General Services Administration
Public Buildings Service

PUBLIC BUILDINGS MAINTENANCE STANDARDS FINAL

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This Maintenance Standard is divided into the following Sections:

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General Services Administration
Public Buildings Service

Maintenance Practices and General Information for Federal Buildings

Section 1: Introduction and Maintenance Standard List

General Overview:

The objective of these maintenance standards is to provide helpful instruction in the performance of preventive and predictive maintenance techniques, in order to maximize the efficiency of operation and the useful life of equipment, systems, and structures, and to provide reliable and suitable conditions for the building tenants. They are generic in nature and not intended to substitute for manufacturer's instructions or to apply uniformly across all types and configurations of equipment and systems installed in Federal buildings. Therefore, maintenance staffs and contractors must exercise a measure of caution in the application of these standards.

Maintenance Standard Numbers:

The GSA Maintenance standard is arranged by sections according to building equipment groups or building components. A four (4) tier system is used to easily identify the type of building group, equipment type and frequency for performing maintenance on these systems. The format is as follows:

1. **Tier 1** identifies the building component system or type of building equipment group, i.e. Electrical (ELEC), Heating Ventilation, Air Conditioning (HVAC)
2. **Tier 2** identifies the type of equipment, i.e. Transformer (TRN), Chiller (CLR)
3. **Tier 3** further defines the equipment by number when there is more than one type, i.e. Centrifugal Chiller (04), Absorption Chiller (05)
4. **Tier 4** defines the frequency for the specific maintenance task to be performed, i.e. Monthly (01M), Quarterly (03M) Semi-annually (06M), Annually (01Y)

The Standard number appears in the format of: **HVAC-CLR-04-01Y** which identifies the standard as: a HVAC System chiller of type 4 (centrifugal) to be performed annually.

Equipment Attributes:

Appendix D contains Equipment Attributes lists that the Operations and Maintenance Contractor is required to collect data from each piece of equipment. This task is part of the maintenance requirements for each building in order for GSA to have an accurate and up to date database of each building's equipment. Equipment is listed with the values and the type of data that shall be collected.

Attribute fields have been created in the CMMS for each equipment type. Once the data has been collected it shall be input into the CMMS by the contractor.

Good Maintenance Practices

The following is a list of good practices to observe when performing maintenance.

1. Machinery and equipment shall be cleaned and touch up painted as necessary to restore surface condition and inhibit corrosion.
2. Install replacement parts that are appropriate to the equipment, its operating conditions, and the required performance levels. Substandard components shall not be used in government equipment. All parts, materials, components, and replaceable inserts used in the maintenance and repair of equipment and systems in Federally controlled space shall be new, suitable for the type and severity of service, and meet safety performance codes and standards. Refurbished parts are not to be used unless approved by proper authority. Normal rework of machinery casings, tube sheets, shafts, and other similar types of work, where repair to a major structural item is accepted industry practice, is permitted unless safety and performance are adversely affected.
3. Proper documentation through a system of record keeping is required; if available, a Computerized Maintenance Management System (CMMS) shall be used. The types of records authorized may be preprinted government forms or locally produced forms of an appropriate format. It is paramount to maintain equipment history records to facilitate decision making throughout the life of the equipment. Predictive maintenance frequently entails trending analysis, so a history of the test data on the equipment is required.
4. The intent of language such as "check", "inspect", etc., is to determine the status of the check point item and to take appropriate corrective action to eliminate any deficiencies found on the spot if within contract limits if possible and or to notify GSA as soon as practicable when repair exceeds contract limits or cannot be repaired on the spot. If additional calibration, adjustment, replacement of parts and fluids, and other work are necessary, that work shall be accomplished or scheduled for future action.
5. Maintenance work shall be scheduled so as to minimize the disruption to building occupants and operations. Proper notification and coordination shall be made when maintenance work necessitates shutting down equipment or otherwise terminating services to the building occupants.
6. Equipment under warranty shall be maintained in accordance with warranty instructions and conditions. Warranty provisions will be stringently complied with during the periods that they apply.
7. When fixed fire protection systems are temporarily removed or disconnected from service, they must be reconnected and/or placed back into service at the end of each work day unless otherwise authorized. Fixed fire protection

systems include equipment and devices whose function is to prevent, detect, or control fires, or transmit signals related to fire emergencies. The status of major equipment or systems not operating or that become non operational during the workday, or any system or equipment item, including elevators, not operational by the official working hours start time, shall be reported to the proper authority (buildings manager or contracting officer's representative.) Security and fire alarm system malfunctions must be reported immediately to the GSA call center. All fire related equipment operation and maintenance shall follow the appropriate National Fire Protection Association (NFPA) code or standard, such as NFPA 72 the National Fire Alarm Code.

8. When performing maintenance on equipment that requires working with (CFC's) refrigerants. Those working on the equipment must maintain the applicable certifications for working on such equipment. All applicable local, state, federal guidelines and regulations must be adhered to with respect to documentation, handling and disposal of refrigerants.
9. When performing maintenance in space that may be occupied or accessible during the performance of the work, provide adequate steps for the protection of the public and employees.
10. Trash, debris, and wastes from contract work inside buildings shall be removed daily. Exceptions shall be approved in advance. Premises shall be left neat and clean after each work shift so that the Government business can proceed without interruption the next regular workday. All waste material shall be properly disposed of in accordance with applicable Federal, State and local regulations.
11. All equipment and systems shall be maintained at a level, fair wear and tear excepted, to assure that the building(s) are operated in an efficient and economical manner.
12. All work, including contact with and handling of hazardous materials and wastes, the disturbance or dismantling of structures or equipment containing hazardous materials and/or the disposal of ordinary and hazardous materials and wastes shall comply with applicable Federal requirements including 29 CFR 1910/1926, 40 CFR 260-265, 40 CFR 61, 49 CFR 171-179, and applicable state and municipal safety and environmental requirements. Submit copies of permits, certificates, and manifests that indicate hazardous waste has been disposed of in compliance with the regulations. Where there is a conflict between applicable regulations, the most stringent shall apply.

Electrical test equipment.

All electrical test equipment shall conform to the following requirements, outlined in ANSI/NETA MTS-2011.

Suitability of Test Equipment

1. All test equipment shall meet the requirements in paragraph b) Test Instrument Calibration and be in good mechanical and electrical condition.
2. Field test metering used to check power system meter calibration must be more accurate than the instrument being tested.
3. Accuracy of metering in test equipment shall be appropriate for the test being performed.
4. Wave shape and frequency of test equipment output waveforms shall be appropriate for the test to be performed and the equipment to be tested.
5. Test Equipment calibration
   a) The testing organization shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy for each test instrument calibrated.
   b) The firm providing calibration service shall maintain up-to-date instrument calibration instructions and procedures for each test instrument calibrated.
   c) The accuracy shall be directly traceable to the National Institute of Standards and Technology (NIST).
   d) Instruments shall be calibrated in accordance with the following frequency schedule:
      i. Field instruments: analog and digital, 12 month maximum.
      ii. Laboratory instruments: 12 month maximum.
      iii. Leased specialty equipment: 12 month maximum.
   e) Dated calibration labels shall be visible on all test equipment.
   f) Records which show date and results of instruments calibrated or tested must be kept up to date.
   g) Calibrating standard shall be of better accuracy than that of the instrument tested.

Tools:

The following tool groups are referenced within this standard. The lists serve as guides for supplying maintenance personnel with tools. Basic and trade tools required will vary depending on equipment served and on individual preferences. Special recommended tools, materials, and equipment are listed in the individual standards as required.

STANDARD TOOLS - BASIC
(All Trades)

1. Standard and Phillips head screw drivers-various sizes.
2. Pliers-vise grip (2), slip-joint, needle-nose, diagonal,
3. cutting pliers, side cutters.
4. Ball peen hammer.
5. Hack saw and spare blades.
6. 3/8' drive socket set and ratchet.
7. Small set of Allen wrenches.
8. Assorted center punches, drift punches, and steel chisel.
9. 12' measuring tape.
10. Crescent wrenches 4" to 8".
11. Open and box end wrenches ¼" to ¾".
12. File.
13. Pipe wrenches to 14".
14. Small level and square.
15. Pocket knife.
16. Flashlights.
17. Grease guns and oilers
18. Wire brush.
19. Extension cord and inspection lights.
20. Various cleaning tools - brushes, scrapers, etc.
21. Emery cloth.

TOOL GROUP A

1. Standard tools - basic
2. Refrigeration - gauges
3. Leak detector-electronic or halogen
4. Pocket thermometer
5. Clamp on meter (volt - ohm - amp meter)
6. Flaring tool
7. Tubing cutters

8. Packing kit and packing
9. Crescent wrenches to 14"

TOOL GROUP B

1. Standard tools - basic
2. Insulated pliers and screwdrivers
3. Wire strippers
4. Wire crimpers
5. Voltmeter - Ohmmeter - Milliammeter
6. Clamp on meter(volt - ohm - amp meter)
7. Soldering kit
8. 1/8" 25' fish tape
9. Burnishing tool

TOOL GROUP C

1. Standard tools - basic
2. Pipe wrenches to 24"
3. Tubing cutters
4. Flaring tool
5. Small acetylene outfit
6. Packing tool kit and packing
7. ¾" socket set
8. Crescent wrenches to 14"

Section 2: Maintenance Standard Listing

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
ARCHITECTURAL AND STRUCTURAL			
ARCS-BAR-01-06M	Security Bollards and Barricades	Oct-1	Semi-annually
ARCS-DAV-01-01Y	Davits	Oct-1	Annually
ARCS-DOR-01-06M	Door, Power Operated	Oct-1	Semi-annually
ARCS-DOR-02-03M	Door, Hydraulic, Electric or Pneumatic Operated	Oct-1	Quarterly
ARCS-DOR-03-06M	Door, Manual, Overhead	Oct-1	Semi-annually
ARCS-DOR-04-06M	Door, Main Entrance	Oct-1	Semi-annually
ARCS-FPL-01-01M	Fireplace	Oct-1	Monthly
ARCS-FPL-02-01Y	Incinerator	Oct-1	Annually
ARCS-LND-01-06M	Fountain, Memorial or Decorative	Oct-1	Semi-annually
ARCS-LND-02-06M	Gates and Fences, Security and Access	Oct-1	Semi-annually
ARCS-LND-03-01Y	Lawn Sprinklers (per nozzle)	Oct-1	Annually
ARCS-LND-04-03M	Flag Pole, Electric and Manual	Oct-1	Quarterly
ARCS-LND-05-06M	Lawn Mower and Edger	Oct-1	Semi-annually
ARCS-MHL-01-01Y	Manhole, Electrical	Oct-1	Annual
ARCS-MHL-02-03M	Manhole, Sewer	Oct-1	Quarterly
ARCS-MHL-03-06M	Manhole, Water/Steam/Fuel Oil (also includes hot water, chilled water, and condenser water)	Oct-1	Semi-annually
ARCS-RFS-01-06M	Roof Inspection - Built-up type (per square, or 100 sq. ft.)	Oct-1	Semi-annually
ARCS-RFS-02-06M	Roof Inspection - Shingle Type (per 100 sq. ft.)	Oct-1	Semi-annually
ARCS-RFS-03-03M	Extensive and Intensive Vegetative Roof	Oct-1	Quarterly
ARCS-SCT-01-03M	Key Card System	Oct-1	Quarterly
ARCS-SCT-02-01Y	Parking Arm Gates	Oct-1	Annually
ARCS-STR-01-01Y	Lightning Protection (per down conductor)	Oct-1	Annually
ARCS-SWM-01-01M	Storm Water Management: Ponds (Dry and Wet)	Oct-1	Monthly
ARCS-SWM-02-01M	Storm Water Management: Basins	Oct-1	Monthly
ARCS-SWM-03-01M	Storm Water Management: Trenches	Oct-1	Monthly
ARCS-SWM-04-01M	Storm Water Management: Dry Wells	Oct-1	Monthly
ARCS-SWM-05-01M	Storm Water Management: Permeable Pavers	Oct-1	Monthly
ARCS-SWM-06-01M	Storm Water Management: Hydrodynamic Structures (i.e. swales)	Oct-1	Monthly
ARCS-SWM-07-01M	Storm Water Management: Biofiltration	Oct-1	Monthly
ARCS-WIN-01-01Y	Window Washing Scaffold, Power Operated	Oct-1	Annually

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
CHILD CARE			
CHLD-EQP-01-01M	Child Care Equipment	Oct-1	Monthly
CHLD-SEC-01-01M	Child Care Secured Perimeter Systems	Oct-1	Monthly
CHLD-SPC-01-01M	Child Care Areas	Oct-1	Monthly
CLEANING			
CLNG-SCB-01-03M	Scrubbing Machine, Battery or Propane Powered	Oct-1	Quarterly
CLNG-SNO-01-01Y	Snow Blower	Oct-1	Annually
CLNG-SWP-01-06M	Sweeper	Oct-1	Semi-annually
CLNG-TCP-01-01Y	Trash Compactor	Oct-1	Annually
CLNG-VAC-01-06M	Vacuum Cleaner, Heavy Duty, Tank Type	Oct-1	Semi-annually
CLNG-VAC-02-01Y	Vacuum System, Centralized	Oct-1	Annually
CONTROLS			
CTRL-DDC-01-01W	BAS Server	Oct-1	Weekly
CTRL-DDC-01-01M	BAS Server	Oct-1	Monthly
CTRL-DDC-01-03M	BAS Server	Oct-1	Quarterly
CTRL-DDC-01-01Y	BAS Server	Oct-1	Annually
CTRL-DDC-02-01W	BAS Server Client Workstation	Oct-1	Weekly
CTRL-DDC-02-01M	BAS Server Client Workstation	Oct-1	Monthly
CTRL-DDC-02-03M	BAS Server Client Workstation	Oct-1	Quarterly
CTRL-DDC-02-01Y	BAS Server Client Workstation	Oct-1	Annually
CTRL–DDC-03-03M	Network, Management Level	Oct-1	Quarterly
CTRL–DDC-03-01Y	Network, Management Level	Oct-1	Annually
CTRL–DDC-04-03M	Network, Building Level	Oct-1	Quarterly
CTRL–DDC-04-01Y	Network, Building Level	Oct-1	Annually
CTRL–DDC-05-01Y	Field Panel	Oct-1	Annually
CTRL–DDC-06-01Y	Controller	Oct-1	Annually
CTRL-DDC-07-01Y	Controls, Sensors Electronic	Oct-1	Annually
CTRL-DDC-08-01M	Alarm Maintenance	Oct-1	Monthly
CTRL-DDC-09-06M	BAS Wireless Electronic/Pneumatic End Devices (Thermostats)	Oct-1	Semi-annually
CTRL-DDC-09-01Y	BAS Wireless Electronic/Pneumatic End Devices (Thermostats)	Oct-1	Annually
CTRL-END-01-01Y	End Devices	Oct-1	Annually
CTRL-PNU-01-06M	Control Air System	Oct-1	Semi-annually
CTRL-PNU-02-06M	Receiver Controller	Oct-1	Semi-annually
CTRL-PNU-03-03M	Filter, Control Air	Oct-1	Quarterly
ELECTRICAL			
ELEC-ATS-01-01M	Automatic Transfer Switch, per NFPA 110	Oct-1	Monthly
ELEC-ATS-01-01Y	Automatic Transfer Switch	Oct-1	Annually
ELEC-BDT-01-01Y	Metal-Enclosed Busways, Thermographic Survey	Oct-1	Annually

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
ELEC-BDT-01-03Y	Metal-Enclosed Busways	Oct-1	3-Year
ELEC-CAP-01-01Y	Capacitors, Thermographic Survey	Oct-1	Annually
ELEC-CAP-01-03Y	Capacitors	Oct-1	3-Year
ELEC-CAP-02-01Y	Reactors-Dry-Type, Thermographic Survey	Oct-1	Annually
ELEC-CAP-02-03Y	Reactors – Dry-Type	Oct-1	3-Year
ELEC-CAP-03-01M	Reactors – Liquid-Filled, Oil Leakage	Oct-1	Monthly
ELEC-CAP-03-01Y	Reactors – Liquid-Filled, Oil Sampling	Oct-1	Annually
ELEC-CAP-03-03Y	Reactors – Liquid-Filled	Oct-1	3-Year
ELEC-CBL-01-01Y	Cables, Low-Voltage, Thermographic Survey	Oct-1	Annually
ELEC-CBL-01-03Y	Cables, Low-Voltage	Oct-1	3-Year
ELEC-CBL-02-01Y	Medium- and High-Voltage Cables, Thermographic Survey	Oct-1	Annually
ELEC-CBL-02-03Y	Medium- and High-Voltage Cables	Oct-1	3-Year
ELEC-CKB-01-01Y	Circuit Breakers, Air, Insulated-Case/Molded-Case	Oct-1	Annual
ELEC-CKB-01-03Y	Circuit Breakers, Air, Insulated-Case/Molded-Case	Oct-1	3-Year
ELEC-CKB-02-01Y	Circuit Breakers, Air, Low-Voltage Power	Oct-1	Annually
ELEC-CKB-02-03Y	Circuit Breakers, Air, Low-Voltage Power	Oct-1	3-Year
ELEC-CKB-03-01Y	Circuit Breakers, Air, Medium-Voltage	Oct-1	Annually
ELEC-CKB-03-03Y	Circuit Breakers, Air, Medium-Voltage	Oct-1	3-Year
ELEC-CKB-04-01M	Circuit Breakers, Oil, Medium- and High-Voltage	Oct-1	Monthly
ELEC-CKB-04-01Y	Circuit Breakers, Oil, Medium- and High-Voltage	Oct-1	Annually
ELEC-CKB-04-03Y	Circuit Breakers, Oil, Medium- and High-Voltage	Oct-1	3-Year
ELEC-CKB-05-01Y	Circuit Breakers, Vacuum, Medium-Voltage	Oct-1	Annually
ELEC-CKB-05-03Y	Circuit Breakers, Vacuum, Medium-Voltage	Oct-1	3-Year
ELEC-CLK-01-06M	Clocks, Central System	Oct-1	Semi-annually
ELEC-DCS-01-01M	DC Batteries, Lead Acid	Oct-1	Monthly
ELEC-DCS-01-01Y	DC, Batteries, Lead-Acid	Oct-1	Annually
ELEC-DCS-02-01M	Dry Cell Battery	Oct-1	Monthly
ELEC-DCS-03-03M	Nickel Cadmium Batteries	Oct-1	Quarterly
ELEC-DCS-04-01M	Direct-Current Systems, Chargers	Oct-1	Monthly
ELEC-DCS-04-01Y	Direct-Current Systems, Chargers	Oct-1	Annually
ELEC-EMG-01-01M	Emergency Generator, Electric Tests	Oct-1	Monthly
ELEC-EMG-01-01Y	Emergency Generator, Electric Tests	Oct-1	Annually
ELEC-GRD-01-01Y	Grounding Systems	Oct-1	Annually
ELEC-GRD-01-03Y	Grounding Systems	Oct-1	3-Year
ELEC-ITR-01-01Y	Instrument Transformers	Oct-1	Annually
ELEC-ITR-01-03Y	Instrument Transformers	Oct-1	3-Year
ELEC-LTG-01-03M	Dimmer and Control, Stage and General Lighting	Oct-1	Quarterly
ELEC-LTG-02-02Y	Fluorescent Lighting Fixture, Washing and Relamping	Oct-1	2-Year

