DOCUMENT CONTROL

Document Number	**TPDF02-DIS01-OCP-019**	
Title of Document	**SURVEY BASED MAINTANANCE & BREAKDOWN MAINTENANCE OF HT OVERHEAD LINE**	
Document owner:	General Manager (HV Cell)	
Prepared by / Modified by	Mr. Amit Magdum Manager HV Cell	07.11.2021
Reviewed by	Mr. Shilajit Ray Mr. Satish Shah Asst. General Manager HV Cell	22.11.2021
Approved by	Mr. Snehal Shah Mr. Abdulrashid Shaikh Vice President HV Cell	30.11.2021
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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. Maintenance (Breakdown & Survey Based) of 22 KV & 11 KV Overhead Line.

2. SCOPE OF DOCUMENT

2.1. The scope of this document is to define a structured activity-level flow for Schedule Shutdown, unscheduled shut down for maintenance of OH line

2.2. The process document aims to define the guidelines to ensure the process effectiveness as required by the Integrated Management System

3. FIELD OF APPLICATION

3.1. This procedure is used for maintenance of 22KV and 11 KV Overhead line 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. OCP # TPDF02-STO01-OCP-006 (Operational Control Procedure for Handling, Collection, Storage and Management of Hazardous Waste)

6.2. Guideline # TPDF02-DIS01-GDL-003_Guideline for Applicable Legal Requirement

7. SPECIFIC COMPETENCY REQUIREMENTS

7.1. Technician/GET/Jr.Exe/Exe/AM/M should have Knowledge of

(1) O&M of Overhead Line equipment

(2) Safe working practices and use of PPE

7.2. Technician/GET/Jr.Exe/Exe/AM/M shall have authority for electrical isolation and issue of PTW

7.3. As per competency profile and assessment.

8. INTERFACE WITH OTHER DEPARTMENTS/SECTIONS, IF ANY

8.1. Control Room/NPC for Outage and temporary switching Information

8.2. Call centre for information to the consumer

8.3. Store for material issue and return

8.4. Service Providers for material and manpower

9. TOOLS AND TACKLES

9.1. Live line detector

9.2. Short links

9.3. FRP Ladder

9.4. Tree cutter/trimmer/Axe, if required

9.5. Telescopic earth discharge rod

9.6. Operating rod

9.7. Boom Arrangement (wherever required)

10. PERSONAL PROTECTIVE EQUIPMENTS / SAFETY TOOLS

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

10.1. Safety Shoes/Gum boots.

10.2. Safety helmet.

10.3. Full body harness with lanyard/ double hook

10.4. Reflective jacket

10.5. Insulated hand gloves of 22 KV class

11. SIGNIFICANT RISK PARAMETERS

11.1. Quality Management System: Low

11.2. Impact on Environment: High

11.3. Health and Safety Risk: High

11.4. Energy Management: Low

11.5. Asset Management Risk: Medium

12. PROCEDURE

12.1. JOB PREPARATION

(1) Shutdown Planning.

While planning for shutdown following points are generally being followed:

(a) To take shutdown of HT OH line in industrial area during Staggering day / plan load shedding.

(b) HT OH line in residential area on any working day / plan load shedding.

(c) HT OH line in commercial area generally on Sunday / Holiday / plan load shedding.

(d) For breakdown maintenance unscheduled shutdown to be taken in consultation with control room .

(2) List of various activities to be carried out during breakdown / Survey based maintenance of HT overhead line:-

(a) Collect the data from Asset survey/ breakdown patrolling Report

(b) Collect the data for capital job to be carried out in said network feeders.

(c) Tree trimming / tree cutting below / nearby HT OH line.

(d) Line cleaning if required (i.e., removing kite sticks / thread / foreign material etc. on OH line conductor across the span / Pole fittings etc.

(e) Reinstate stay / providing stay / stay insulator.

(f) Attending leaning / damage pole.

(g) Attending / replacing damage conductor.

