1. Purpose

The purpose of the commissioning standard is to confirm that the HV Metal Clad Switchgear is ready to be placed into service reliably and safely.

2. Description of Applicable Equipment

All HV metal clad switches, circuit breakers, fuse switches, metering cubicles and ring main units such as used on the distribution network (excluding zone substations).

The RMU tests are applicable for stand-alone units and those that form part of a kiosk substation.

3. Test required

1. Insulation Resistance test (Megger)
2. Continuity test
3. Pressure Test -- High Pot (11kV Extensible equipment only)

Consult manufacturer's installation instructions for additional specific instructions if required.

4. Tools and Equipment

1. 5kV Megger
2. Approved test leads
3. DC test set

5. Test Procedures

Ensure correct Operational authorities are issued by an authorised operator prior to starting any test.

Preferred tester to be a metal clad switchgear operator.

The use of the Switchgear Operating Manual should be used in conjunction with the testing procedures.

5.1. Continuity Test

5.1.1. If switchgear is interconnected with Kiosk Transformer, remove HV fuse or open circuit breaker.

5.2. Checking earth switches are working

5.2.1. Ensure that all the load carrying switches are open

5.2.2. Ensure that all the earth switches are closed.

5.2.3. Check the continuity between all HV to earth.

5.2.4. Open earth switches and check the continuity between all HV bushings to earth.

5.3. Checking load switches are working

5.3.1. Ensure that all the load carrying switches are closed.

5.3.2. Ensure that all the earth switches are open.

5.3.3. Check the continuity between all HV bushings of the same phase.

5.3.4. Open load switches and check the continuity between all HV bushings of the same phase.

5.4. Insulation Resistance Test (Megger set on 5kV)

5.4.1. Open all earth switches, close all load carrying switches.

5.4.2. Confirm that all HV fuse or circuit breakers are open.

5.4.3. Earth two of the three actives.

5.4.4. Check one phase at a time to earth.

5.4.5. Change one earth to the active just tested and megger the next phase until all phases have been tested.

5.5. Pressure Test -- High Pot (Phase --phase/earth) 11kV Metal Clad Switchgear only @ 25kV 50Hz for 1 min (For extensible switchgear only)

5.5.1. OPEN all earth switches and load carrying switches.

5.5.2. Confirm that all HV fuses or circuit breakers are OPEN.

5.5.3. Earth one of the three phases

5.5.4. Apply 25kV 50Hz voltage across the other two phases for 1 minute.

5.5.5. At the end of the minute measure the impedance across the phases / phase to earth.

5.5.6. Repeat process (5.5.3 to 5.5.5) for all three phase to phase combinations.

5.5.7. Apply 25kV 50Hz voltage across one phase to earth for 1 minute.

5.5.8. At the end of the minute measure the impedance across that phase to earth.

5.5.9. Repeat (5.5.7 to 5.5.8) for all three phases.

6. Test Result Pass Criteria

When recording these values, an accurate measurement must be recorded. Values with ranges (e.g. 55+MΩ) will not be acceptable. The test results will form the baseline for future maintenance purposes.

Test type	Test Result
Continuity Test	
Earth Switch Closed (Phase to Earth)	Short Circuit (0 Ω / BυZZ
Earth Switch Open (Phase to Earth)	> 5000M Ω / No BυZZ
Load Switch Closed (Phase to Phase)	Short Circuit (0 Ω / BυZZ
Load Switch Open (Phase to Phase)	> 5000MΩ / No BυZZ
Insulation and resistance test (Megger)	
Phase to Earth	> 5000 MΩ (5 GΩ)
Pressure test (Hi Pot Test) 11kV equipment only	
Phase to Phase impedance	> 5000 MΩ (5 GΩ)
Phase to Earth impedance	> 5000 MΩ (5 GΩ)

7. Supporting documents

7.1. Test Report Forms

The commissioning test report is available in the appendix:

- HV Metal Clad Switchgear Test Report

For CitiPower/Powercor employees the commissioning test reports are to be completed via the ClickMobile application, for further details refer to guideline “Testing Form” (Document No. JEQA4UJ443MT-1864305901-228).

The commissioning standards and test reports can also be found on CitiPower/Powercor’s external website from:

- Home/Industry/Supplier Resources/Forms, Reports and Bulletins/Commissioning Standards and Test Reports.

