



**Bangladesh Power Development Board**  
**INTEGRATED MANAGEMENT SYSTEM**  
**(BASED ON ISO 9001:2015, ISO 14001:2015 & ISO**  
**45001:2018 STANDARDS)**

**PROCEDURE FOR SUBSTATION MAINTENANCE**



# INTEGRATED MANAGEMENT SYSTEM

Document No.:  
BPDB-IMS-PR-055

Revision No.: 00

## PROCEDURE FOR SUBSTATION MAINTENANCE

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### 1.0 Purpose

- To standardize the maintenance works of Sub-Station equipment & lines for effective operation
- To maintain the distribution substation & lines in the best possible way
- To ensure reliable and safe supply of power
- To ensure longevity of the distribution system

### 2.0 Scope

Applies to whole of Integrated Management System of Bangladesh Power Development Board (BPDB).

### 3.0 Terms & Definition

#### Definition

None

#### Abbreviations

BPDB – Bangladesh Power Development Board  
MR – Management Representative  
DMR – Deputy Management Representative  
SDE – Sub Divisional Engineer  
SAE – Sub Assistant Engineer  
AE – Assistant Engineer

### 4.0 Roles and Responsibility

Tasks in Reference Clause Nos.	Responsibility
5.0, 5.1	Concerned SDE/AE/SAE/ Lineman/Gang Leader
5.2, 5.2.1, 5.2.1.1	SDE/AE/SAE/ Line supervisor/ Foreman
5.2.2	SDE/AE SAE, Foreman, Lineman
5.2.3	XEN (O&M), SAE, Foreman, Lineman
5.2.4, 5.3, 5.4, 5.4.1, 5.4.2	XEN, SDE, AE
5.5	DMR, Management review Committee

### 5.0 Procedure

#### 5.1 Planning

- Distribution substation maintenance planning, the first considerations are
  - Bus-bar and feeder arrangement
  - Redundancy of transformers

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- Minimum level of operation
- Equipment clearance
- Availability of materials/ spares
- Available manpower for maintenance
- Minimum outage time
- Minimum cost involvement possible etc.
- Periodic inspection is classified as follows
  - Yearly Inspection
  - Emergency Inspection In doing above-mentioned tasks guidelines provided in BPDB's "Manual for Operation & Maintenance of Distribution System"
  - Volume-I and Volume-II is followed
  - Monthly inspection and yearly inspection is carried out according to the schedule.
  - The frequency of scheduled maintenance is decided by the location of equipment and the condition of the system.
  - The staff members wear approved uniforms on duty hours. Casual wear & loose sandals are not allowed.
- Every Lineman keep following items with him during patrolling
  - Safety Belt, Helmet,
  - Set of Hand-tools,
  - Walkie Talkie set,
  - Other means of communication
  - Any other tools & equipment which are required to be carried as decided by the competent authority
- Each gang leader keeps note book for recording, reporting sheet or form, pencil, etc. with him during line inspection
- Patrolling of the line is done in a group of at least two men unless compelled as security point of view as well as from the possibility that in case of emergency one man can contact with the office while References
- Safety clearance is maintained of energized line/ equipment

### 5.2 Implementation

#### 5.2.1 Monthly Inspection

- Preparing a suitable monthly schedule of patrol so that the whole length of distribution lines of the region are inspected at least once in a month.
- Special section of the lines as stated below are identified and patrolled as frequently as possible
  - a) Sections where trees, bamboos, etc. grow high more quickly than other places
  - b) Sections where erosion seems likely to occur
  - c) Sections where houses are crowded
  - d) River crossings

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- Identification and required actions are circulated among respective line supervisor
- Inspection of at least 10% of the lines at the respective region with special attention to angle towers/ poles, river crossings, line isolators, other important locations, etc. as required/ seem to be required
- Inspection of 100% of the lines at the respective region is covered by couple of months
- Inspection done during Patrol:
- Building, structure, hut, factory, plant, chimney, etc. under construction or under planning in the right of way or in the vicinity of the line
- Tree, bamboo, sugarcane, banana, orchard, etc. in the right of way or in the vicinity of the line which have grown enough and may create hazard by reducing clearance from the conductor.
- Any other electric or communication line, railway line, bridge, road, etc. under construction or under planning in the right of way or in the vicinity of the line, any erosion or crack of the ground around foundation of tower/pole and symptom of the same
- Any damage to line materials such as insulator, conductor, hardware, pole, tower, etc.
- Any abnormality in the line which may cause hindrance in smooth operation of the line