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
ELEC-LTG-02-05Y	Fluorescent Light Fixture, Relamping Only	Oct-1	5-Year
ELEC-LTG-03-01Y	Lighting, Special Feature	Oct-1	Annually
ELEC-LTG-04-06M	Lighting, Outside Incandescent Fluorescent	Oct-1	Annually
ELEC-LTG-04-05Y	Lighting, Outside Incandescent Fluorescent, Mercury Vapor or High Pressure Sodium, Metal Halide	Oct-1	5-Year
ELEC-LTG-05-01M	Spotlights, Fixed and Portable	Oct-1	Monthly
ELEC-LTG-06-03M	Emergency Lights, Closed System	Oct-1	Quarterly
ELEC-LTG-07-03M	Emergency Lighting, Wet Cell	Oct-1	Quarterly
ELEC-MCC-01-01Y	Low-Voltage Motor Starters	Oct-1	Annually
ELEC-MCC-01-03Y	Low-Voltage Motor Starters	Oct-1	3-Year
ELEC-MCC-02-01Y	Medium-Voltage Motor Starters	Oct-1	Annually
ELEC-MCC-02-03Y	Medium-Voltage Motor Starters	Oct-1	3-Year
ELEC-MCC-03-01Y	Low-Voltage Motor Control Centers	Oct-1	Annually
ELEC-MCC-03-03Y	Low-Voltage Motor Control Centers	Oct-1	3-Year
ELEC-MCC-04-01Y	Medium-Voltage Motor Control Centers	Oct-1	Annually
ELEC-MCC-04-03Y	Medium-Voltage Motor Control Centers	Oct-1	3-Year
ELEC-MOT-01-01M	Rotating Machinery, AC Induction Motors and Generators	Oct-1	Monthly
ELEC-MOT-01-01Y	Rotating Machinery, AC Induction Motors and Generators	Oct-1	Annually
ELEC-MOT-01-02Y	Rotating Machinery, AC Induction Motors and Generators	Oct-1	2-Year
ELEC-MTR-01-01Y	Metering Devices	Oct-1	Annually
ELEC-MTR-01-03Y	Metering Devices	Oct-1	3-Year
ELEC-MTR-02-01Y	Advanced Metering	Oct-1	Annually
ELEC-NWP-01-01Y	Network Protectors, 600 V Class	Oct-1	Annually
ELEC-PVS-01-06M	Photovoltaic Systems	Oct-1	Semi-Annually
ELEC-REG-01-01M	Step-Voltage Regulators	Oct-1	Monthly
ELEC-REG-01-01Y	Step-Voltage Regulators	Oct-1	Annually
ELEC-REG-01-02Y	Step-Voltage Regulators	Oct-1	2-Year
ELEC-REG-02-01M	Induction Regulators	Oct-1	Monthly
ELEC-REG-02-01Y	Induction Regulators	Oct-1	Annually
ELEC-REG-02-03Y	Induction Regulators	Oct-1	3-Year
ELEC-REG-03-01M	Load-Tap-changers	Oct-1	Monthly
ELEC-REG-03-01Y	Load-Tap-changers	Oct-1	Annually
ELEC-REG-03-03Y	Load-Tap-changers	Oct-1	3-Year
ELEC-RLY-01-01Y	Protective Relays, Microprocessor-Based	Oct-1	Annually
ELEC-SRG-01-01Y	Surge Arresters, Low-Voltage Surge Protection Devices	Oct-1	Annually

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
ELEC-SRG-01-03Y	Surge Arresters, Low-Voltage Surge Protection Devices	Oct-1	3-Year
ELEC-SRG-02-01Y	Medium Voltage Surge Arresters	Oct-1	Annually
ELEC-SRG-02-03Y	Medium Voltage Surge Arresters	Oct-1	3-Year
ELEC-SWB-01-01Y	Switchgear and Switchboard Assemblies	Oct-1	Annually
ELEC-SWB-01-03Y	Switchgear and Switchboard Assemblies	Oct-1	3-Year
ELEC-SWT-01-01Y	Low-Voltage Air Switches	Oct-1	Annually
ELEC-SWT-01-03Y	Low-Voltage Air Switches	Oct-1	3-Year
ELEC-SWT-02-01Y	Switches, Air, Medium-Voltage, Metal-Enclosed	Oct-1	Annually
ELEC-SWT-02-03Y	Switches, Air, Medium-Voltage, Metal-Enclosed	Oct-1	3-Year
ELEC-SWT-03-01Y	Medium- and High-Voltage Open Switches	Oct-1	Annually
ELEC-SWT-03-03Y	Medium- and High-Voltage Open Switches	Oct-1	3-Year
ELEC-SWT-04-01M	Medium-Voltage Oil Switches	Oct-1	Monthly
ELEC-SWT-04-01Y	Medium-Voltage Oil Switches	Oct-1	Annually
ELEC-SWT-04-03Y	Medium-Voltage Oil Switches	Oct-1	3-Year
ELEC-SWT-05-01Y	Medium-Voltage Vacuum Switches	Oct-1	Annually
ELEC-SWT-05-03Y	Medium-Voltage Vacuum Switches	Oct-1	3-Year
ELEC-SWT-06-01M	Medium-Voltage SF-6 Switches	Oct-1	Monthly
ELEC-SWT-06-01Y	Medium-Voltage SF6 Switches	Oct-1	Annually
ELEC-SWT-06-03Y	Medium-Voltage SF6 Switches	Oct-1	3-Year
ELEC-SWT-07-01Y	Cutouts	Oct-1	Annually
ELEC-SWT-07-03Y	Cutouts	Oct-1	3-Year
ELEC-TRN-01-01Y	Transformers, Dry-Type, Air-Cooled, Low-Voltage, Small	Oct-1	Annually
ELEC-TRN-01-03Y	Transformers, Dry-Type, Air-Cooled, Low-Voltage, Small	Oct-1	3-Year
ELEC-TRN-02-01Y	Transformers, Dry-Type, Air-Cooled, Large	Oct-1	Annually
ELEC-TRN-02-03Y	Transformers, Dry-Type, Air-Cooled, Large	Oct-1	3-Year
ELEC-TRN-03-01M	Transformers, Liquid-Filled	Oct-1	Monthly
ELEC-TRN-03-01Y	Transformers, Liquid-Filled	Oct-1	Annually
ELEC-TRN-03-03Y	Transformers, Liquid-Filled	Oct-1	3-Year
ELEC-UPS-01-01M	Uninterruptible Power System	Oct-1	Monthly
ELEC-UPS-01-01Y	Uninterruptible Power System	Oct-1	Annually
ELEC-VFD-01-01Y	Adjustable Speed Drive Systems	Oct-1	Annually
ELEC-VFD-01-03Y	Adjustable Speed Drive Systems	Oct-1	3-Year
FIRE LIFE SAFETY			
FLSF-ALM-01-01M	Alarm Check Valves and Accessories	Oct-1	Monthly
FLSF-ALM-02-03M	Fire Supervisory Signals, Testing	Oct-1	Quarterly
FLSF-ALM-03-01Y	Automatic Fire Detection, Smoke Detectors	Oct-1	Annually
FLSF-ALM-04-03M	Automatic Fire Detection, Waterflow Alarms	Oct-1	Quarterly

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Standard #	**Equipment Item**	**Effective Date**	**Frequency**
FLSF-ALM-05-01Y	Automatic Fire Detection, Heat Detectors	Oct-1	Annually
FLSF-ALM-06-06M	Automatic Fire Detection, Operational Testing (per zone)	Oct-1	Semi-annually
FLSF-ALM-07-01Y	Fire Alarm Control Panel and Remote Annunciators	Oct-1	Annually
FLSF-ALM-08-01Y	Fire Alarm Control Panel, Special Systems (Halon, etc)	Oct-1	Annually
FLSF-ALM-09-01Y	Central Station, Transmitters	Oct-1	Annually
FLSF-ALM-10-01D	Central Station, Receiver and Re-transmission Equipment	Oct-1	Daily
FLSF-ALM-11-01W	Fire Alarm System, Recorder	Oct-1	Weekly
FLSF-ALM-12-03M	Fire Alarm System. Event Printer	Oct-1	Quarterly
FLSF-ALM-13-01Y	Fire Alarm System, Audio Control Panel	Oct-1	Annually
FLSF-ALM-14-01Y	Fire Alarm System, Remote Controller	Oct-1	Annually
FLSF-ALM-15-01Y	Fire Alarm System, Remote Amplifier	Oct-1	Annually
FLSF-ALM-16-01Y	Manual Fire Alarm Stations - Coded and Uncoded	Oct-1	Annually
FLSF-ALM-17-01Y	Fire Life Safety Fire Alarm	Oct-1	Annually
FLSF-ALM-17-05Y	Fire Life Safety Fire Alarm	Oct-1	5-Year
FLSF-DOR-01-03M	Fire Doors, Stairwells and Exitways, Swinging	Oct-1	Quarterly
FLSF-EPR-01-01Y	Emergency Generator; Gasoline, or Natural Gas Engine	Oct-1	Annually
FLSF-EPR-02-03M	Emergency Generator, Diesel Engines	Oct-1	Quarterly
FLSF-EPR-02-01Y	Emergency Generator, Diesel Engines	Oct-1	Annually
FLSF-EPR-03-01W	Emergency Generator	Oct-1	Weekly
FLSF-EPR-03-01M	Emergency Generator	Oct-1	Monthly
FLSF-EPR-03-03M	Emergency Generator	Oct-1	Quarterly
FLSF-EPR-03-06M	Emergency Generator	Oct-1	Semi-annually
FLSF-EPR-04-03M	Emergency Pumps and Ventilators	Oct-1	Quarterly
FLSF-EPR-04-01Y	Emergency Pumps and Ventilators	Oct-1	Annually
FLSF-EPR-05-06M	Fuel Oil Filter/Strainer	Oct-1	Semi-annually
FLSF-EPR-06-01Y	Fuel Oil Heater	Oct-1	Annually
FLSF-EPR-07-01M	Emergency Generator, Steam Driven	Oct-1	Monthly
FLSF-EPR-07-01Y	Emergency Generator, Steam Driven	Oct-1	Annually
FLSF-EPR-08-01Y	Load Bank Testing	Oct-1	Annually
FLSF-EPR-08-03Y	Load Bank Testing	Oct-1	3-Year
FLSF-FEX-01-01M	Fire Extinguisher, Inspection	Oct-1	Monthly
FLSF-FEX-01-05Y	Fire Extinguisher, Hydrostatic Testing	Oct-1	5-Year
FLSF-FEX-01-12Y	Fire Extinguisher, Hydrostatic Testing	Oct-1	12-Year
FLSF-FEX-02-01Y	Fire Extinguisher, Stored Pressure with Gauge	Oct-1	Annually
FLSF-FEX-02-06Y	Fire Extinguisher, Stored Pressure with Gauge (Non Stainless Steel Shell)	Oct-1	6-Year
FLSF-FEX-03-01Y	Fire Extinguishers - Non rechargeable	Oct-1	Annually

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
FLSF-FEX-04-01Y	Fire Extinguisher, Gas Cartridge or Cylinder (No Gauge)	Oct-1	Annually
FLSF-FEX-05-01M	Water Spray Extinguishing Systems	Oct-1	Monthly
FLSF-FEX-05-01Y	Water Spray Extinguishing Systems	Oct-1	Annually
FLSF-FEX-06-01M	Fire Extinguisher System, Carbon Dioxide (High Pressure), Halon, Dry Chemical - Inspection	Oct-1	Monthly
FLSF-FEX-06-06M	Fire Extinguisher System, Carbon Dioxide (High Pressure), Halon, Dry Chemical	Oct-1	Semi-annually
FLSF-FSD-01-02Y	Fire and Smoke Dampers	Oct-1	2-Year
FLSF-FSP-01-01Y	Sprinkler Head, Sprinklered Areas (per 1,000 sq. ft.)	Oct-1	Annually
FLSF-FSP-02-01Y	Antifreeze Solution in Sprinkler Systems	Oct-1	Annually
FLSF-HSE-01-01M	Fire Hose - 1.5 in., Racked in Buildings	Oct-1	Monthly
FLSF-HSE-01-01Y	Fire Hose - 1.5 in., Racked in Buildings	Oct-1	Annually
FLSF-HSE-02-03M	Fire Department Hose Connections (Standpipe Outlets)	Oct-1	Quarterly
FLSF-HSE-02-05Y	Fire Department Hose Connections (Standpipe Outlets)	Oct-1	5-Year
FLSF-HSE-03-01M	Fire Department Pumper Connections, Standpipe or Sprinkler	Oct-1	Monthly
FLSF-HYD-01-05Y	Fire Hydrant Flow Test - Dry Barrel and Wet Barrel	Oct-1	5-Year
FLSF-HYD-01-06M			
FLSF-PMP-01-01W	Fire Pump, Diesel Engine Driven	Oct-1	Weekly
FLSF-PMP-01-01M	Fire Pump, Diesel Engine Driven	Oct-1	Monthly
FLSF-PMP-01-03M	Fire Pump, Diesel Engine Driven	Oct-1	Quarterly
FLSF-PMP-01-01Y	Fire Pump - Diesel Engine Driven	Oct-1	Annually
FLSF-PMP-02-01W	Fire Pump - Electric Motor Driven	Oct-1	Weekly
FLSF-PMP-02-01M	Fire Pump - Electric Motor Driven	Oct-1	Monthly
FLSF-PMP-02-01Y	Fire Pump - Electric Motor Driven	Oct-1	Annually
FLSF-VLV-01-01W	Dry Pipe, Deluge and Preaction Valves	Oct-1	Weekly
FLSF-VLV-01-01M	Dry Pipe, Deluge and Preaction Valves	Oct-1	Monthly
FLSF-VLV-01-01Y	Dry Pipe, Deluge and Preaction Valves	Oct-1	Annually
FLSF-VLV-01-05Y	Dry Pipe, Deluge and Preaction Valves: Strainers, Filters and Orifices	Oct-1	5-Year
FLSF-VLV-02-01MY	Post Indicator Valves	Oct-1	Annually
FLSF-VLV-03-01W	Fire Control Valves	Oct-1	Weekly
FLSF-VLV-03-01M	Fire Control Valves	Oct-1	Monthly
FLSF-VLV-03-01Y	Fire Control Valves	Oct-1	Annually
FLSF-VLV-04-01Y	Valves, Fire System - Pressure Regulating Type	Oct-1	Annually
FLSF-VLV-04-05Y	Valves, Fire System - Pressure Regulating Type	Oct-1	5-Year
HEATING VENTILATION AND AIR CONDITIONING			
HVAC-ACR-01-01M	Air Conditioning Unit, Special Purpose	Oct-1	Monthly

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
HVAC-ACR-02-01Y	Heat Pumps, Water Cooled	Oct-1	Annually
HVAC-ACR-03-01Y	Air Conditioning Unit or Heat Pump, Split System	Oct-1	Annually
HVAC-ACR-04-01Y	Air Conditioning Unit, Ceiling/Wall Mounted	Oct-1	Annually
HVAC-ACR-05-01Y	Air-cooled Condenser	Oct-1	Annually
HVAC-ACR-06-01Y	Evaporative Condenser	Oct-1	Annually
HVAC-AHU-01-02M	Built Up Air Handler, Predictive Maintenance	Oct-1	Bi-Monthly
HVAC-AHU-01-01Y:	Built-Up AHU	Oct-1	Annually
HVAC-AHU-03-01Y	Built-Up AHU >5000 CFM Predictive	Oct-1	Annually
HVAC-AHU-04-01Y	Package AHU (includes DX, Heat Pumps, Gas Heat)	Oct-1	Annually
HVAC-AHU-05-01Y	Package AHU Predictive	Oct-1	Annually
HVAC-AHU-06-01Y	Air Washer or Wet Coil System	Oct-1	Annually
HVAC-AHU-07-01Y	Hot Air Furnace	Oct-1	Annually
HVAC-AHU-08-01Y	AHU UV Treatment System	Oct-1	Annually
HVAC-AIR-01-06M	Air Dryer, Refrigerated or Regenerative Desiccant Type	Oct-1	Semi-annually
HVAC-AIR-02-06M	Air Compressor	Oct-1	Semi-annually
HVAC-AIR-03-06M	Glycol Dry Cooler	Oct-1	Semi-annually
HVAC-AIR-04-06M	After-Cooler/Separator	Oct-1	Semi-annually
HVAC-BLR-01-01Y	Boiler (Natural Gas and Oil Fired)	Oct-1	Annually
HVAC-BLR-02-01Y	Boiler, Electric	Oct-1	Annually
HVAC-BLR-03-01Y	Burner, Gas	Oct-1	Annually
HVAC-BLR-04-01Y	Burner, Oil	Oct-1	Annually
HVAC-BLR-05-01Y	Boiler, Instruments/Controls	Oct-1	Annually
HVAC-BSB-01-02Y	Radiant Baseboards/Convectors (steam, hot water, or electric - per linear foot)	Oct-1	2-Year
HVAC-CLR-01-03M	Central Chilled Water Package Unit, Special Purpose	Oct-1	Quarterly
HVAC-CLR-01-01Y	Central Chilled Water Package Unit	Oct-1	Annually
HVAC-CLR-02-01Y	Refrigeration Machine, Screw and Scroll	Oct-1	Annually
HVAC-CLR-03-01Y	Refrigeration Machine, Centrifugal	Oct-1	Annually
HVAC-CLR-04-01Y	Refrigeration Machine, Absorption Unit	Oct-1	Annually
HVAC-CLR-05-01Y	Control Panel - Central Refrigeration Unit	Oct-1	Annually
HVAC-CLR-06-01M	Refrigerant Monitor	Oct-1	Monthly
HVAC-CLR-07-01Y	High Efficiency Purge Units	Oct-1	Annually
HVAC-CLR-08-02Y	Vibration Analysis, Chillers	Oct-1	2-Year
HVAC-CLR-09-03Y	Non-Destructive Tube Analysis (Eddy Current Analysis)	Oct-1	3-Year
HVAC-CLS-01-01Y	Coils, Preheat, Reheat, Etc. (Remote Locations)	Oct-1	Annually
HVAC-CND-01-01M	Condensing Unit, Refrigeration	Oct-1	Monthly
HVAC-CND-01-01Y	Condensing Unit, Refrigeration	Oct-1	Annually

