

7.7 Pre-commissioning Test of Substation

(Test reports and documents required for substation commissioning)

Pre commissioning test report format & schedule shall be submitted to and approved by SE, System Protection & Testing-Commissioning, BPDB, Dhaka or Director, Design & Inspection-2, BPDB, Dhaka.

The pre-commissioning test must be witnessed by BPDB engineers and must be signed by the testing team members and witnesses. Description of the test equipment (must have calibration certificate) for each test shall be mentioned.

The below mentioned information and reports must be submitted to the office of the Directorate of Design & Inspection-2, BPDB, Dhaka and SPTC, BPDB, Dhaka at least **15 days** before the expected date of commissioning. Softcopy of the requested information and documents shall be emailed to dir.design2@bpdb.gov.bd / se.sptc@bpdb.gov.bd / dir.system.protection@bpdb.gov.bd.

All the pre commissioning test witness observations shall be complied & the relay settings have to be finalized as per BPDB's recommendation before commissioning.

7.7.1 Circuit Breaker (33 kV):

1. Name plate data
2. Insulation Test (Insulation resistance & DAR across open contact, Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hipot)/ Leakage current test etc.)
3. Closing/Opening operation check from Remote & Local, Closing Interlock check, Anti-pumping operation check
4. Closing/Opening timing check
5. Contact resistance check
6. Spring charge operation check, heating and illumination circuit functionality check

7.7.2 CT/PT (33 kV & 11 kV):

1. Name plate data
2. Insulation Test (Insulation resistance & DAR across Primary to Ground, Secondary to Ground, Primary to Secondary, Secondary 1 to Secondary 2, Phase to Phase etc. with minimum 5 kV test voltage for primary and 500 V test voltage for secondary / Power frequency withstand test (Hipot)/ Leakage current test/ $\tan \delta$ test etc.)
3. Polarity & Ratio test
4. CT magnetization curve test
5. CT secondary winding resistance check

7.7.3 Control & Relay Protection Panel (33 kV):

1. Name Plate Data
2. Complete Relay test (Over current & Earth fault relay, Directional Over current & Earth fault relay (if applicable), Differential relay etc.

3. Primary injection test (Tripping & indication test of Over current & Earth fault relay, CT core allocation check, Single point earthing check)
4. Differential relay & Restricted Earth Fault relay tripping, indication and stability test
5. Master Trip relay, Trip circuit supervision relay, DC/AC fail relay and all other auxiliary relay functionality check
6. Closing/Opening operation check from CP & SCADA, Closing Interlock check, Anti-pumping operation check
7. Trip logic test
8. Alarm and indication circuit functionality check, Indicative meter and Energy meter check
9. Heating and illumination circuit functionality check
10. Wiring/ Ferrule Number/ Color Coding check as per drawing

7.7.4 Switchgear Panel (11 kV):

1. Name Plate Data
2. Insulation Test of Circuit breaker (Insulation resistance & DAR across open contact, Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hipot)/ Leakage current test etc.)
3. Insulation Test of Busbar (Insulation resistance & DAR across Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hipot)/ Leakage current test etc.)
4. Complete Relay test (Over current & Earth fault relay, Directional Over current & Earth fault relay (if applicable) etc.)
5. Primary injection test (Tripping & indication test of O/C & E/F relay, CT core allocation check, Single point earthing check)
6. Master Trip relay, Trip circuit supervision relay, DC/AC fail relay and all other auxiliary relay functionality check
7. Closing/Opening operation check from CP & SCADA, Closing Interlock check, Mechanical Interlock check, Anti-pumping operation check
8. Alarm and indication circuit functionality check, Indicative meter and Energy meter check
9. Closing/Opening timing check
10. Contact resistance check
11. Spring charge operation check, heating and illumination circuit functionality check
12. Wiring/ Ferrule Number/ Color Coding check as per drawing

7.7.5 Power Transformer:

1. Name plate data
2. Insulation Test (Insulation resistance, DAR & PI across HV to LV, HV to Ground, LV to Ground etc. with minimum 5 kV test voltage / Power frequency withstand test (Hipot)/ Leakage current test/ $\tan \delta$ test etc.)
3. Winding Resistance check
4. OLTC functionality check
5. Voltage Ratio check (At all tap changer positions)
6. Open circuit test (magnetizing current and no load loss measurement)
7. Short circuit test (At all tap changer positions)

8. Magnetic balance test
9. Vector group check
10. Bushing CT polarity & ratio test, magnetization curve test, secondary winding resistance check
11. Functionality check of cooling fan (Manual operation by WTI, OTI)
12. Functionality check and trip test of WTI, OTI, PRD, Buchholz relay (MT and OLTC) etc.
13. AVR functionality check (if provided)
14. Oil Test Report (Main Tank (Top & Bottom) & OLTC)
15. Heating circuit functionality check.

7.7.6 Disconnecting Switch/Isolator/Earthing Switch (33 kV & 11 kV):

1. Name plate data
2. Insulation Test (Insulation resistance & DAR across open contact, Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hipot)/ Leakage current test etc.)
3. Contact resistance check
4. Closing/Opening operation check, Mechanical Interlock check

7.7.7 Busbar (33 kV):

1. Busbar details (Size, Type and Capacity etc.)
2. Insulation Test (Insulation resistance & DAR across Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hipot)/ Leakage current test etc.)
- 3.

7.7.8 Underground Cable & Line Conductor (33 kV & 11 kV):

1. Underground Cable & Line Conductor details (Size, Type and Capacity etc.)
2. Insulation Test (Insulation resistance, DAR & PI across Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hipot)/ Leakage current test/ tan δ test (for cable only) etc.)
3. Phase Sequence Check

7.7.9 Earthing Resistance Measurement (Desired value < 0.25 Ω):

1. Substation mesh earthing
2. CRP panel & Switchgear panel earthing
3. 33 kV CB/CT/PT/LA/Isolator etc. earthing
4. Power Transformer body & neutral earthing

7.7.10 ACR (33 kV & 11 kV): (Not applicable)

1. Name Plate Data
2. Insulation Test (Insulation resistance & DAR across open contact, Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hipot)/ Leakage current test etc.)
3. Primary injection test (Tripping & indication test of O/C & E/F protection)
4. Closing/Opening operation check from control unit
5. Closing/Opening timing check
6. Contact resistance check

7.7.11 DC System:

Charger:

1. Nameplate data
2. Functionality check (Boost charge, Float charge, Trickle charge etc.)
3. Protection check (Over voltage, Over load, Short circuit, Earth fault, Reverse polarity etc.)
4. Alarm & Indication check

Battery:

1. Nameplate data
2. Capacity test (Battery bank shall be discharged at rated current by applying load bank under charger switched off condition and voltage of each cell shall be measured at 30 minutes interval with a duration up to Cell EODV)

7.7.12 Attachments:

1. Approved Equipment Layout Drawing (33 kV Switchyard, Control Room, 11 kV Switchgear).
2. Approved Single Line Diagram along with relay model, CT ratio and load.
3. Approved Schematic diagram of CRP panel and Switchgear panel.
4. Approved General Arrangement (GA) drawing of Front View, Rear View, LHS view, RHS view of the panel.
5. Fault level calculation, CT sizing calculation.
6. Trip Matrix along with detail relay settings and related calculation for Line Feeder, Transformer feeder, Incomer Feeder and Outgoing Feeder.