(h) Attending / replacing / providing Guard wire.

(i) Replacing corroded / damaged pole fittings like pin top / V cross arm / Terminal channel/cut point channel/support angle.

(j) DP structure accessories.

(k) Replacing Insulators like Pin insulator / Disc insulator.

(l) Replacing tension/suspension hardware.

(m) Providing pole earthing.

(n) Attending / replacing HT Jumpers / Line to DO & DO to Transformer jumpers

(o) Attending/ replacing DO unit / DO fitting / DLS.

(p) Attending HT Outdoor terminations.

(3) Identify data regarding the feeder & the various jobs to be executed as listed above

(a) Name of feeder.

(b) Whether part or entire feeder under shutdown / breakdown

(c) Decide the switching in sequence for carrying out above shutdown / breakdown

(d) Collect the data from Asset survey/breakdown patrolling Report

(e) Collect the data for capital job to be carried out in said network feeders.

(f) Plan for man power to carryout various jobs during schedule shutdown / breakdown as per the priority and site situation.

(g) Material required for associated activities, as required.

(4) Ensure and provide for adequate access, working space.

(5) Inform all above details to allocated person.

(6) Ensure that the contractor / technician gang has necessary manpower to carry out the

job and all the persons to work at site should have valid ID card issued by HR department, TPL.

(7) To communicate site supervisor regarding the person involved in the electrical job shall refrain from wearing conductive ornaments (like: Ring, chain in neck, bracelet and wrist watch)

12.2. **PRECAUTIONS**

(1) Barricading the working area by barricading tape with appropriate sign board indicating the hazard shall be displayed near the barricade wherever required

(2) Aware all persons for nearby any live network and maintain safe clearance and safety while working, and isolate the same if required

(3) Use all required PPEs during execution of the job.

(4) Following steps to be followed for working at height.

(a) Boom van or scaffolding/temporary platform with railing shall be used.

(b) Whenever boom/platform not available, ladder shall be used

(c) Whenever & wherever reaching with boom and/or ladder is not possible, suitable clamp (like top-fitting, LT 2-pin channel etc.) shall be used at suitable intervals generally at 1 mtr. interval for hooking the safety harness. No monkey climbing shall be done at any point of time

(d) Person who has to climb on the ladder and/or aforesaid support clamps must wear/use safety helmet, safety shoes, , fall arrestor, full body harness with lanyard which is be hooked & locked properly in ladder and/or aforesaid support clamps and finally at v-cross arm/channel on pole at convenient height where the person has to perform the job.

(e) Ladder is to be erected in safe working condition wherever available and its top end is to be tied with pole by means of rope.

(f) All the materials should be lifted or lowered by means of hand line only and nothing should be thrown up by the helper at ground or thrown down by the lineman above. As there is tendency, many times on the part of the work man to throw smaller items such as spanner, bolts, nuts etc. from the ground to the top or from the top to the ground to save the labour and time which may lead to an accident hence it is should be strictly avoided.

(g) Persons certified medical fit shall only be allowed for working at height.

12.3. **ISOLATIONS**

(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) Maintenance of Overhead Line:

(a) Removal of kite stick/s, threads, wires etc.

(b) Take the bamboo rod of sufficient length & strength.

(c) Place a metallic wire on top of the bamboo rod.

(d) Elevate the bamboo & run the top of bamboo stick on the conductor along the span & trap the kite thread / magnetic tape / kite sticks / bird nest etc. in above metallic wire &pole fitting / conductor etc. Repeat the same for all three conductors as per the site requirement & see that all above foreign materials have been removed & span is cleaned.

(e) If kite sticks, threads or wires are present on the pole, and then remove them by climbing the pole.

(2) Removal of tree branches.

(a) Prior permission from respective authorities (like Gram Panchayats, Municipal Corporations, local Forest Department etc.) may be required before plan out above activities.

