	Closing Circuit		
D	Anti-hunting Feature		
E	Pole Discrepancy Feature		
F	Breaker Position Indication		
G	Heater In Switch Cubicle		
H	Heater In Control Cubicle		
I	Illum. In Switch Cubicle		
J	Illum. In Control Cubicle		

IV. Operating Time (In milli-seconds)

Phase (Ø)	Close (Max 150ms)	Closing Coil Current	Trip		Tripping Coil Current		Close Open		OCO (OK/NOT OK)	
			Trip - I	Trip - II	Trip - I	Trip - II	Trip - I	Trip - II	Trip – I	Trip - II
R- Ø main contact										
R- Ø PIR										
Auxiliary contact										
Y - Ø main contact										
Y - Ø PIR										
Auxiliary contact										
B - Ø main contact										
B - Ø PIR										
Auxiliary contact										

Permissible limits

Timing	220 KV	132 KV
Close	150 ms	150 ms
Open	35 ms	40 ms
Phase to Phase time difference – Closing	5.0 ms	
Phase to Phase time difference - Opening	3.33 ms	

V. IR Value of Control Circuit (using 500-volt megger)

Make of Kit:

Date of Calibration:

Coil Details	Unit	Value
R – Ø TRIP COIL – I	MΩ	
R – Ø TRIP COIL – II	MΩ	
R – Ø CLOSE COIL	MΩ	
Y – Ø TRIP COIL – I	MΩ	
Y – Ø TRIP COIL – II	MΩ	
Y – Ø CLOSE COIL	MΩ	
B – Ø TRIP COIL – I	MΩ	
B – Ø TRIP COIL – II	MΩ	
B – Ø CLOSE COIL	MΩ	

Permissible limit (Minimum): 50 MΩ

PRECAUTION: Isolate necessary DC for trip coil I and trip coil II, closing coil before IR measurement.

VI. Breaker Operation Counter Reading

Counter Type	Put √ Mark
ELECTRICAL	
MECHANICAL	

(Reading to be recorded before energisation)

Sl. No	Phase	Reading	Date
A	R-Ø		
B	Y-Ø		
C	B-Ø		

VII. Dynamic Contact Resistance & Travel Measurement

Availability of Travel Transducer to be ensured prior to commencement of DCRM test.

Phase (Ø)	Factory	Site	Remarks
R			
Y			
B			

VIII. Operation Time Measurement of Pole Discrepancy Relay

Pole discrepancy relay	Setting	Actual

Note- 2.5 Sec for CBs with Auto Reclose Function & 0.5 Sec for CBs without Auto Reclose Function.

IX. Local Close Interlock Checked (with Earth Switch open)

Yes	No

X. Final Documentation Review

i. Factory test results are available.

Yes	No

ii. Final documents of Pre- Commissioning checks reviewed and approved.

Yes	No

iii. Document regarding spares equipment, O&M manuals etc available at site for O&M purpose

Yes	No

iv. After modification, if any, "As built Drawings" are available at site

Yes	No

v. CRITAL approved DCRM signatures available

Yes	No

Signatures:-

Supplier Representative	Erection Agency Representative	BSPTCl- Commisiong Representative

4. PRE-COMMISSIONING CHECKS ON CURRENT TRANSFORMERS

I. General Details

DETAILS	
Region:	**Sub-Station:**
Bay Name:	**LOA No:**
Make:	**Rating:**
Sr. No: **R- Ø:** **Y- Ø:** **B- Ø:**	**Type:**
Year of Manufacturer: **R –Ø:** **Y- Ø:** **B- Ø:**	**Date of Receipt at site:** **R –Ø:** **Y- Ø:** **B- Ø:**
Date of Erection: **R –Ø:** **Y- Ø:** **B- Ø:**	**Date of Energization:**

II. Rated Data and Duty

Core	Ratio	Class	Burden	KVp	Protection / Metering
Winding I					
Winding II					
Winding III					
Winding IV					
Winding V					

III. Pre-Commissioning Checks:

S. N	Description	Status		Remark
		Yes	No	Record Deficiencies If Any
1	Equipment is cleaned and free from dust / dirt foreign materials etc.			
2	Equipment is free from all visible defects on physical inspection			
3	Levelling and alignment of structure and base frame is checked			
4	Erection completed as per schematic			
5	Any paint removed / scratched in transit has been touched up			
6	Check primary polarity of CTs erected as per relevant drawing. Name plate details and P1/ P2 marking are available on equipment enclosure.			
7	All the cable identification tags provided, and all cores are provided with identification ferrules in CT sec box and LCC panel.			
8	Check secondary cables are properly routed and dressed in proper support/ trays and unused holes at cable entry are sealed.			
9	Check the IR value of secondary cable			
10	Check external cabling from LCC panel to relay panel completed			
11	Ensure unused secondary cores, if any, has been shorted and earthed in LCC panel.			
12	Check star point has been formed properly and grounded at relay panel end only.			
13	Check that lugs used in secondary circuit are of ring type			
14	Check direction of primary (P1/ P2) w.r.t. Bus/ line on erection			

IV. Insulation Resistance Measurement

a. Insulation Resistance Measurement in MΩ (Using 500 V Megger)

Make & S.No of testing kit _____

Date of last Calibration of the kit _____

Ambient temp. in º C _____

Between	Unit	Phase		
		R Ø	YØ	B Ø
Secondary Core I – Earth	MΩ			
Secondary Core II – Earth	MΩ			
Secondary Core III – Earth	MΩ			
Secondary Core IV – Earth	MΩ			
Secondary Core V – Earth	MΩ			

b.

Between	Unit	Phase		
		R Ø	YØ	B Ø
Core I – Core II	MΩ			
Core I – Core III	MΩ			
Core I – Core IV	MΩ			
Core I – Core V	MΩ			
Core II – Core III	MΩ			
Core II – Core IV	MΩ			
Core II – Core V	MΩ			
Core III – Core IV	MΩ			
Core III – Core V	MΩ			
Core IV – Core V	MΩ			

V. Measurement of Secondary Winding Resistance (In Ohm)

Make & Sl.No of testing kit _____

Date of last Calibration of the kit _____

Ambient temp. in ° C _____

Core	Terminal	Unit	R Ø		YØ		B Ø	
			Factory	Site	Factory	Site	Factory	Site
CORE I	1S1 – 1S2	Ω						
	1S1 – 1S3	Ω						
	1S1 – 1S4	Ω						
CORE II	2S1 – 2S2	Ω						
	2S1 – 2S3	Ω						
	2S1 – 2S4	Ω						
CORE III	3S1 – 3S2	Ω						
	3S1 – 3S3	Ω						
	3S1 – 3S4	Ω						
CORE IV	4S1 – 4S2	Ω						
	4S1 – 4S3	Ω						
	4S1 – 4S4	Ω						
CORE V	5S1 – 5S2	Ω						
	5S1 – 5S3	Ω						
	5S1 – 454	Ω						

VI. POLARITY TEST

Core	Between		Phase		
			R Ø	YØ	B Ø
CORE I	1S1 (+VE)	1S2 (-VE)			
	1S1 (+VE)	1S3 (-VE)			
	1S1 (+VE)	1S4 (-VE)			
CORE II	2S1 (+VE)	2S2 (-VE)			
	2S1 (+VE)	2S3(-VE)			
	2S1 (+VE)	2S4 (-VE)			
CORE III	3S1 (+VE)	3S2(-VE)			
	3S1 (+VE)	3S3(-VE)			
	3S1 (+VE)	3S4(-VE)			
CORE IV	4S1 (+VE)	4S2(-VE)			
	4S1 (+VE)	4S3(-VE)			
	4S1 (+VE)	4S4(-VE)			
CORE V	5S1 (+VE)	5S2(-VE)			
	5S1 (+VE)	5S3(-VE)			
	5S1 (+VE)	5S4(-VE)			

VII. Current Ratio Test

Make & Sl. No of testing kit _____

Date of last Calibration of the kit _____

R Phase-

Core	Between		Rated Ratio	Actual Ratio	Percentage Error
CORE I	1S1	1S2			
	1S1	1S3			
	1S1	1S4			
CORE II	2S1	2S2			
	2S1	2S3			
	2S1	2S4			
CORE III	3S1	3S2			
	3S1	3S3			
	3S1	3S4			
CORE IV	4S1	4S2			
	4S1	4S3			
	4S1	4S4			
CORE V	5S1	5S2			
	5S1	5S3			
	5S1	5S4			

Y Phase-

Core	Between		Rated Ratio	Actual Ratio	Percentage Error
CORE I	1S1	1S2			
	1S1	1S3			
	1S1	1S4			

CORE II	2S1	2S2			
	2S1	2S3			
	2S1	2S4			
CORE III	3S1	3S2			
	3S1	3S3			
	3S1	3S4			
CORE IV	4S1	4S2			
	4S1	4S3			
	4S1	4S4			
CORE V	5S1	5S2			
	5S1	5S3			
	5S1	5S4			

B Phase-

Core	Between		Rated Ratio	Actual Ratio	Percentage Error
CORE I	1S1	1S2			
	1S1	1S3			
	1S1	1S4			
CORE II	2S1	2S2			
	2S1	2S3			
	2S1	2S4			
CORE III	3S1	3S2			
	3S1	3S3			
	3S1	3S4			
CORE IV	4S1	4S2			
	4S1	4S3			
	4S1	4S4			
CORE V	5S1	5S2			

	5S1	5S3			
	5S1	5S4			

VIII. Magnetizing Curve Performance

R Phase-

Core	Between		Rated Knee Point Voltage	Actual Knee Point Voltage	Ext. Current at Rated Knee point Voltage	Ext. Current at Actual R.Knee point Voltage
*CORE I	1S1	1S2				
	1S1	1S3				
	1S1	1S4				
*CORE II	2S1	2S2				
	2S1	2S3				
	2S1	2S4				
*CORE V	5S1	5S2				
	5S1	5S3				
	5S1	5S4				

Y Phase-

Core	Between		Rated Knee Point Voltage	Actual Knee Point Voltage	Ext. Current at Rated Knee point Voltage	Ext. Current at Actual R. Knee point Voltage
*CORE I	1S1	1S2				
	1S1	1S3				
	1S1	1S4				
*CORE II	2S1	2S2				
	2S1	2S3				
	2S1	2S4				
*CORE V	5S1	5S2				
	5S1	5S3				
	5S1	5S4				

B Phase-

Core	Between		Rated Knee Point Voltage	Actual Knee Point Voltage	Ext. Current at Rated Knee point	Ext. Current at Actual r. Knee point Voltage
*CORE I	1S1	1S2				
	1S1	1S3				
	1S1	1S4				
*CORE II	2S1	2S2				
	2S1	2S3				
	2S1	2S4				
*CORE V	5S1	5S2				
	5S1	5S3				
	5S1	5S4				

*Note: To be carried out only for protection cores. Format has been designed considering a five core CT. Format may be modified by site depending upon number of Cores.

IX. Final Documentation Review

i. Final documents of Pre- Commissioning checks reviewed and approved.