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
HVAC-DMP-01-01Y	Motorized Dampers, Pneumatic or Electric	Oct-1	Annually
HVAC-EVP-01- 03M	Indirect Evaporative Cooling	Oct-1	Quarterly
HVAC-EVP-02-03M	Direct Evaporative Cooling	Oct-1	Quarterly
HVAC-EVP-03-03M	Humidification Systems	Oct-1	Quarterly
HVAC-FAN-01-01Y	Fan, Centrifugal	Oct-1	Annually
HVAC-FAN-02-01Y	Fan, Propeller, 24 in. Diameter or Larger	Oct-1	Annually
HVAC-FCU-01-03M	Fan Coil Units	Oct-1	Quarterly
HVAC-FLT-01-03M	Filter, Throw Away	Oct-1	Quarterly
HVAC-FLT-02-03M	Filter, Roll Type, Disposable Media	Oct-1	Quarterly
HVAC-FLT-02-01Y	Filter, Roll Type, Disposable Media, Manual or Motor Driven	Oct-1	Annually
HVAC-FLT-03-03M	Filter, Electrostatic	Oct-1	Quarterly
HVAC-FLT-04-03M	Filters, Viscous Type (Wire Mesh)	Oct-1	Quarterly
HVAC-FLT-05-03M	Filter, Charcoal	Oct-1	Quarterly
HVAC-FLT-06-01M	Filter, Special situations or conditions	Oct-1	Monthly
HVAC-HXR-01-01Y	Plate and Frame Heat Exchanger	Oct-1	Annually
HVAC-PMP-01-01Y	Pump, Centrifugal	Oct-1	Annually
HVAC-PMP-02-01Y	Pump, Vacuum	Oct-1	Annually
HVAC-STM-01-01Y	Condensate or Vacuum Pump	Oct-1	Annually
HVAC-TAB-01-05Y	Test and Balance	Oct-1	5-Year
HVAC-TMU-01-01Y	Terminal Units, Pneumatic or Electric	Oct-1	Annually
HVAC-TMU-02-03M	Terminal Units, DDC Only, Predictive	Oct-1	Quarterly
HVAC-TWR-01-03M	Cooling Tower, Cleaning	Oct-1	Quarterly
HVAC-TWR-01-01Y	Cooling Tower, Maintenance	Oct-1	Annually
HVAC-UHT-01-01Y	Unit Heater (Steam and Hot Water)	Oct-1	Annually
HVAC-UHT-02-01Y	Unit Heater (Gas and Oil Fired)	Oct-1	Annually
HVAC-VLV-01-01Y	Valve, Motor Operated (DDC)	Oct-1	Annually
HVAC-WTM-01-01M	Water Treatment Guide	Oct-1	Monthly
HVAC-WTM-03-06M	Chemical Feeder	Oct-1	Semi-annually
HVAC-WTM-04-03M	Water Treatment, Chemical Free	Oct-1	Quarterly
HVAC-WTM-04-01Y	Water Treatment, Chemical Free	Apr-12	Annually
KITCHEN			
KTCH-DSH-01-03M	Dishwashing Machine	Oct-1	Quarterly
KTCH-FRY-01-03M	Fryer	Oct-1	Quarterly
KTCH-GRL-01-03M	Grill	Oct-1	Quarterly
KTCH-ICM-01-03M	Ice Cream & Shake Maker	Oct-1	Quarterly
KTCH-ICE-02-03M	Ice Maker	Oct-1	Semi-annually
KTCH-KTL-01-06M	Kettle	Oct-1	Semi-annually
KTCH-OVN-01-03M	Oven	Oct-1	Quarterly
KTCH-OVN-01-06M	Oven	Oct-1	Semi-annually

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
KTCH-RFG-01-03M	Walk-In Refrigerators and Freezers	Oct-1	Quarterly
KTCH-RFG-01-06M	Walk-In Refrigerators and Freezers	Oct-1	Semi-annually
KTCH-RFG-02-03M	Reach-In Refrigerators and Freezers	Oct-1	Quarterly
KTCH-RFG-02-06M	Reach-In Refrigerators and Freezers	Oct-1	Semi-annually
KTCH-RNG-01-03M	Range	Oct-1	Quarterly
KTCH-RNG-01-06M	Range	Oct-1	Semi-annually
MATERIAL HANDLING			
MHDL-CRN-01-03M	Crane, Electric	Oct-1	Quarterly
MHDL-DMW-01-03M	Dumbwaiter	Oct-1	Quarterly
MHDL-HST-01-01Y	Chain Hoist and Trolley	Oct-1	Annually
MHDL-HST-02-01Y	Hoist, Electric	Oct-1	Annually
MHDL-HST-03-01Y	Hoist, Lighting	Oct-1	Annually
MHDL-LFT-01-06M	Lift, Electric, Stage Screen	Oct-1	Semi-annually
MHDL-LFT-02-01M	Material Handling Equipment Electric Lift Trucks	Oct-1	Monthly
MHDL-LFT-02-01Y	Material Handling Equipment Electric Lift Trucks	Oct-1	Annually
MHDL-LFT-03-03M	Loading Ramp, Adjustable	Oct-1	Quarterly
MHDL-LFT-04-01M	Lift, Automotive	Oct-1	Monthly
MHDL-LFT-04-01Y	Lift, Automotive	Oct-1	Annually
MHDL-PPB-01-01Y	Paper Baler	Oct-1	Annually
MDHL-VHL-01-06M	Material Handling Equipment, Engine Driven Vehicles	Oct-1	Semi-annually
MHDL-VHL-02-01Y	Carts and Scooters, Engine or Battery Powered	Oct-1	Annually
PLUMBING			
PLMB-DRN-01-01Y	Roof Drains, Downspout, and Gutter Inspection	Oct-1	Annually
PLMB-DRN-02-01Y	Drains, Areaway, Driveway, Storm	Oct-1	Annually
PLMB-DWS-01-01Y	Hot Water Heater, Gas	Oct-1	Annually
PLMB-DWS-02-01Y	Hot Water Heater, Electric	Oct-1	Annually
PLMB-DWS-03-01Y	Hot Water Heater, Steam Coil	Oct-1	Annually
PLMB-DWS-04-06M	Water Softener	Oct-1	Semi-annually
PLMB-DWS-05-06M	Water Filter	Oct-1	Semi-annually
PLMB-DWV-01-01Y	Sewage Ejector (Pneumatic Tank Type Ejectors)	Oct-1	Annually
PLMB-DWV-02-01Y	Sewage ejector, Sump Type	Oct-1	Annually
PLMB-DWV-03-01Y	Sump Pump	Oct-1	Annually
PLMB-DWV-04-01W	Emergency Wash	Oct-1	Weekly
PLMB-DWV-05-01Y	Emergency Shower	Oct-1	Annually
PLMB-DWV-06-01Y	Septic Tank and Drain Field	Oct-1	Annually
PLMB-HWS-01-01Y	Hot Water Converter, Steam	Oct-1	Annually
PLMB-HWS-02-06M	Solar Heating System	Oct-1	Semi-annually
PLMB-HWS-02-01Y	Solar Heating System	Oct-1	Annually
PLMB-PLB-01-01Y	Expansion Joints in Piping	Oct-1	Annually
PLMB-PLB-02-01Y	Strainer, Y-Type	Oct-1	Annually

General Services Administration	MAINTENANCE TIME STANDARDS	Office of Real Property Management and Safety	
Standard #	**Equipment Item**	**Effective Date**	**Frequency**
PLMB-PLB-03-01Y	Strainer, Bolted Flange (water and steam)	Oct-1	Annually
PLMB-PLB-04-01Y	Dual Strainer	Oct-1	Annually
PLMB-PLB-05-01Y	Backwash Strainer	Oct-1	Annually
PLMB-PLB-06-01Y	Steam Traps, All Types high pressure	Oct-1	Annually
PLMB-PLB-06-05Y	Steam Traps, All Types low pressure	Oct-1	5-Year
PLMB-PLB-07-01Y	Distiller, Water, Laboratory use only	Oct-1	Annually
PLMB-VLV-01-01M	Valve, Safety Relief	Oct-1	Monthly
PLMB-VLV-02-01Y	Valve Regulating	Oct-1	Annually
PLMB-VLV-03-01Y	Valve, Manually Operated	Oct-1	Annually
PLMB-VLV-04-01Y	Valve, Critical Check	Oct-1	Annually
PLMB-VLV-05-01Y	Backflow Preventer	Oct-1	Annually
TANKS			
TANK-AGS-01-01Y	Tank, Air/Refrigerant/LP Gas	Oct-1	Annually
TANK-CHM-01-01Y	Tank, Chemical	Oct-1	Annually
TANK-FOL-01-04Y	Tank, Fuel Oil Storage	Oct-1	4-Year
TANK-UST-01-01MY	Underground Storage Tank (UST)	Oct-1	Anually
TANK-WTR-01-03Y	Tank, Water (All Types)	Oct-1	3-Year
VERTICAL TRANSPORTATION			
VTRN-ELV-01-06M	Elevator, Hydraulic, Inspection 4 floors or less.	Oct-1	Semi-annually
VTRN-ELV-01-01Y:	Elevator, Hydraulic, Inspection 4 floors or less.	Oct-1	Annually
VTRN-ELV-02-06M			
VTRN-ELV-02-01Y	Elevator, Electric, Inspection 4 floors or less.	Oct-1	Annually
VTRN-ELV-02-05Y	Elevator, Electric, Inspection 4 floors or less.	Oct-1	5-Year
VTRN-ELV-03-01W	Elevator, Electric or Hydraulic 4 floors or less.	Oct-1	Weekly
VTRN-ELV-03-01M	Elevator, Electric or Hydraulic 4 floors or less.	Oct-1	Monthly
VTRN-ELV-03-03M	Elevator, Electric or Hydraulic	Oct-1	Quarterly
VTRN-ESC-01-01W	Escalator	Oct-1	Weekly
VTRN-ESC-01-01Y	Escalator (and Moving Walkway)	Oct-1	Annually
VTRN-WLF-01-01M	Wheelchair Lift	Oct-1	Monthly

SECTION 2: PREVENTATIVE MAINTENANCE STANDARDS

ARCS-BAR-01-06M

Frequency: Semi-annually

Security Bollards/Barricade

Application:

This standard card applies to automatic hydraulic security Bollards/Barricades found at driveway entrances, and other areas where vehicular traffic must be controlled.

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. Review manufacturer's instructions.
3. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
4. De-energize, lock out, and tag electrical circuits.
5. This work should be scheduled at non-peak hours.
6. Notify affected personnel before performing PM (alarmed or security entrances).
7. Post "out of service" signs and/or barricades, as appropriate.

Check points:

1. Check that Bollards/Barricade extend to full height.
2. Check that Bollards/Barricade retract to full depth.
3. Check Bollards/Barricade for exterior damage.
4. Check and clean sump pits and pump.
5. Check that Bollards/Barricade fasteners are tight.
6. Check Bollard/Barricade safeties (proximity, Photo, infra red, pressure etc)
7. Check Bollard/Barricade activation devices for proper operation (auto/manual/emergency)
8. Check Bollard operation under no power.
9. Inspect electrical power panel. Check electrical connections and wiring for loose or overheated conditions.
10. Inspect control panel for loose connections.
11. Check that traffic light functions, change lamps and clean lenses every 12 months.

12. Check hydraulic unit fluid level and pressures/ change fluid per manufactures recommendations.
13. Check hydraulic unit fluid connections, pump, piping and hoses for damage and leaks.
14. Clean motor and assembly.
15. Check the drive motor amperage against nameplate.
16. Clean drive mechanism compartment.
17. Inspect Bollard/Barricade coatings, decals and paint.
18. Check that all placards and warnings signs are posted.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

ARCS-DAV-01-01Y

Frequency: Annually

Davits

Application:

This standard applies to davits, structures typically used to lower things over an edge. This standard is not intended to address all fall protection related equipment.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. All fall protection equipment is required by OSHA to be checked prior to each use.
3. This section does not address powered man-lifts, harnesses, self retracting fall limiters, shock absorbers, and other related fall protection equipment that falls into the above requirements.
4. Any and all personnel involved in the use or maintenance of fall protection or who may, in the course of their work, be present on any elevated surface without a guard rail are required to have regular training in fall protection safety. Conformance includes but is not limited to ASME, ASME A 120.1, IWCA I 14.1, OSHA 1910.66, CALOSHA, AISC, AWS and local code requirements.
5. Visually inspect for corrosion. Verify all components are securely mounted.
6. Check bolt torque.

Check Points:

See Special Instructions.

Recommended Tools, Materials, and Equipment:

1. Standard Tools – Basic.

ARCS-DOR-01-06M

Frequency: Semi-annually

Door, Power Operated

Application:

This standard applies to warehouse or large overhead rolling doors.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Inspect general arrangement of door and mechanism, mountings, standards, wind locks, anchor bolts, counterbalances, weather stripping, door sweeps etc. Clean, tighten, and adjust repair as required.
2. Operate with power from stop to stop and at intermediate positions. Observe performance of various components, such as brake, limit switches, door operating speed, motor, gear box, etc. Clean and adjust as needed.
3. Check operation of safety edges, stops, electric eye, treadle, or other operating devices. Clean and make required adjustments or repairs.
4. Check manual operation. Note brake release, motor disengagement, functioning or hand pulls, chains sprockets, clutch, etc.
5. Examine all wiring, motor, starter, push button, etc., blow out or vacuum if needed.
6. Inspect gear box, change or add oil as required.
7. Perform required lubrication. Remove old or excess lubricant.
8. Clean unit and mechanism thoroughly. Touch up paint where required.
9. Clean up and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Standard Tools-Basic
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

3. Cleaning Materials. Consult the MSDS for hazardous ingredients and proper PPE.

ARCS-DOR-02-03M

Frequency: Quarterly

Door; Hydraulic, Electric or Pneumatic Operated

Application

This standard applies to entrance doors operated by sensors or switches (i.e. handicap access doors).

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Set suitable barriers at the entrance and exit of the door. Prevent obstructions from impeding pedestrian traffic around the work area.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Check alignment of door and mechanism. Inspect mountings, hinges, mats, and trim, weather stripping, etc. Replace, tighten, and adjust as required.
2. Operate with power, observing operation of actuating and safety mats, door speed, and checking functions.
3. Check manual operation.
4. Inspect power unit, lubricate and tighten lines as required.
5. Check operation of control board relays, clean, replace, adjust contacts as required.
6. Inspect door operating unit, tighten lines, and adjust as required.
7. Clean and lubricate door pivot points.
8. On pneumatic or hydraulically operated door operators, check for correct operating pressures per manufacturer's instructions.
9. Clean up and remove all debris from work area.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

ARCS-DOR-03-06M

Frequency: Semi-annually

Door, Manual, Overhead

Application

1. This standard applies to manually operated overhead doors. These doors normally range in size from 7 to 24 feet wide by 7 to 20 feet in height.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. If the door is equipped with intrusion alarms, notify the appropriate person before operating.
3. Schedule maintenance on these doors so that it does not interfere with loading dock operations.
4. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work. Follow lock out/tag out procedures at all times.

Check Points:

1. Inspect general arrangement of door and mechanism, mountings, standards, wind locks, anchor bolts, counterbalance, weather-stripping, etc. Clean, tighten, and adjust as required. Make minor repairs as needed.
2. Inspect cables for frayed or broken strands or excessive rusting.
3. Inspect winding drum for tightness and proper tracking of cables.
4. Manually raise and lower door, noting that door tracks evenly and action of break release, functioning of hand pulls, chains, sprockets, clutch, etc.
5. If equipped, inspect gearbox; change or add oil as needed.
6. Perform required lubrication. Remove old or excess lubricant.
7. Clean unit and mechanism thoroughly. Touch up paint where needed.

Recommended Tools, Materials, and Equipment:

1. Standard tools – basic
2. Rust inhibitor and paint. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Grease gun, oil, and grease
4. Ladder constructed according to OSHA/ANSI standards. Check ladder for defects. Do not use defective ladders.

ARCS-DOR-04-06M

Frequency: Semi-annually

Door, Manually Operated Entrance

Application

This standard applies to manually operated entrance doors, hinged and sliding type.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Set suitable barriers at the entrance and exit of the door. Prevent obstructions from impeding pedestrian traffic around the work area.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Hinged Doors
   a) Inspect the frame and supporting structures.
   b) Inspect hardware; hinges, latch keeper, lock, etc. Apply graphite where needed, wipe off excess.
   c) Inspect glass, putty, or retaining pieces. Correct any deficiencies.
   d) Operate door to observe functioning of check. Adjust and service as needed.
   e) Check opening/closing resistance pressure and speed.
   f) Touch up paint as needed.
   g) Clean up and remove all debris from work area.
2. Sliding Doors
   a) Center door within track and remove, start by lifting up to remove from bottom track first.
   b) Clean out track of any debris.
   c) Inspect hardware; rollers, track etc. Correct any deficiencies.
   d) Return door to track, start by inserting door into bottom track first.
   e) Operate door to observe function.
   f) Check opening/closing resistance pressure and speed.

g) Touch up paint as required.

h) Clean up and remove all debris from work area.

3. Revolving Doors

a) Remove obstructions and clean out track.

b) Fold door. Note action and freedom of motion.

c) Inspect locking device, adjust as needed.

d) Clean pivot points and apply graphite.

e) Inspect felt or rubber seals.

f) Set the emergency fold pressure on the door to the manufacturer's specifications.

g) Touch up paint as required.

h) Clean up all debris from work area.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Standard Tools - Basic.
2. Graphite. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Clean wiping cloths.
4. Suitable barriers.

ARCS-FPL-01-01M

Frequency: Monthly

Fireplace

Application:

The purpose of this standard is to perform a cleaning of the fire box and an inspection of the flue, chimney, fire damper, and smoke shelf. This function should be performed once a month, during the time of year that the fireplace is in use.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Do not use any flammable lubricants or solvents. If lubrication is necessary, use only dry powdered graphite.

Check Points:

1. Remove loose ash and vacuum inside of fire box (fireplace).
2. Inspect fire brick and mortar joints for cracks or breakage. Repair or replace as necessary.
3. Inspect fire damper, checking for proper operation.
4. Make a visual inspection of the flue and chimney, checking for obstructions.
5. Clean surrounding area.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Small shovel, dust pan, and broom
3. Vacuum
4. Eye protection, NIOSH/MSHA approved respirator, gloves, and coveralls

ARCS-FPL-02-01Y

Frequency: Annually

Incinerator

Application:

The work required by this standard applies to incinerators.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. If the insulation is known or suspected to contain asbestos, check the building's asbestos management plan to see it has been tested for asbestos. If it is suspect but has not been tested, have it tested. Manage asbestos in accordance with the plan.

Check Points:

1. Thoroughly clean furnace, ash pit, grates, etc.
2. Remove fly ash and soot from flue gas passages.
3. Examine furnace. Replace burned or damaged parts.
4. Inspect for loose, broken, or missing refractory or fire brick.
5. Examine all doors, inspect and/or clean out ports. Make them fit properly and stop any air leaks around them.
6. Check uptakes or connections to stack or chimney. Remove dirt, fly ash scale, etc.
7. Examine dampers for condition and freedom of motion.
8. Examine structure and supports. Look for warped or sagging members, cracks, or other indications of weakness.
9. Check charging chute, frame, cover, etc. Replace broken, missing, or defective parts.
10. Check all instruments, gauges, etc. Test for proper operation.
11. Repair any damaged or missing insulation. If the insulation contains asbestos, refer to Appendix G for the Universal Waste Guide.

12. Inspect stack or chimney for holes, cracks or deterioration.
13. Inspect spark arrestor or screen on top of stack. Repair holes as necessary or replace.
14. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Respirator
3. Goggles
4. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

ARCS-LND-01-06M

Frequency: Semi-annually

Fountain, Memorial or Decorative

Application:

The work required by this standard applies to memorial or decorative fountains. These fountains normally operate during the summer season. They are usually drained and secured in the fall and are reactivated again in the spring.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Fall

1. Drain fountain
2. Remove fountain head(s)
3. Clean scale from head(s) after removing and install cover plate.
4. Clean bolts and spacers. Replace defective bolts as needed.
5. Check and clean fill tube, remove spacer pipe and cap fill tube.
6. Clean overflows and strainers.
7. Check for structural damage. Repair as necessary.
8. Where applicable, add an approved safe winterizing/anti freeze agent to water to prevent freezing.

Spring

1. Remove fill tube cap, install spacer pipe and install fill tube.
2. Remove fountain head cover(s) (if applicable) and install fountain head.
3. Clean basins
4. Check for structural damage. Repair as necessary.
5. Remove tags from valves and fill fountain
6. Remove tags from pump and put into service.

7. Add an appropriate biocide.

Recommended Tools, Materials, and Equipment:

1. Standard tools - Basic
2. Hip boots
3. Cleaning equipment and materials - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Biocide.

ARCS-LND-02-06M

Frequency: Semi-annually

Gates and Fences, Security and Access

Application:

This standard applies to fences and gates found at driveway entrances, walkway entrances, and other areas where pedestrian or vehicular traffic must be controlled. This classification applies only to those fences and gates where a definite need exists for this type of maintenance to be performed.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. This work should be scheduled at non-peak hours.
6. Notify affected personnel before performing PM (alarmed or security entrances).
7. Post "out of service" signs and/or barricades, as appropriate.