#### 5.2.1.1 Works done during Patrol

- If construction work as stated at clause no 2.1.8.1 are found, the owner should be asked to clear or stop the work and the matter should be reported to SDE in charge in on the following day of inspection
- If any obstacles or defects are found in the line and seem possible to be removed or repaired by lineman without any danger, Lineman does first the same and then report to the SDE/AE in-charge through SAE
- If any tree and/or bamboo grow up, it is cut or trimmed so as to keep sufficient clearance. For proper safety measures, if necessary, line shut-down is confirmed before performing such activity.
- Immediately re-tight any loose bolts if no danger on the work observed, otherwise report to the SDE/AE through SAE. If linemen are informed of any defect of line from the local people, they report the matter to the higher authority in-charge without delay after inspection by themselves
- Lineman always explain to local people the importance and danger of the line and warn not to climb up towers/ poles, not to throw stones or not to shoot with pin towards insulators, conductors, and not to fly kites near the lines
- In case of forest fire or house fire occurs in the vicinity of the line, lineman immediately take necessary action for the protection of the line and request the local people to assist them, if necessary at the same time he informs his office about the occurrence.

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- SDE/ SE investigate sites by himself as stated to investigate the site physically as stated in the "Manual for Operation & Maintenance of Distribution System" Volume-I

### 5.2.2 Yearly Inspection

- The line is inspected in detail once in every year
- Schedule of yearly inspection patrol is prepared and given to the SAE the schedule and instructions who will perform the inspection with the help of foreman and lineman/line helper. During the yearly inspection patrolling, monthly inspection on the same section may be eliminated
- Following Items are Inspected in detail on the whole line during yearly inspection

**Towers/ Poles:** Followings are observed and necessary actions are taken as required

- Inclination of tower/pole
- Rust, corrosion, damage and missing of tower members, bands, washers, bolts & nuts, pole & pole fittings
- Loosening of bolts and nuts
- Crack or damages on concrete foundation
- Erosion, crack of ground around the foundation
- Missing of tower/pole earthling
- Loosening of Guy wire/Stay wire
- Missing of Guy wire/Stay wire

**Insulators:** Followings are observed and necessary actions are taken as required

- Assembling of insulator string set, mounting of pin insulator
- Crack, chip, damage, dirt or nest of birds/ wasps on insulator Rust, corrosion, dirt, damage, bent, missing, loosening, etc. of fittings, bolts, nuts and pins.
- Conductor & Ground Wire: Followings are observed and necessary actions are taken as required
  - Damage of conductor and ground wire, corrosion of steel core of ACSR ground wire.
  - Loosening of conductor/ too much sag.
  - Clearance between conductor and pole/tower body Bend or any defect of joint Obstacles on conductor or ground wire such as kite, kite string, dead bird, etc. Loosening, rust, corrosion, missing or damage of clamp, armor rod, etc.
- Scrutinize in detail the report and make a schedule of necessary repairing works for further inspection or other necessary actions

### 5.2.3 Emergency Inspection

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- Making a schedule of the repairing work which presumably succeeds to the emergency patrol
- After a storm, heavy rainfall or thunder or after a short time line fault, the precautionary patrol is made as soon as possible
- Precautionary Patrol
- Even in the case of no fault after a storm, heavy rainfall or thunder, linemen urgently patrol the whole line route according to the instruction of the XEN
- Special attention is paid to inspect the location & growth of trees, bamboos, etc. If anything find out which appears to give a cause of fault, they do as required
- After patrol linemen reports to the concerned officer/ CS who should immediately take necessary preventive measure, if needed
- When the power supply is interrupted due to a permanent fault on the line, linemen are sent along the line immediately
- Each linemen thus deputed, should quickly inspect poles/towers, insulators, conductors, etc. in his section and return to report the result of his inspection for the arrangement of repairing work
- If the cause of fault seems to be cleared easily, the linemen clear it and return for reporting