Yes	No

ii. Document regarding spares equipment, O&M manuals etc available at site for O&M purpose

Yes	No

iii. After modification, if any, "As built Drawings" are available at site

Yes	No

Signatures:-

Representative of supplier Representative of Erection Agency Representative of BSPTCL

5. PRE-COMMISSIONING CHECKS ON POTENTIAL TRANSFORMERS

I. General Details

DETAILS	
Region:	**Sub-Station:**
Bay Name:	**LOA No:**
Make:	**Primary Voltage Rating:**
Secondary Voltage Rating: **Winding - I:** **Winding - II:** **Winding - IIII:**	**Secondary Voltage Burden:** **Winding - I:** **Winding - II:** **Winding - IIII:**
Sr. No: **R- Ø:** **Y- Ø:** **B- Ø:**	**Type:**
Year of Manufacturer: **R –Ø:** **Y- Ø:** **B- Ø:**	**Date of Receipt at site:** **R –Ø:** **Y- Ø:** **B- Ø:**
Date of Erection: **R –Ø:** **Y- Ø:** **B- Ø:**	**Date of Energization:**

II. Pre-Commissioning Checks

Sl. No	Description	Status		Remarks Record Deficiencies, If Any
		YES	NO	
1	Equipment is free from all visible defects on physical inspection			
2	Check VT LV side winding has been provided			

	with double earthing			
3	Check that PT secondary terminal box is earthed correctly as per specified GA drg.			
4	All nuts and bolts are tightened			
5	All fittings as per outline general arrangement drawing.			
6	Labelling and identification marking is available on GIS enclosure.			
7	Any paint removed / scratched in transit has been touched up			
8	Check secondary cable end box is properly fixed and ensure cable entry at the bottom.			
9	Check rating / healthiness of fuses at PT secondary terminal box			
10	Check the IR value of secondary cable (> 50 M ohms for control cables)			
11	All the cable identification tags provided, and all cores are provided with identification ferrules at secondary terminal box and LCC panel			

III. Continuity of Winding

i. Between terminals 1a – 1n

Yes	No

ii. Between terminals 2a – 1n

Yes	No

iii. Between terminals 3a – 1n

Yes	No

IV. Secondary Winding Resistance

Phase	Core – I		Core – II		Core – III	
	Factory	Site	Factory	Site	Factory	Site
R - Ø						
Y - Ø						
B - Ø						

Factory Test Report Ref. No: _____

V. Insulation Resistance Measurement (at 500 V)

Between	Unit	Measured Value		
		R Ø	Y Ø	B Ø
Secondary Core – I to Earth	MΩ			
Secondary Core – II to Earth	MΩ			
Secondary Core – III to Earth	MΩ			
Core – I to Core – II	MΩ			
Core - I to Core – III	MΩ			
Core – II to Core – III	MΩ			

VI. Voltage Ratio Test

To be tested at the time of HV test (during fifteen-minute conditioning)

Phase	Primary Voltage	Secondary Voltage		Rated Ratio	Measured Ratio	Percentage Error
		Theoretical	Measured			
R						
Y						
B						

VII. Final Documentation Review

i. Final documents of Pre- Commissioning checks reviewed and approved.

Yes	No

ii. Document regarding spares equipment, O&M manuals etc available at site for O&M purpose

Yes	No

iii. After modification, if any, "As built Drawings" are available at site.

Yes	No

Signatures:-

Representative of supplier Representative of Erection Agency Representative of BSPTCL

6. PRE-COMMISSIONING FORMATS FOR ISOLATOR AND GROUNDING SWITCH

I. GENERAL DETAILS

DETAILS	
Region:	**Sub-Station:**
Feeder name:	**LOA No.:**
Make:	**Type:**
Sr. No.: **R Ø:** **YØ:** **BØ:**	**Operating Voltage rating**
Control Voltage:	**Current Carrying capacity:**
Year of Manufacture: **R Ø:** **Y Ø:** **B Ø:**	**Date of Receipt at site:** **R Ø:** **Y Ø:** **B Ø:**
Date of Erection: **R Ø:** **Y Ø:** **B Ø:**	**Date of Energization:**

II. PRE-COMMISSIONING CHECKS

SL.NO	**DESCRIPTION**	**STATUS**		**REMARK / RECORD DEFICIENCIES, IF ANY**
		YES	**NO**	
1	Equipment is free from dirt/dust foreign materials etc.			
2	Equipment is free from all visible defects on physical Inspection			
3	All nuts and bolts are tightened correctly as per specified Torque			
4	Equipment erection is complete in all respect as per instruction Manual (attach remaining activities, if any)			
5	Auxiliary contacts and relays have been Cleaned and free from rust / damage			

6	Functional checking of auxiliary contacts for indications and interlocks			
7	Earth switch connected to earth firmly			
8	Earth switch link grounding point marked clearly			
9	Interlocks checked as per approved scheme with all combinations			
10	Check that operation and positioning of the limit switch & the auxiliary contacts assembly are ok			
11	Check that all three phase isolators are closing & opening at a time			
12	Position indicator of isolator/earth switch drive checked			
13	Checking of manual operation through handle			
14	Electrical operation blocking during manual operation			

III. MOTOR DETAILS

	R – Ø	Y - Ø	B - Ø
Make			
Type			
Volt			
Amperes			
Hp/ kW			
O/L setting (Thermal Over load)			

IV. INSULATION RESISTANCE MEASUREMENT

Make of testing kit:

Date of calibration:

Ambient temperature:

Using 500 volt megger measure resistance between the winding of motor and earth

SL. NO	BETWEEN	PHASE		
		R Ø	Y Ø	B Ø
1	**Winding to Earth**			

PERMISSIBLE LIMIT (Min): 50 M ohm

IV. OPERATIONAL CHECKS

i. Operate the isolator and record the motor current.

ISOLATOR OPERATION	MOTOR CURRENT					
	R – Ø		Y – Ø		B – Ø	
	FACTORY	SITE	FACTORY	SITE	FACTORY	SITE
CLOSE						
OPEN						

ii. Operation of isolator from local / remote Ok/Not Ok

ISOLATOR OPERATION	CONTROL PANEL	
	LOCAL	REMOTE
CLOSE	OK	OK
OPEN	OK	OK

iii. Measurement of operating time

OPERATION	UNIT	PHASE		
		R - Ø	Y - Ø	B - Ø
OPENING TIME	Sec			
CLOSING TIME	Sec			

V. FINAL DOCUMENTATION REVIEW

i. Final documents of Pre- Commissioning checks reviewed and approved.

Yes	No

ii. Document regarding spares equipment, O&M manuals etc. available at site for O&M purpose

Yes	No

iii. After modification, if any, "As built Drawings" are available at site

Yes	No

Signatures:-

Representative of supplier Representative of Erection Agency Representative of BSPTCL

OTHER PRE-COMMISSIONING CHECKS ON GIS

I. Contact Resistance Measurement

Contact Resistance Measurement to be conducted for whole GIS by injecting 100 A current or more. Contact Resistance Measurement to be carried out using following philosophy:

a. Contact Resistance Measurement should be carried out using two adjacent Earth Switches. The measurement path shall include resistance of Main Conductor as well as Earth Switches.

b. Long Sections by skipping adjacent Earth Switches shall not be acceptable.

c. Factory test values to be provided by Manufacturer before starting Contact Resistance Measurement.

d. In case any deviation in measured value of contact resistance w.r.t. factory value, checking of connections and re-measurement should be attempted and justification for variation in contact resistance beyond permissible limit to be taken from Manufacturer.

e. Measurement of Contact Resistance can also be done by using milli-volt drop method in case of limitation on account of cable length to be used for injecting current by CRM kit.

Typical Configuration for performing Contact Resistance Measurement for reference SLD (Double Main Bus Scheme) attached as Annexure – I has been shown in the table.

Make of Testing Kit:
Serial Number of Kit:
Date of Calibration of Kit:
Ambient Temperature:

Bay/Equipment Details	Phase	Between		Date	Measured Value	*Expected /Design Value
		Point No	Point No			
	R	1	2			
	Y	1	2			
	B	1	2			
	R	2	3			
	Y	2	3			
	B	2	3			
	R	3	4 (Bus – I)			
	Y	3	4 (Bus – I)			
	B	3	4 (Bus – I)			
	R	3	4 (Bus – II)			
	Y	3	4 (Bus – II)			
	B	3	4 (Bus – II)			
	R	3	5			
	Y	3	5			
	B	3	5			

	R	3	6			
	Y	3	6			
	B	3	6			
	R	4	5			
	Y	4	5			
	B	4	5			
	R	4	6			
	Y	4	6			
	B	4	6			
	R	6	7			
	Y	6	7			
	B	6	7			
	R	5	8			
	Y	5	8			
	B	5	8			
	R	7	8			
	Y	7	8			
	B	7	8			

Permissible limit: +/ 20 percentage of design/factory value

Note:

1. CRM Measurement for a bay to be carried out in following parts:
    a. Line/ICT/Reactor side Isolator Earth switch (Point no: 1) to CB – Line/ICT/Reactor side Earth switch (Point no: 2)
    b. CB – Line/ICT/Reactor side Earth switch (Point no: 2) to CB – Bus side Earth switch (Point no: 3)
    c. CB – Bus side Earth switch (Point no: 3) to adjacent bay CB – Bus side Earth switch (Point no: 4) (Through Both bus)
2. CRM measurement from Bus side Isolators (Q1/89A & Q2/89B) to Bus Earth Switch to be carried out for each bay for references at the time of Maintenance in future.

Typical Configuration for performing Contact Resistance Measurement for reference SLD (One and Half Breaker Scheme) attached as Annexure – II has been shown in the table.

Bay/Equipment Details	Phase	Between		Date	Measured Value	*Expected /Design Value
		Point No	Point No			
	R	1	2			
	Y	1	2			
	B	1	2			
	R	2	3			
	Y	2	3			
	B	2	3			
	R	3	4			
	Y	3	4			
	B	3	4			
	R	4	5			
	Y	4	5			
	B	4	5			
	R	5	6			
	Y	5	6			
	B	5	6			
	R	6	14			
	Y	6	14			
	B	6	14			
	R	1	9			
	Y	1	9			
	B	1	9			
	R	6	7			
	Y	6	7			
	B	6	7			
	R	1	8			
	Y	1	8			
	B	1	8			
	R	2	16			
	Y	2	16			
	B	2	16			
	R	15	16			
	Y	15	16			
	B	15	16			
	R	3	16			
	Y	3	16			
	B	3	16			
	R	15	19			
	Y	15	19			
	B	15	19			
	R	4	20			
	Y	4	20			
	B	4	20			

	R	5	20			
	Y	5	20			
	B	5	20			
	R	20	21			
	Y	20	21			
	B	20	21			
	R	20	24			
	Y	20	24			
	B	20	24			

Permissible limit: +/ 20 percentage of design value

Note:

1. CRM measurement from Bus side Isolators to Bus Earth Switch to be carried out for each bay for references at the time of Maintenance in future.

