District Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date Prepared Date Revised:

**OBJECTIVE**

To ensure adequate safety to persons engaged in the maintenance and operation of electrical switchgear.

**RATIONALE/PURPOSE**

An effective Switch Maintenance Program is essential to:

* Ensure electrical distribution system reliability.
* Develop predictive maintenance programs.
* Determine capital improvement budgeting.
* Develop loss trend analysis.
* Ensure system isolation capability.

**METHODS/PROCEDURES**

The following methods and procedures are recommendations that illustrate methods used by the electrical industry for switchgear equipment.

**Plan for the Maintenance of Switchgear Equipment**

The following steps will help you formulate a comprehensive maintenance action plan and in turn an effective Switchgear Maintenance Program.

**Before the Outage**

Review your equipment history. What failures have occurred? Are you aware of any repair or refurbishment needs?

* Review drawings and other documentation. Are relevant drawings current? Do you have the correct instruction manuals?
* Perform visual inspection(s), thermal scan(s), partial discharge test(s), and other test(s) before the outage so you can take corrective action when it happens.
* Identify and order all materials required for the outage and take lead times into account.
* Develop a specific written work plan and schedule. Communicate this information to all involved personnel and update.

**This model form/template must be customized to meet your Agency’s needs.**

* Conduct a tailgate safety meeting to be sure each person understands any dangers, special circumstances, and related work assignments.

**During the Outage**

* Shutdown the switchgear and apply protective grounds. Follow lockout/tagout procedures. Barricade and put-up warning signs as appropriate.
* Check and correct any drawing inconsistencies or connection questions.
* Perform inspections and cleanings.
* Disconnect as necessary for tests.
* Make any planned repairs, changes, or upgrades.
* Perform measurements and tests.
* Based on test results, make additional repairs.
* Ensure inspections, repairs, and tests are recorded.

**Concluding the Outage**

* Re-connect and torque connections.
* Account for all tools and personnel.
* Make a visual check of all work.
* Remove grounds and then test to ensure you have no-unintentional grounds.
* Energize switchgear and verify normal operation.
* Remove barricades and signs and follow appropriate procedures to clear the lockout/tagout condition.

**After the Outage**

* Interview crews about problems they may have encountered. Ask them for recommendations for improving response efforts during the next outage or preventing problems that occurred in this one.
* Prepare a report of maintenance outage and test results. Include trending and analysis of results and recommendations for future maintenance as appropriate.

**SAFETY CONSIDERATIONS**

The effective maintenance and operation of electrical facilities can help to prevent damage to property, environment, injury to the public, and employees by:

* Preclude electrical equipment and distribution system damage.
* Inspection and testing frequency.
* Visual observations,
* Mechanical and electrical testing.
* Facilitate operations and maintenance personnel safety.
* Identify safe work practices.
* Electric shock and burns.
* Electrical shock hazard from ungrounded or poorly grounded enclosures,
* Arc-flash.
* Burns to skin and eyes from electrical arcing and molten metal.
* Personal Protective Equipment requirements,
* Lockout/tagout.
* Crowded working conditions within enclosures resulting in personnel-safety. hazards.
* Safety signs and/or warning lights.

**COST-BENEFIT**

* Reduce system failure.
* Avoid costly repair and replacement.
* Create a manageable capital improvement budget.
* Enhance system reliability.

**INSPECTION FORMS/CHECKLISTS/DOCUMENTATION/ASSETS**

* Switchgear checklist
* Low voltage <600 volts and switchgear

**REFERENCES**

Electrical work should comply with the latest revisions to the following codes and standards:

A. National Electrical Code (NEC) - [National Fire Protection Association (NFPA) No. 70](https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70).

B. National Electrical Safety Code [(NESC) - ANSI C2](https://www.techstreet.com/ieee/standards/ieee-c2-2017?_bt=224075084340&_bk=+nesc%20+code&_bm=b&_bn=g&_bg=24308510286&gclid=EAIaIQobChMI4NDRps_m6gIVUCCtBh3PTAMJEAAYASAAEgJDbvD_BwE&gateway_code=ieee&product_id=1914980).

C. Cal/OSHA [8 CCR – 2299-2599](https://www.dir.ca.gov/title8/sub5.html) (Low Voltage) and [2700-2889](https://www.dir.ca.gov/title8/sub5.html) High Voltage.

Title 8, Division 1, Chapter 4, Subchapter 5 (Electrical Safety Order).

Group 1 Low Voltage, Group 2 High Voltage Safety Order.

D. Occupational Safety and Health Act (OSHA).

Title 29 CFR 1910 Subpart S – Electrical.

Title 29 CFR 1926 Subpart K, Subpart V – Electrical.

E. [NFPA 70E](https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=70E)- Standard for Electrical Safety Requirements for Employee Workplaces.

F. International Electrical Testing Association (NETA) Section 7.