

Periodic Maintenance Schedule

NETA Section	Equipment Description	Maintenance	Visual	Visual & Mechanical	Visual & Mechanical & Electrical
7.1	Switchgear & Switchboard Assemblies	Inspect internally, clean, lubricate insulation resistance test, over potential test, function test	Annual	Annual	2 Years
7.2	Transformers				
7.2.1.1	Small Dry Type Transformers	Inspect internally, clean, polarization index, power factor test, insulation resistance test, turns-ratio test	Bi-Monthly	Annual	3 Years
7.2.1.2	Large Dry Type Transformers	Inspect internally, clean, polarization index, power factor test, insulation resistance test, turns-ratio test	Monthly	Annual	2 Years
7.2.2	Liquid Filled Transformers	Inspect internally, clean overall power factor test, insulation resistance test, turns-ratio test, fluid analysis	Monthly	Annual	2 Years
	Fluid Analysis	Dielectric, acidity, specific gravity, interfacial tension, color, visual, Karl Fischer, power factor, dissolved gas			Annual
7.3	Cables				
7.3.2	Low Voltage Cables	Inspect, insulation resistance test, D.C. high potential test	Bi-Monthly	Annual	3 Years
7.3.3	Medium and High Voltage Cables	Inspect, insulation resistance test, D.C. high potential test	Bi-Monthly	Annual	3 Years
7.4	Metal Enclosed Busways	Inspect, clean, insulation resistance test, D.C. high potential or power factor test, infrared scan	Bi-Monthly	Annual	2 Years
	Infrared Only				Annual
7.5	Switches				
7.5.1.1	Low Voltage Air Switches	Inspect, clean, lubricate and adjust, insulation resistance test, contact resistance test, operational test	Bi-Monthly	Annual	3 Years
7.5.1.2	Medium Voltage Metal Enclosed Switches	Inspect, clean, lubricate and adjust, insulation resistance test, contact resistance test, operational test		Annual	2 Years
7.5.1.3	Medium and High Voltage Open Switches	Inspect, clean, lubricate and adjust, insulation resistance test, contact resistance test, operational test	Monthly	Annual	2 Years
7.5.2	Medium Voltage Oil Switches	Inspect, clean, lubricate and adjust, insulation resistance test, contact resistance test, operational test	Monthly	Annual	2 Years
7.5.3	Medium Voltage Vacuum Switches	Inspect, clean, lubricate and adjust, insulation resistance test, contact resistance test, operational test	Monthly	Annual	2 Years
7.5.4	Medium Voltage SF6 Switches	Inspect, clean, lubricate and adjust, insulation resistance test, contact resistance test, operational test	Monthly	Annual	2 Years
7.5.5	Cutouts	Inspect, clean, lubricate and adjust, insulation resistance test, contact resistance test, operational test	Annual	2 Years	2 Years
7.6	Circuit Breakers				
7.6.1.1	Low Voltage Insulated/Molded Case CB	Inspect, clean, lubricate and adjust, high current test, calibrate overcurrent device, contact resistance test, insulation resistance test or full replacement	Monthly	Annual	3 Years
7.6.1.2	Low Voltage Power CB	Inspect, clean, lubricate and adjust, high current test, calibrate overcurrent device, contact resistance test, insulation resistance test	Monthly	Annual	3 Years
7.6.1.3	Medium Voltage Air CB	Inspect, clean, lubricate and adjust, power factor test, contact resistance test, insulation resistance test, full operational test	Monthly	Annual	3 Years
7.6.2.1	Medium Voltage Oil CB	Inspect, clean, lubricate and adjust, power factor test, contact resistance test, insulation resistance test, fluid analysis	Monthly	Annual	3 Years
	Fluid Analysis	Dielectric, acidity, specific gravity, interfacial tension, color, visual, Karl Fischer, power factor, dissolved gas			Annual
7.6.2.2	High Voltage Oil CB	Inspect, clean, lubricate and adjust, power factor test, contact resistance test, insulation resistance test, fluid analysis, time-travel analysis	Monthly	Annual	Annual
	Fluid Analysis	Dielectric, acidity, specific gravity, interfacial tension, color, visual, Karl Fischer, power factor, dissolved gas			Annual
7.6.3.1	Medium Voltage Vacuum CB	Inspect, clean, lubricate and adjust, power factor test, contact resistance test, high potential test, vacuum bottle integrity test	Monthly	Annual	2 Years
7.6.4.1	Extra High Voltage SF6	Inspect, clean, lubricate and adjust, power factor test, contact resistance test, insulation resistance test, full operational test	Monthly	Annual	Annual
7.7	Circuit Switches	Inspect, clean, lubricate and adjust, verify SF6 pressure, contact resistance test, insulation resistance test, full operational test	Monthly	Annual	Annual
7.8	Network Protectors	Inspect, clean, lubricate and adjust, contact resistance test, insulation resistance test, calibrate network relay, operational test	Annual	Annual	2 Years
7.9	Protective Relays				
	Electromechanical	Inspect, clean and lubricate, insulation resistance test, operational test	Monthly	Annual	Annual