II. DS & ES Electrical Operations Test

a. For Double Main Bus Scheme, Sample SLD for reference attached as Annexure - III

Bay Details	Equipment Details	Operation	SCADA	LCC Panel Indication Lamp	Status Indicator At Equipment
	Q1/89A	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q2/89B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q51/ES	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q52/ES	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q9/89L	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q8/89LE	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK

b. For One and Half Breaker Scheme, Sample SLD attached as Annexure - IV

Bay Details	Equipment Details	Operation	SCADA	LCC Panel Indication Lamp	Status Indicator At Equipment
	Q1A	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q51A	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q52A	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q2A	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q2C	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q52C	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**

		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q51C	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q1C	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q2B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q52B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q51B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q1B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q54A-R	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q54A-Y	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q54A-B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q11A-R	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q11A-Y	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q11A-B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q10B-R	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q10B-Y	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q10B-B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q55A-R	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q55A-Y	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q55A-B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q55B-R	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q55B-Y	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q55B-B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q10B-R	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q10B-Y	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK
	Q10B-B	Close	OK/NOT OK	OK/NOT OK	OK/NOT OK
		Open	OK/NOT OK	OK/NOT OK	OK/NOT OK

	Q11B-R	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q11B-Y	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q11B-B	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q54B-R	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q54B-Y	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
	Q54B-B	**Close**	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**
		Open	**OK/NOT OK**	**OK/NOT OK**	**OK/NOT OK**

III. Alarms & Annunciation Check

Description of Alarm	**Initiating Point**		**Checked At**	
	Device Name (Density	**Terminal No As per**	**LCC Panel Facia**	**SCADA HMI Alarm**
Compartment 1 R phase Loss of SF6				
Compartment 1 Y phase Loss of SF6				
Compartment 1 B phase Loss of SF6				
Compartment 1 General Lockout				
Compartment 1 R phase Zone trip				
Compartment 1 Y phase Zone trip				
Compartment 1 B phase Zone trip				
Compartment 2 R phase Loss of SF6				
Compartment 2 Y phase Loss of SF6				
Compartment 2 B phase Loss of SF6				
Compartment 2General Lockout				
Compartment 2 R phase Zone trip				
Compartment 2 Y phase Zone trip				
Compartment 2 B phase Zone trip				
Compartment N R phase Loss of SF6				

Compartment N Y phase Loss of SF6				
Compartment N B phase Loss of SF6				
Compartment N General Lockout				
Compartment N R phase Zone trip				
Compartment N Y phase Zone trip				
Compartment N B phase Zone trip				
CB Lockout				
CB Phase Discrepancy				
CB Motor Protection				
CB Motor Run Time Exceed				
CB Spring Discharge				
DC Failure				
Dis connector Q1 Blocked Mode				
Dis connector Q2 Blocked Mode				
Dis connector Q9 Blocked Mode				
ES Q51 Blocked Mode				
ES Q52 Blocked Mode				
ES Q53 Blocked Mode				
Dis connector Q1 Manual Mode				
Dis connector Q2 Manual Mode				
Dis connector Q9 Manual Mode				
ES Q51 Manual Mode				
ES Q52 Manual Mode				
ES Q53 Manual Mode				
Any other alarms				

IV. CHECKING OF INTERLOCKS

For Double Main Bus Scheme

Typical Configuration for checking interlocks for reference bay attached as Annexure–V has been shown in the table. The same principle should be replicated to each bay and the conditions should be derived from the scheme approved by the Engineering department.

Circuit Breaker	**Q0**						
Operation	**Q1**	**Q2**	**Q9**	**Q51**	**Q52**	**Possible/Not Possible**	**OK/Not OK**
Close	Close	Open	Close	NA	NA	Possible	
	Open	Open	Close	NA	NA	Not Possible	
	Open	Open	Open	NA	NA	Not Possible	
	Close	Open	Open	NA	NA	Not Possible	
	Open	Close	Close	NA	NA	Possible	
	Open	Open	Close	NA	NA	Not Possible	
	Open	Open	Open	NA	NA	Not Possible	
	Open	Close	Open	NA	NA	Not Possible	
	NA	NA	NA	Close	Close	Possible	
	NA	NA	NA	Open	Open	Not Possible	
	NA	NA	NA	Close	Open	Not Possible	
	NA	NA	NA	Open	Close	Not Possible	

Isolator	**Q1**							
Operation	**C404 - Q51 (Bus Coupler Bay)**	**Q0**	**Q2**	**Q51**	**Q52**	**Selector Switch Position of Q1**	**Possible/Not Possible**	**OK/ Not OK**
Close/Open	Open	Open	Open	Open	Open	Not in Manual	Possible	
	Close	Open	Open	Open	Open	Not in Manual	Not Possible	
	Open	Close	Open	Open	Open	Not in Manual	Not Possible	
	Open	Open	Close	Open	Open	Not in Manual	Not Possible	
	Open	Open	Open	Close	Open	Not in Manual	Not Possible	
	Open	Open	Open	Open	Close	Not in Manual	Not Possible	
	Open	Open	Open	Open	Open	Manual	Not Possible	

Operation	C404 - Q0 (Bus Coupler Bay)	C404 - Q1 (Bus Coupler Bay)	C404 - Q2 (Bus Coupler Bay)	Q0	Q2	Selector Switch Position of Q1	Possible/Not Possible	OK/ Not OK
Close/Open	Close	Close	Close	Close	Close	Not in Manual	Possible	
	Open	Close	Close	Close	Close	Not in Manual	Not Possible	
	Close	Open	Close	Close	Close	Not in Manual	Not Possible	
	Close	Close	Open	Close	Close	Not in Manual	Not Possible	
	Close	Close	Close	Close	Open	Not in Manual	Not Possible	
	Close	Close	Close	Close	Close	Manual	Not Possible	

Isolator	Q2							
Operation	C404 - Q52 (Bus Coupler Bay)	Q0	Q1	Q51	Q52	Selector Switch Position of Q2	Possible/Not Possible	OK/ Not OK
Close/Open	Open	Open	Open	Open	Open	Not in Manual	Possible	
	Close	Open	Open	Open	Open	Not in Manual	Not Possible	
	Open	Close	Open	Open	Open	Not in Manual	Not Possible	
	Open	Open	Close	Open	Open	Not in Manual	Not Possible	
	Open	Open	Open	Close	Open	Not in Manual	Not Possible	
	Open	Open	Open	Open	Close	Not in Manual	Not Possible	
	Open	Open	Open	Open	Open	Manual	Not Possible	
Operation	**C404 - Q0 (Bus Coupler Bay)**	**C404 - Q1 (Bus Coupler Bay)**	**C404 - Q2 (Bus Coupler Bay)**	**Q0**	**Q2**	**Selector Switch Position of Q2**	**Possible/Not Possible**	**OK/ Not OK**
Close/Open	Close	Close	Close	Close	Close	Not in Manual	Possible	
	Open	Close	Close	Close	Close	Not in Manual	Not Possible	
	Close	Open	Close	Close	Close	Not in Manual	Not Possible	
	Close	Close	Open	Close	Close	Not in Manual	Not Possible	
	Close	Close	Close	Close	Open	Not in Manual	Not Possible	
	Close	Close	Close	Close	Close	Manual	Not Possible	

Earth Switch	Q51					
Operation	**Q1**	**Q2**	**Q9**	**Selector Switch Position of Q51**	**Possible/Not Possible**	**OK/ Not OK**
Close/Open	Open	Open	Open	Not in Manual	Possible	
	Close	Open	Open	Not in Manual	Not Possible	
	Open	Close	Open	Not in Manual	Not Possible	
	Open	Open	Close	Not in Manual	Not Possible	
	Open	Open	Open	Manual	Not Possible	

Earth Switch	Q52					
Operation	**Q1**	**Q2**	**Q9**	**Selector Switch Position of Q52**	**Possible/Not Possible**	**OK/ Not OK**
Close/Open	Open	Open	Open	Not in Manual	Possible	
	Close	Open	Open	Not in Manual	Not Possible	
	Open	Close	Open	Not in Manual	Not Possible	
	Open	Open	Close	Not in Manual	Not Possible	
	Open	Open	Open	Manual	Not Possible	

Isolator	Q9							
	Q0	**Q51**	**Q52**	**Q8**	**LV E/SW**	**Selector Switch Position of Q9**	**Possible/Not Possible**	**OK/ Not OK**
Operation	Open	Open	Open	Open	Open	Not in Manual	Possible	
Close/Open	Close	Open	Open	Open	Open	Not in Manual	Not Possible	
	Open	Close	Open	Open	Open	Not in Manual	Not Possible	
	Open	Open	Close	Open	Open	Not in Manual	Not Possible	
	Open	Open	Open	Close	Open	Not in Manual	Not Possible	
	Open	Open	Open	Open	Close	Not in Manual	Not Possible	
	Open	Open	Open	Open	Open	Manual	Not Possible	

Earth Switch	Q8				
Operation	**Q9**	**Q9 IV side**	**Selector Switch Position of Q8**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Not in Manual	Possible	
	Close	Open	Not in Manual	Not Possible	
	Open	Close	Not in Manual	Not Possible	
	Open	Open	Manual	Not Possible	

For One & Half Breaker Scheme

Typical Configuration for checking interlocks for reference bay attached as Annexure – VI has been shown in the table. The same principle should be replicated to each bay and the conditions should be derived from the scheme approved by the Engineering department.

For an ICT Main Bay

Isolator	**709-89A**						
Operation	**709-89AE2**	**Bus side Earth Switch Any Other bay-89AE2**	**709-89BE**	**709-89AE1**	**709-52**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Open	Not Possible	
	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Close	Not Possible	

Isolator	**709-89B**							
Operation	**709-89BE**	**709-89AE1**	**709-52**	**709-89TSE1R**	**709-89TSE1Y**	**709-89TSE1B**	**Possible/Not Possible**	**OK/ Not OK**
Close/Open	Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Open	Open	Not Possible	
	Open	Open	Close	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Open	Close	Not Possible	

Earth Switch	**709-89AE2**			
Operation	**Isolator of Main Bay connected to Bus same as 709**	**709-89A**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Possible	
	Close	Open	Not Possible	
	Open	Close	Not Possible	

Earth Switch	709-89AE1			
Operation	**709-89A**	**709-89B**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Possible	
	Close	Open	Not Possible	
	Open	Close	Not Possible	
Earth Switch	**709-89BE**			
Operation	**709-89A**	**709-89B**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Possible	
	Close	Open	Not Possible	
	Open	Close	Not Possible	

Circuit Breaker	709-52 (Local Operation)			
Operation	**709-89AE1**	**709-89BE**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Close	Close	Possible	
	Open	Close	Not Possible	
	Close	Open	Not Possible	

Isolator	709-89T-R											
Operation	**709-52**	**708-52**	**LV Side - Main CB**	**LV Side - Tie CB**	**709-89T-S1R&S2R**	**709-89TE-R**	**LV Side ICT - 89TE-R**	**709-89TSE1 R**	**709-89TSE1 Y**	**709-89TSE1 B**	**Possible/Not Possible**	**OK / Not OK**
Close/Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Close	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Close	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Close	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Close	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Open	Close	Not Posssible	

Isolator	709-89T-Y											
Operation	**709-52**	**708-52**	**LV Side - Main CB**	**LV Side - Tie CB**	**709-89T-S1Y&S2Y**	**709-89TE-Y**	**LV Side ICT - 89TE-Y**	**709-89TSE1 R**	**709-89TSE1 Y**	**709-89TSE1 B**	**Possible/Not Possible**	**OK/ Not OK**
Close/Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	

	Open	Close	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Close	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Close	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Close	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Close	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Open	Close	Not Possible	
Isolator	**709-89T-B**											
Operation	**709-52**	**708-52**	**LV Side - Main CB**	**LV Side - Tie CB**	**709-89T-S1B&S2B**	**709-89TE-B**	**LV Side ICT - 89TE-B**	**709-89TSE1 R**	**709-89TSE1 Y**	**709-89TSE1 B**	**Possible /Not Possible**	**OK/ Not OK**
Close/Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Close	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Close	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Close	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Close	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Open	Close	Not Possible	
Isolator	**709-89T-S1R&S2R**											
Operation	**709-52**	**708-52**	**LV Side Main CB**	**LV Side - Tie CB**	**709-89T-R**	**709-89T-S1Y&S2Y**	**709-89T-S1B&S2B**	**709-89TSE1 R**	**709-89TSE1 Y**	**709-89TSE1 B**	**Possible /Not Possible**	**OK / Not OK**
Close/Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Close	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Close	Open	Open	Open	Open	Open	Not Possible	