Check Points:

Gates:

1. Inspect all pivot points, hinges, latches, etc. Apply lubricant where needed, wiping off excess.
2. Check all locking devices. Lubricate as required.
3. Inspect center gate support rollers and lubricate as required.
4. Clean roller track of any debris.
5. Check bolts, fasteners, and mounting hardware. Tighten or adjust as necessary.
6. Check for any obstructions that retard full swing or movement of the gate.
7. Check that shrubs and trees are pruned clear of gate.
8. Check hold open devices for proper operation. Lubricate as required.

Fences:

1. Check posts and corner posts, support guys, and horizontal bars between each support post.
2. Check wire and anchor point; re-stretch and re-anchor if necessary.
3. Inspect fence anchors along the bottom of the fence and at the point where the fence is connected to the post.
4. Treat with galvanized protectant where rust has developed.
5. Apply weed control along entire base of fence. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
6. Check that shrubs and trees are pruned clear of fencing

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. "Out of Service" signs
3. Cleaning equipment and materials. Consult the MSDS for hazardous ingredients and proper PPE.
4. Ladder constructed according to OSHA/ANSI standards. Check ladder for defects. Do not use defective ladders.
5. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
6. Wire Stretcher
7. Rust Protectant. Consult the MSDS for hazardous ingredients and proper PPE.

ARCS-LND-03-01Y

Frequency: Annually

Lawn Sprinkler Nozzles

Application:

This standard applies to all installed sprinkler systems with nozzles.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. This work should be scheduled prior to flushing system.

Check Points:

1. Check nozzle and remove corrosion/encrustation.
2. Check for proper spray pattern of nozzles, minimize over spray on surfaces or structures.
3. Replace washers and/or "o" rings if required.
4. Clean unit thoroughly and inspect for freedom of operation.
5. On rotating types:
    a. Check throw regulator and spring assembly for tightness.
    b. Lightly lubricate pivot arm and standard bushings.
    c. Check adjustment screw and retaining spring.
6. Clean up work area on lawn, remove any debris around sprinkler heads.

Recommended Tools, Materials, and Equipment:

1. Standard tools - Basic
2. Washers
3. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).

ARCS-LND-04-03M

Frequency: Quarterly

Flag Pole, Electric and Manual

Application:

This standard applies to all installed flag poles with electric and manual cabling systems.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Electrical Flag Pole

1. Adjust tension on cable.
2. Adjust spring adjustment cam.
3. Check stops on cable.
4. Inspect manual and automatic controls and adjust if necessary.
5. Lubricate all bearings.
6. Inspect cable, standards, hooks and clasps for wear and replace if necessary.
7. Check power and control wire and connections.
8. Check and test safeties and controls.
9. Inspect access doors and ports including gaskets.
10. Inspect anchor bolts.
11. Inspect pole surface condition.

Manual Flag Pole

1. Adjust tension on cable.
2. Check stops on cable.
3. Lubricate all bearings.
4. Inspect cable, standards, hooks and clasps for wear and replace if necessary.

5. Inspect anchor bolts.
6. Inspect pole surface condition.

Recommended Tools, Materials, and Equipment:

1. Standard tools - Basic
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Cleaning materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).

ARCS-LND-05-06M

Frequency: Semi-annually

Lawn Mower and Edger

Application:

This applies to gasoline powered, hand operated, rotary mowers and edgers. Maintenance should be scheduled after every 50 hours of operation or twice a season. Routine lubrication should be accomplished by operator.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Change engine oil. **Note**: Oil should be changed at end of season prior to laying unit up for winter.
2. Service air and fuel filters.
3. Sharpen or replace cutting blade.
4. Clean and gap or replace spark plug.
5. Inspect unit, clean debris from cooling air passages and make other needed adjustments.
6. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic

ARCS-MHL-01-01Y

Frequency: Annually

Manhole, Electrical

Application:

This standard applies to manholes which contain electrical distribution cables or other electrical wiring and cabling.

Special Instructions:

1. Review the Standard Operating Procedure for "Confined Space Entry." Follow OSHA guidelines for permitting of entry and atmospheric testing of confined spaces. NEVER enter a confined space without a safety watch.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection."
5. Wear appropriate protective clothing.
6. No open flames or smoking.
7. Use barricade around manhole.
8. Provide ventilation within manhole. Ensure that the exhaust from the gas or diesel-powered air compressor or blower is directed well away from the manhole.

Check points:

1. Test for gas in accordance.
2. Pump out water.
3. Clean out trash, debris, etc., and dispose of properly.
4. Inspect cable, racks, splices, etc.
5. Inspect structural features.
6. Inspect manhole seal, replace if necessary.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Respirator
3. Barricade

ARCS-MHL-02-03M

Frequency: Quarterly

Manhole, Sewer

Application:

This standard applies to manholes which contain sanitary sewer lines or other related piping systems.

Special Instructions:

1. Review the Standard Operating Procedure for "Confined Space Entry." Follow OSHA guidelines for permitting of entry and atmospheric testing of confined spaces. NEVER enter a confined space without a safety watch.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection."
5. Wear appropriate protective clothing.
6. No open flames or smoking.
7. Use barricade around manhole.
8. Provide ventilation within manhole. Ensure that the exhaust from the gas or diesel-powered air compressor or blower is directed well away from the manhole.

Check points:

1. Test for gas.
2. Remove cover.
3. Observe flow.
4. Clean work area and remove all debris.
5. Treat for insect infestation as necessary.
6. Inspect manhole seal, replace if necessary.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Respirator
3. Barricade

ARCS-MHL-03-06M

Frequency: Semi-annually

Manhole (Water, Steam, and Fuel Oil)

Application:

This standard applies to manholes which contain water, steam system, fuel oil or other systems.

Special Instructions:

1. Review the Standard Operating Procedure for "Confined Space Entry." Follow OSHA guidelines for permitting of entry and atmospheric testing of confined spaces. NEVER enter a confined space without a safety watch.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection."
5. Wear appropriate protective clothing.
6. No open flames or smoking.
7. Use barricade around manhole.
8. Provide ventilation within manhole. Ensure that the exhaust from the gas or diesel-powered air compressor or blower is directed well away from the manhole.
9. Maintenance of any equipment located in the manhole will be performed under the appropriate standard card in conjunction with this maintenance activity.

Check points:

1. Test for gas.
2. Remove cover.
3. Observe flow.
4. Examine structural features of sewer line, interior of manhole, manhole frame and cover, etc.
5. If applicable, Check for water accumulation. Pump out water. If contaminated follow hazmat procedures for proper disposal.
6. Clean work area and remove all debris.

7. Treat for insect infestation as necessary.
8. Inspect manhole seal, replace if necessary.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Respirator
3. Barricade

ARCS-RFS-01-06M

Frequency: Semi-annually

Roof Inspection, Built Up Type

Application

This standard applies to Built-Up roofing systems typically consisting of a waterproof membrane (bituminous) over a deck, an outer protective coating (rocks, gravel, roll roofing, cement shingles, metal, etc.) and metal flashing or coping at edges and seams.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's or installer's instructions (if available)
3. Perform inspections twice annually in the spring and fall when the roof is driest and most accessible.
4. Additional inspections should be performed after any severe winds or storms.
5. A maintenance check list and copy of the roof plan should be used at time of inspection and areas of concern should be clearly marked so they can be easily located by repair crews.
6. It is vitally important to identify and repair the root cause of any problem to prevent further damage to the roofing system.
7. Use care when working in high places, use safety belt if necessary.

Check Points:

1. Check ceilings and the underside of the deck for signs of water entry such as stained ceiling tiles, dry rot in a wooden deck, or rust in a steel deck. Note all deteriorated areas on the roof plan for comparison later on the roof.
2. Walk around the perimeter of the building. Check for cracks and signs of water entry into the walls; examine exterior drainage accessories such as downspout, scupper heads and gutters for signs of leakage. Mark the deficiencies on the roof plan and proceed to the roof.
3. Check for ponding and plant growth (roof should drain within 48 hours of a rain fall). Accumulation of water (ponding) should be noted on the roof plan. Pay particular attention to areas near building air intakes.
4. Check for physical damage such as punctures, note location of patches, repairs and accumulation of debris especially near drains.

5. Check for wrinkles, buckles, bubbles and sponginess. Note exposure of bituminous coating due to loose or missing gravel.
6. Check all flashing for wind damage, missing caulking, curling, and exposed edges. Check flashing fasteners for looseness and deterioration. Check any fibrous material that might be asbestos for deterioration. Report information on any asbestos material to the asbestos program.
7. Check the condition of any joints, roof to wall joint in particular. Check the termination of roofing expansion joints at parapet walls. Be sure that water drains off the top of the coping and that it is well attached.
8. Check coping for deterioration, especially rusting, punctures, open seams and spalling or cracking in masonry coping.
9. Check whether walkways are in logical locations and in good condition with no blistering below them.
10. Check that any installed equipment such as antennas, HVAC equipment and flagpoles are properly installed according to building codes, including necessary I-beam supports for heavy A/C equipment and are flashed and secured to the building.
11. Cleanout and refill pitch pockets (penetration pockets) where filler is cracked or shrinking.
12. Check ballast (rock) for even spread; remove any with very sharp edges.
13. TPO Roofs (if applicable) must be kept clean for maximum reflectivity.
14. Check all roof hatches, doors and access/egress points. Inspect weather seals, replace if necessary. Check for proper latching/ opening pressure and swing. Inspect (locking mechanism where applicable)
15. Remove all trash, debris or unsecured material from roof and dispose of properly.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Standard Tools - Basic
2. Ladder constructed in accordance with OSHA/ANSI STANDARDS. Check ladder for defects. Do not use defective ladders.
3. Safety line and harness (if necessary).

ROOF INSPECTION CHECKLISTS

Building_____
Location_____
Maintenance Inspector's Name_____
Date_____

General Appearance • Good • Fair • Poor
Water Tightness • No Leaks • Leaks with Long Rain
• Leaks with Every Rain
Ballast (as applicable) • Even spread with out sharp edges.

BUILT-UP ROOF

REPORTED CAUSE OF LEAKS
- Weathering of Material
- Faulty Material
- Faulty Design
- Wind Damage
- Hail Damage
- Faulty Construction
- Roof Traffic
- Flashing Failure
- Low Spots
- Gravel Stop Failure
- Other_____

ADHESION OF MINERAL SURFACING TO BITUMEN
- Good
- Fair
- Poor

ASPHALT SHINGLE ROOF

REPORTED CAUSE OF LEAKS
- Wind
- Weathering of Shingles
- Faulty Design
- Faulty Material
- Faulty Application

OTHER PROBLEMS
- Hail Damage
- Traffic on Roof
- Other Mechanical Damage
- Failure of Flashings

CONDITION OF SHINGLES
- Unchanged
- Buckled
- Blistered
- Curled
- Tabs Missing

LOSS OF GRANULES
- Slight
- Medium
- Severe

OTHER PROBLEMS
- Asphalt Coating Damaged
- Coating Alligatored or Cracked
- Other_____

ASPHALT ROLL ROOFING ROOF

REPORTED CAUSE OF LEAKS

- Weathering
- Faulty Material
- Wind
- Traffic
- Faulty Application
- Hail Damage
- Other_____

CONDITION OF ROOFING

- Unchanged
- Buckled
- Blistered

LOSS OF GRANULES

- Slight
- Medium
- Severe

OTHER PROBLEMS

- Asphalt Coating Damage
- Coating Alligatored or Cracked
- Other_____

METAL ROOF

REPORTED CAUSE OF LEAKS

- Corrosion
- Faulty Design
- Broken Seams
- Faulty Construction
- Faulty Seams
- Insufficient Lap
- Defective Fasteners
- Flashings
- Other_____

GENERAL CONDITION

Rust or Corrosion • None • slight • Severe
Condition of Protective Coating • Good • Fair • Poor
Seams Broken • Yes • No • Location_____

CEMENT COMPOSITION ROOF

REPORTED CAUSE OF LEAKS

- Weathering
- Faulty Design
- Flashings
- Faulty Construction
- Faulty Material
- Underlayment
- Wind
- Hail
- Other_____

CONDITION OF ROOFING

- Unchanged
- Loose Shingles
- Broken Shingles_____%
- Broken Corrugated Sheets_____%

FAILURE OF FASTENERS

- Yes_____%
- No

FLASHINGS

Chimney Flashings --------	• Satisfactory	• Defective
Wall Flashings ----------	• Satisfactory	• Defective
Ridge Flashings ----------	• Satisfactory	• Defective
Vent Flashings----------	• Satisfactory	• Defective
Valley Flashings----------	• Satisfactory	• Defective
Edge Flashings----------	• Satisfactory	• Defective

DRAINAGE

Gutters----------	• Satisfactory	• Defective
Downspouts ----------	• Satisfactory	• Defective

GENERAL REMARKS:

COMMENTS

ROOF DETAIL GRID*

* USE TO INDICATE LOCATION OF PROBLEM AREAS

ROOF INSPECTION WORKSHEET - COMMENTS

INSTRUCTIONS: This worksheet may be used to supplement other worksheets or as an alternate to other worksheets provided with the guide cards. Circle the response. i.e., Y = yes, N = no or U = unknown or not observed. If Y (yes), circle the type of problem

A. EVALUATION OF INTERIOR CONDITIONS

1. Does the roof leak? Describe:_____ Y N U
_____
_____

2. Are there water stains on: Y N U
   a. walls c. deck e. structural elements
   b. ceilings d. floor f. other:_____

3. Do structural elements show any of the following: Y N U
   a. cracks d. alteration g. physical damage
   b. splits e. rotting h. insect damage
   c. spalling f. settlement i. other:_____

4. Does the underside of the deck show any of the following: Y N U
   a. rusting c. spalling e. sagging
   b. rotting d. cracks f. other:_____

B. EVALUATION OF EXTERIOR CONDITIONS

1. Do the exterior walls show any of the following: Y N U
   a. cracks c. spalling e. water stains
   b. rusting d. peeling f. other_____

2. Does the fascia or soffit show any of the following: Y N U
   a. cracks c. spalling e. water stains
   b. rusting d. movement f. other:_____

3. Do the gutters or downspouts show any of the following: Y N U
   a. loose c. missing e. clogged
   b. damaged d. disconnect f. other:_____

C. EVALUATION OF ROOFTOP CONDITIONS

1. Is there any unauthorized, unnecessary, or improperly installed installed equipment on the roof? Y N U
   a. equipment c. antennas e. cables
   b. signs d. platforms f. other:_____

2. Do adjacent parapet walls show any of the following: Y N U
   a. cracks c. cap cracked e. sealant
   b. spalling d. cap missing f. other:_____

D. REMARKS: _____
_____

ARCS-RFS-02-06M

Frequency: Semi-annually

Roof Inspection, Shingle Type

Application

This standard applies to Shingle roofing systems typically consisting of a waterproof membrane (bituminous) over a deck, an outer protective coating of shingles, and metal flashing or coping at drip edges and valleys.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's or installer's instructions (if available)
3. Perform inspections twice annually in the spring and fall when the roof is driest and most accessible.
4. Additional inspections should be performed after any severe winds or storms.
5. A maintenance check list and copy of the roof plan should be used at time of inspection and areas of concern should be clearly marked so they can be easily located by repair crews.
6. It is vitally important to identify and repair the root cause of any problem to prevent further damage to the roofing system.
7. Use care when working in high places, use safety belt if necessary.

Check Points:

1. Check ceilings and the underside of the roof deck for signs of water entry such as stained ceiling tiles, dry rot in a wooden deck. Note all deteriorated areas on the roof plan for comparison later on the roof.
2. Walk around the perimeter of the building. Check for cracks and signs of water entry into the walls; examine exterior drainage accessories such as downspout, scupper heads and gutters for signs of leakage. Mark the deficiencies on the roof plan and proceed to the roof.
3. Check for physical damage such as punctures, note location of patches, repairs and accumulation of debris especially near drains.
4. Check for wrinkles, buckles, and sponginess.
5. Check all flashing for wind damage, missing caulking, curling, and exposed edges. Check flashing fasteners for looseness and deterioration. Check any fibrous material that might be asbestos for deterioration. Report information on any asbestos material to the asbestos program.

6. Check the condition of any joints, roof to wall joint in particular. Check the termination of roofing expansion joints at parapet walls. Be sure that water drains off the top of the coping and that it is well attached.
7. Check coping for deterioration, especially rusting, punctures, open seams and spalling or cracking in masonry coping.
8. Check that any installed equipment such as antennas, HVAC equipment and flagpoles are properly installed according to building codes, including necessary I-beam supports for heavy A/C equipment and are flashed and secured to the building.
9. Cleanout and refill pitch pockets (penetration pockets) where filler is cracked or shrinking.
10. Remove all trash, debris or unsecured material from roof and dispose of properly.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Standard Tools - Basic
2. Ladder constructed in accordance with OSHA/ANSI STANDARDS. Check ladder for defects. Do not use defective ladders.
3. Safety line and harness (if necessary).

ROOF INSPECTION CHECKLISTS

Building_____
Location_____
Maintenance Inspector's Name_____
Date_____

General Appearance
- Good
- Fair
- Poor

Water Tightness
- No Leaks
- Leaks with Long Rain
- Leaks with Every Rain

Ballast (as applicable)
- Even spread with out sharp edges.

BUILT-UP ROOF

REPORTED CAUSE OF LEAKS
- Weathering of Material
- Faulty Material
- Faulty Design
- Wind Damage
- Hail Damage
- Faulty Construction
- Roof Traffic
- Flashing Failure
- Low Spots
- Gravel Stop Failure
- Other_____

ADHESION OF MINERAL SURFACING TO BITUMEN
- Good
- Fair
- Poor

ASPHALT SHINGLE ROOF

REPORTED CAUSE OF LEAKS
- Wind
- Weathering of Shingles
- Faulty Design
- Faulty Material
- Faulty Application

OTHER PROBLEMS
- Hail Damage
- Traffic on Roof
- Other Mechanical Damage
- Failure of Flashings

CONDITION OF SHINGLES
- Unchanged
- Buckled
- Blistered
- Curled
- Tabs Missing

LOSS OF GRANULES
- Slight
- Medium
- Severe

OTHER PROBLEMS
- Asphalt Coating Damaged
- Coating Alligatored or Cracked
- Other_____

ASPHALT ROLL ROOFING ROOF

REPORTED CAUSE OF LEAKS

- Weathering
- Faulty Material
- Wind
- Traffic
- Faulty Application
- Hail Damage
- Other_____

CONDITION OF ROOFING

- Unchanged
- Buckled
- Blistered

LOSS OF GRANULES

- Slight
- Medium
- Severe

OTHER PROBLEMS

- Asphalt Coating Damage
- Coating Alligatored or Cracked
- Other_____

METAL ROOF

REPORTED CAUSE OF LEAKS

- Corrosion
- Faulty Design
- Broken Seams
- Faulty Construction
- Faulty Seams
- Insufficient Lap
- Defective Fasteners
- Flashings
- Other_____

GENERAL CONDITION

Rust or Corrosion • None • slight • Severe
Condition of Protective Coating • Good • Fair • Poor
Seams Broken • Yes • No • Location_____

CEMENT COMPOSITION ROOF

REPORTED CAUSE OF LEAKS

- Weathering
- Faulty Design
- Flashings
- Faulty Construction
- Faulty Material
- Underlayment
- Wind
- Hail
- Other_____

CONDITION OF ROOFING

- Unchanged
- Loose Shingles
- Broken Shingles_____%
- Broken Corrugated Sheets_____%

FAILURE OF FASTENERS

- Yes_____%
- No

FLASHINGS

Chimney Flashings --------	• Satisfactory	• Defective
Wall Flashings ----------	• Satisfactory	• Defective
Ridge Flashings ----------	• Satisfactory	• Defective
Vent Flashings----------	• Satisfactory	• Defective
Valley Flashings----------	• Satisfactory	• Defective
Edge Flashings ----------	• Satisfactory	• Defective

DRAINAGE

Gutters----------	• Satisfactory	• Defective
Downspouts ----------	• Satisfactory	• Defective

GENERAL REMARKS:

COMMENTS

ROOF DETAIL GRID*

* USE TO INDICATE LOCATION OF PROBLEM AREAS

ROOF INSPECTION WORKSHEET - COMMENTS

INSTRUCTIONS: This worksheet may be used to supplement other worksheets or as an alternate to other worksheets provided with the guide cards. Circle the response. i.e., Y = yes, N = no or U = unknown or not observed. If Y (yes), circle the type of problem

A. EVALUATION OF INTERIOR CONDITIONS

1. Does the roof leak? Describe:_____ Y N U
_____
_____

2. Are there water stains on: Y N U
   a. walls c. deck e. structural elements
   b. ceilings d. floor f. other:_____

3. Do structural elements show any of the following: Y N U
   a. cracks d. alteration g. physical damage
   b. splits e. rotting h. insect damage
   c. spalling f. settlement i. other:_____

4. Does the underside of the deck show any of the following: Y N U
   a. rusting c. spalling e. sagging
   b. rotting d. cracks f. other:_____

B. EVALUATION OF EXTERIOR CONDITIONS

1. Do the exterior walls show any of the following: Y N U
   a. cracks c. spalling e. water stains
   b. rusting d. peeling f. other_____

2. Does the fascia or soffit show any of the following: Y N U
   a. cracks c. spalling e. water stains
   b. rusting d. movement f. other:_____

3. Do the gutters or downspouts show any of the following: Y N U
   a. loose c. missing e. clogged
   b. damaged d. disconnect f. other:_____

C. EVALUATION OF ROOFTOP CONDITIONS

1. Is there any unauthorized, unnecessary, or improperly installed installed equipment on the roof? Y N U
   a. equipment c. antennas e. cables
   b. signs d. platforms f. other:_____

2. Do adjacent parapet walls show any of the following: Y N U
   a. cracks c. cap cracked e. sealant
   b. spalling d. cap missing f. other:_____

D. REMARKS: _____
_____

ARCS-RFS-03-03M

Frequency: Quarterly

Extensive and Intensive Vegetative Roof

Application:

This standard applies to Extensive and Intensive Vegetative Roofs.