	Electronic	Inspect, clean and lubricate, insulation resistance test, operational test	Monthly	Annual	Annual
7.10	Instrument Transformers	Inspect, clean, insulation resistance test, polarity test, ratio verification test	Annual	Annual	3 Years
7.11	Metering Devices	Inspect, clean, verify freedom of movement, verify accuracy	Annual	Annual	3 Years
7. Annual	Regulating Apparatus				
7. Annual.1.1	Step Voltage Regulators	Inspect, clean and lubricate, insulation resistance test, verify liquid level, verify heaters are operational, inspect contacts, inspect tap changer, turns ratio test, fluid analysis, operational test	Monthly	Annual	2 Years
	Fluid Analysis	Dielectric, acidity, specific gravity, interfacial tension, color, visual, Karl Fischer, power factor, dissolved gas			Annual
7. Annual.3	Load Tap Changers	Inspect, clean, operational test, resistance measurement, insulation resistance test, fluid analysis	Monthly	Annual	2 Years
	Fluid Analysis	Dielectric, acidity, specific gravity, interfacial tension, color, visual, Karl Fischer, power factor, dissolved gas			Annual
7.13	Grounding Systems	Inspect, ground resistance test (fall of potential) and two point test	Bi-Monthly	Annual	2 Years
7.14	Ground Fault Protection Systems	Inspect, verify sensors, insulation resistance test, verify pick-up and time delay, functional test	Bi-Monthly	Annual	Annual
7.16	Motor Control				
7.16.1.1	Low Voltage Motor Starters	Inspect, clean and lubricate, inspect contractor, insulation resistance test, test circuit breaker	Bi-Monthly	Annual	2 Years
7.16.1.2	Medium Voltage Motor Starters	Inspect, clean and lubricate, insulation resistance test, over potential test, contact resistance test	Bi-Monthly	Annual	2 Years
7.16.2.1	Low Voltage Motor Control Centers	Inspect, clean, lubricate and adjust, insulation resistance test, contact resistance test, operational test	Bi-Monthly	Annual	2 Years
7.16.2.2	Medium Voltage Motor Control Centers	Inspect, clean and lubricate, insulation resistance test, over potential test, contact resistance test	Bi-Monthly	Annual	2 Years
7.17	Adjustable Speed Drive Systems	Inspect, clean, insulation resistance test, test circuit breaker, relay calibration, operational test	Monthly	Annual	2 Years
7.18	Direct Current System				
7.18.1	Batteries	Inspect, clean, service cell, specific gravity test, cell test, equalizing chargers	Monthly	Annual	Annual
7.18.2	Battery Chargers	Inspect, clean, verify operation of cooling fans, meters and alarms	Monthly	Annual	Annual
7.19	Surge Arrestors				
7.19.1	Low Voltage Devices	Inspect, clean, resistance measurement, insulation resistance test	Bi-Monthly	Annual	2 Years
7.19.2	Medium and High Voltage Devices	Inspect, clean, resistance measurement, insulation resistance test	Bi-Monthly	Annual	2 Years
7.20	Capacitors and Reactors				
7.20.1	Capacitors	Inspect, clean, resistance measurement, insulation resistance test, resistance of internal discharge resistors	Monthly	Annual	Annual
7.20.3.1	Reactors Dry Type	Inspect, clean, insulation resistance test, winding resistance measurement, over potential test	Bi-Monthly	Annual	2 Years
7.20.3.2	Reactors Liquid Filled	Inspect, clean, insulation resistance test, winding resistance measurement, over potential test, fluid analysis	Monthly	Annual	2 Years
	Fluid Analysis	Dielectric, acidity, specific gravity, interfacial tension, color, visual, Karl Fischer, power factor, dissolved gas			Annual
7.21	Outdoor Bus Structures	Inspect, clean porcelain, check connections infrared scan, insulation resistance test	Monthly	Annual	3 Years
7.22	Emergency Systems				
7.22.1	Engine Generator	Inspect, clean, insulation resistance test, check vibration, verify governor and regulator	Monthly	2	Annual
	Functional Testing				2
7.22.2	Uninterruptible Power Systems	Inspect, clean, resistance measurement, test alarms, test circuit breakers, test batteries, test transfer switch	Monthly	Annual	Annual
	Functional Testing				2
7.22.3	Automatic Transfer Switches	Inspect, clean, lubricate and adjust, insulation resistance test, contact resistance test	Monthly	Annual	Annual
	Functional Testing				2
7.2 Years	Automatic Circuit Reclosers & Line Sectionalizers				
7.2 Years.1	Automatic Circuit Reclosers, Oil/Vacuum	Inspect, clean, resistance measurement, insulation resistance test, function test	Monthly	Annual	2 Years
	Fluid Analysis	Dielectric, acidity, specific gravity, interfacial tension, color, visual, Karl Fischer, power factor, dissolved gas			Annual
7.2 Years.2	Automatic Line Sectionalizers, Oil	Inspect, clean, check contact alignment, insulation resistance test, fluid analysis, function test	Monthly	Annual	2 Years
	Fluid Analysis	Dielectric, acidity, specific gravity, interfacial tension, color, visual, Karl Fischer, power factor, dissolved gas			Annual