	Open	Open	Open	Open	Open	Close	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Close	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Open	Close	Not Possible	

Isolator	**709-89T-S1Y&S2Y**											
Operation	**709-52**	**708-52**	**LV Side - Main CB**	**LV Side - Tie CB**	**709-89T-Y**	**709-89T-S1R&S2R**	**709-89T-S1B&S2B**	**709-89TSE1 R**	**709-89TSE1 Y**	**709-89TSE1 B**	**Possible/ Not Possible**	**OK/ Not OK**
Close/Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Close	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Close	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Close	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Close	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Open	Close	Not Possible	

Isolator	**709-89T-S1B&S2B**											
Operation	**709-52**	**708-52**	**LV Side - Main CB**	**LV Side - Tie CB**	**709-89T-B**	**709-89T-S1R&S2R**	**709-89T-S1Y&S2Y**	**709-89TSE1 R**	**709-89TSE1 Y**	**709-89TSE1 B**	**Possible/Not Possible**	**OK / Not OK**
Close/Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Close	Open	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Close	Open	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Close	Open	Open	Open	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Close	Open	Open	Not Possible	

	Open	Open	Open	Open	Open	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Open	Open	Open	Open	Open	Close	Not Possible	

For a Tie Bay (Line & ICT)

Isolator	**708-89A**							
Operation	**708-52**	**708-89AE**	**708-89BE**	**709-89TSE1R**	**709-89TSE1Y**	**709-89TSE1B**	**Possible/Not Possible**	**OK/ Not OK**
Close/Open	Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Open	Open	Not Possible	
	Open	Open	Close	Open	Open	Open	Not Possible	
	Open	Open	Open	Close	Open	Open	Not Possible	
	Open	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Open	Close	Not Possible	

Isolator	**708-89B**				
Operation	**708-52**	**708-89AE**	**708-89BE**	**Possible/Not Possible**	**OK/ Not OK**
Close/Open	Open	Open	Open	Possible	
	Close	Open	Open	Not Possible	
	Open	Close	Open	Not Possible	
	Open	Open	Close	Not Possible	

Earth Switch	**708-89AE**			
Operation	**708-89A**	**708-89B**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Possible	
	Close	Open	Not Possible	
	Open	Close	Not Possible	

Earth Switch	**708-89BE**			
Operation	**708-89A**	**708-89B**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Possible	
	Close	Open	Not Possible	
	Open	Close	Not Possible	

Circuit Breaker	708-52 (Local Operation)			
Operation	**708-89AE**	**709-89BE**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Close	Close	Possible	
	Open	Close	Not Possible	
	Close	Open	Not Possible	

For a Line Main Bay

Isolator	707-89A						
Operation	**707-89AE2**	**Bus side Earth Switch Any Other bay-89AE2**	**707-89BE**	**707-89AE1**	**707-52**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Open	Not Possible	
	Open	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Open	Close	Not Possible	

Isolator	707-89B				
Operation	**707-89BE**	**707-89AE1**	**707-52**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Open	Possible	
	Close	Open	Open	Not Possible	
	Open	Close	Open	Not Possible	
	Open	Open	Close	Not Possible	

Isolator	707-89L				
Operation	**707-89LE**	**708-52**	**707-52**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Open	Possible	
	Close	Open	Open	Not Possible	
	Open	Close	Open	Not Possible	
	Open	Open	Close	Not Possible	

Earth Switch	707-89AE1			
Operation	**707-89A**	**707-89B**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Possible	
	Close	Open	Not Possible	
	Open	Close	Not Possible	

Earth Switch	707-89BE			
Operation	**707-89A**	**707-89B**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Possible	
	Close	Open	Not Possible	
	Open	Close	Not Possible	

Earth Switch	707-89AE2			
Operation	**Isolator of Main Bay connected to Bus same as 707**	**707-89A**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Possible	
	Close	Open	Not Possible	
	Open	Close	Not Possible	

Circuit Breaker	707-52 (Local Operation)			
Operation	**707-89AE1**	**709-89BE**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Close	Close	Possible	
	Open	Close	Not Possible	
	Close	Open	Not Possible	

For ICT (without Spare ICT Switching Scheme) Main Bay

Typical Configuration for checking interlocks for reference bay attached as Annexure – VII has been shown in the table. The same principle should be replicated to each bay and the conditions should be derived from the scheme approved by the Engineering department.

Isolator	4Z-89B					
Operation	**4n-89BE2**	**4Z-52**	**4Z89BE/BE-1**	**4Z-89AE**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Open	Open	Possible	
	Close	Open	Open	Open	Not Possible	
	Open	Close	Open	Open	Not Possible	
	Open	Open	Close	Open	Not Possible	
	Open	Open	Open	Close	Not Possible	

Earth Switch	**4Z-89BE/BE1**				
Operation	**4Z-89B**		**4Z-89A**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open		Open	Possible	
	Close		Open	Not Possible	
	Open		Close	Not Possible	
Isolator	**4Z-89A**				
Operation	**4Z-52**	**4Z-89AE**	**4Z-BE/BE1**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Open	Possible	
	Close	Open	Open	Not Possible	
	Open	Close	Open	Not Possible	
	Open	Open	Close	Not Possible	
Earth Switch	**4Z-89AE**				
Operation	**4Z-89B**	**4Z-89B**	**Possible/Not Possible**		**OK/Not OK**
Close/Open	Open	Open	Possible		
	Close	Open	Not Possible		
	Open	Close	Not Possible		
Isolator	**4Z-89T**				
Operation	**4Z-52**	**4B-52**	**4Z-89TE**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Open	Open	Open	Possible	
	Close	Open	Open	Not Possible	
	Open	Close	Open	Not Possible	
	Open	Open	Close	Not Possible	
Earth Switch	**4Z-89TE**				
Operation	**4Z-89T**	**220 KV Line Isolator**	**Possible/Not Possible**		**OK/Not OK**
Close/Open	Open	Open	Possible		
	Close	Open	Not Possible		
	Open	Close	Not Possible		
Circuit Breaker	**4Z-52 (Local Operation)**				
Operation	**4Z-52 Mode**	**4Z-89AE**	**4Z-89BE/BE1**	**Possible/Not Possible**	**OK/Not OK**
Close/Open	Local	Open	Open	Possible	
	Local	Close	Open	Not Possible	
	Local	Open	Close	Not Possible	

V. High Voltage and Partial Discharge Measurements

a. Onsite Sensitivity Test

The sensitivity verification test to be done in accordance to CIGRE Task Force 15/33.03.05 of working group 15.03. the onsite UHF sensor Sensitivity verification is done before performing HV test & PD test so as to ascertain the proper functioning of UHF sensors & kit. Artificial pulses are injected into PD couplers to stimulate electromagnetic wave and measured in the adjacent couplers. The sensitivity test is performed by injecting a artificial pulse magnitude equivalent to an apparent charge of 5 pc in UHF sensors and then detecting PD in adjacent UHF sensors. The calibration/test report of artificial pulse injector to prove equivalence to 5 pC in accordance to Step I of the CIGRE Task Force TF 15/33.05.05 procedure is required to be submitted by the testing agency. Sensitivity values measured at sensors during on-site sensitivity verification test as a reference value and saved to compare with actual PD measured to determine if actual PD is less/ more than 5 pC. By conducting sensitivity test, it can be ensured that a defect/ particle creating a partial discharge of 5 pc or above can be detected during PD measurements by the kit. As per CIGRE recommendation, Onsite Sensitivity Test should be done using same UHF sensors, Pulse Generator & PD Test System which have been in the factory at the time of determination of artificial pulse magnitude.
The artificial pulse injected at any PD coupler must be detectable by the adjacent PD couplers and if the same is not detected, matter to be taken up with manufacturer for review of location of PD couplers of GIS.

Requirements:
Sensitivity test plan to be submitted by erection agency to Site In-charge for approval with following details:

a. Single Line Diagram showing position of UHF sensors along with sensor ID.
b. Sensor Combinations to be used for sensitivity measurement as per "Sensitivity – Sensor Combination Table" shown below.
c. Test report of artificial pulse injector to prove equivalence to 5 pC in accordance to Step I of the CIGRE Task Force TF 15/33.05.05.
d. Calibration report of standard signal generator.

Typical Configuration for conducting Sensitivity test for reference SLD attached as Annexure – VIII has been shown in the table.

Sensitivity – Sensor Combination Table

Bay/ Equipment Details	Phase	Pulse Injected at Sensor No	Measuring Sensor & Measured Value (in dB, %, mV)		Measuring Sensor & Measured Value (in dB, %, mV)		Measuring Sensor & Measured Value (in dB, %, mV)	
			Sensor	Value	Sensor	Value	Sensor	Value
	R	1	2					
	Y	1	2					
	B	1	2					

	R	2	8		1			
	Y	2	8		1			
	B	2	8		1			
	R	6	5		10		9	
	Y	6	5		10		9	
	B	6	5		10		9	
	R	10	11		4			
	Y	10	11		4			
	B	10	11		4			

Based on the above combinations shown in table as reference, sensitivity test for different combinations possible at site shall be performed.

Prior to commencement of test, sensitivity test plan submitted by manufacturer to be sent to CC/AM for approval at least one week in advance.

b. High Voltage Test

High Voltage test is performed on GIS before commencing PD measurement. Test voltage will be applied between phase and earth with other two phases and enclosure in earthed condition. Test voltage will be supplied by a resonant test system of variable frequency. High Voltage is achieved by resonating the test kit at a particular frequency. The resonant frequency will be different depending on capacitance of GIS test sections. Test frequency should not be less than frequency guaranteed by VT manufacturer.

Requirements:

1. Secondary circuit of VT are open.

2. Secondary circuit of CT are short circuited and earthed.

3. HV cables are disconnected from GIS.

4. ICTs, Reactors and Transmission lines are disconnected from GIS.

5. Valid Calibration report of HV test kit is available.

6. All the Earth switches of the testing section shall be open and earthing link shall be tight

7. Voltage transformers to be connected (minimum up to rated voltage) and tested with switchgear

Note: It is to be ensured that all pre commissioning test shall be completed before starting High Voltage test (as per IEC 62271-102 Clause No: 10.2.101.1.1).

Prior to commencement of HV test, test plan for same submitted by manufacturer to site incharge of BSPTCL for approval.

Make of Testing Kit:

Serial Number of Kit:

Date of Calibration of Kit:

Ambient Temperature:

Note: Ud = 0.45 x 0.8 x lightning impulse voltage
As per IEC 62271-203

Bay/Equipment Details	Phase	Date	555 KV for 15 minutes	650 KV for 3 minutes	760 KV for 1 minute	PD Voltage 555 KV	Remarks (if any) Regarding Flashovers
	R						
	Y						
	B						
	R						
	Y						
	B						
	R						
	Y						

II. Partial Discharge Measurement

PD measurement is conducted to detect any void/contamination/surface defect/floating particle defect in GIS before commissioning. PD test to be done immediately after completion of Hi Voltage as shown in HV test diagram above. Maximum permissible Limit for PD measurement of GIS is 5 pC as per IEC 62271-203. The PD measurement taken for each UHF coupler is compared with the results obtained in sensitivity test to compare if the actual PD is higher than 5 pC.