(b) Whenever tree branches have been engrossed in the line & for removing the same if line is to be safeguarded, prior to tree cutting activity, necessary precautions are to be taken like

(c) safeguarding of pole,

(d) Lowering of conductor line conductors.

(e) While cutting the tree branches proper cutting tools like Axe etc. to be used & no man other than who is cutting the tree stand below the tree.

(f) Also, the person who is cutting the branch should use required PPEs like safety belt etc. & same is to be tightened at suitable location so that during the tree cutting / tree branch falling, it will not create any unsafe situation to the person carrying out above activity.

(g) Check that trees are at a sufficient distance from overhead line.

(h) If the distance is less, then

I. Climb the tree with the help of ladder.

i. Start cutting branches that are near to line.

ii. Cut branches till sufficient distance is maintained.

II. Similarly check the entire span in the section & remove tree branches as required.

If heavy big branch / trunk of trees is to be cut, it is to be tied with cotton rope of required length & other end of the rope should be tide on suitable support on opposite site of the location from where tree cutting is to be done. When the

tree branch is on verge of removal, the tension is to be released from the support by releasing the rope from the same. When the cut tree branch falls on the ground rope is to be released.

(3) Check for the guard wire.

(a) If old guard wire is to be removed, then

I. Choose any one end of the span between two shackle points.

II. Ensure binding of guard wire is secure at the far end of span.

III. Tie rope / come along clamp to guarding at first end.

IV. Remove binding of guard wire on all the poles in between two tension poles.

V. Lower guard wire to ground.

VI. Lower guard wire to ground at far end.

(4) Insulators:

(a) All the insulators (Pin / Disc Insulator) should be minutely checked for flashover mark / crack and chippings and where these are observed and if required same is to be replaced

(b) Clean all disc & pin insulators with the waste cloth where ever it is required.

(5) Poles:

(a) The foundation or earth filling should be checked and rectified.

(b) PSC / Rail pole should be checked for cracks / corrosion and replaced wherever necessary. The barbed wires & caution board on the pole should be retied properly.

(c) Wherever it is required, concrete the pole foundation.

(d) Attending Leaning Poles:

I. Understand the scope of work to be carried out on the line.

II. Place the support pole / ladder just below the pole on the leaning direction and hold the support firmly on its based on the ground.

III. Tide a sling wire on the pole top fitting.

IV. Re instatement of pole in plumb position:

i. Anchor the hook of hoist of the crane in the loop of cotton wire/belt on the pole top fitting.

ii. Tie the pole by temporary guy ropes of adequate size approximately 1200 mm apart for controlling the movement of pole. Open the pole foundation and excavate the pit in opposite direction of pole leaning.

iii. Move the boom of the crane slowly such that the pole comes in plumb position. Tide the guy ropes firmly on the ground on the crowbar which is to be inserted in the ground for taking load exerted on above guy rope.

V. Preparing foundation

i. Simultaneously prepare mixture of cement, sand & kapachi.

a. The concreting is done in ratio 1:2:4 (that is 1 part of cement, 2 part of sand and 4 parts of coarse aggregates/metals) where concreting is done muffing of the pole should be carried out normally 300 mm in diameter and up to 300 mm above the ground level and finished smooth by cement slurry. This will prevent the pole from rusting due to water. Proper care should be taken while earth filling is carried out. The excavated earth is first making with rubble or coarse aggregates in dry form outside the pit then adequate quantity of water is sprinkled on it and the mass of excavated earth then shovelled up back and forth to form homogeneous lump. This mass is then filled up inside the pit and during this process ramming by means of wooden piece or crowbar to be done to ensure no air voids in filled earth.

b. After allowing the concreting material to be cured, dismantle ropes tide on poles & release the hoist of the crane.

c. The other erection related jobs on the pole to be performed after the concreting is got solid.

VI. Check the alignment of pole in respect to other poles of line.

VII. If it is required to provide stay on the pole. Follow the procedure as per OCP No: TPDF02-DIS01-OCP-020 for Stay work for pole.