Special Instructions:

1. Check membrane, flashing and roof penetration condition for degradation and signs of leakage
2. Clean drains and gutters
3. Check irrigation system for uniform coverage, valve leakage, plugged heads, and leaking solenoids
4. Check and clean cisterns
5. Check operation of any pumps, floats, or irrigation controls. Irrigation controls tied to a weather service should have connection verified (verify appropriate weather station is used)
6. Check for invasive/damaging weeds and treat appropriately
7. Assess any needs for fertilization

Check Points:

See Special Instructions

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Ladder constructed in accordance with OSHA/ANSI STANDARDS. Check ladder for defects. Do not use defective ladders.
3. Safety line and harness (if necessary).

ARCS-SCT-01-03M

Frequency: Quarterly

Key Card System

Application:

This standard applies to Key Card Access systems which control building access.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Disassemble card reader head and vacuum.
2. Check card printer unit and vacuum.
3. Check wiring for loose connections, discoloration, etc.
4. Change filter.
5. Change batteries.
6. Check cards to see if codes are in operation.
7. Reassemble unit.
8. Clean exterior and surrounding area of unit.

Recommended Tools, Materials, and Equipment:

1. Tool group B
2. Spare filter and batteries
3. Cleaning equipment and material. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Vacuum cleaner

ARCS-SCT-02-01Y

Frequency: Annually

Parking Arm Gates

Application:

This standard applies to parking arm gates which control building parking access.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Lubricate mechanism with graphite.
2. Adjust linkage between motor and arm.
3. Check and adjust arm pressure.
4. Check and adjust sensitivity on magnetic coils embedded in asphalt.
5. Fill cracks in asphalt where coils are imbedded.
6. Clean and adjust electric breakers.
7. Paint arm as required. Replace if damaged.

Recommended Tools, Materials, and Equipment:

1. Tool group B
2. Torque wrenches
3. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Asphalt filler
5. Appropriate lubricants. Consult the MSDS for hazardous ingredients and proper PPE.

ARCS-STR-01-01Y

Frequency: Annually

Lightning Protection

Application:

This standard applies to Lightning Protection systems installed on the building to discharge to ground any electrical charges caused by lightning.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. During the first inspection, check that:
   a) All air terminals (lightning rods) are interconnected.
   b) At least two down conductors are installed with their own ground connection.

Check points:

1. Inspect air terminals for corrosion and rigid attachment to structure.
2. Examine conductors and all connections for corrosion, strong mechanical joints which provide good electrical conductivity, and loose or broken fasteners.
3. Check for loops, sharp bends (less than 8" radius) and frayed horizontal and vertical conductors.
4. Check for damaged guards and down conductors.
5. Inspect grounding attachment for permanency and corrosion (if practical).
6. Test resistance to ground for each down conductor.
7. Clean up work area and remove debris.

Recommended Tools, Materials, and Equipment:

1. Tool Group B

ARCS-SWM-01-01M

Frequency: Monthly

Storm Water Management: Ponds (Dry and Wet)

Application

This standard is intended for Detention and Retention Ponds. This standard is intended to be used to ensure ponds sustain effective removal of a variety of pollutants in accordance with local jurisdiction and requirements.

Special Instructions:

In addition to the procedure(s) outlined in this standard, local jurisdiction shall be strictly adhered.

Check points:

A checklist can be found in the Operation, Maintenance and Management of Stormwater Management Systems authored by the Office of Water, U.S. Environmental Protection Agency. As of this writing, the most recent document was authored in 1997. Refer to Chapter 7, Appendix 7-1 for specific monthly checklist requirements as it pertains to dry ponds.

Recommended Tools, Materials, and Equipment:

Recommended tools are itemized in the Operation, Maintenance and Management of Stormwater Management Systems (Chapter 7), Office of Water, U.S. Environmental Protection Agency.

ARCS-SWM-02-01M

Frequency: Monthly

Storm Water Management : Basins

Application

This standard is intended for stormwater basins.

Special Instructions:

In addition to the procedure(s) outlined in this standard, local jurisdiction shall be strictly adhered.

Check points:

A checklist can be found in the Operation, Maintenance and Management of Stormwater Management Systems authored by the Office of Water, U.S. Environmental Protection Agency. As of this writing, the most recent document was authored in 1997. Refer to Chapter 7, Appendix 7-2 for specific monthly checklist requirements as it pertains to basins.

Recommended Tools, Materials, and Equipment:

Recommended tools are itemized in the Operation, Maintenance and Management of Stormwater Management Systems (Chapter 7), Office of Water, U.S. Environmental Protection Agency.

ARCS-SWM-03-01M

Frequency: Monthly

Storm Water Management : Trenches

Application

This standard is intended for stormwater trenches.

Special Instructions:

In addition to the procedure(s) outlined in this standard, local jurisdiction shall be strictly adhered.

Check points:

A checklist can be found in the Operation, Maintenance and Management of Stormwater Management Systems authored by the Office of Water, U.S. Environmental Protection Agency. As of this writing, the most recent document was authored in 1997. Refer to Chapter 7, Appendix 7-2B for specific monthly checklist requirements as it pertains to trenches.

Recommended Tools, Materials, and Equipment:

Recommended tools are itemized in the Operation, Maintenance and Management of Stormwater Management Systems (Chapter 7), Office of Water, U.S. Environmental Protection Agency.

ARCS-SWM-04-01M

Frequency: Monthly

Storm Water Management : Dry Wells

Application

This standard is intended for stormwater dry wells.

Special Instructions:

In addition to the procedure(s) outlined in this standard, local jurisdiction shall be strictly adhered.

Check points:

A checklist can be found in the Operation, Maintenance and Management of Stormwater Management Systems authored by the Office of Water, U.S. Environmental Protection Agency. As of this writing, the most recent document was authored in 1997. Refer to Chapter 7, Appendix 7-2C for specific monthly checklist requirements as it pertains to dry wells.

Recommended Tools, Materials, and Equipment:

Recommended tools are itemized in the Operation, Maintenance and Management of Stormwater Management Systems (Chapter 7), Office of Water, U.S. Environmental Protection Agency.

ARCS-SWM-05-01M

Frequency: Monthly

Storm Water Management : Permeable Pavers

Application

This standard is intended for permeable pavers.

Special Instructions:

In addition to the procedure(s) outlined in this standard, local jurisdiction shall be strictly adhered.

Check points:

A checklist can be found in the Operation, Maintenance and Management of Stormwater Management Systems authored by the Office of Water, U.S. Environmental Protection Agency. As of this writing, the most recent document was authored in 1997. Refer to Chapter 7, Appendix 7-2D for specific monthly checklist requirements as it pertains to pavers.

Recommended Tools, Materials, and Equipment:

Recommended tools are itemized in the Operation, Maintenance and Management of Stormwater Management Systems (Chapter 7), Office of Water, U.S. Environmental Protection Agency.

ARCS-SWM-06-01M

Frequency: Monthly

Storm Water Management : Hydrodynamic Structures (i.e. swales)

Application

This standard is intended for hydrodynamic structures (swales).

Special Instructions:

In addition to the procedure(s) outlined in this standard, local jurisdiction shall be strictly adhered.

Check points:

A checklist can be found in the Operation, Maintenance and Management of Stormwater Management Systems authored by the Office of Water, U.S. Environmental Protection Agency. As of this writing, the most recent document was authored in 1997. Refer to Chapter 7, Appendix 7-2E for specific monthly checklist requirements as it pertains to hydrodynamic structures (swales).

Recommended Tools, Materials, and Equipment:

Recommended tools are itemized in the Operation, Maintenance and Management of Stormwater Management Systems (Chapter 7), Office of Water, U.S. Environmental Protection Agency.

ARCS-SWM-07-01M

Frequency: Monthly

Storm Water Management : Biofiltration

Application

This standard is intended for the biofiltration: bioretention cells and/or rain gardens.

Special Instructions:

In addition to the procedure(s) outlined in this standard, local jurisdiction shall be strictly adhered.

Check points:

A checklist can be found in the Operation, Maintenance and Management of Stormwater Management Systems authored by the Office of Water, U.S. Environmental Protection Agency. As of this writing, the most recent document was authored in 1997. Refer to Chapter 7, Appendix 7-4 for specific monthly checklist requirements as it pertains to bioretention.

Recommended Tools, Materials, and Equipment:

Recommended tools are itemized in the Operation, Maintenance and Management of Stormwater Management Systems (Chapter 7), Office of Water, U.S. Environmental Protection Agency.

ARCS-WIN-01-01Y

Frequency: Annually

Window Washing Scaffold, Power Operated

Application

This standard applies to window washing scaffold that is deployed from the roof.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Set suitable barriers on the ground as necessary. Prevent obstructions from impeding pedestrian traffic around the work area.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Inspect structural features on roof. Remove obstructions from the track and from, on, or near the garage.
2. Inspect roof car, platform, steps, wire mesh panels, gate, hinges, hardware, etc.
3. Observe operation of drive motor and mechanism, brake, cable, reel, drive, wheels, guide rollers, etc. Adjust as necessary.
4. Examine telephone cable reel and make a test call.
5. Inspect operation of electric controller, direction switches, inching buttons, protective devices, limit switches, position interlocks, locking pins and sockets, etc. Adjust as necessary.
6. Check operation of manual and emergency controls, hand crank, motor disengagement, brakes, and other devices. Adjust as necessary.
7. Inspect fresh water and wash water tanks, pipe lines, drains, inspection or access openings and covers, etc. Empty and wash out tanks after use.
8. Test operation of scaffold from low to high position and along track to assure safe operation. Test all control devices, interlocks, limits, etc.
9. Inspect hoist ropes for worn, frayed, or broken strands.
10. Perform any work prescribed by manufacturer that is not indicated here.
11. Lubricate all necessary moving parts per the manufacturer's recommendations.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Lubricants

CHLD-EQP-01-01M

Frequency: Monthly

Child Care Equipment

Application

This standard is intended for Child Care equipment. This standard is intended to be used to ensure that the equipment and systems are maintained in a safe operating condition, there are no parts, pieces, conditions or situations that my cause injury or endanger the users or pedestrians when used in accordance with the manufacturers placards, recommendations, instructions or guidelines.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Obtain and understand the manufacturer's inspection and maintenance requirements for the equipment.
3. Read and understand manufacturer's instructions of each device before making adjustments to the equipment or to the system. Understand what effects making adjustments will have on the operation of the equipment PRIOR to making any changes.
4. Ensure that the equipment is not in use and that the area is free and clear of children and bystanders that may either be in the work area or may be in danger by in close proximity to tools and serviced equipment. This may require closing the area or constructing a safety barrier.
5. This PM will typically require one person.
6. If a condition is found to exist which is, unsafe, or may cause injury, immediate action must be taken to resolve the situation by securing the equipment or area from further use and notifying the building Property Manager / Child care operator.
7. Responsibility for correction of deficiencies may fall to others, such as the child care provider, cleaning and lawn maintenance programs, or field office manager/child care coordinator. Findings shall be reported to the appropriate manager.
8. Be particularly alert to potential entrapment hazards in playground equipment.

Check points:

1. Visually inspect equipment to ensure structural integrity, check all mechanical connections and fasteners for tightness.
2. Visually inspect equipment for body shearing or pinch points.

3. Visually inspect equipment for any parts or structure that could pierce or puncture.
4. Visually inspect all welded connections for signs of cracks or deterioration.
5. Visually inspect all rope and chain for proper coverings and for signs of wear.
6. Visually inspect any wheels and or bearings.
7. Lubricate moving parts as appropriate.
8. Visually inspect all areas and surfaces that are seating and sliding surfaces for sharp edges or indentations that may injure users.
9. Visually inspect all ground anchor points and supports.
10. Visually inspect any anti slip coatings or strips. Recoat or replace if necessary.
11. Visually inspect paint, decorative coatings or decals, repaint or replace.(No lead based paints shall be used) . If lead paint is suspected, paint shall be tested. If positive for lead paint notify GSA manager immediately and follow proper procedure to mitigate.
12. Visually inspect safety notices and placards. Replace if necessary.
13. Check for any unsafe pinch points or conditions.
14. Visually inspect ground area beneath equipment to insure no sharp objects and that the ground surface cushioning is adequate for the piece of equipment.
15. If equipment is found to be in an unsafe condition, the equipment shall be removed from service and placed in a safe condition until repairs can be made.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Wrench set
2. Socket set
3. Screw driver
4. Pliers
5. Safety barrier kit

CHLD-SEC-01-01M

Frequency: Monthly

Child Care secured perimeter systems

Application

This standard is intended for Child Care secured perimeter systems. This standard is intended to be used to ensure that the areas designated for child care are secured and maintained in a safe condition, there are no, conditions or situations that my cause injury or endanger the users or occupants when the area is used in accordance with its designed intent and/or the occupants follow the specific instructions placards or guidelines set forth for the use of the space or area. Prior to conducting these tasks, review all specifications and requirements specific to Child Care areas.

Special Instructions:

1. If a condition is found to exist which is, unsafe, or may cause injury, immediate action must be taken to resolve the situation by securing the equipment or area from further use and notifying the building Property Manager / Child care operator.
2. Responsibility for correction of deficiencies may fall to others, such as the child care provider, cleaning and lawn maintenance programs, or field office manager/child care coordinator. Findings shall be reported to the appropriate manager.
3. Be particularly alert to potential entrapment hazards in playground equipment.

Check points:

1. Visually inspect the perimeter barrier, fence or walls for any breaches.
2. Visually inspect perimeter gates/doors or hatches to ensure they are secured from the outside.
3. Visually inspect that all means of egress from inside are fully functional and open under the required opening pressure.
4. Visually inspect that all Fire life safety devices/systems are functional.
5. Visually inspect ground area for any trip hazards.
6. Verify that electronic security alarms/CCTV systems are functional.
7. Visually inspect for trees or shrubs that may be obstructing or overhanging area.
8. Visually inspect that all warning and notice signs/ placards are in place.

Recommended Tools, Materials, and Equipment:

1. Flashlight

2. Screw driver
3. Wrenches
4. Ladder

CHLD-SPC-01-01M

Frequency: Monthly

Child Care Areas

Application

This standard is intended for Child Care areas. This standard is intended to be used to ensure that the areas designated for child care use are maintained in a safe condition, there are no conditions or situations that my cause injury or endanger the users or occupants when the area is used in accordance with its design intent and/or the occupants follow the specific instructions placards or guidelines set forth for the use of the space or area. Prior to conducting these tasks, review all specifications and requirements specific to Child Care space for example: HVAC systems (temperature, air flow, outside air), Domestic water (temperatures/pressures).

Special Instructions:

1. If a condition is found to exist which is, unsafe, or may cause injury, immediate action must be taken to resolve the situation by securing the equipment or area from further use and notifying the building Property Manager / Child care operator.
2. Responsibility for correction of deficiencies may fall to others, such as the child care provider, cleaning and lawn maintenance programs, or field office manager/child care coordinator. Findings shall be reported to the appropriate manager.
3. Be particularly alert to potential entrapment hazards in playground equipment.

Check points:

1. Visually inspect fire life safety devices/equipment. Fire extinguishers for location, mounting and inspection date. Fire sprinkler heads not obstructed. Smoke detectors and pull stations unobstructed and functional. Emergency lighting is functional. Fire exits unobstructed and door opening pressure is correct.
2. Verify any emergency notification devices (Duress alarm/Phones) are functional.
3. Verify any security alarm/CCTV systems are functional.
4. Visually inspect any lifts/elevators for proper operation.
5. Visually inspect all electrical system components. Electrical rooms are locked; panels secured and locked Switches and switch plates in proper working condition. Outlets properly covered where required and cover plates fastened securely.

6. Visually inspect floor drains, covers secured and traps primed.
7. Check all service doors/ hatches to ensure they are secured and locked.
8. Visually inspect all windows for proper operation. Ensure max opening limits are correct and that locking mechanism is functional.
9. Visually inspect doors for proper operation. Door closer tension is correct and doors latch and lock properly.
10. Visually inspect all glass panes in windows /doors for cracks and loose panes.
11. Verify the space HVAC systems are functioning properly and the air flows and temperatures are within those specified.
12. Verify domestic hot water temperature is within range with no scalding hazards.
13. Verify drinking fountains are working properly.
14. Verify all hot water piping or hot surfaces are properly insulated or out of reach.
15. Inspect floor surfaces for tears, rips, bubbling, wrinkling and/or other trip hazards.
16. Inspect cabinetry for any loose attachments, faulty hinges, loose screws, sharp edges and that cabinet doors close and latch securely and properly.
17. Visually inspect lighting for failed lamps.
18. Visually inspect ceiling tile for water damage, damaged or loose tile.
19. Visually inspect wall surfaces for loose wall coverings and/or areas with paint that is chipped or pealing. If lead paint is suspected, paint shall be tested. If positive for lead paint notify GSA manager immediately and follow proper procedure to mitigate.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Flashlight
2. Digital thermometer
3. Screw driver
4. Safety barrier kit
5. Ladder

CLNG-SCB-01-03M

Frequency: Quarterly

Scrubbing Machine, Battery or Propane Powered

Application

This standard applies to battery or propane powered scrubbing machines used for scrubbing hard floor surfaces such as marble, ceramic tile, and terrazzo in lobbies, corridors, and toilet rooms. Daily equipment care should be accomplished by operator in accordance with established procedures.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's maintenance instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Battery powered scrubbing machine:

1. Inspect all connections for tightness.
2. Vacuum or blow out dust from cooling air passages.
3. Lubricate according to manufacturer's instructions.
4. Check and adjust, as needed, belts and/or chain drive.
5. Check brakes, clutch, wheels, tires, steering, and frame for wear and damage. Replace or repair according to manufacturer instructions.
6. Inspect lights, buzzers, controls, flashers and wiring for tight connections and proper operation.
7. Check engine starter battery, charge if necessary.
8. Start machine and observe operation. Check suction on the dirty scrub water pickup.