### 5.2.4 Maintenance of Sub-Station Equipment

- Isolator
- Lightning arrester
- Circuit breaker I
- Battery and battery charger
- Oil circuit reclosure (OCR)
- Moulded case circuit breaker (MCCB)
- Current transformer
- Voltage transformer
- Control relay & meter panel
- Protective relays
- Other Items
- All equipment are inspected, necessary tests are carried out following the provisions of the "Manual for Operation & Maintenance of Distribution System" Volume-I and Volume-II

### 5.3 Break down Maintenance

- Whenever a fault occurs in sub-station equipment the tripping record is analyzed to confirm whether there is a break down.
- XEN/ SDE is informed over telephone about the break down within quickest possible time.
- XEN/ SDE inspect the equipment & send feedback information confirming the fault nature

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- Action plan for repairing and maintenance of the equipment is taken up if instantaneous repair is not possible
- Local grid/ Control center to be informed
- After getting the requested shutdown of the equipment and necessary clearance, maintenance work is done
- A report will be prepared by SAE/AE/SDE including Repair/ Rectification

### 5.4 Preventive Maintenance

- For all sub-station equipment long-term preventive maintenance plan at least for 3 years is prepared
- Equipment history and maintenance of all equipment are maintained
- Concern authority approve preventive maintenance plan
- Resources and spares are mobilized to carryout preventive maintenance
- Where applicable, shutdown is solicited
- Plan/ Scheduled maintenance is modified to adjust with the approval of shut down
- Maintenance work is carried out following approved plan
- Necessary checks are performed after maintenance work
- Recording

#### 5.4.1 Recording

- All equipment test reports along with the records of the actual maintenance works performed including the spare parts used are maintained for future reference
- All kinds of maintenance work are recorded, both in the maintenance log & shift diary

#### 5.4.2 Reporting

After the completion of annual maintenance program, submits the report to XEN

### 5.5 Safety Procedures to Follow

Safety of both man (maintenance gang) and equipment must be considered

- Team leader of the working party must ensure that, the equipment is de-energized, isolated from the system & properly grounded (by both Earth Switch & locally) and & safe for working.
- The maintenance zone must be marked
- Tags are used for easy recognition of equipment under maintenance and/or out of Operation
- Before giving clearance, team leader of the working party ensures that
  - All personnel have cleared the maintenance zone
  - All tools & equipment are removed from the area

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- Local grounding is removed.
- Procedure for Substation Maintenance regarding the maintenance of grid substations and its effectiveness after implementation of its decisions will be checked and reviewed during internal audits.
- Review consideration will be raised in MRC Meeting for decision
- Corrective actions will be taken to improve the system on the basis of review

### 5.6 Environmental Aspect, Impact & Controls

Any activity at the plant, whether it is carried out for ensuring quality of service or meeting requirement of the interested parties, there will be some environmental aspects associated with it. It is a requirement of the IMS of BPDB to identify those environmental aspects, evaluate their impact and determine necessary controls. While carrying out the activities and operation, the employees of BPDB need to exercise appropriate and predetermined controls so as to prevent or mitigate any adverse impact that may be associated with the activity or the process. Some examples of environmental aspects associated with the Procedure for Substation Maintenance are as below:

SI Nos.	Aspect	Impact	Controls
1.	Solid Waste(wires, plastics)	Soil / Water Pollution	1. Follow the waste management plan
2.	Discarding of Rare Earth Metals	Depletion of Resource	1. Follow the waste management plan
3.	Chemical Cleaning Agent	Soil / Water Pollution	1. Work and dispose as per the chemical disposal plan 2. Provide Necessary Training
4.	Rejection of Refrigerant	Depletes Ozone layer	1. Use the latest eco-friendly air-conditioner
5.	Water for Cleaning	Water Use	
6.	Paper Use	Natural Resource Depletion	Avoid printing e-mail and drafts (display documents on screen rather than printing out a paper copy) § Archive electronically
7.	Lighting	Natural Resource Depletion	Using day lightings § Unnecessary lights should be switched off

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8.	Empty Packs	Waste Generation	Segregate properly and deliver to the central admin department
9.	Effluent from toilet use	Water Pollution	Dispose to Municipal discharge connection for adequate disposal
10.	Battery Disposal	Soil / Water Pollution	1. Follow the waste management plan
11.	Capacitors Disposal	Soil / Water Pollution	1. Follow the waste management plan

The table above provides examples only. The IMS team of each site needs to identify the aspect impact and controls related to specific activities and ensures that the environmental performance of the organization is effectively maintained. For this purpose, the procedure “Environmental Aspect Impact Assessment Procedure” is to be followed and forms “Environmental Aspect Impact Register” is to be filled up by the IMS team.