VIII. If it is required to provide strut pole to support above pole, then erect the pole of required size.

(6) Cross Arm:

(a) The cross arm and clamps as well as top fittings and other metal parts should be checked for proper levelling and wherever necessary these should be brought in level.

(b) If metallic parts are found rusted, these should be replaced by new fittings. The bolt nuts are tightened. The broken & rusted bolt / nuts are to be replaced.

(7) Stays

(a) If stay is found loose, the stay rod is to be tightened by means of bolts provided on stay bow channel assembly. The stay assembly near the stay foundation should be checked to keep the stay in proper position.

(b) If stay rod is rusted and a weak section is developed, same is to be replaced. If stay wire is rusted or strands are damaged particularly near stay bow same is to be replaced. For that during replacement, temporary stay is to be provided by means of cotton / manila rope of required length & one end of the same is to be tightened with pole & other end to be tightened on crowbar which is to be fixed away from the pole at required distance. After fixing stays, temporary stay is to be dismantled.

(8) Conductor:

(a) The OH conductor should be checked for equal & adequate sagging. In case the sag is found, it should be got adjusted as per the site requirement.

(b) The conductor should be checked for broken strands as these develop into weak points and ultimately break, such broken strands should be repaired by properly covering by using repair sleeves.

(c) In case of ACSR conductor if steel conductor is got damaged, same is to be attended by making joints with Aluminium twisting joint pipes / mid span compression joint of suitable size as per conductor size.

(d) Binding on insulator should be checked and replaced if found broken.

(e) Joints should be checked for burns mark / improper binding in case of maximum joints and preferably to be replaced by Aluminium twisting joint pipes / mid span compression joint.

(f) In case of breakdown attending, Conductor jointing to be done with use of binding on overlapping of conductors not less than 200 mm, replacement of same span can be planned in scheduled shutdown of feeder .

(9) Jumpers attending

(a) Check jumpers of shackle point

(b) Check whether jumpers are straight.

(c) All jumpers are to be connected properly with main line conductors preferably with

I. Crimping of proper size of Aluminium lugs on tails of main line conductor & ends of jumper wires & connecting the same by means of nut, bolts & washers.

II. By means of binding with Aluminium wires. In such cases end of jumpers & tails of main conductors at all cut points are to be overlapped at least by 150 mm & then binding is to be done by aluminium strands of main line conductor

III. Put support pin insulator below jumpers wherever required.

IV. Tie jumper to pin insulator by binding.

V. Check jumper provided between cable & conductor.

VI. Check for sparking, corrosion of nut bolt.

VII. If it is present, then replace lug or nut bolt.

VIII. Apply insulating tape at lugs.

(10) Attending OH line isolation Devices (Viz. DL/ DO etc.)

(a) Disconnector link

I. Check & overhaul the clamping arrangement of Dis-connector link. Through DO operating ROD check for its "ON"/ "Off" operation.

II. Copper braded strips / or any male - female contact assembly is worn out entire contact assembly is to be replaced as per the requirement.

(b) Drop Out unit assembly

I. Check the proper DO fuse wire is used as per the transformer rating.

II. Check for DO contact, if worn out replace the DO unit along with DO carrier.

III. Also, wherever bare fuse wires are there in place of DO carrier same is to be replaced by entire DO unit along with the DO carrier & proper size of DO fuse element.

(11) Outdoor Termination

(a) Check the pole box clamping arrangement. No excessive load should be exerted on HT bushing of the equipment on which the termination is connected.

(b) The HT jumpers of HT outdoor termination should be supported on pole structure fitting suitably so that load of the same should not come on the trifurcation point as it is most critical point for the reason of failure of the termination.

(c) Each outdoor termination should be provided with name plate of respective substation name to which it is connected.

(12) Painting & numbering/renumbering of poles:

(a) For iron pole (Rail pole/ Girder pole etc. pole painting is necessary. Wherever it is required same is to be painted / repainted with two coats of primer (red oxide paints) & then two coats of silver (Aluminium paint).

