
	Torrent Power Ltd. – Distribution Franchise	Doc. No.: TPDF02-DIS01-OCP-011
	OCP - INSTALLATION AND REPLACEMENT OF SUBSTATION EQUIPMENT	Rev. No. /Dt: 00/ 01.12.2021

DOCUMENT CONTROL


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Amendment Details:

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1	1	0	01.12.2021	First Issue	Shilajit Ray Satish Shah	Snehal Shah Abdulrashid Shaikh
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1. PURPOSE

- 1.1. Installation and Replacement of Substation Equipment.

2. SCOPE OF DOCUMENT

- 2.1. The scope of this document is to define a structured activity-level flow for Installation and Replacement of Substation Equipment
- 2.2. The process document aims to define the guidelines to ensure the process effectiveness as required by the Integrated Management System whenever implemented.

3. FIELD OF APPLICATION

- 3.1. This procedure is used for Installation and Replacement of Substation Equipment in TPL-D's Franchisee areas of Bhiwandi & SMK.

4. FREQUENCY

- 4.1. As and when required

5. AUTHORITIES AND RESPONSIBILITY

- 5.1. The Head of Distribution is responsible for implementation of this procedure for effectiveness.
- 5.2. The Head of HT O&M/Projects at respective locations are responsible for execution of this procedure for effectiveness.

6. REFERENCES

- 6.1. MERC Regulations (with its latest amendments)
- 6.2. Central Electricity Authority (Measures Relating to Safety & Electric Supply) Regulations 2010 (with its latest amendments)
- 6.3. Operating manual of OEM
- 6.4. Guideline # TPDF02-DIS01-GDL-001_Guideline for 22/11KV HV Network Design
- 6.5. Guideline # TPDF02-DIS01-GDL-002_Guideline for HV Asset Management
- 6.6. OCP # TPDF02-STO01-OCP-006 (Operational Control Procedure for Handling, Collection, Storage and Management of Hazardous Waste)

7. SPECIFIC COMPETENCY REQUIREMENTS

- 7.1. Technician / GET/ Jr.Exe/Exe/AM/M should have Knowledge of
 - (1) O&M of Switching & Sub-station equipment
 - (2) Safe working practices and use of PPE
- 7.2. Technician / GET/Jr.Exe/Exe/AM/M having valid authorization from General Manager Distribution shall have authority for electrical isolation and issue of Permit to Work (PTW).
- 7.3. As per competency profile and assessment.

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8. INTERFACE WITH OTHER DEPARTMENTS/SECTIONS, IF ANY

- 8.1. Control Room/NPC for Outage Information
- 8.2. LT O&M, Customer Care Department
- 8.3. Stores for material issue

9. TOOLS AND TACKLES

- 9.1. Tool bag
- 9.2. Multimeter, if required.
- 9.3. Level Gauge
- 9.4. Sling/Nylon ropes/Cotton ropes and D-shackle
- 9.5. Chain pulley block as per site requirement.
- 9.6. Shorting link.
- 9.7. Ladder for working on PMT, if required.
- 9.8. Operating Handle of Switchgear of required make.
- 9.9. Live line detector / Test Lamp
- 9.10. Earth Discharge Rod
- 9.11. DO operating rod (If required)
- 9.12. Special tools for switchgear if required
- 9.13. Testing kits if required


10. PERSONAL PROTECTIVE EQUIPMENTS / SAFETY TOOLS

Following PPEs shall be used to carry out work at site.

- 10.1. Safety shoes.
- 10.2. Safety helmet
- 10.3. Full body harness with lanyard, if required
- 10.4. Hand gloves of 22 KV
- 10.5. Barricading tape (if required)
- 10.6. Caution board / “Men at work” sign board (if required)
- 10.7. Barricading cone (if required)

11. SIGNIFICANT RISK PARAMETERS

- 11.1. Quality Management System: Low
- 11.2. Impact on Environment: High

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- 11.3. Health and Safety Risk: High
- 11.4. Energy Management: Low
- 11.5. Asset Management Risk: High