7.2. Standard Works Practices

Related works practices are available from Source:

- SWP High Voltage Underground Cable and Plant Commissioning

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Appendix A - HV Metal Clad Switchgear Test Report

Job Title:

Test Instrument Model		**Instrument No.**	
Test Instrument Model		**Instrument No.**	
Tested by		**Date**	

Type of Switchgear	
Manufacturer	
Serial No	

NOTE: When recording these values, an accurate measurement must be recorded. Values with ranges (e.g. 55+MΩ) will not be acceptable. The test results will form the baseline for future maintenance purposes.

CONFIRM HV FUSES REMOVED OR HV CB OPEN.

CONTINUITY TESTS HV switches to earth:

All load carrying switches open, all earth switches closed. Short circuit 0Ω = PASS.

Switch 1			Switch 2			Switch 3		
A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**

CONTINUITY TESTS HV switches to earth:

All load carrying switches open, all earth switches open. >5000MΩ/ No Buzz =PASS.

Switch 1			Switch 2			Switch 3		
A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**

CONTINUITY TESTS on load switches:

All HV load switches closed, all earth switches open. Short circuit 0Ω = PASS.

		Switch **2**			Switch **3**		
		A	**B**	**C**	**A**	**B**	**C**
Switch **1**	**A**	(0Ω)			(0Ω)		
	B		(0Ω)			(0Ω)	
	C			(0Ω)			(0Ω)

Appendix A - HV Metal Clad Switchgear Test Report (Continues)

CONTINUITY TESTS on load switches:
All load carrying switches open, all earth switches open. >5000MΩ/ No Buzz =PASS

		Switch **2**			Switch **3**		
		A	**B**	**C**	**A**	**B**	**C**
Switch **1**	**A**	(0Ω)			(0Ω)		
	B		(0Ω)			(0Ω)	
	C			(0Ω)			(0Ω)

CONFIRM HV FUSES REMOVED OR HV CB OPEN.

INSULATION RESISTANCE TESTS- 5kV Single phase to earth (earth 2 of the 3 actives):
All HV load switches closed, all earth switches open. >5000MΩ (5GΩ) =PASS

Switch 1			Switch 2			Switch 3		
A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
	Earthed	**Earthed**		**Earthed**	**Earthed**		**Earthed**	**Earthed**
A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Earthed		**Earthed**	**Earthed**		**Earthed**	**Earthed**		**Earthed**
A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**
Earthed	**Earthed**		**Earthed**	**Earthed**		**Earthed**	**Earthed**	

HI POT – 11kV EXTENSIBLE EQUIPMENT ONLY
CONTINUITY TESTINSULATION RESISTANCE TEST

Phase to Phase		**Phase to Earth**	
Red to White	MΩ	Red to Earth	MΩ
Red to Blue	MΩ	White to Earth	MΩ
Blue to White	MΩ	Blue to Earth	MΩ

CHECKLIST

Items	**Checked**	**Comments (if any)**
All required tests satisfactorily completed as per CB021		
Check that the switchgear and complete installation complies with the work instruction requirements		
No visible damage		
Checked HV Gas switch has sufficient SF6/insulant		

Appendix A - HV Metal Clad Switchgear Test Report (Continues)

CHECKLIST (Continues)		
Items	**Checked**	**Comments (if any)**
Mechanical operation checks all carried out with all sources of supply disconnected		
Check all switches open/close correctly		
Check all breakers open/close correctly		
Check all earth switches open/close correctly		
Ensure that interlocks preventing the closure of an earth switch, on a closed switch circuit, operate		
Switchgear body is correctly earthed		
Labels identifying each circuit are correct		
Labels identifying the switchgear by unique number and name are correct		
Cables are correctly terminated		
Cable screen wires are earthed		
Cable phasing is correct		
Cable terminations are correctly installed on the terminations		
Cables are fixed below the terminations		
Current transformers where required are fitted, including fault indicator CTs		
Unused bushings have the dust cover removed and an insulating cap fitted		
Panel mounted fault indicators are on the correct setting		
Unit fitted with Fuses		
Fuses appropriate to the substation size are installed where applicable		
Units fitted with Circuit Breaker		
Protection Setting No		
Protection relay correctly set		
Trip supply correct & connected		
Test trip		

Commissioning Test Passed **Yes -** ☐ **No -** ☐

Comments _____

_____

_____

Signed: _____ **Date:** _____

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