(b) Before applying above paints, the entire surface is to be cleaned thoroughly & allow the time interval between each coat to be applied.

(c) Each pole is to be verified for its pole numbering & wherever required pole numbering is to be given to the required pole & painted on its surface at required height as per the standard practice of giving pole numbering. (Having alpha numeric numbering)

(13) Pole Accessories:

(a) Each pole is provided & tied properly with caution board showing voltage level of the line & danger symbol as per the standard at about 8 feet height.

(b) Each pole is tied with Anti climbing Devices i.e. barbed wire

(c) Wherever the pole is having double power, caution board showing" Double Power" or any suitable nomenclature to be painted & provided on the pole.

(14) Site housekeeping

(a) 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) Ensure the backfilled areas are level with ground surface.

(e) Remove caution boards, traffic bollards (plastic cones).

12.5. **RESTORATION**

(1) Remove shorting & earthing link from HT as well as from LT side.

(2) Take clearance from concerned person and Cancel "Permit to Work"

(3) For normalisation of above switching follow the procedure as per OCP No: TPDF02-DIS01-OCP-005 for Distribution Network Isolation and Normalisation.

(4) Check power available on FSP/DT Meter

(5) Remove temporary switching for above isolation from control room giving all required details in it

(6) Inform Control Room/NPC & Respective EHV S/S from which the feeder is emanating.

12.6. **WORK CHECKLIST**

(1) Update entries in Standard Format (Field Force Application or Hard copy

12.7. **UPDATION**

(1) Material reconciliation is to be done.

(2) Update in Drawing / GIS / SAP, if applicable.

13. IMPACT ANALYSIS OF SIGNIFICANT RISKS

13.1. **QUALITY MANAGEMENT SYSTEM**

(1) Details of Quality Issues involved

(a) Incompetent manpower (Improper Maintenance)

(2) Details of Quality Assurance plan

(a) Work Quality/OCP Training

(b) Effective supervision

(c) Penalty mechanism

13.2. **ENVIRONMENTAL**

(1) Details of environmental impact

(a) Resource Depletion

(b) Land Contamination

(2) Precautions to minimize Environmental impact

(a) Avoid unnecessary tree cutting.

(b) Convert OH to UG

(c) 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.

13.3. **HEALTH AND SAFETY**

(1) Details of Health and Safety Hazard involved

(a) Person working at site without TPL supervision

(b) working/travelling in extreme weather condition

(c) Animal/ insect bite

(d) Contact with Live terminal/ cable/ wire/ busbar

(e) Working in congested area

(f) Working nearby flooded area during monsoon

(g) Use of faulty Tools

(h) Negligence of use of safety PPEs / Non usage of PPEs/ Use of faulty PPEs

(i) Accident to public due to Working without Area barricading

(j) Fall of overhead line

(k) Working in unhygienic area

(l) Contact with sharp edges

(m) Fall of person from Height

(n) Slips, trips and Falls of Persons

(o) Fall of material /equipment during loading / unloading / shifting/handling

(p) Travelling in heavy traffic

(q) Electric shock due to improper earthing of welding / Other electrical tools

(r) Failure of loading / unloading equipment

(2) Health and Safety Precautions required

(a) Ensure use of PPEs

(b) Maintain Clearance as per Guideline

(c) Ensure authorised person is working on site.

(d) To follow the OCP.

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 – OH line

(a) Loss of Equipment's

(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) Ageing/ Corrosion/ Rusting

(2) Mitigation plan for asset related risks

(a) Work as per OCP

(b) OH to UG work

14. LIST OF ATTACHMENTS

Sr	Document /Record Description	Reference No.
1	Network Survey/patrolling report format	TPDF02-DIS01-CHK-001-F01
2	Permit to Work (PTW)	TPDF02-SAQ02-OCP-005
3	Deviation Format	TPDF02-DIS00-FOR-001

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