12. PROCEDURE

12.1. JOB PREPARATION

- (1) Identification of purpose of replacement or installation
 - (a) New installation.
 - (b) Additional requirement of Transformer/Switchgear/FSP in existing substation.
 - (c) Up gradation/ replacement of existing equipment
- (2) Identify and visit the site location for prelims for necessary tools, manpower and material requirement.
- (3) Prepare Reservation / sub reservation for the material required to carry out the work.
- (4) Collect and transport the material and equipment at site.
- (5) Ensure that the crew has necessary manpower to carry out the Installation / Replacement work and only authorised persons shall be allowed to work.
- (6) Ensure that the contractor has necessary manpower to carry out the work and all the persons to work at site should have valid identity card issued by HR department of TPL.

12.2. PRECAUTIONS

- (1) Barricade the working area by barricading tape. Where appropriate sign board indicating the hazard shall be displayed near the barricade. (Requirement is based on site condition)
- (2) Working area should be free from slippery material to prevent slipping.
- (3) Aware all persons for nearby live equipment and maintain safe clearance and safety while working.
- (4) Use all required PPEs during execution of the job.
- (5) Ensure switchgear oil / gas level before operation.
- (6) Carry out the switching in consultation with Control Room
- (7) In case of switchgear wherein remote / local operation is possible through SCADA, ensure that while doing local operation, control switch is to be changed to local from remote position in consultation with control room. In above case in normal condition the control switch is being kept in Remote mode.
- (8) Before / after isolation of the section ensure the substation supply status from DT meter.

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- (9) At each location where isolation has been carried out and in which provision is there for pad locking, provide pad locking or LOTO/ Padlock & Put the NTC sticker and mention the details as under
- (10) Kept NTC sticker and mention the details as under where there is no provision for pad locking
 - (a) Reason for Isolation.
 - (b) Date and Time of Isolation.
 - (c) Isolation carried out by Engineer Name / Sign of Engineer.
- (11) After isolation, ensure zero potential on equipment where work is to be carried out using suitable device (like HV line detector / multimeter / test lamp etc.)

12.3. ISOLATION

- (1) For isolation equipment from the system follows the procedure as per OCP No: TPDF02-DIS01-OCP-005 for Distribution Network Isolation and Normalisation as per the switching requirement.
- (2) Authorized person issue “Permit to Work” as applicable to competent person after required isolation and local earthing

12.4. WORK PROCEDURE

- (1) Loading and unloading of Transformer/Switchgear/FSP is as OCP no. TPDF02-DIS01-OCP-017 for loading, transporting and unloading and storing material.
- (2) Inform to concern person or Department for opening of LT cables
- (3) Make phase indications on each phase of HT/LT cables.
- (4) Disconnect earthing of equipment
- (5) For Transformer Replacement or Installation
 - (a) Disconnect HT/LT cables from bus bars and lower down in the trench.
 - (b) Ensure polarity of DT metering / APFC CT before removing
 - (c) Replace transformer of required size on location.
 - (d) If required, provide suitable packing for leveling of equipment
 - (e) Provide wheel locking as per site situation (Applicable)
 - (f) Install DT meter / APFC CT
 - (g) Ensure correct polarity and size of CT
 - (h) If old termination is required to be replaced, then make new end termination
 - (i) HT/LT cables to be clamped
 - (j) Connect HT/LT/ CT Cables
- (6) For Switchgear Replacement or Installation

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- (a) Removal of Old Switchgear
 - I. Provide tagging on cable before disconnection
 - II. Disconnect HT cables from bus bars and lower down in the trench
 - III. Short three cores of all HT cable termination
 - IV. Remove all coupling of switchgear (if applicable)
 - V. Remove foundation bolts
 - VI. Remove switchgear from foundation
- (b) Installation of switchgear
 - I. Couple switchgear if applicable
 - II. Fix channel on switchgear Base frame.
 - III. Install switchgear at desired location
 - IV. Grouting of switchgear
 - i. Ensure that holes of switchgear match with the grouting bolts.
 - ii. Preparation of plum concrete.
 - iii. Fill the duct properly with the plum concrete.
 - iv. Ensure proper alignment with the help of level gauge
 - v. If not proper, provide suitable packing base of switchgear.
 - vi. Give final touch to the grouting.
- (c) HT Cable Connection
 - I. If old termination is required to be replaced, then make new end termination
 - II. Fix clamps for HT cables if required
 - III. Install Fault Passing Indicator (FPI) CT and CBCT wherever present
 - IV. Connect HT cables as tagged.
- (7) Relay replacement
 - (a) Confirm relay operation by providing external battery source
 - (b) If found faulty then replace as under after making proper isolation
 - I. Open the facia of switchgear
 - II. Confirm and mark Control wiring of relay to be replaced
 - III. Remove all wirings of old relay
 - IV. Remove relay from facia

