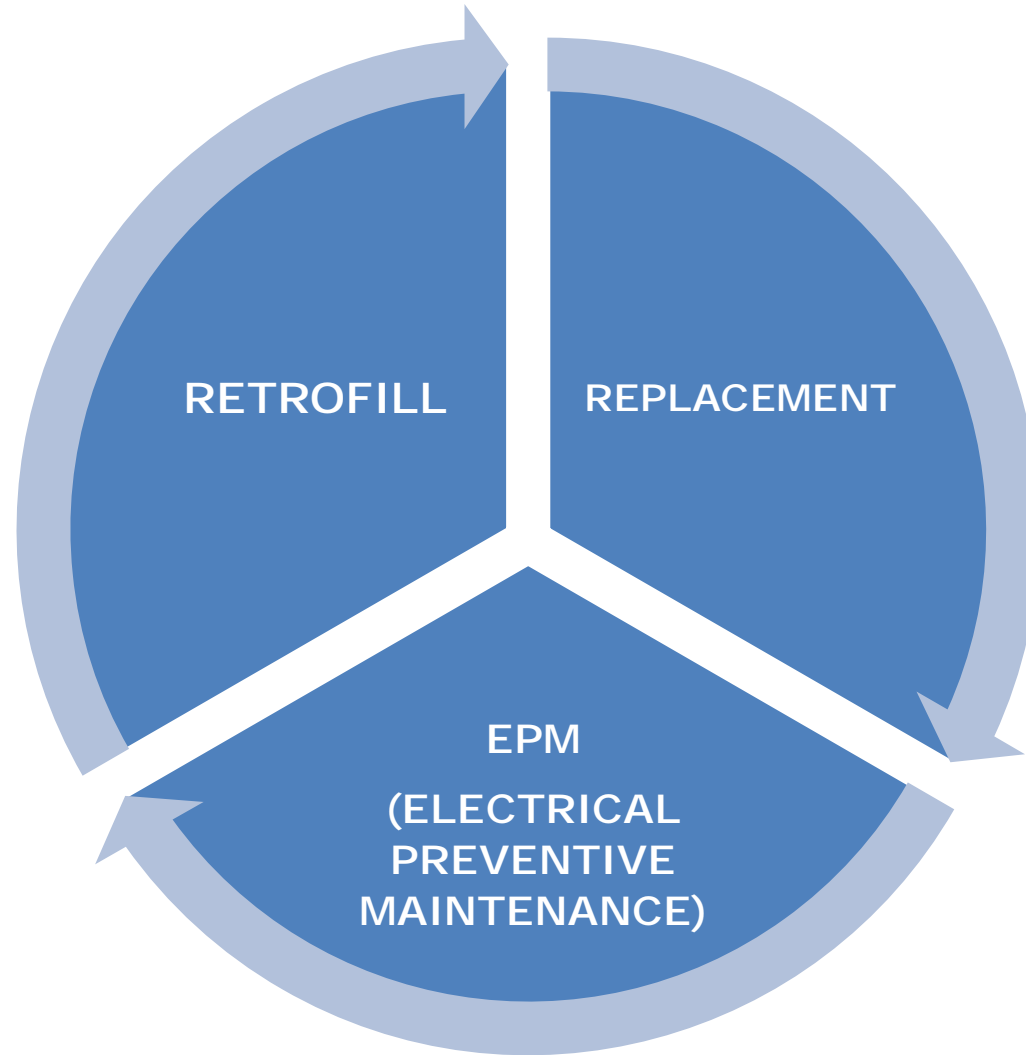




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Electrical Preventive Maintenance (EPM)

- ✓ Frequency of EPM
- ✓ Recommended Maintenance Practice
- ✓ Record Keeping
- ✓ Infrared Inspection



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Standard Recommendations

✓ NFPA 70B

✓ NEMA AB4

✓ NETA

✓ OSHA

✓ IEEE 1415

✓ IEEE 43



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Recommended Maintenance Practices

SWITCHGEAR

ü *Enclosure*

ü *Insulator, Supports, Connectors*

ü *Conductors*

ü *Shutter & Mechanism Cassette of VCB or VCS*



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Recommended Maintenance Practices

Air Circuit Breaker

- ü *External*
- ü *Insulation & Contacts*
- ü *Arc Interrupters*
- ü *Operating Mechanism*
- ü *Aux. Devices*



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Recommended Maintenance Practices

Vacuum Circuit Breaker

- ü *External*
- ü *Insulation & Contacts*
- ü *Vacuum Interrupters*
- ü *Operating Mechanism*
- ü *Aux. Devices*



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Recommended Maintenance Practices

Oil Circuit Breaker

- ü *External*
- ü *Insulation Oil Test*
- ü *Contact*
- ü *Operating Mechanism*
- ü *Aux. Devices*



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Recommended Maintenance Practices

Molded Case Circuit Breaker

- ü *External*
- ü *Insulation & Contact*
- ü *Operating Mechanism*
- ü *Aux. Devices if any*



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Recommended Maintenance Practices

Air Disconnecting Switch

- ü External*
- ü Insulation & Contact*
- ü Operating Mechanism*
- ü Arc Blade*
- ü Aux. Devices if any*



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Recommended Maintenance Practices

CT's & VT's

ü Clean & Tighten All Terminals Connection

ü Insulation & Contact

ü Poor Grounded



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Recommended Maintenance Practices

Battery Station & Charger

- ü Clean & Tighten All Terminals Connection*
- ü Clean Battery Studs & Cable ends*
- ü Check Electrolyte levels & Specific Gravity*
- ü Battery Rooms Should be Well Ventilated*



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Recommended Maintenance Practices