Propane powered scrubbing machine:

1. Inspect fuel tank, connections, and lines for leaks and deterioration. Tighten or replace as required.
2. Check for oil leaks and change oil, air, and fuel filters.
3. Change points, radiator, plugs, and rotor button if applicable.
4. Lubricate according to manufacturer's recommendations.

5. Check and adjust, as needed, belts and/or chain drive.
6. Check brakes, clutch, wheels, tires, steering, and frame for wear and damage. Replace or repair according to manufacturer instructions.
7. Inspect lights, buzzers, controls, flashers and wiring for tight connections and proper operation.
8. Check engine starter battery, charge if necessary.
9. Start machine and observe operation. Check suction on the dirty scrub water pickup.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Oil and Lubricants.
3. Brake adjusting tool
4. Belts
5. Gap gauge.
6. Spark plug (if required)
7. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
8. Vacuum
9. Tire gauge

CLNG-SNO-01-01Y

Frequency: Annually

Snow Blower

Application:

This applies to gasoline powered, hand operated, and reel type snow blowers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's maintenance instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Routine cleaning, lubrication, and the application of rust preventive compound to bare metal parts of the equipment prior to storing shall be accomplished by the operator.

Check Points:

1. Change engine oil (Note: Oil should be changed at end of season prior to storing for summer). Review the Material Safety Data Sheets (MSDS) for proper disposal of used oil. If appropriate, recycle oil at an authorized station. Contact the Regional S&EM office if you have any questions.
2. Service air and fuel filters.
3. Clean and gap or replace spark plug.
4. Inspect blades.
5. Inspect tires.
6. Inspect belts or chains. Lubricate as necessary. Place a light coat of oil on chains prior to summer layup.
7. Inspect unit, remove any debris from cooling air passages, and make other needed adjustments.
8. Check engine starter battery, charge if necessary.
9. Start machine and observe operation.
10. Clean up work area, and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Gap gauge

3. Lubricants.
4. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
5. Filters - fuel and air
6. Spark plug (if required)

CLNG-SWP-01-06M

Frequency: Semi-annually

Sweeper, Riding

Application

This applies to gasoline or gas powered type sweepers used in driveways, parking lots, sidewalks, etc. Daily lubrication should be accomplished by the operator.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's maintenance instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Change oil and filter every fifty operating hours.
2. Service air and fuel filters.
3. Inspect engine, clean cooling air passages.
4. Clean and gap, or change spark plug.
5. Check oil level in gear boxes.
6. Adjust tension and/or replace V-belts.
7. Adjust brakes, brushes, and operating mechanisms as recommended by the manufacturer's instructions.
8. Clean entire unit.
9. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Oil
3. Gap gauge
4. Brake adjusting tool
5. Drive Belts
6. Spark plug (if required)

CLNG-TCP-01-01Y

Frequency: Annually

Trash Compactor

Application

This applies to large trash compactors set an the site to handle building waste. Daily equipment care should be accomplished by the operator in accordance with established procedures.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's maintenance instructions.
3. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Protection".
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Extend ram, open door, check guide block retainers, and fit of guide blocks (Ram should not score wall).
2. Check operation of safety switches to insure they have not been by-passed. Check switches, contactors, disconnects. Tighten connections.
3. Grease couplings.
4. Check oil. Change if required.
5. Clean strainer in tank.
6. Clean pump exterior, motor exterior, line, etc. Remove trash and debris from mechanical areas.
7. Clean inside and outside of unit.
8. Lubricate according to manufacturer's instructions.
9. Start machine and observe operation.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

3. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.

CLNG-VAC-01-06M

Frequency: Semi-annually

Vacuum Cleaner, Heavy Duty, Tank Type

Application

This applies to heavy duty, tank type cleaners used for vacuum cleaning carpet in office areas. Daily equipment care should be accomplished by the operator in accordance with established procedures.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's maintenance instructions.
3. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Protection".
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Check interior of tank for damage.
2. Inspect screens, bags, bag frames and exhaust parts.
3. Clean and wash all bags and bag frames
4. Vacuum or blow out dust from cooling air passages.
5. Service filter.
6. Lubricate according to manufacturer's instructions.
7. Start machine and observe operation.
8. Operate unit and check for vacuum leaks.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Portable vacuum cleaner
3. Sealing compound. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Extra vacuum bag replacements
5. Respirator and other appropriate safety equipment

CLNG-VAC-02-01Y

Frequency: Annually

Vacuum, Central System

Application

This standard card applies to the vacuum producer on centralized, permanently installed vacuum cleaning systems. The motor or driver will be serviced using the standard for motors. Tubing and outlets will be serviced on a service call basis.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's maintenance instructions.
3. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Protection".
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Lubricate as required.
2. Check vibration collars and seals for leaks.
3. Check interior of tank for damage.
4. Inspect screens, bags, bag frames and exhaust parts.
5. Clean and wash all bags and bag frames
6. Remove tags and restore power.
7. Operate unit and check for vacuum leaks.
8. Check vacuum gauge and controls.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Portable vacuum cleaner
3. Sealing compound. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Extra vacuum bag replacements
5. Respirator and other appropriate safety equipment

CTRL-DDC-01-01W

Frequency: Weekly

BAS Server

Application:

Building automation system (BAS) computers “Front Ends” act as an application server and/or a database server for building mechanical, electrical and safety systems. These computers are generally standalone desktop computers used as servers for a multiple workstation network. Some “Front Ends” are connected to the internet where they are controlled or accessed by different users.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to. Obtain and review manufacturer's information for servicing, testing and operating.
2. Schedule maintenance with operating personnel.
3. Obtain and review manufacturer's information for servicing, testing and operating.
4. This procedure must be completed by a user with sufficient privileges to perform administrative and maintenance tasks on the computer.
5. This procedure may require additional assistance from the IT department or the controls contractor.

Children of this Parent Piece of Equipment

BAS Server Client Workstation, Building Level Network

Check Points:

1. Review Windows System, Security, and Application Event Logs. Correct any critical errors denoted by a red circle with a white “X”. Make note of and/or correct any warning notices denoted by a yellow triangle with a black “!”. WARNING: Correcting these errors may require a system reboot.
2. If system data backups are completed automatically, verify the backup ran on schedule and without errors. Perform a monthly manual backup, if backups are run manually.
3. Back up monthly trends

CTRL-DDC-01-01M

Frequency: Monthly

BAS Server

Application:

Building automation system (BAS) computers “Front Ends” act as an application server and/or a database server for building mechanical, electrical and safety systems. These computers are generally standalone desktop computers used as servers for a multiple workstation network. Some “Front Ends” are connected to the internet where they are controlled or accessed by different users.

Special Instructions:

1. This maintenance should be completed at the same time as the weekly maintenance.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Schedule maintenance with operating personnel. Microsoft issues regular security patches the second Tuesday of every month.
4. Obtain and review manufacturer's information for servicing, testing and operating.
5. This procedure must be completed by a user with sufficient privileges to perform administrative and maintenance tasks on the computer.
6. This procedure may require additional assistance from the IT department or the controls contractor.
7. It is recommended to have a backup of the system prior to completing this procedure.

Children of this Parent Piece of Equipment

BAS Server Client Workstation, Building Level Network

Check Points:

1. Perform a system back up.
2. Using the Windows Update utility, install any security patches issued by Microsoft. **WARNING**: Installing these patches may require a system reboot.
3. Back up monthly trends.

CTRL-DDC-01-03M

Frequency: Quarterly

BAS Server

Application:

Building automation system (BAS) computers “Front Ends” act as an application server and/or a database server for building mechanical, electrical and safety systems. These computers are generally standalone desktop computers used as servers for a multiple workstation network. Some “Front Ends” are connected to the internet where they are controlled or accessed by different users.

Special Instructions:

1. This maintenance should be completed at the same time as the weekly and monthly maintenance.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Schedule maintenance with operating personnel. Microsoft issues regular security patches the second Tuesday of every month.
4. Obtain and review manufacturer's information for servicing, testing and operating.
5. This procedure must be completed by a user with sufficient privileges to perform administrative and maintenance tasks on the computer.
6. This procedure may require additional assistance from the IT department or contractor or the controls contractor.
7. It is recommended to have a backup of the system prior to completing this procedure.

Children of this Parent Piece of Equipment

BAS Server Client Workstation, Building Level Network

Check Points:

1. Defragment the hard drive using the Windows defragmentation utility or third party software on the workstation or server. This can take up to several hours to complete depending on the size of the hard drive.
2. Perform disk cleanup Windows disk cleanup utility or third party software on the workstation or server
3. Replace the backup media used for system backups with new media as recommended by the backup device’s manufacturer.
4. Laptop Workstations

a) Plug laptop into GSA network and get software updates

b) Contact local IT to insure laptop is updated correctly

Recommended Tools

Backup drive media.

CTRL-DDC-01-01Y

Frequency: Annually

BAS Server

Application:

Building automation system (BAS) computers “Front Ends” act as an application server and/or a database server for building mechanical, electrical and safety systems. These computers are generally standalone desktop computers used as servers for a multiple workstation network. Some “Front Ends” are connected to the internet where they are controlled or accessed by different users.

Special Instructions:

1. This maintenance should be completed at the same time as the weekly, monthly and quarterly maintenance.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Schedule maintenance with operating personnel.
4. Obtain and review manufacturer's information for servicing, testing and operating.
5. Obtain "AS BUILT" diagrams of installation.
6. Computers and the electronic components of which they are comprised are highly susceptible to electrostatic discharge. Ensure personnel adequately ground themselves prior to working on electronic equipment to avoid equipment damage and/or loss of data.

Children of this Parent Piece of Equipment

BAS Server Client Workstation

Check Points:

1. Clean key board with clean, dry, compressed air and/or cleaning kit
2. Clean mouse with a cleaning kit
3. Shut down the computer, clean internal enclosure
4. Check all internal cables are inserted fully into the motherboard and devices.
5. Back up system weekly
6. Defragment hard drive using computer operating system or third party software
7. Update “Front End” software, check with software provider

8. Laptop Workstations
   a) Windows 7
      i. Open the battery power meter dialog box by clicking on the battery icon, then "more power options".
      ii. Verify that the top of the window does NOT say "Consider replacing your battery". If the checkbox "Warn me if my battery may need to be replaced" is visible, make sure that it is checked. This checkbox may not be visible with a healthy battery.
      iii. Replace battery if indicated.
   b) Other operating systems
      i. Charge battery to 100%
      ii. Unplug charger for 10 minutes.
      iii. If the battery has lost more than 10% of its charge (charge shows 90% or less), replace battery.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Cleaning tools and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
2. Anti-static field kit

CTRL-DDC-02-01W

Frequency: Weekly

BAS Server Client Workstation

Application:

Building automation system (BAS) workstations act as an application server and/or a database server for building mechanical, electrical and safety systems. These computers are generally standalone desktop computers used as servers in a multiple workstation network.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule maintenance with operating personnel.
3. Obtain and review manufacturer's information for servicing, testing and operating.
4. This procedure must be completed by a user with sufficient privileges to perform administrative and maintenance tasks on the computer.
5. This procedure may require additional assistance from the IT department or the controls contractor.

Check Points:

Review Windows System, Security, and Application Event Logs. Correct any critical errors denoted by a red circle with a white "X". Make note of and/or correct any warning notices denoted by a yellow triangle with a black "!". **WARNING**: Correcting these errors may require a system reboot.

CTRL-DDC-02-01M

Frequency: Monthly

BAS Server Client Workstation

Application:

Building automation system (BAS) workstations act as an application server and/or a database server for building mechanical, electrical and safety systems. These computers are generally standalone desktop computers used as servers in a multiple workstation network.

Special Instructions:

1. This maintenance should be completed at the same time as the weekly maintenance.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Schedule maintenance with operating personnel. Microsoft issues regular security patches the second Tuesday of every month.
4. Obtain and review manufacturer's information for servicing, testing and operating.
5. This procedure must be completed by a user with sufficient privileges to perform administrative and maintenance tasks on the computer.
6. This procedure may require additional assistance from the IT department or the controls contractor.
7. It is recommended to have a backup of the system prior to completing this procedure.

Check Points:

1. Perform a system back up.
2. Using the Windows Update utility, install any security patches issued by Microsoft. **WARNING**: Installing these patches may require a system reboot.

CTRL-DDC-02-03M

Frequency: Quarterly

BAS Server Client Workstation

Application:

Building automation system (BAS) workstations act as an application server and/or a database server for building mechanical, electrical and safety systems. These computers are generally standalone desktop computers used as servers in a multiple workstation network.

Special Instructions:

1. This maintenance should be completed at the same time as the weekly and monthly maintenance.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Schedule maintenance with operating personnel. Microsoft issues regular security patches the second Tuesday of every month.
4. Obtain and review manufacturer's information for servicing, testing and operating.
5. This procedure must be completed by a user with sufficient privileges to perform administrative and maintenance tasks on the computer.
6. This procedure may require additional assistance from the IT department or contractor or the controls contractor.
7. It is recommended to have a backup of the system prior to completing this procedure.

Check Points:

1. Defragment the hard drive using the Windows defragmentation utility or third party software on the workstation or server. This can take up to several hours to complete depending on the size of the hard drive.
2. Replace the backup media used for system backups with new media as recommended by the backup device's manufacturer.

Recommended Tools

Backup drive media.

CTRL-DDC-02-01Y

Frequency: Annually

BAS Server Client Workstation

Application:

Building automation system (BAS) workstations act as an application server and/or a database server for building mechanical, electrical and safety systems. These computers are generally standalone desktop computers used as servers in a multiple workstation network.

Special Instructions:

1. This maintenance should be completed at the same time as the weekly, monthly and quarterly maintenance.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Schedule maintenance with operating personnel.
4. Obtain and review manufacturer's information for servicing, testing and operating.
5. Obtain "AS BUILT" diagrams of installation.
6. Computers and the electronic components of which they are comprised are highly susceptible to electrostatic discharge. Ensure personnel adequately ground themselves prior to working on electronic equipment to avoid equipment damage and/or loss of data.

Check Points:

1. Clean key board with clean, dry, compressed air and/or cleaning kit
2. Clean mouse with a cleaning kit
3. Shut down the computer, clean internal enclosure
4. Check all internal cables are inserted fully into the motherboard and devices.
5. Backup system weekly
6. Defragment hard drive using computer operating system or third party software
7. Update "Front End" software, check with software provider
8. Computer Virus protection scans, weekly
9. Computer Software error scans, weekly

10. Perform maintenance as suggested by manufacturer's instruction book.

Recommended Tools, Materials, and Equipment:

1. Cleaning tools and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
2. Anti-static field kit

CTRL–DDC-03-03M

Frequency: Quarterly

Network, Management Level

Application

This standard is for Ethernet networks that are an integral part of a Direct Digital (DDC) Building Automation System (BAS). High performance and clean network construction is essential for the efficient and optimal operation of building mechanical systems. A facility should maintain a comprehensive list in the building equipment inventory of all networking devices and network details.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
4. Obtain and understand control system diagrams.
5. This procedure may require the assistance of the controls contractor.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check points:

Audit all Ethernet connections to the system. Verify all Ethernet connections are plugged into properly assigned BAS hub, router, and switch ports. Record and correct any discrepancies.

CTRL–DDC-03-01Y

Frequency: Annually

Network, Management Level

Application

This standard is for Ethernet networks that are an integral part of a Direct Digital (DDC) Building Automation System (BAS). High performance and clean network construction is essential for the efficient and optimal operation of building mechanical systems. A facility should maintain a comprehensive list in the building equipment inventory of all networking devices and network details.

Special Instructions:

1. This maintenance should be completed at the same time as the quarterly maintenance.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
3. Obtain and understand control system diagrams.
4. Schedule network outages for the affected segment(s) of network(s).
5. This procedure may require the assistance of the controls contractor.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Children of this Parent Piece of Equipment

BAS Server, BAS workstations

Check points:

1. Check wiring at each connection for loose wires, broken or cracked insulation, and un-insulated wire length.
2. Check physical condition of networking device. Clean if needed.
3. Check electrical power connections.
4. Check that device is located appropriately on the network.
5. Clean and inspect all Firewalls, routers, switches, hubs, modems, and gateways. The inspection should included a verification of proper settings per the manufacturer's and controls system requirements.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Canned clean, dry air
3. Vacuum cleaner.

CTRL–DDC-04-03M

Frequency: Quarterly

Network, Building Level

Application

This standard is for Ethernet, non-Ethernet and field level networks that are an integral part of a Direct Digital (DDC) Building Automation System (BAS). High performance and clean network construction is essential for the efficient and optimal operation of building mechanical systems. A facility should maintain a comprehensive list in the building equipment inventory of all networking devices and network details.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
4. Obtain and understand control system diagrams.
5. This procedure may require the assistance of the controls contractor.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Parent of this Piece of Equipment

BAS server

Children of this Parent Piece of Equipment

Field Panel

Check points:

Run and review building level and floor level network diagnostic reports. Any errors or excessive changes of value may be an indication of impending network or device failure. Consult with the manufacturer's instructions or your controls contractor to resolve these issues.

CTRL–DDC-04-01Y

Frequency: Annually

Network, Building Level

Application

This standard is for non-Ethernet and field level networks that are an integral part of a Direct Digital (DDC) Building Automation System (BAS). High performance and clean network construction is essential for the efficient and optimal operation of building mechanical systems. A facility should maintain a comprehensive list in the building equipment inventory of all networking devices and network details.

Special Instructions:

1. This maintenance should be completed at the same time as the quarterly maintenance.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
5. Obtain and understand control system diagrams.
6. Schedule network outages for the affected segment(s) of network(s).
7. This procedure may require the assistance of the controls contractor.
8. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Parent of this Piece of Equipment

BAS server

Children of this Parent Piece of Equipment

Field Panels

Check points:

1. Check wiring at each connection for loose wires, broken or cracked insulation, proper shield landing, stray strands of wire, and un-insulated wire length. There should be no more than 1/8" wire showing at the

connection point. It is important to have a small amount of wire showing to ensure there is no insulation disrupting the connection.

2. Check physical condition of networking device. Clean if needed.
3. Check electrical power connections.
4. Check that device is located appropriately on the network.
5. Check that trunk terminators are installed as required by the manufacturer's network setup instructions.
6. Check network repeaters, isolators, extenders, or other signal amplifying equipment is installed at the appropriate location and is configured per manufacturer's network setup instructions.
7. Check voltage and/or resistance readings are consistent with manufacturer's specifications for network communication. Verify the signal is a clean square wave without clipped or peaked edges and has no A/C interference present. Correct conditions on the network as indicated by waveform.
8. Conduct a communications speed test per manufacturer's instructions to verify current network configuration will support optimum network speed without data loss.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Portable Oscilloscope
3. Volt Ohm Meter
4. Spares as needed
5. Test kits as required
6. Canned clean, dry air
7. Vacuum cleaner.