Note:

1. Background Noise pattern without High Voltage and artificial pulse injection shall also be recorded for reference at the time of PD Measurement.
2. PD Measurement kit to be synchronized with Voltage feedback from Hi voltage test system.
3. PD graphs corresponding to each sensor measured during test needs to be saved both in soft as well as hard form for future reference at the time of O&M period.
4. In case any partial discharge is observed at any sensor, PRPD pattern of that sensor to be recorded to ascertain type of partial discharge (void/floating electrode/noise stc).

III. Switching Impulse Test **(To be carried out only incase provision for this test exists in Scope of Contract)**

Switching Impulse Test is carried out on 800kV rating Gas Insulated Substation to detect presence of contaminations & abnormal field configurations.

Requirements

a. GIS must be filled with SF6 at rated pressure.

b. Secondary windings of all CTs should be short circuited & grounded.

c. Voltage Transformers must be open.

d. Surge Arresters must be dis-mantled.

e. During Test, ICTs, Reactors, Transmission lines & Cables must be disconnected from GIS.

f. Valid Calibration report of Impulse Voltage Generator test kit is available.

g. All the Earth switches of the testing section shall be open and earthing link shall be tight

Procedure

GIS shall be subjected to three impulses of each polarity (positive & negative) and values of impulses shall be calculated as per following formula mentioned in IEC 62271 – 100 :

Test Voltage = 0. 8 x Rated Switching Impulse Level

As per Technical Specifications, Rated Switching Impulse Level for 800kV GIS has been mentioned as 1550kV.

Test Voltage = 0.8 x 1550 = 1240kV peak

In order to pass the test, GIS must withstand three impulses of each polarity (positive & negative) with full test test voltage (i.e. 1240kV pk).

VI. Earth Resistance Measurement

Earth Resistance needs to be measured for Outdoor Yard (at each voltage level) and each Bay in GIS Hall.

Indoor GIS Hall

Sl	Bay	Resistance (In Ohm)

Outdoor (To be Measured at Minimum 2 locations in yard for each Voltage Level)

Sl	Voltage Level	Resistance (In Ohm)	
		Location – I	Location – II

FORMAT FOR RECORDING OF MAJOR FAILURES OF EQUIPMENT AND COMPONENTS DURING PRE-COMMISSIONING STAGE

In order to have complete information of problems observed during pre-commissioning stage for assessment of quality of product and erection workmanship, record of major problems is required to be maintained. This helps in identifying the critical area vulnerable/ prone to failure and analysing the same to avert the same in future during O&M stage with the help of manufacture/ supplier. The record of major problems observed during erection and pre-commissioning stage to be maintained in the format given below and to be signed by contractor, manufacturer & BSPTCL. The problems including GIS mechanical assembly parts, motor drives & drive mechanism, SF6 gas leakage, Density monitor and contacts, items rejected due to transport /storage damage, failures observed during HV test with details of location and reason found after opening the compartment, detection of partial discharge during HV test, improper contact resistance, CB, Isolator, CT, VT improper test values, indication and interlocks etc may be recorded.

SL. NO.	DATE OF OBSERVATION	BAY NO	EQUIPMENT/COMPONENT DETAILS	DESCRIPTION OF PROBLEM	ACTION TAKEN
1.					
2					
3					
4					
5					
6					

Signature

Representative of Supplier **Representative of Energy Agency** **Representative of BSPTCL**

FORMAT – A

FORMAT FOR RECORDING HEALTHINESS OF GIS PACKING ON RECIEPT AT SITE

Sl	Packing No./ Description	Physical damage to packing (Yes/No)	Positive N2 pressure (Yes/No)	Shock Indicator Operated (Yes/No)	Impact Recorder data & Report submitted (Yes/No)	Impact Limit Violation (Yes/No	Remarks (if any)
1.							
2.							
3.							
4.							
5.							
.							

Signature:	Signature:
Name:	Name:
Designation:	Designation:
GIS Manufacturer	BSPTCL Site In-charge

PRE-COMMISSIONING CHECK ON GIB

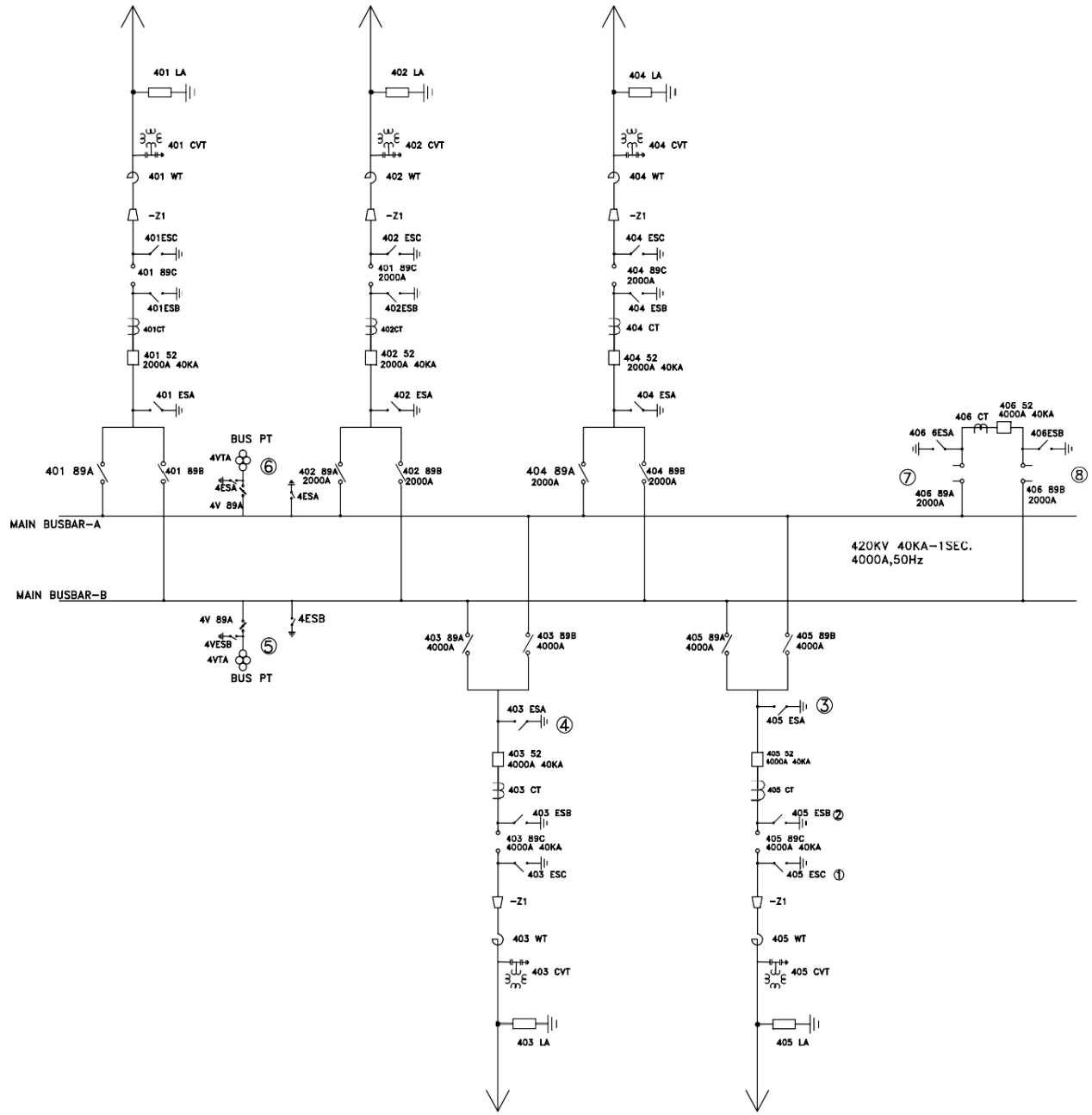
Outdoor GIB Foundation Level & Alignment Check/Measurement

Level & Alignment check of outdoor GIBs has to be carried out during pre-commissioning after completion of all erection activities. Level of each outdoor GIB support structure foundation w.r.t FGL is to be recorded in the format below:

FGL in mm: ……..

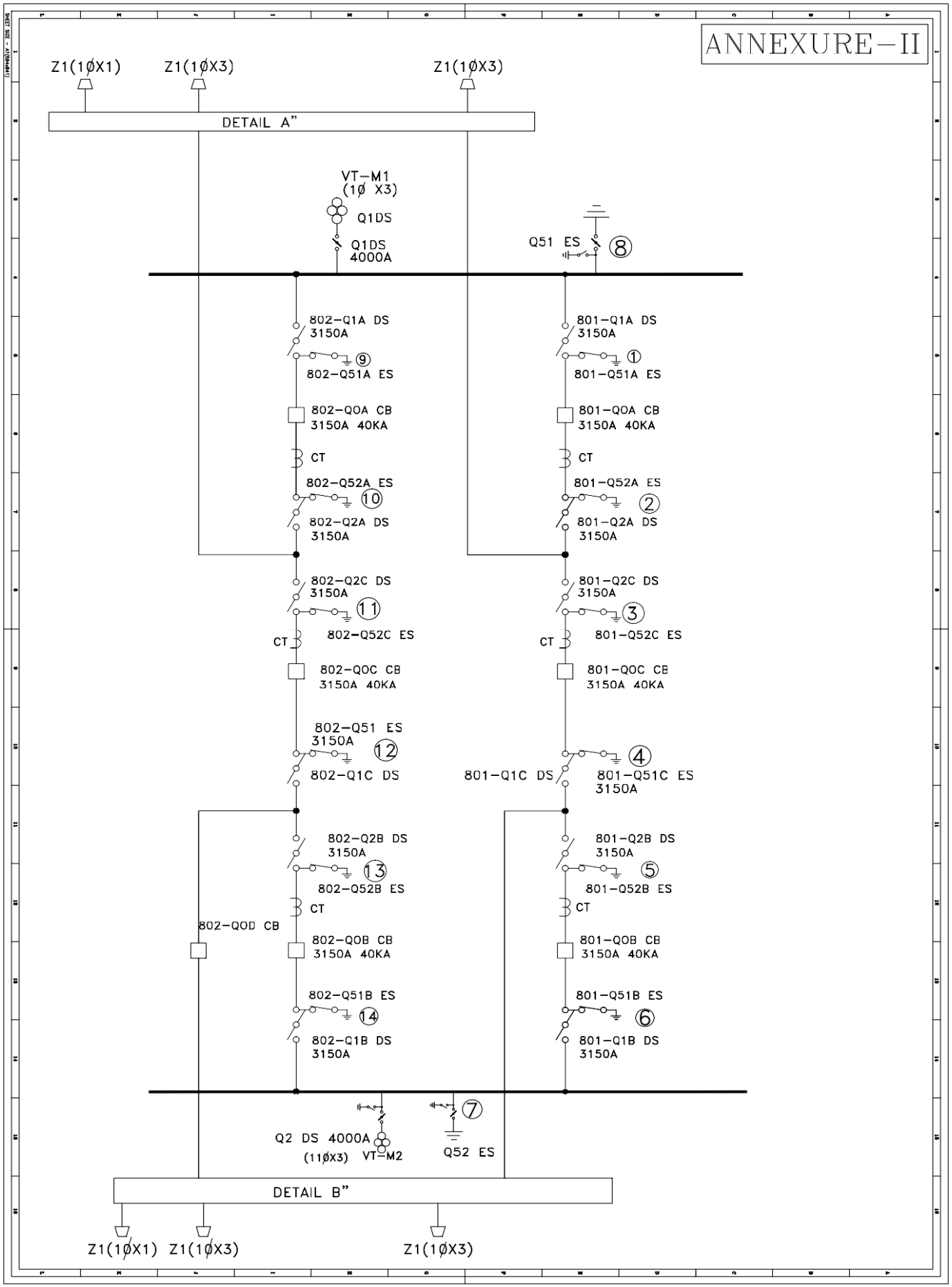
S. No	Bay	Foundation No.	GIB Support Structure Foundation level w.r.t. FGL (in mm)			Remarks (Ok/Not Ok)
			R	Y	B	
1						
2						
3						