The International Electrical Testing Association (NETA) recognizes that the ideal maintenance program is reliability-based, unique to each plant and to each piece of equipment. The schedule above is a guide to NETA recommended testing and maintenance intervals and should be used in conjunction with a qualified maintenance program.

With Quad Plus, you are assured that all testing is performed objectively, according to NETA specifications, using calibrated instruments traceable to the National Institute of Standards and Technology (NIST).



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Cost Control and Progress Reporting
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Process & P&ID development
Process Investigation
Process Improvements
Site Selections—Greenfield Sites—Brownfield Sites

Power Studies

Arc-Flash Analysis
Coordination Study
Transient Stability
Short Circuit Studies
Power Quality Analysis
Stability Studies
Power Factor Correction
Harmonic Analysis
Load Flow Studies
Grounding System Studies
Arc-Flash Corrections
Power Engineering
Substation Design
Custom Substation Expansions
Transformer Upgrades
Automatic Transfer Switch Design/Supply
Synchronous Motor Field Application System Retrofits
Power Monitoring
Wound Rotor Motor Slip Recovery Systems
AC & DC Drive Retrofits
One-Line Drawings Creation
Turn-Key Projects
PLC Systems LOTO Procedures Creation

Testing Services

Low to Medium Voltage Circuit Breakers
Switchgear and Panelboards
Low, Medium and High Voltage Transformers
Solid State Relays
Electro-mechanical Relays
Generator and Motor Testing
Low to Medium Voltage Cable Testing
Medium Voltage Cable Fault Locating
Infrared Thermography
Ground Grid Testing
Low to Medium Voltage Switches
Vacuum Bottle Interrupters
Automatic Transfer Switch
Metering
Instrument Transformers
Surge Arrestors
Low and Medium Voltage Bus-duct
Battery Banks
Transformer Oil Analysis
Power Quality Analysis
High Resistance Grounds

Electronic Repair

Authorized Drive Repair Center
Circuit Board Testing and Repair
AC & DC Drive Repair
Medium Voltage Drive Repair
Machine Safety
Independent ISO 13849 Verification
Peer Risk Analysis
Safety Field Validation
Safety Reviews
Due Diligence Compliance
Risk Assessments
Safety Mitigation Planning
Fabrication Capabilities
Custom Panel Design
Custom Bus Bar Forming
UL, CE and CSA Certification
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