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- V. Install another relay
- VI. Connect all the control wirings as marked
- VII. Close the fascia of switchgear
- VIII. Check function and settings of relay as per requirement

(8) FSP Replacement / Installation

(a) Removal of old FSP

- I. Disconnect LT Incoming and Outgoing cables from FSP.
- II. Excavate area for removal of FSP
- III. Remove foundation grouting (if applicable)
- IV. Remove foundation bolt of FSP.
- V. Remove FSP from location.

(b) Installation of new FSP


- I. Make a pit for the foundation for FSP wherever it is required
- II. Prepare foundation base with the help of stay blocks
- III. If required, provide suitable packing for levelling of equipment
- IV. Fix FSP Bottom frame with Stay block using Nut Bolts/Anchor Bolts
- V. Reconnect all outgoing and incoming cables.

(c) Installation of FSP on trench

- I. Provide channel and grout the same on trench.
- II. Fix FSP Bottom frame with Channel using Nut Bolts
- III. If required, provide suitable packing for levelling of equipment
- IV. Reconnect all outgoing and incoming cables.

(d) LT Switch/MCCB Replacement

- I. Connect shorting link on Outgoing Side of FSP.
- II. Remove old LT switch/MCCB by disconnecting the LT incoming cables and bus-bar.
- III. Check continuity of new switch/MCCB before installation in ON position
- IV. Install new switch/MCCB in OFF position
- V. Reconnect LT Cables and bus-bar
- VI. Provide proper tapping on exposed live part of LT switch/MCCB

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(e) LT Cable Replacement

- I. Excavate area/ Clean trench to remove excess soil to facilitate LT Cable replacement
- II. Opening of LT cables from FSP side and Transformer LT box side.
- III. Remove old LT incoming cables as per the site requirement between transformer LT cable box to FSP.
- IV. Before laying clean the trench to avoid puncher in cable due to piece of stone of other waste material.
- V. Laying of new LT incoming cable for respective phase as per the site requirement.
 - i. Laying of LT Cable in Ground/Trench, as per site requirement
 - ii. Laying and clamping of LT Cable in case of PMT.
- VI. There should not be any ring or knot in cable.
- VII. Provide Cable holding clamps
- VIII. Crimping of LT cable with proper size of die
- IX. Make termination on Transformer and FSP.

(9) Connect equipment earthing (separate Body and Neutral)

(10) Ensure correct CT Ratio, HT Fuse rating and Relay Setting as applicable.

(11) Phase sequence & Voltage between the phases and between the neutral and phase should be measure/Confirm in DT meter

(12) Do masonry work on foundation (If required)

(13) Provide terminal protectors wherever it is required.


(14) For APFC installation and replacement, refer OCP no. TPDF02-DIS01-OCP-013.

(15) Site housekeeping

- (a) After completion of work remove all packing, waste material and dump, Collect & submit to stores.
- (b) Remove barricades, temporary stakes etc.
- (c) Clean the area of dirt, loose soil etc.
- (d) Remove caution boards, plastic cones

12.5. RESTORATION

- (1) Remove shorting & earthing link from HT as well as from LT side. Remove LOTO/ Padlock and caution board from respective location.
- (2) Take clearance from concerned person and Cancel "Permit to Work"

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- (3) For normalisation of above switching follow the procedure as per OCP No: TPDF02-DIS01-OCP-005 for Distribution Network Isolation and Normalisation.
- (4) First transformer will be charged on no load and phase sequence and voltage test are carried out without fuses for incomer cables in FSP keeping switch OFF LT incoming switch/MCCB in FSP
- (5) After inserting HRC fuses for incomer cables / making LT switch/MCCB “ON” measure voltage of between phase and phase and neutral if required.
- (6) Check power available on FSP/DT Meter
- (7) Inform Control room / NPC of respective zone about restoration of supply.
- (8) Remove temporary switching for above isolation from control room giving all required details in it.