ANNEXURE–I

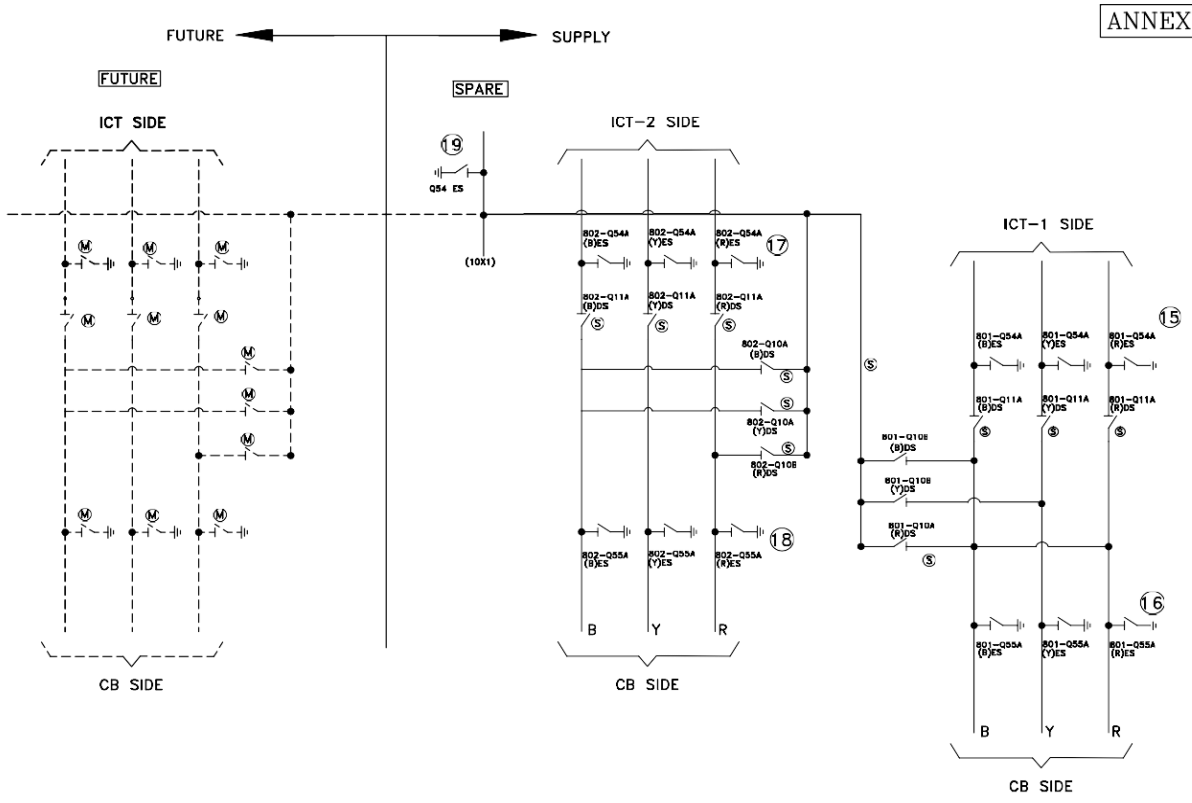


SHEET SIZE – A1(594x841)

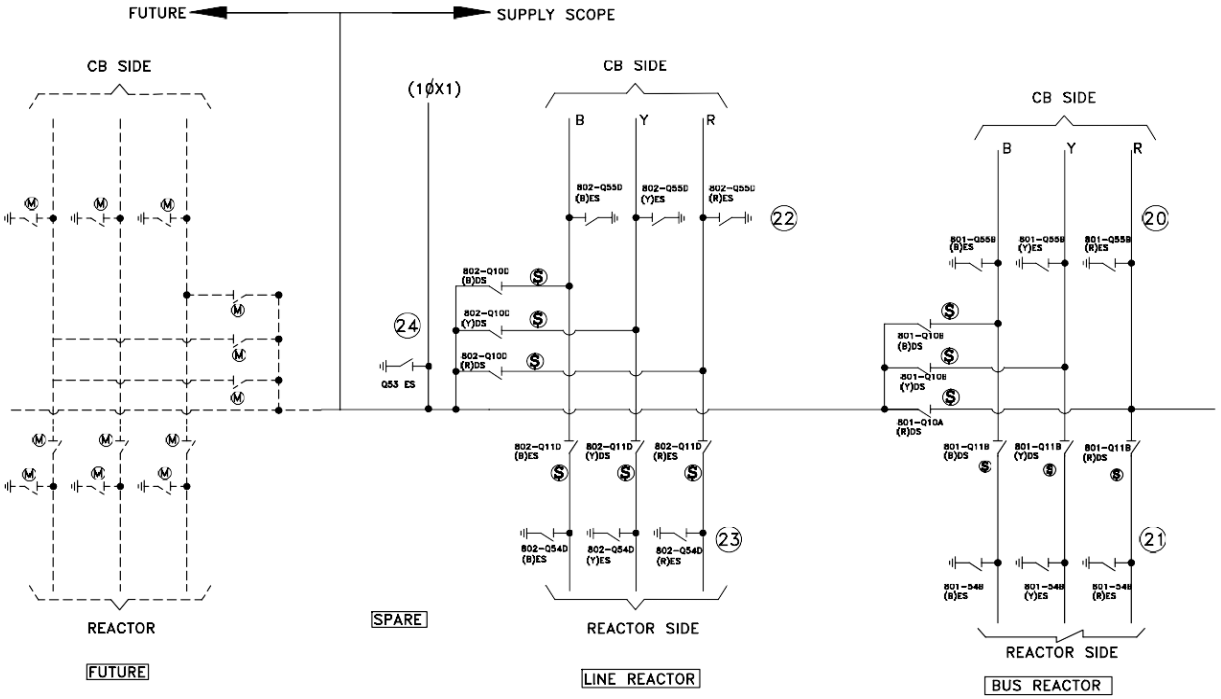
ANNEXURE–II


Z1(1ØX1)
Z1(1ØX3)
Z1(1ØX3)
DETAIL A"
VT–M1
(1Ø X3)
Q1DS
Q1DS
4000A
Q51 ES
8
802–Q1A DS
3150A
9
802–Q51A ES
802–QOA CB
3150A 40KA
CT
802–Q52A ES
10
802–Q2A DS
3150A
802–Q2C DS
3150A
11
CT
802–Q52C ES
802–QOC CB
3150A 40KA
802–Q51 ES
3150A
12
802–Q1C DS
802–Q2B DS
3150A
13
802–Q52B ES
CT
802–QOD CB
802–QOB CB
3150A 40KA
802–Q51B ES
14
802–Q1B DS
3150A
801–Q1A DS
3150A
1
801–Q51A ES
801–QOA CB
3150A 40KA
CT
801–Q52A ES
2
801–Q2A DS
3150A
801–Q2C DS
3150A
3
CT
801–Q52C ES
801–QOC CB
3150A 40KA
801–Q1C DS
4
801–Q51C ES
3150A
801–Q2B DS
3150A
5
801–Q52B ES
CT
801–QOB CB
3150A 40KA
801–Q51B ES
6
801–Q1B DS
3150A
Q2 DS 4000A
(11ØX3) VT–M2
7
Q52 ES
DETAIL B"
Z1(1ØX1)
Z1(1ØX3)
Z1(1ØX3)