CTRL–DDC-05-01Y

Frequency: Annually

Field Panel

Application

This standard is for field level panels that are an integral part of a Direct Digital Control (DDC) Building Automation System (BAS). A facility should maintain a comprehensive list in the building equipment inventory of all field panels.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
3. Obtain and understand control system diagrams.
4. Schedule service outages for the areas controlled by the field panel.
5. This procedure may require the assistance of the controls contractor.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Parent of this Piece of Equipment

Building Level Network

Children of this Parent Piece of Equipment

Controllers, Electronic Sensors, End Devices

Check points:

1. Check wiring at each connection for loose wires, broken or cracked insulation, stray strands of wire, and un-insulated wire length. There should be no more than 1/8" wire showing at the connection point. It is important to have a small amount of wire showing to ensure there is no insulation disrupting the connection. Tighten any loose connections. Ensure any required high voltage barriers are in place and installed correctly.
2. Check physical condition of the device.
   a) Shut off power to the unit.
   b) Blow out the panel with clean, dry air.

c) Vacuum any remaining dust

d) Turn power back on to the unit.

3. Check electrical power connections including incoming line voltage.
4. Check voltages on the main board or backplane of the panel as applicable per manufacturer's specifications.
5. Check all fuses for evidence of heating or weakening.
6. Check output voltages from each analog output are correct across the full specified voltage range.
7. Check all binary inputs and outputs open and close with the appropriate signal.
8. Check all analog inputs work across the full range of designed input.
9. Check all point labels are correct and up to date, if applicable.
10. Check all local man-machine interface ports work correctly.
11. Check all plug connections in the panel to ensure the plugs are fully seated.
12. Replace the panel back up battery with a manufacturer approved replacement battery.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Low voltage, portable, AC/DC signal generator
2. Canned clean, dry air
3. Small blade and phillips head screw drivers
4. Volt Ohm Meter
5. Batteries
6. Spares as needed
7. Test kits as required

CTRL–DDC-06-01Y

Frequency: Annually

Controller

Application

This standard is for field level controllers that are an integral part of a Direct Digital Control (DDC) Building Automation System (BAS). A facility should maintain a comprehensive list in the building equipment inventory of all field panels.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
3. Obtain and understand control system diagrams.
4. Schedule service outages for the areas controlled by the field panel.
5. This procedure may require the assistance of the controls contractor.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Parent of this Piece of Equipment

Field Panel

Children of this Parent Piece of Equipment

Electronic Sensors, End Devices

Check points:

1. Check wiring at each connection for loose wires, broken or cracked insulation, stray strands of wire, and un-insulated wire length. There should be no more than 1/8" wire showing at the connection point. It is important to have a small amount of wire showing to ensure there is no insulation disrupting the connection. Tighten any loose connections. Ensure any required high voltage barriers are in place and installed correctly.
2. Check physical condition of the device.
   a) Shut off power to the unit.
   b) Blow out the panel with clean, dry air.

c) Vacuum any remaining dust

d) Turn power back on to the unit.

3. Check electrical power connections including incoming line voltage.
4. Check all fuses for evidence of heating or weakening.
5. Check output voltages from each analog output are correct across the full specified voltage range.
6. Check all binary inputs and outputs open and close with the appropriate signal.
7. Check all analog input work across the full range of designed input.
8. Check all point labels are correct and up to date, if applicable.
9. Check all local man-machine interface ports work correctly.
10. Check all plug connections in the panel to ensure the plugs are fully seated.
11. Verify the controller is on the logical floor level network and has the proper address.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Low voltage, portable, AC/DC signal generator
2. Canned clean, dry air
3. Small blade and phillips head screw drivers
4. Volt Ohm Meter
5. Spares as needed
6. Test kits as required

CTRL-DDC-07-01Y

Frequency: Annually

Sensors, Electronic

Application

This standard is for electronic sensors that are an integral part of a Direct Digital (DDC) Building Automation System (BAS) and that measure variables such as temperature, humidity and pressure. Accurate measurement and reporting of control system variables is essential for the efficient and optimal operation of building mechanical systems. A facility should maintain a comprehensive list in the building equipment inventory of all electronic sensors. It is recommended that the inventory of sensors be recorded as equipment attributes of the field controller.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Read and understand manufacturer's instructions of each device before making adjustments or performing calibration. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
4. Obtain and understand control system diagrams.
5. Ensure that the equipment associated with the sensors being checked is operational as needed to verify/calibrate sensor.
6. This PM will typically require two (2) people; one to measure and calibrate and the other to read the sensor value on the BAS.
7. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Typical Sensors that require calibration include, but are not limited to:

1. Outside air temperature
2. Air temperature (e.g. air handler supply air, mixed air, return air)
3. Water temperature (e.g. chilled water, condenser water, hot water)
4. Relative Humidity
5. Enthalpy

6. Space temperature
7. Static pressure (e.g. supply air static pressure, building static pressure)
8. Differential pressure
9. Air flow
10. Water flow
11. Carbon monoxide
12. Carbon dioxide

Parent of this Piece of Equipment

Field Panel

Check points:

1. Check that sensor is mounted securely and free of obstructions
2. Check physical condition of sensor
3. Check that sensor is located appropriately
4. Check the voltage, amperage, or resistance of the sensor in accordance with manufacturer's specifications. If the device falls out of this range, adjust or replace the device.
5. Check that physical location is consistent with graphical representation on BAS front end.
6. If the sensor has an associated setpoint, verify and confirm that the setpoint is reasonable and consistent with values specified in building documentation (e.g. building operating manual, controls as-built drawings, commissioning reports, re-commissioning reports)
7. Compare BAS value with field measurement using a calibrated handheld device at least as accurate as the desired BAS accuracy
8. For calibration of CO and CO_2 sensors use a gas canister to create high readings for both the handheld device and the BAS sensor.
9. Record at least five (5) separate readings from the BAS and handheld device.
10. Where BAS readings are outside accuracy specified for sensor, either calibrate or replace sensor.

Recommended Tools, Materials, and Equipment:

1. Calibrated Pressure gauge, psychrometer
2. Volt Ohm Meter

3. CO and CO_2 canisters

4. Calibrated Handheld Measuring Devices at least as accurate as desired sensor accuracy.
5. Sensor spares as needed
6. Test kits as required

CTRL-DDC-08-01M

Frequency: Monthly

Alarm Maintenance

Application

This standard is for alarmable points that are an integral part of a Direct Digital (DDC) Building Automation System (BAS) and operate or control equipment in the building automation system. Accurate alarming of these points is essential for the efficient and optimal operation of building mechanical systems. A facility should maintain a comprehensive list of all points with the alarm property currently enabled.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
2. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
3. Obtain and understand control system diagrams.
4. Ensure that the equipment associated with the alarm point being checked is operational as needed to verify operation of the control device.
5. This PM will typically require two (2) people; one to observe actual operation of the equipment the device controls and the other to monitor and control the BAS.
6. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work. Follow lock out/tag out procedures at all times.

Parent of this Piece of Equipment

Field Panel

Check points:

1. Obtain a list of alarm points from BAS.
2. Examine the list for any omissions due to renovation, remodel, program changes, and newly added equipment. Make points alarmable as required.

3. Examine the list for points deemed as no longer required to be alarmable due to renovations, remodels, program changes, or deleted equipment. Disable or remove alarm properties as required.
4. Examine the list for any points that are known to give “nuisance” alarms. If the point should be alarmable, correct the condition causing excessive alarming or adjust the alarm set point as required.
5. Examine the list of alarms for priority level. Adjust point alarms to the appropriate priority level.

CTRL-DDC-09-06M

Frequency: Semi-annually

BAS Wireless Electronic/Pneumatic end devices (Thermostats)

Application

This standard is for all Wireless pneumatic/ electronic controls that sense space temperature. This standard is intended to be used to ensure that the system is operating as intended, there are no air leaks in the control air system and to ensure that the devices are operating optimally for those devices associated with operating equipment controlled by the Building Automation System.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
3. Obtain and understand control system diagrams and identify zone thermostat locations.
4. Ensure that the equipment associated with the end device being checked is operational as needed to verify operation of the control device.
5. This PM will typically require one person.

Parent of this Piece of Equipment

Field Panel

Check points:

1. From the server, run the manufacturers system diagnostic software for the wireless system. This diagnostic shall produce a report of all functional aspects of the wireless system indicating faults that should be addressed in this maintenance.
2. Review all zone set points at the server.

CTRL-DDC-09-01Y

Frequency: Annually

BAS Wireless Electronic/Pneumatic end devices (Thermostats)

Application

This standard is for all Wireless pneumatic/ electronic controls that sense space temperature. This standard is intended to be used to ensure that the system is operating as intended, there are no air leaks in the control air system and to ensure that the devices are operating optimally for those devices associated with operating equipment controlled by the Building Automation System.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
3. Obtain and understand control system diagrams and identify zone thermostat locations.
4. Ensure that the equipment associated with the end device being checked is operational as needed to verify operation of the control device.
5. This PM will typically require one person.

Parent of this Piece of Equipment

Field Panel

Check points:

1. From the server, run the manufacturers system diagnostic software for the wireless system. This diagnostic shall produce a report of all functional aspects of the wireless system indicating faults that should be addressed in this maintenance.
2. Review all zone set points at the server.
3. Inspect thermostat installation; ensure mounting is correct, fastened secure and that the thermostat is not blocked by equipment generating heat or furniture blocking air circulation.
4. Remove thermostat cover and lightly blow away any accumulated dust with canned low pressure air.
5. Listen for air leaks.

6. Replace battery.

CTRL-END-01-01Y

Frequency: Annually

End Devices

Application

This standard is for all pneumatic and electronic controls that sense temperature, pressure, differential pressure, humidity, and flow or operate devices such as valves and dampers. This standard is intended to be used to ensure that the system is operating as intended, there are no air leaks in the control air system and to ensure that the devices are operating optimally for those devices associated with operating equipment controlled by the Building Automation System.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to. Read and understand manufacturer's instructions of each device before making adjustments or performing calibration. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any changes.
2. Obtain and understand control system diagrams.
3. Before calibrating or adjusting pneumatic controls, adjust the pressure of the main control air supplying pneumatic sensors, thermostats, and controllers to manufacturer's specifications.
4. Servicing of pneumatic air compressors and control air reducing stations shall be performed at the same time to prevent duplication of some service check points.

Typical Sensors and Actuators to be checked or calibrated:

1. Outside air temperature
2. Mixed air temperature
3. Return air temperature
4. Discharge or supply air temperature
5. Coil face discharge air temperatures
6. Chilled water supply/return temperature
7. Condenser water supply/return temperature
8. Heating water supply/return temperature
9. Wet bulb temperature or relative humidity (RH) sensors

10. Enthalpy Sensors
11. Space temperature sensors
12. Economizer and related dampers
13. Cooling and heating coil valves
14. Static pressure transmitters
15. Differential pressure transmitters
16. Air or water flow
17. Terminal unit dampers and flows
18. General dampers
19. Transducers and relays

Parent of this Piece of Equipment

Receiver Controllers, Controllers, Field Panel

Check points:

Pneumatic:

1. Listen for audible leaks and feel for any escaping air at tubing joints and terminations. Reed devices (i.e. thermostats) may produce audible air escape at setpoint, but any air noise should completely disappear when setpoint is significantly below (for direct acting) or above (for reverse acting) the signal level.
2. Check Control Air system pressure, ensure air is clean and dry. Blowdown all moisture separators in system.
3. Check physical condition of sensor or end device. Clean devices per manufacturer's recommendations.
4. Ensure sensor, actuator and controllers are mounted correctly, securely and are free of any obstructions. Check unit and linkage for proper opening, closing, binding, and loose connections. Adjust linkage as required for full range of operation.
5. Check that physical location is consistent system controls diagrams.
6. Check set point of controls (temperature, humidity, or pressure) against original sequence of operation and control diagrams.
7. Check the unit over its range of control (minimum, midpoint, and maximum). Using a squeeze bulb and a pressure gage, impose simulated conditions to activate controls and check operation through full range or range of motion.

8. Check for control point cycling.
9. Check for correct pressure differential on all two position controllers (on-off-open-closed).

10. Check condition and action of primary elements in the controllers and actuators. These can be bi-metallic strips, and or sealed bellows with capillary tubing for remote sensing, diaphragm operated pneumatic actuators.
11. Note the action of the controlling device (thermostats, humidistats, and pressure stats) which changes the action of the controlled device (motors, valves, dampers, etc.).
12. Check units for proper closing and loose connections.
13. Check the condition and the ability of humidity sensing control elements (hair, wood, leather, or similar substances) to read the moisture changes and their action on the control mechanism.
14. Check resulting action of the pressure sensing primary control elements such as diaphragms, bellows, inverted bells, and similar devices when activated by air, water, or similar pressure. Check operation of all relays, pilot valves, and pressure regulators.
15. Check the resulting action of electrically controlled devices such as for valves, dampers, solenoids
16. Replace air filters at sensors, controllers, and thermostats.
17. Replace air filters at sensors, controllers, and thermostats as required.
18. Check all external restrictors for proper size and to verify the restrictor is installed per controls drawings. Verify the restrictor is not clogged.
19. Use test kits and specific manufacturer's instructions whenever possible. If possible, replace rather than rebuild a control installed in the system. Take removed control device to shop for repair.
20. If the sensor is out of calibration, follow manufacturer’s instructions for calibration. NOTE: Some manufacturer’s sensors cannot be field calibrated and must calibrated at the factory. Have a spare sensor for replacement if necessary.
21. Any device that cannot be field calibrated should be replaced with equipment spares and turned in to shop for repair or to be sent out for factory calibration as required.

Electronic:

1. Check that sensor is mounted securely and free of obstructions
2. Check physical condition of device. Clean if needed.

3. Check electrical connections.
4. Check that device is located appropriately
5. Check that physical location is consistent with graphical representation on BAS front end
6. Check voltage and/or resistance readings are consistent with manufacturer's specifications for the device. Calibrate or replace if necessary.
7. Check the device through its range and ensure that the controlled equipment responds correctly to the given command.
8. Compare BAS value with field observation, i.e. open or closed, start or stop, to ensure device operation.

Any device that cannot be field verified should be repaired or replaced with equipment spares and either thrown away, turned in to shop for repair or be sent out for factory service as required.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Volt Ohm Meter
3. Calibrated Pressure gauge, psychrometer
4. Squeeze bulb with 3 psi to 15 psi gage.
5. Calibrated Handheld Temperature Measuring Device at least as accurate as desired calibration range of BAS device.
6. Restrictor replacements
7. Air filter replacements
8. Control spares as needed
9. Test kits as required

CTRL-PNU-01-06M

Frequency: Semi-annually

Control Air System

Application

This standard applies the control air distribution system for the HVAC system.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall system and the operation of the building PRIOR to making any changes.
2. Schedule shutdown with operating personnel, as needed.
3. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall system and the operation of the building PRIOR to making any changes.
4. Obtain and understand control system diagrams.
5. For pneumatic systems, verify proper main line pressure per manufacturer's specifications.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Children of this Parent Piece of Equipment

Receiver Controllers, End Devices

Check points:

1. Perform the following procedures concurrent with this procedure:
   a) HVAC-AIR-01-06M Air Dryer, Refrigerated or Regenerative Desiccant Type
   b) HVAC-AIR-02-06M Air Compressor
2. Verify correct main line pressure leaving the main line air regulator. If the pressure is not correct adjust or repair the regulator
3. Check all main line filters for evidence of clogging, leaks, oil, or water.

a) Replace the filter. If evidence of oil contamination is present, find the source of contamination and correct.

b) If evidence of water contamination drain the device. Verify the air dryer is not bypassed.

c) If the device leaks, repair or replace per manufacturer's instructions.

d) If the device has clogged, unclog or replace device per manufacturer's instructions.

4. Check all pneumatic tubing for tightness and damage. Repair or replace lines as necessary.

Recommended Tools, Materials, and Equipment:

1. Standard Tools – Basic
2. Replacement filter cartridge.

CTRL-PNU-02-06M

Frequency: Semi-annually

Receiver Controllers

Application

This standard applies to all single and dual input receiver controllers in the HVAC pneumatic control system. These devices direct control air to a device to control or actuate it.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall system and the operation of the building PRIOR to making any changes.
2. Schedule shutdown with operating personnel, as needed.
3. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall system and the operation of the building PRIOR to making any changes.
4. Obtain and understand control system diagrams.
5. For pneumatic systems, verify proper main line pressure per manufacturer's specifications.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. It is recommended that a spare calibrated receiver controller be taken into the field during this procedure to replace any non-functioning controller.

Children of this Parent Piece of Equipment

End Devices

Check points:

1. Check inline filter for oil and moisture. Replace as required.
2. Check all external restrictors for proper size, correct installation, and clogs. Replace as required.

3. Verify correct main line pressure at the receiver controller. If the pressure is not correct the receiver controller will not function properly. Find the cause of incorrect pressure and correct.
4. Verify the spring range of all attached end devices.
5. Verify the range of all attached sensors.
6. Check all receiver controller modules, bellows, and bleed ports as applicable for evidence of clogging , leaks, oil, or water.
    a) If evidence of oil contamination is present, replace the device.
    b) If evidence of water contamination replace the device with a spare. Let the device dry out and recalibrate. If the device won't calibrate, discard the device.
    c) If the device leaks, repair or replace per manufacturer's instructions.
    d) If the device is clogged, unclog or replace device per manufacturer's instructions.
7. Follow the manufacturer's instructions for calibrating the device.
8. Check all pneumatic tubing for tightness. Repair or replace lines as necessary.
9. Change input and/or setpoint and verify the device stabilizes (doesn't hunt) and reaches setpoint.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Standard Tools – Basic
2. Squeeze bulb with 3 psi to 15 psi gauge
3. Calibrated digital thermometer
4. Pneumatic fittings
5. .007" and .016" Restrictors
6. Inline air filters

CTRL-PNU-03-03M

Frequency: Quarterly

Control Air Filter

Application

This standard card applies to all control air filters installed in control air systems that are not part of the basic air compressor or air drier configurations.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
3. Schedule shutdown with operating personnel, as needed.
4. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall system and the operation of the building PRIOR to making any changes.
5. For pneumatic systems, verify proper main line pressure per manufacturer's specifications.

Check Points:

1. Valve filter out of service.
2. Remove and discard old cartridge.
3. Clean inside of housing.
4. Install new cartridge.
5. Open inlet valve and check for leaks.
6. Open outlet valve.

Recommended Tools, Materials, and Equipment:

1. Standard Tools – Basic
2. Replacement filter cartridge.

ELEC-ATS-01-01M

Frequency: Monthly

Automatic Transfer Switches

Application:

This standard card applies to Automatic Transfer Switches as part of the building electrical system and the emergency power system found in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Perform Monthly inspections following NFPA 110 procedures, outlined in Chapter 8, .8.4 section, Operational Inspection and Testing.