12.6. WORK CHECKLIST

- (1) Update the activities done

12.7. UPDATION

- (1) Give the changes made in the system through SAP Notification so that same can be updated in SDB (System Diagram Book).
- (2) Material reconciliation is to be done.
- (3) Inform GIS/concerned department regarding changes made in the system.

13. IMPACT ANALYSIS OF SIGNIFICANT RISKS

13.1. QUALITY MANAGEMENT SYSTEM

- (1) Details of Quality Issues involved
 - (a) Incompetent manpower (Wrong / Improper installation of accessories of equipment's during replacement)
- (2) Details of Quality Assurance plan
 - (a) Ensure all vendor/staff undergone through Work Quality Training
 - (b) Ensure Effective supervision
 - (c) Penalty mechanism

13.2. HEALTH AND SAFETY

- (1) Details of Health and Safety Hazard involved
 - (a) Contact with Live terminal/ cable/ wire/ busbar
 - (b) Flash Over during switching operation
 - (c) Hit by handles/tools due to slippage/ mishandling
 - (d) Contact with sharp edges

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- (e) Accident due to improper isolation
- (f) Person working at site without TPL supervision
- (g) working/travelling in extreme weather condition
- (h) Electric shock due to improper earthing of welding / Other electrical tools
- (i) Animal/ insect bite
- (j) Use of faulty Tools
- (k) Negligence of use of safety PPEs / Non usage of PPEs/ Use of faulty PPEs.
- (l) Working in bending position / Awkward Posture
- (m) injury due to welding work
- (n) Slips, trips and Falls of Persons
- (o) Working in unhygienic area
- (p) Fall of external object
- (q) Working in congested area
- (r) Fall of person from Height
- (s) Skin contact with oil
- (t) Consumer aggression
- (u) Fire in distribution Transformer
- (v) Contact with Partially charged capacitor
- (w) Poor illumination
- (x) Fall of material /equipment during loading / unloading / shifting/handling
- (y) Flash Due to wrong isolation
- (2) Health and Safety Precautions required
 - (a) Ensure use of PPEs
 - (b) Ensure that authorized person should work
 - (c) Ensure work area is properly barricaded and caution board displayed

13.3. ENVIRONMENT

- (1) Details of Environmental impact
 - (a) Resource depletion
 - (b) Land contamination
 - (c) Air Pollution

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(d) Land pollution

(2) Precautions to minimize Environmental impact

(a) Ensure that all persons working at site are aware about the significant environmental impacts

(b) Ensure that all type of generated waste including hazardous waste should be collected and submitted to stores as per OCP no: TPDF02-STO01-OCP-006.

13.4. ENERGY MANAGEMENT

(1) Details of energy use involved

(a) Fuel consumption in transportation/ material movement

(2) Precautions to minimise energy use

(a) Ensure Optimum Usage & Turn off the engine when not in use

13.5. ASSET MANAGEMENT

(1) Details of Asset related risks

(a) Loss of Equipments

(b) Frequent Small Duration Forced Outages

(c) Sustained Forced Outage requiring Major Repair

(d) Frequent Planned Outages

(e) Overloading of equipment

(f) Mishandling by handling equipment

(g) Derating

(h) Derating / Ageing


(i) Overloading of MCCB

(j) Ageing/ Corrosion/ Rusting

(2) Mitigation plan for asset related risks

(a) Ensure Work as per OCPs

(b) Ensure Training to workforce

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14. LIST OF ATTACHMENTS

Sr	Document /Record Description	Reference No.
1.	Loading, unloading & transportation of material	TPDF02-DIS01-OCP-017
2	Deviation format	TPDF02-DIS00-FOR-001
3	Permit to Work (PTW)	TPDF02-SAQ02-OCP-005-F02

***** End of Procedure *****