ANNEXURE–II

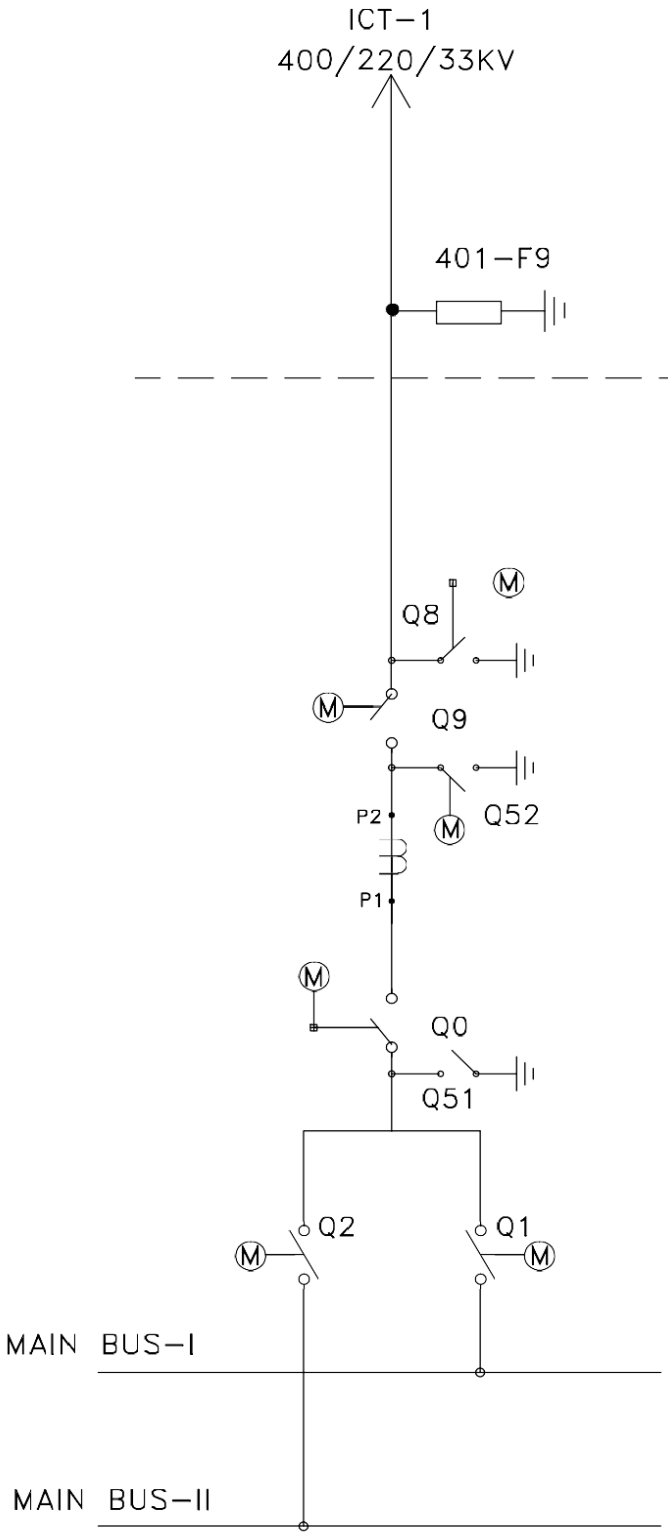


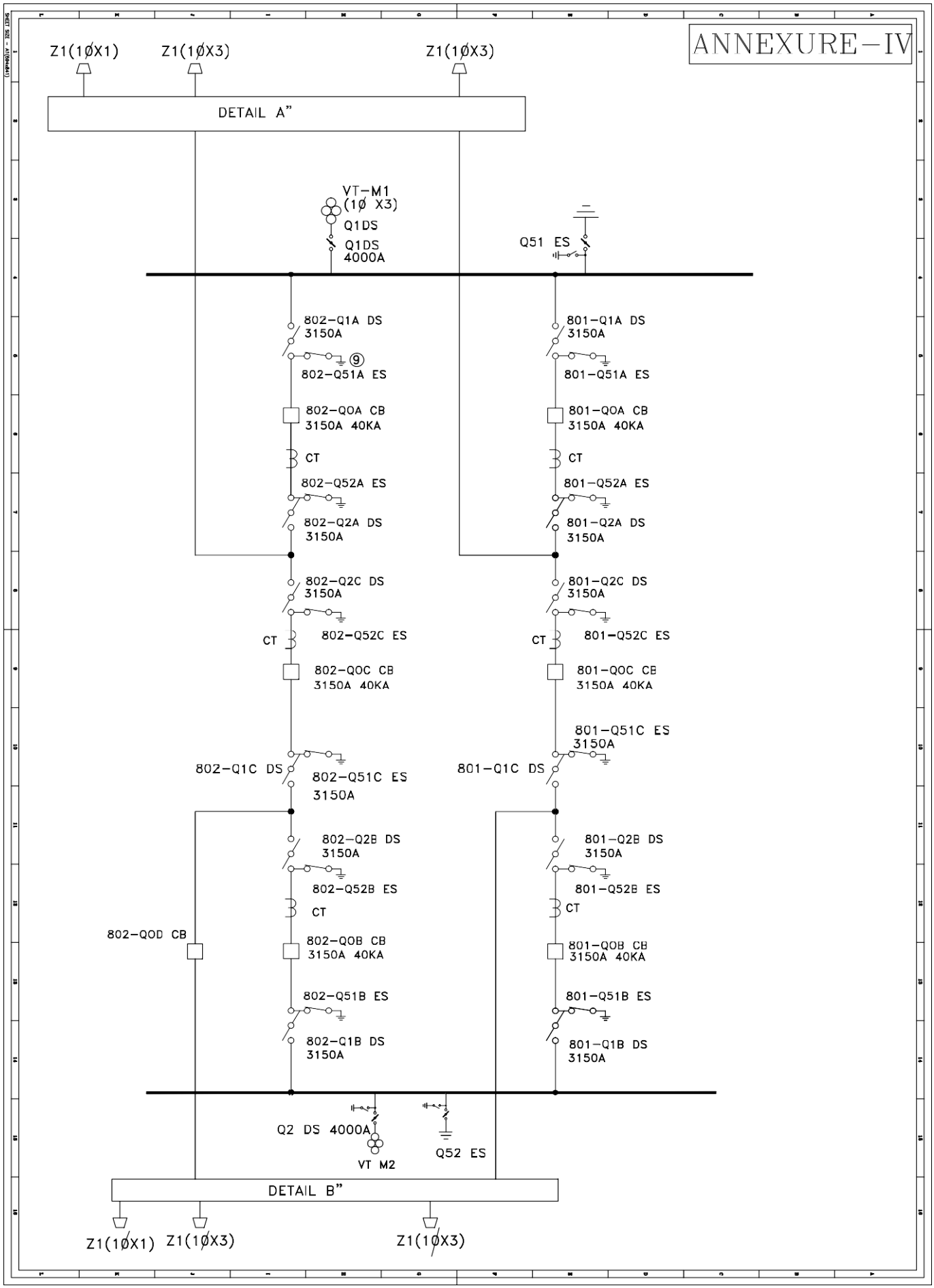
DETAIL "A" (SINGLE PHASE)



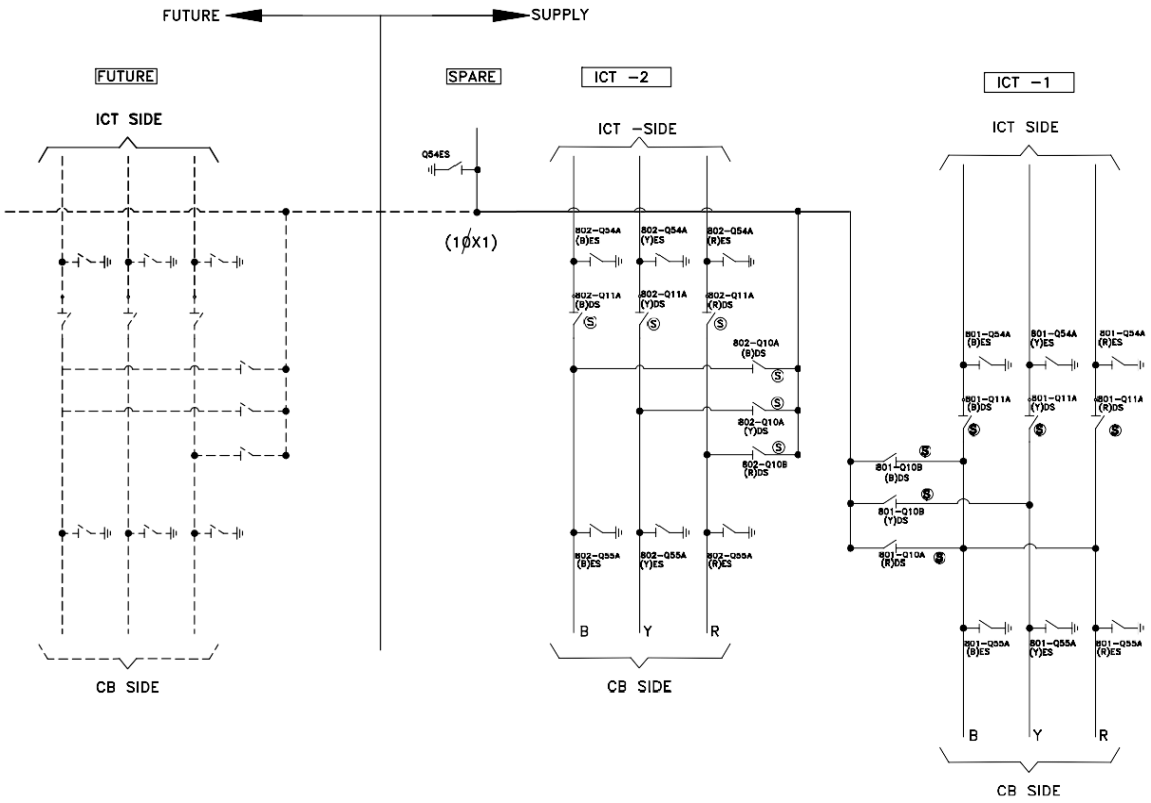
DETAIL "B" (SINGLE PHASE)

ANNEXURE–III

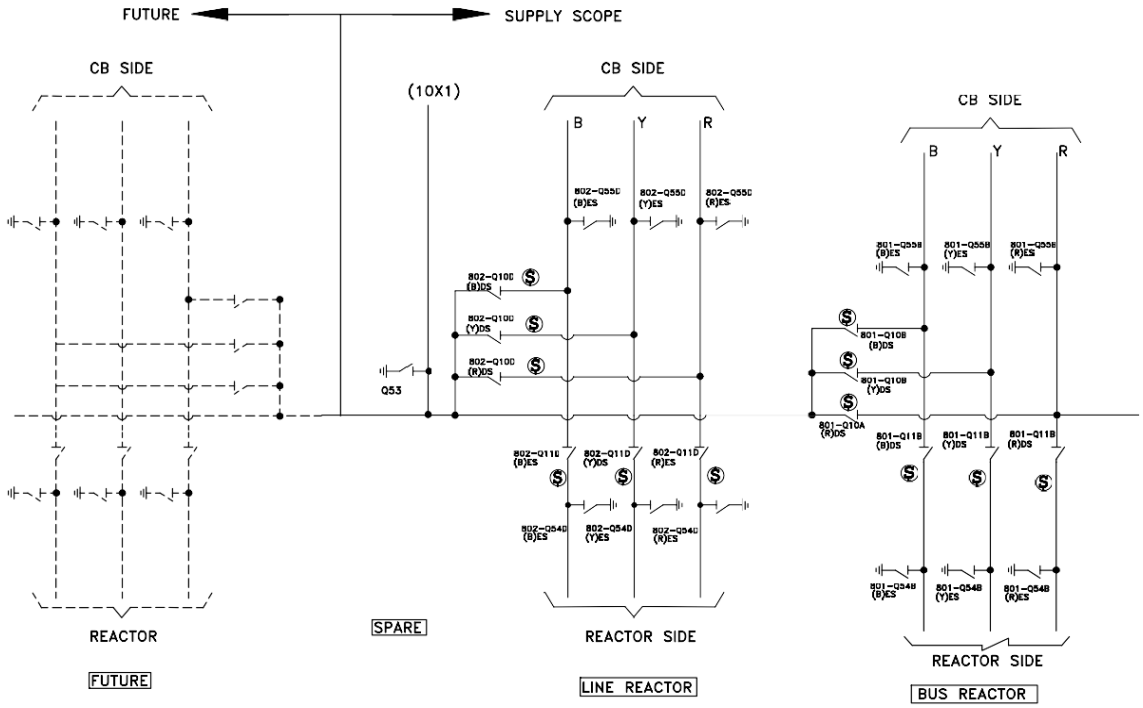



ANNEXURE–IV
Z1(1ØX1)
Z1(1ØX3)
Z1(1ØX3)
DETAIL A"
VT–M1
(1Ø X3)
Q1DS
Q1DS
4000A
Q51 ES
802–Q1A DS
3150A
802–Q51A ES
802–QOA CB
3150A 40KA
CT
802–Q52A ES
802–Q2A DS
3150A
802–Q2C DS
3150A
CT
802–Q52C ES
802–QOC CB
3150A 40KA
802–Q1C DS
802–Q51C ES
3150A
802–Q2B DS
3150A
802–Q52B ES
CT
802–QOD CB
802–QOB CB
3150A 40KA
802–Q51B ES
802–Q1B DS
3150A
801–Q1A DS
3150A
801–Q51A ES
801–QOA CB
3150A 40KA
CT
801–Q52A ES
801–Q2A DS
3150A
801–Q2C DS
3150A
CT
801–Q52C ES
801–QOC CB
3150A 40KA
801–Q51C ES
3150A
801–Q1C DS
801–Q2B DS
3150A
801–Q52B ES
CT
801–QOB CB
3150A 40KA
801–Q51B ES
801–Q1B DS
3150A
Q2 DS 4000A
VT M2
Q52 ES
DETAIL B"
Z1(1ØX1)
Z1(1ØX3)
Z1(1ØX3)