UPS System

- ü Clean & Tighten All Terminals Connection*
- ü Clean Battery Studs & Cable ends*
- ü Check Inverters for Fluid Leaks from Wave-Forming Capacitors.*
- ü UPS Rooms Should be Well Ventilated*



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Recommended Maintenance Practices

Oil Transformer

- ü Check Insulation Oil*
- ü Ensure All Connection are Tightened*
- ü Check Tank & Bushing Should be un-leakage*
- ü External*



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Recommended Maintenance Practices

Dry Transformer

- ü Clean All Coils, Connection, Insulator*
- ü Ensure All Connection are Tightened*
- ü Check Cooling Fan*
- ü External*



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Recommended Maintenance Practices

Surge Arrester

- ü Clean & Inspect*
- ü Ensure All Connection are Tightened*
- ü Poor Grounded*
- ü Ensure Leakage Current Test, Insulation Resistance Test*



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Recommended Maintenance Practices

Protective Relays

- ü Visual & Mechanical Inspection*
- ü Ensure All Connection are Tightened at Terminal Relays*
- ü Poor Grounded*
- ü Electrical Testing, Ensure All Function Are Established Settings Specified by Relays.*



Recommended Maintenance Practices

Cable & Bus

- ü Cables in Main Holes, Check for Sharp Bend – Physical Damage - Excessive Tension – Cable Movement – Cracked Jackets – Poor Ground Connection – Corroded*
- ü Aerial Cables, Check for Excessive Wear at Support Points – Check Mechanical Damage from Vibration*
- ü Raceways, Check for Proper Mechanical Support*
- ü Busduct, All Connection Busbar Should be Cleaned & Properly Torque - Check for Proper Mechanical Support – Cracked Busbar Support – Poor Ground Connection*



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Recommended Maintenance Practices

Infrared Inspection

An infrared or thermo-graphic, inspection should be performed at least once every three years on all switchgear, distribution panels, cable and bus connections, motor control centers and starters, and other critical equipment. Infrared inspections are extremely beneficial in reducing electrical failures by identifying potentially dangerous conditions; such as, loose or dirty connections, overloaded or imbalanced circuits, or improperly installed equipment



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Recommended Maintenance Practices

Record Keeping

The electrical preventive maintenance program should be well-documented as to scope and frequency of maintenance. Record all routine maintenance activities and the results of routine testing for trending purposes. Document all repair and/or replacement of electrical components. When changes are made to the electrical distribution system, update all applicable drawings and maintenance schedules to reflect the changes. Ensure that spare parts inventories are updated for any new equipment added based on the manufacturer's recommendations.



Recommended Maintenance Practices

Form Check List

SWITCHGEAR CHECK LIST

LOCATION _____
 JOB # _____ DATE _____ TEMPERATURE _____ °F _____ HUMIDITY % _____

MANUFACTURE DATA
 MANUFACTURE _____ SERIAL NO. _____
 VOLTAGE CLASS _____ TYPE _____
 CONSISTING OF: _____ TOTAL BREAKERS _____ TOTAL INSTRUMENTS _____ TOTAL RELAYS _____
 _____ MOLDED CASE BREAKERS

EXTERNAL CONDITION GOOD FAIR POOR

GENERAL INSPECTION OF EXTERIOR OF EQUIPMENT	INSPECT BREAKER AND CELL CONTACTS
INSPECT FOR DAMAGE, BENT OR TWISTED DOORS	VACUUM AND CLEAN INTERIOR OF CIRCUIS
INSPECT DOOR HANDELS, LOCKING BARS AND MECHANISM	LUBRICATE DRAWOUT ASSEMBLY
CHECK DOOR INTERLOCKS FOR PROPER OPERATION	CHECK CELL INTERLOCKS AND AUXILIARY CONTACT ASSEMBLIES
CHECK CONTROL KNOBS AND SWITCHES FOR FREEDOM OF MOVEMENT AND CONTACT CONDITION	PERFORM BREAKER INSPECTION AND TEST
INSPECT FOR BROKEN RESTRAINTS, RELAY COVERS AND GLASS	INSPECT AND PERFORM INSULATION TEST OF POWER CABLE / BUS TO GROUND
INSPECT FOR IMPROPER GROUNDING OF EQUIPMENT	RESTORE CONTROL POWER TO SWITCHGEAR
INSPECT BUS AND SUPPORT INSULATORS	CHECK RELAYS FOR POSITIVE TRIPPING
CLEAN BUS INSULATORS	TEST AMMUNISTOR-ALARM FOR TARGET
ELECTRIC TEST OF BUS BORN AND POTHEADS	CHECK PANEL LEDS FOR OPERATIONAL BURNED OUT / MISSING BULBS AND LAMP COVERS
INSPECT CONTROL AND HEATING TRANSFORMERS	OPERATE CLOSE AND TRIP BREAKER CONTROLS
INSPECT AND CHECK INSTRUMENTS	CHECK AUTOMATIC TRANSFER OPERATION
CHECK CONDITION OF WIRING AND TERMINAL CONNECTIONS	MAKE FINAL VISUAL INSPECTION; REMOVE LEADS, TOOLS, ETC.
REMOVE DRAWOUT BREAKING	NOTE AND REPORT ANY UNMARKED CIRCUITS
CHECK RAILS, GUIDES, ROLLERS AND SHUTTER MECHANISM	REPORT UNSAFE CONDITIONS

COMMENTS: _____

DEFICIENCIES: _____

TESTED BY: _____



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Recommended Maintenance Practices

Training Support

- ü Safety Procedure & Operation Procedure*
- ü Maintenance Procedure*
- ü Basic Fault Finding*
- ü Re-Engineering Design System*



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