### 5.7 OHS Hazard, Risk & Controls

Any activity at the plant, whether it is carried out for ensuring quality of service or meeting requirement of the interested parties, there will be some occupational hazards with it related to the occupational health and safety (OHS) to the workers and employees. It is a requirement of the IMS of BPDB to identify those OHS hazards and determine necessary controls.

While carrying out the activities and operation, the employees of BPDB need to exercise appropriate and predetermined controls so as to prevent or mitigate any adverse consequence that may be associated with the activity or the process.

Some examples of OHS hazards and with the Procedure for Substation Maintenance are as below:

SI Nos.	OHS Hazard	Controls
1.	Soldering	1. Provide Necessary training 2. Maintain adequate PPE whilst at worksite 3. Ensure a Permit to Work is issued as per guidance before personnel is sent for work
2.	Energized Components	1. Completely de-energizing equipment, conductors or circuits before an employee begins work

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		<ol style="list-style-type: none"><li>2. Maintain adequate PPE whilst at worksite</li><li>3. Ensure a Permit to Work is issued as per guidance before personnel is sent for work</li></ol>
3.	Control Room Fire Hazard	<ol style="list-style-type: none"><li>1. Use of fire extinguisher</li><li>2. Follow the 'Prevention of Fire and Explosion' Procedure</li></ol>
4.	Failure of PTW Process	<ol style="list-style-type: none"><li>1. Provide Necessary Training</li><li>2. Active Supervision of activity</li></ol>
5.	Wrong Use of tools	<ol style="list-style-type: none"><li>1. Provide Necessary Training</li><li>2. Active Supervision of activity</li></ol>
6.	Wrong use of Lifting equipment	<ol style="list-style-type: none"><li>1. Provide Necessary Training</li><li>2. Active Supervision of activity.</li><li>3. Maintain adequate PPE whilst at worksite</li></ol>
7.	Dropped object	<ol style="list-style-type: none"><li>1. Provide Necessary Training</li><li>2. Maintain adequate PPE whilst at worksite</li></ol>
8.	Fall	<ol style="list-style-type: none"><li>1. Provide Necessary Training</li><li>2. Maintain adequate PPE whilst at worksite</li></ol>
9.	Expose to Chemicals	<ol style="list-style-type: none"><li>1. Provide Necessary Training</li><li>2. Maintain adequate PPE whilst at worksite</li></ol>
10.	Cold Burn	<ol style="list-style-type: none"><li>1. Provide Necessary Training</li><li>2. Maintain adequate PPE whilst at worksite</li></ol>
11.	Chemical Burn	<ol style="list-style-type: none"><li>1. Provide Necessary Training</li><li>2. Maintain adequate PPE whilst at worksite</li><li>3. Maintain adequate housekeeping</li></ol>
12.	Electric Shock	<ol style="list-style-type: none"><li>1. Ensure a Permit to Work is issued as per guidance before personnel is sent for work</li><li>2. Maintain LOTO Procedure</li><li>3. Maintain adequate PPE whilst at worksite</li></ol>
13.	Wrong Startup	<ol style="list-style-type: none"><li>1. Alarm</li><li>2. Ensure a Permit to Work is issued as per guidance before personnel is sent for work</li></ol>
14.	Improper re-assembly of equipment	<ol style="list-style-type: none"><li>1. Provide Necessary Training</li><li>2. Active Supervision of activity</li></ol>

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The table above provides examples only. The IMS team of each site needs to identify the OHS hazards and necessary controls related to specific activities and ensures that the environmental performance of the organization is effectively maintained. For this, the procedure Hazard Identification and Risk Assessment Procedure is to be followed and Hazard Identification and Risk Assessment Register is to be filled up by the IMS team.

### 6.0 Reference

- a) Manual for Operation & Maintenance of Distribution System" Volume-I and Volume-II
- b) Monthly inspection schedule of patrol
- c) Performa No MIR-L1

### 7.0 Appendix

None

### 8.0 Revision History

SI No.	Revision Number	Section	Change Made	Date of Revision

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