ANNEXURE–IV

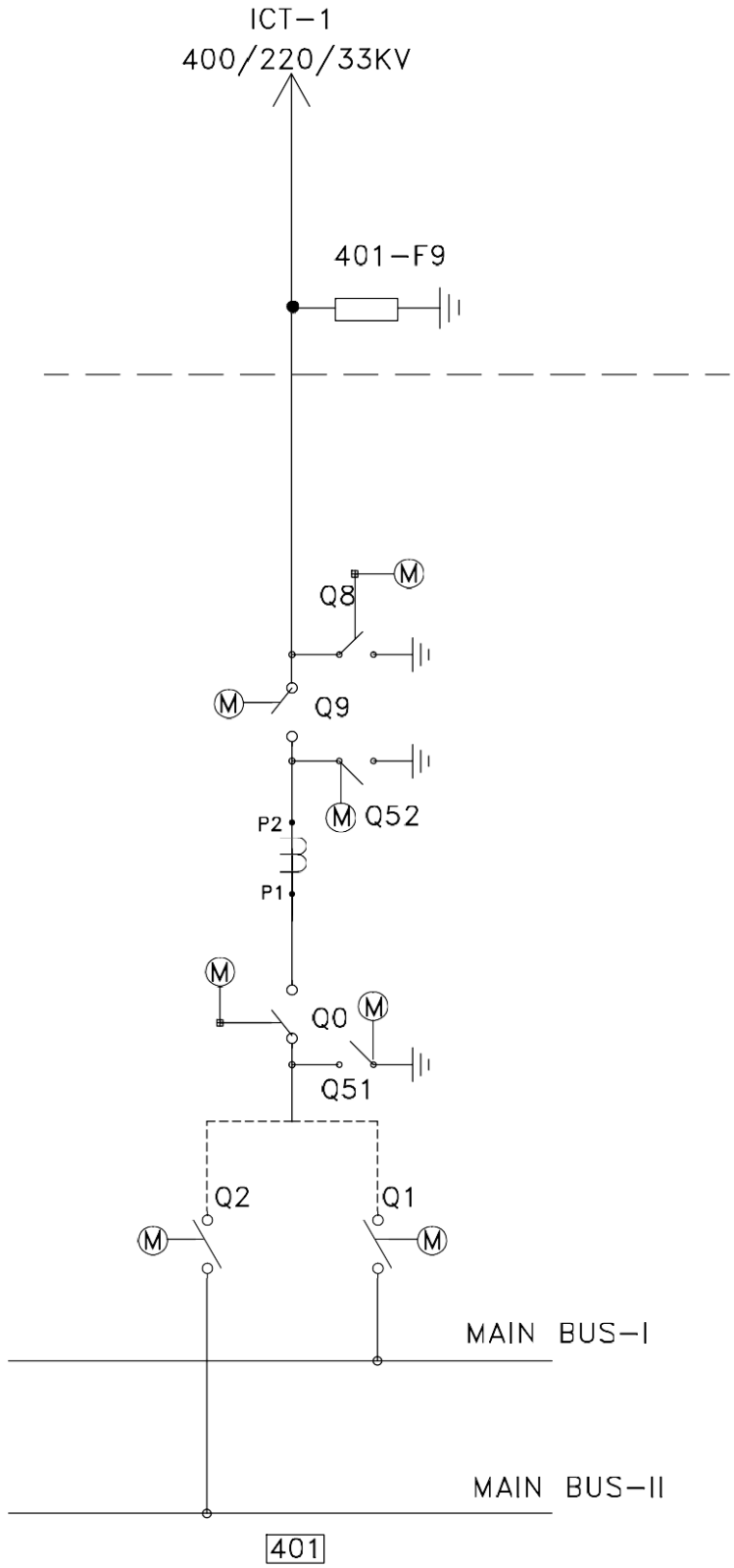


DETAIL "A" (SINGLE PHASE)

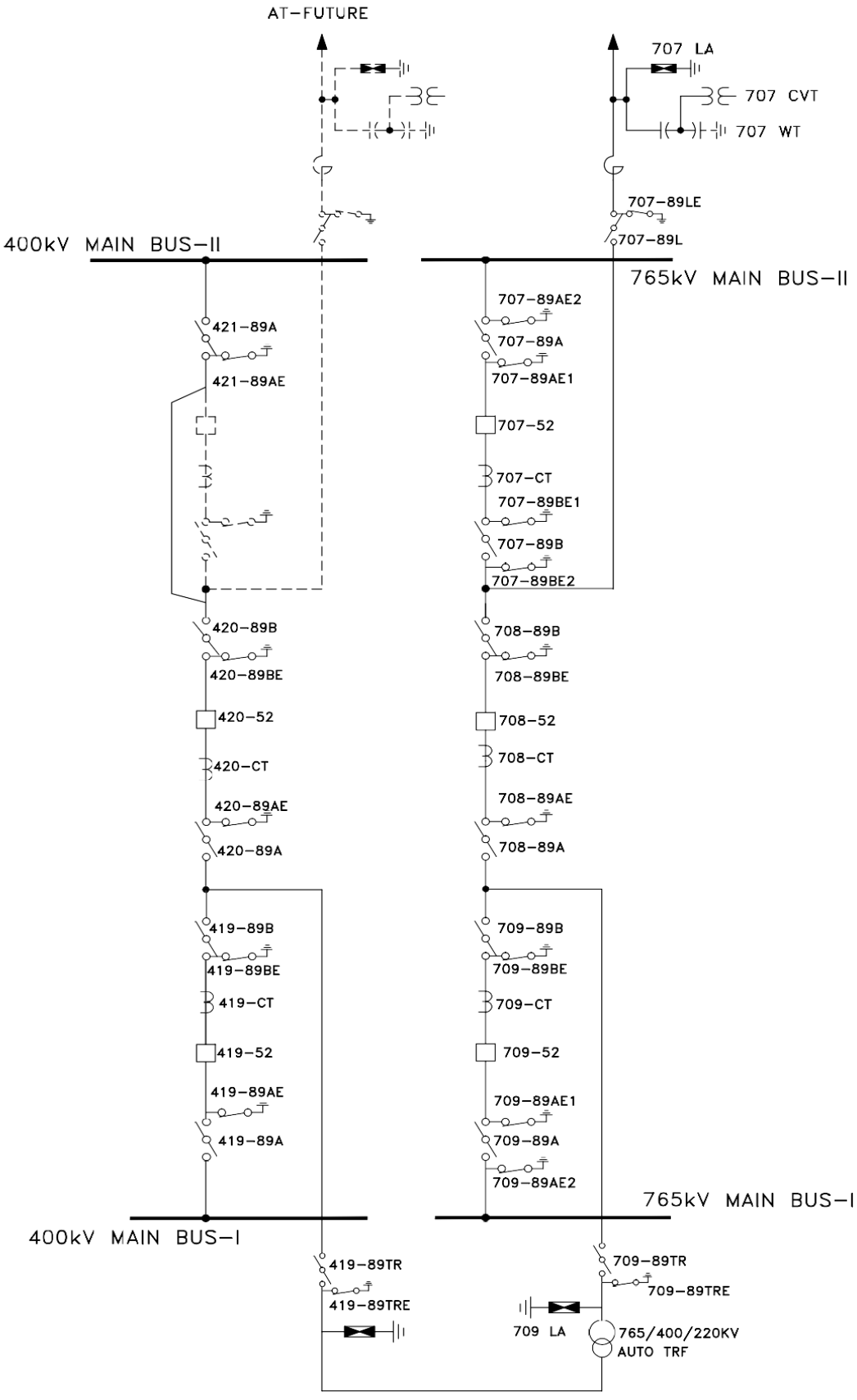


DETAIL "B" (SINGLE PHASE)

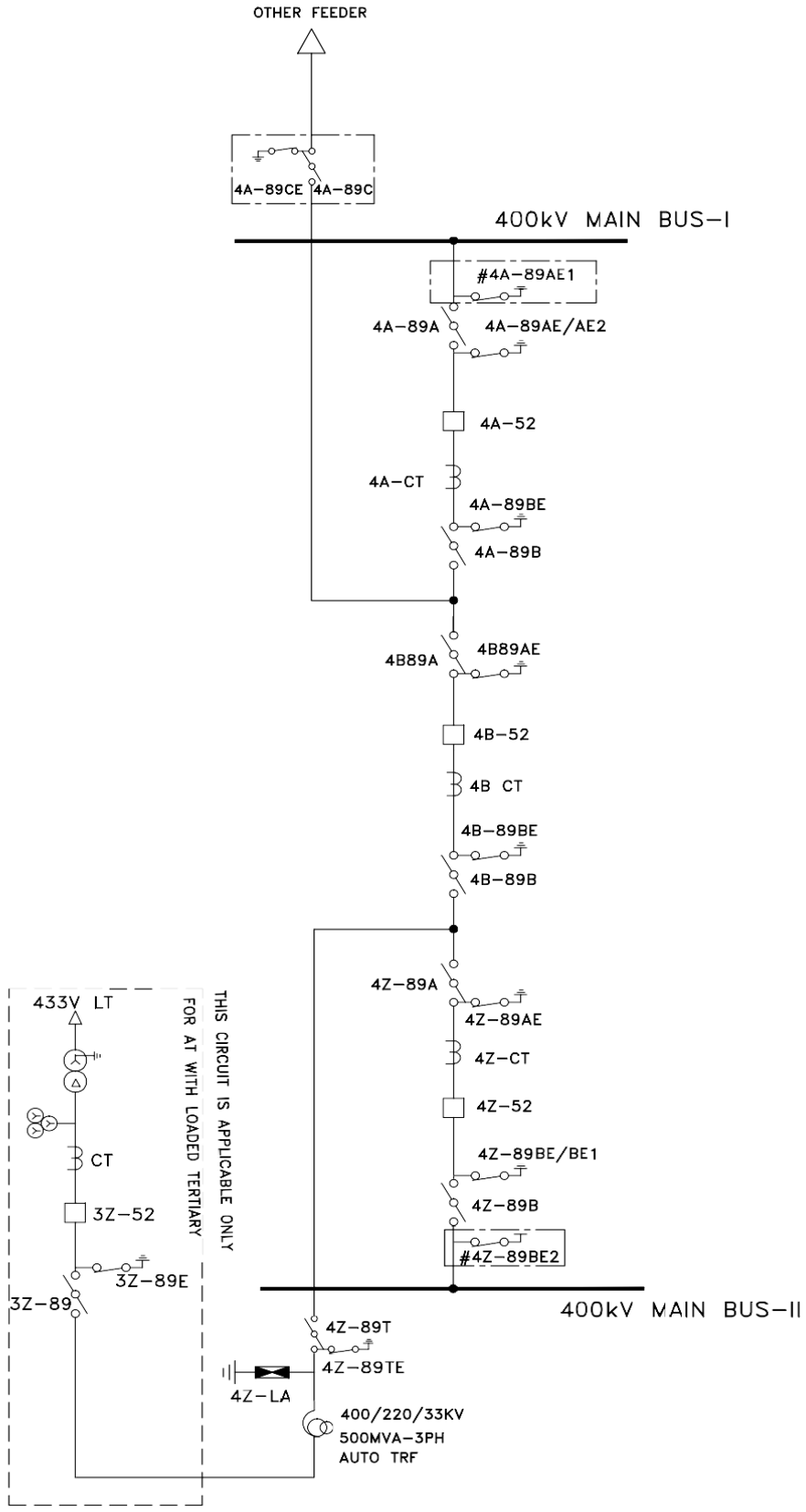
ANNEXURE–V


ICT–1
400/220/33KV
401–F9
Q8
Q9
Q52
P2
P1
Q0
Q51
Q2
Q1
MAIN BUS–I
MAIN BUS–II
401

ANNEXURE – VI


AT-FUTURE
707 LA
707 CVT
707 WT
707-89LE
707-89L
400kV MAIN BUS-II
765kV MAIN BUS-II
421-89A
421-89AE
707-89AE2
707-89A
707-89AE1
707-52
707-CT
707-89BE1
707-89B
707-89BE2
420-89B
420-89BE
420-52
420-CT
420-89AE
420-89A
708-89B
708-89BE
708-52
708-CT
708-89AE
708-89A
419-89B
419-89BE
419-CT
419-52
419-89AE
419-89A
709-89B
709-89BE
709-CT
709-52
709-89AE1
709-89A
709-89AE2
765kV MAIN BUS-I
400kV MAIN BUS-I
419-89TR
419-89TRE
709-89TR
709-89TRE
709 LA
765/400/220KV
AUTO TRF

ANNEXURE–VII



ANNEXURE – VIII