Check Points:

All tested parameters and setpoints shall be within manufacturer's tolerances.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-ATS-01-01Y

Frequency: Annually

Automatic Transfer Switches

Application:

This standard card applies to Automatic Transfer Switches as part of the building electrical system and the emergency power system found in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform quarterly visual inspections concurrently with annual maintenance and testing.
3. Schedule and coordinate work with operating personnel.
4. Obtain and review manufacturer's instructions.
5. Perform ATS thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.
6. Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.
7. Perform thermographic survey prior to annual maintenance testing.
8. Perform ATS maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.22.3 Emergency Systems, Automatic Transfer Switches.
9. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.22.3.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

While performing thermographic survey, follow the equipment arc flash labeling indications of ailable incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category “Dangerous” and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-BDT-01-01Y

Frequency: Annually

Metal Enclosed Busways (Busduct)

Application:

This standard card applies to thermographic survey of the metal enclosed busways as part of the electrical system in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Perform busway thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-BDT-01-03Y

Frequency: 3-Year

Metal Enclosed Busways (Busduct)

Application:

This standard card applies to maintenance tests of metal enclosed busways as part of the electrical system in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule and coordinate work with operating personnel.
4. Obtain and review manufacturer's instructions.
5. For indoor metal enclosed busways perform maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.4 Metal-Enclosed Busways.
6. For outdoor bus structures perform maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.21 Outdoor Bus Structures.
7. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.4.3 Test Values or Section 7.21.3 Test Values, whichever is applicable.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CAP-01-01Y

Frequency: Annually

Capacitors

Application

This standard applies to thermographic survey of capacitors as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Obtain and review manufacturer's instruction.
3. Perform capacitor thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CAP-01-03Y

Frequency: 3-Year

Capacitors

Application

This standard applies to maintenance tests of capacitors as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. Obtain and review manufacturer's instruction (including time current characteristic curve).
5. Perform capacitor maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.20.1 Capacitors and Reactors, Capacitors.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.20.1.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CAP-02-01Y Annually

Reactors-Dry-Type, Thermographic Survey

Application

This standard applies to thermographic survey of capacitors as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Obtain and review manufacturer's instruction.
3. Perform capacitor thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CAP-02-03Y

Frequency: 3-Year

Reactors- Dry-Type

Application

This standard applies to maintenance tests of capacitors as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. Obtain and review manufacturer's instruction (including time current characteristic curve).
5. Perform capacitor maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.20.3.1 Capacitors and Reactors, Reactors Dry Type.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.20.3.1.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CAP-03-01M

Frequency: Monthly

Reactors, Liquid-Filled, Oil Leakage

Application

This standard applies to visual inspection of liquid-filled reactors.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Visually inspect physical and mechanical condition
4. Visually inspect anchorage, alignment, grounding, and required clearances.
5. Visually inspect for oil leaks.

Check Points:

All parameters shall be within manufacturer's tolerances

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CAP-03-01Y

Frequency: Annually

Reactors, Liquid-Filled, Oil Sampling

Application

This standard applies to oil-filled reactors.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Perform monthly visual inspections concurrently with annual mechanical maintenance testing.
4. Perform reactor thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.
5. Perform visual and mechanical inspections following the ANSI/NETA MTS-2011 procedures outlined in Section 7.20.3.2.1
6. Remove oil sample of insulating liquid from the main tank or common tank following the ANSI/NETA MTS-2011 procedures outlined in Section 7.20.3.2.2.7.

Check Points:

1. In regards to thermographic survey follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.
2. Visual and mechanical inspection parameters shall be in accordance with manufacturer's published data..
3. Results of insulating liquid tests shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.20.3.2.3 Test Values

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers

3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CAP-03-03Y

Frequency: 3-Year

Reactors, Liquid-Filled

Application

This standard applies to maintenance tests of liquid-filled reactors as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. Obtain and review manufacturer's instruction (including time current characteristic curve).
5. Perform capacitor maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.20.3.2 Capacitors and Reactors, Reactors, Liquid-Filled.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.20.3.2.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CBL-01-01Y

Frequency: Annually

Cables, Low Voltage 600 Volt Maximum, Thermographic Survey

Application

This standard applies to thermographic survey of low voltage cables as part of the electrical system located in the building.

Special Instructions:

7. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
8. Obtain and review manufacturer's instruction.
9. Perform capacitor thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CBL-01-03Y

Frequency: 3-Year

Cables, Low Voltage 600 Volt Maximum

Application

This standard applies to maintenance tests of low voltage cables 600 volt maximum as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. Obtain and review manufacturer's instruction (including time current characteristic curve).
5. Perform capacitor maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.3.2 Cables Low Voltage 600 Volt Maximum.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.3.2.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CBL-02-01Y

Frequency: Annually

Cables, Medium Voltage

Application

This standard applies to thermographic survey of medium voltage cables as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Obtain and review manufacturer's instruction.
3. Perform capacitor thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CBL-02-03Y

Frequency: 3-Year

Cables, Medium- and High-Voltage

Application

This standard applies to maintenance tests of medium voltage cables as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. Obtain and review manufacturer's instruction (including time current characteristic curve).
5. Perform capacitor maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.3.3 Cables, Medium- and High-Voltage.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.3.3.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CKB-01-01Y

Frequency: Annually

Circuit Breakers, Air, Insulated-Case/Molded-Case

Application

This standard applies to the thermographic survey of low voltage (1,000 Volts or less) Air Insulated-Case/Molded-Case circuit breakers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Perform circuit breaker thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash abeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CKB-01-03Y

Frequency: 3-Year

Circuit Breakers, Air, Insulated-Case/Molded-Case

Application

This standard applies to maintenance testing of low voltage (1,000 Volts or less) Air Insulated-Case/Molded-Case circuit breakers.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform circuit breaker maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.6.1.1 Circuit Breakers, Air, Insulated Case/Molded case.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.6.1.1.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CKB-02-01Y

Frequency: Annually

Circuit Breakers, Air, Low-Voltage Power

Application

This standard applies to thermographic survey of low voltage (1,000 Volts or less) power circuit breakers.

Special Instructions:

1. Schedule thermographic survey with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Perform circuit breaker thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CKB-02-03Y

Frequency: 3-Year

Circuit Breakers, Air, Low-Voltage Power

Application

This standard applies to maintenance testing of low voltage (1,000 Volts or less) power circuit breakers.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform circuit breaker maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.6.1.2 Circuit Breakers, Air, Low-Voltage Power.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.6.1.2.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CKB-03-01Y

Frequency: Annually

Circuit Breakers, Air, Medium Voltage

Application

This standard applies to thermographic survey of medium voltage (1,000 to 100,000 volts) Air Insulated circuit breakers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Perform circuit breaker thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements::

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CKB-03-03Y

Frequency: 3-Year

Circuit Breakers, Air, Medium Voltage

Application

This standard applies to maintenance tests of medium voltage (1,000 to 100,000 volts) Air Insulated circuit breakers.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform circuit breaker maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.6.1.3 Circuit Breakers, Air, Medium-Voltage.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.6.1.3.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CKB-04-01M

Frequency: Monthly

Circuit Breakers, Oil, Medium-Voltage

Application

This standard applies to visual inspection of medium voltage (1,000 to 100,000 volts) Oil Insulated circuit breakers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Visually inspect physical and mechanical condition
4. Visually inspect anchorage, alignment, grounding, and required clearances.
5. Visually inspect for oil leaks.
6. Visually verify correct oil level in all tanks and bushings.
7. Verify that breather vents are clear.

Check Points:

All parameters shall be within manufacturer's tolerances

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CKB-04-01Y

Frequency: Annually

Circuit Breakers, Oil, Medium-Voltage

Application

This standard applies to medium voltage (1,000 to 100,000 volts) Oil Insulated circuit breakers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Perform monthly visual inspections concurrently with annual mechanical maintenance testing.
4. Perform circuit breaker thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.
5. Perform visual and mechanical inspections following the ANSI/NETA MTS-2011 procedures outlined in Section 7.6.2.1.
6. Remove oil sample of insulating liquid from the main tank or common tank following the ANSI/NETA MTS-2011 procedures outlined in Section 7.6.2.2.5.

Check Points:

1. In regards to thermographic survey follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.
2. Visual and mechanical inspection parameters shall be in accordance with manufacturer's published data..
3. Results of insulating liquid tests shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.6.2.3 Test Values

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers

3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CKB-04-03Y

Frequency: 3-Year

Circuit Breakers, Oil, Medium-Voltage

Application

This standard applies to maintenance tests of medium voltage (1,000 to 100,000 volts) Oil Insulated circuit breakers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Perform annual thermographic survey prior to 3-year electrical maintenance testing, if applicable
5. Schedule outage with operating personnel.
6. Perform circuit breaker maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.6.2 Circuit Breakers, Oil, Medium-Voltage.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.6.2.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CKB-05-01Y

Frequency: Annually

Circuit Breakers, Vacuum, Medium-Voltage

Application

This standard applies to thermographic survey of medium voltage (1,000 to 100,000 volts) Oil Insulated circuit breakers.

Special Instructions:

1. Perform these tests only if equipment is safely accessible for the survey.
2. Schedule thermographic survey with operating personnel.
3. Obtain and review manufacturer's instruction (including time current characteristic curve).
4. Perform circuit breaker thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category “Dangerous“ and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-CKB-05-03Y

Frequency: 3-Year

Circuit Breakers, Vacuum, Medium-Voltage

Application

This standard applies to maintenance tests of medium voltage (1,000 to 100,000 volts) vacuum circuit breakers.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing, if applicable
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform circuit breaker maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.6.3 Circuit Breakers, Vacuum, Medium-Voltage.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.6.3.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-CLK-01-06M

Frequency: Semi-annually

Clocks, Central System

Application:

Clocks connected to central system are either digital, analog (pointer type), calendar clocks or special design clocks. These clock's times are synchronized by a central time controller module usually installed within the building. These controllers often incorporate a feature that will synchronize the clocks through a wireless or wired connection with a regional office.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. This work should be done in spring and fall when time is changed from standard to "daylight savings time" in Spring and back one hour in Fall.

Check points:

1. Clean dirt and dust from interior and exterior of cabinet.
2. Adjust relays, check transmission of time signal.
3. Tighten contacts and terminal screws.
4. Burnish contacts if necessary.
5. Perform work suggested by manufacturer's instruction book.

Recommended Tools, Materials, and Equipment.

Standard Tools - Basic

ELEC-DCS-01-01M

Frequency: Monthly

DC Battery System, Lead Acid

Application:

This standard card applies to visual inspections for Direct Current Battery Systems using lead acid as the electrolyte. These can be flooded lead acid or valve-regulated lead acid types.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule and coordinate work with operating personnel.
5. The 2005 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.

Check Points:

Perform Visual Inspection in accordance with NETA *Maintenance Testing Specifications* Section 7.18.1.1 or 7.18.1.3. Test values for this maintenance item are also included in the respective NETA test section.

ELEC-DCS-01-01Y

Frequency: Annually

DC Battery System, Lead Acid

Application:

This standard card applies to visual inspections for Direct Current Battery Systems using lead acid as the electrolyte. These can be flooded lead acid or valve-regulated lead acid types.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Perform monthly visual inspections concurrently with annual maintenance and testing.
5. Schedule and coordinate work with operating personnel.
6. The 2005 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.
7. All tests shall conform to the appropriate NETA test procedure and the values used as standards shall conform to the manufacturer's, NETA, and ANSI Standards specifications.

Check Points:

Perform Mechanical and Electrical Inspection in accordance with NETA Maintenance Testing Specifications Section 7.18.1.1 or 7.18.1.3. Test values for this maintenance item are also included in the respective NETA test section.

ELEC-DCS-02-01M

Frequency: Monthly

Primary Battery (Dry Cell)

Application:

This standard is for primary type (1.5 volt dry cell, one time full discharge, non-rechargeable) batteries used for switch gear, control circuits, fire alarm systems, sprinkler supervisory systems and transformer supervisory systems where the source of DC power must be reliable.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The maximum load for a No. 6 primary battery shall not be more than two amperes per cell.

Check Points:

1. Conduct a load voltage test by measuring and recording the voltage when applying a one test ohm load on an individual (1.5 volt) cell.
2. Replace the battery when the voltage is reduced below one volt.
3. Replace a 6-volt battery assembly when a test load of four ohms reduces the voltage below four volts.
4. Clean terminals and tighten connections and check condition of wiring.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. One ohm test load.
3. Soft cleaning cloths.
4. Replacement batteries.

ELEC-DCS-03-03M

Frequency: Quarterly

Nickel Cadmium Battery

Application:

This standard applies to nickel cadmium type batteries that are used for switch gear, control circuits, fire alarm systems, sprinkler supervisory systems and transformer supervisory systems that require a reliable source of DC power.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Never smoke or carry an open flame in or near the battery room or area.
5. Use caution in handling the electrolyte, it is harmful to the skin and clothing.
6. Never remove any connecting cables or straps while charger is on or there is a possibility of a load being on the batteries.
7. Wear acid resistant apron, gloves and plastic face shield when handling electrolyte.
8. Review the Standard Operating Procedure for "Emergency Eyewash and Shower Equipment." Note the location of emergency eyewash and/or shower equipment.

Check Points:

1. With the battery charger disconnected, measure voltage for entire battery and record results.
2. With the battery charger disconnected, conduct a load voltage test by measuring and recording the voltage of the entire battery with the battery carrying the full connected load. An artificial load equal to the full load connected to the battery may be used for this test. Under load, the battery voltage shall not fall below 1.42 volts per cell nominal. Measure cells individually if possible.
3. With the battery disconnected, conduct a discharge test by following the manufacturer's instructions and measuring and recording the voltage of each cell while load testing the batteries for a minimum of 30 minutes. An

artificial load equal to the full load connected to the battery may be used for this test. The voltage shall not fall below the levels specified.

4. With the battery charger connected and the batteries fully charged, conduct a charger test by placing an amp meter in series with the battery under charge. The charging current shall be the manufacturer's recommendation for the type of battery used.
5. Add distilled water to bring the electrolyte up to the proper level, and record the amount used. Abnormal use of water indicates overcharging.
6. Wipe salt and dirt accumulation from batteries with disposable cloth taking care not to drop foreign matter into batteries.
7. Clean terminals, tighten connections and check condition of wiring.
8. Check battery cable and battery supports for deterioration, paying special attention to wooden members.
9. Replace battery every three years. Dispose of old battery in accordance with all applicable Federal, state, and local regulations.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Tools Group B.
2. Electrolyte.
3. Soft cleaning cloths.
4. Acid resistant apron, gloves, and plastic face shield.
5. Emergency eye wash that provides at least 0.4 gallons/minute for at least 15 minutes.

ELEC-DCS-04-01M

Frequency: Monthly

DC Battery System, Chargers

Application:

This standard card applies to visual inspections for Direct Current Battery System Chargers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule and coordinate work with operating personnel.
5. The 2005 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.

Check Points:

Perform Visual Inspection in accordance with NETA *Maintenance Testing Specifications* Section 7.18.2. Test values for this maintenance item are also included in the respective NETA test section.

ELEC-DCS-04-01Y

Frequency: Annually

DC Battery System, Chargers

Application:

This standard card applies to visual inspections for Direct Current Battery System Chargers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Perform monthly visual inspections concurrently with annual maintenance and testing.
5. Schedule and coordinate work with operating personnel.
6. The 2005 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.
7. All tests shall conform to the appropriate NETA test procedure and the values used as standards shall conform to the manufacturer's, NETA, and ANSI Standards specifications.

Check Points:

Perform Mechanical and Electrical Inspection in accordance with NETA *Maintenance Testing Specifications* Section 7.18.2. Test values for this maintenance item are also included in the respective NETA test section.

ELEC-EMG-01-01M

Frequency: Monthly

Emergency Generator, Electrical

Application:

This standard card applies to emergency generators as part of the building electrical system and the emergency power system found in the building. This standard does not address the prime mover of the generator.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule and coordinate work with operating personnel.
5. The 2005 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.

Check Points:

Perform Visual Inspection in accordance with NETA *Maintenance Testing Specifications* Section 7.22.1. Test values for this maintenance item are also included in the respective NETA test section.

ELEC-EMG-01-01Y

Frequency: Annually

Emergency Generator, Electrical

Application:

This standard card applies to emergency generators as part of the building electrical system and the emergency power system found in the building. This standard does not address the prime mover of the generator.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Perform monthly visual inspections concurrently with annual maintenance and testing.
5. Schedule and coordinate work with operating personnel.
6. The 2005 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.
7. All tests shall conform to the appropriate NETA test procedure and the values used as standards shall conform to the manufacturer's, NETA, and ANSI Standards specifications.

Children of this Piece of Equipment

Emergency Generator, Mechanical (Prime Mover of Emergency Generator)

Check Points:

Perform Electrical Inspection in accordance with NETA *Maintenance Testing Specifications* Section 7.22.1. Test values for this maintenance item are also included in the respective NETA test section.

ELEC-GRD-01-01Y

Frequency: Annually

Grounding Systems

Application

This standard applies to Building Grounding Systems as part of the electrical system located in the building.

Special Instructions:

1. Schedule grounding system inspections with operating personnel.
2. Verify ground system is in compliance with ANSI/NFPA 70 National Electrical Code, Article 250
3. Inspect physical and mechanical condition.
4. Inspect bolted electrical connections using low resistance ohmmeter or calibrated torque wrench.
5. Inspect anchorage.

Check Points:

Bolt torque values for electrical connections shall correspond to ANSI/NETA MTS-2011 Table 100.12.1-4.

ELEC-GRD-01-03Y

Frequency: 3-Year

Grounding Systems

Application

This standard applies to Building Grounding Systems as part of the electrical system located in the building.

Special Instructions:

1. Perform annual visual inspections concurrently with 3-year electrical maintenance and testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform grounding system maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.13 Grounding Systems.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.13.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-ITR-01-01Y

Frequency: Annually

Instrument Transformers

Application

This standard applies to thermographic survey of Instrument Transformers located within the building.

Special Instructions:

1. Schedule thermo graphic survey with operating personnel.
2. Perform these tests only if instrument transformers are easily accessible for survey.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Perform instrument transformer thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-ITR-01-03Y

Frequency: 3-Year

Instrument Transformers

Application

This standard applies to maintenance tests of Instrument Transformers located within the building.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform instrument transformer maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.10 Instrument Transformers.

Check Points:

See Special Instructions

Safety requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-LTG-01-03M

Frequency: Quarterly

Dimmer and Control, Stage and General Lighting

Application:

This standard card applies to dimmers and control panels, both at unit and remotely located, used to control light levels of general and special lights in auditoriums, large conference rooms, etc.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

Dimmer Unit:

1. Remove necessary access covers and panels.
2. Check supply voltage.
3. Tighten all connections to main breaker, sub breakers, contactors, etc.
4. Check operation of contactors, clean and adjust as necessary.
5. Check operation of drive motor and drive mechanism. Lubricate as necessary.
6. Check for discoloration and overheating on rheostat and printed circuit board.
7. Check all wiring, including control wiring for deterioration, overheating, etc.
8. Clean interior of housing.
9. Clean rheostat contact surface.
10. Check dimmer rating against actual load.

Control Unit (Local and Remote):

1. Remove, disassemble and clean slide bars.
2. Check indicator lamps, replace as necessary.
3. Clean interior of unit.

4. Check all connection to slide bars, terminal strip switches, etc.
5. Check calibration of voltage meters.
6. Lubricate control buttons, slide bars and switches.
7. Reassemble unit.
8. Test operation of dimmer throughout full range noting light fluttering or level difference (required for each control unit).
9. If applicable, check time clock , programming and time schedules.
10. If applicable , check each relay form the BAS interface via BAS front end.
11. Replace covers on dimmer unit after making any adjustments.
12. Clean exterior of units.

Recommended Tools, Materials, and Equipment:

1. Standard tools.
2. Cleaning supplies and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Multimeter.
4. Amp-meter.
5. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.

ELEC-LTG-02-02Y

Frequency: 2-Year

Fluorescent Lighting Fixture, Washing and Relamping

Application:

This standard card applies to the group replacement of standard fluorescent lamps in office areas of a single building. Work performed by a two-person crew. Time is allowed for disassembly, washing, reassembly, and replacement of lamps in each fixture. For types of fixtures that cannot be disassembled, time is allowed to clean in place.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. This standard requires that the fluorescent light fixtures be washed every 2.5 years. However, since the expected life of the fluorescent light tubes are in excess of five years, the tubes should be replaced only every other washing. The existing tubes should be reused on the interim washing.
6. Turn off branch circuit at panel or individual light switch in room as appropriate. Do not attempt to wash energized lights.
7. Follow manufacturer's instructions on specular reflectors and specular parabolic lens (diffusers). Use gloves during handling because fingerprints are difficult to remove. Do not use industrial detergents as they will damage these items.
8. Ensure that the replacement lamps are of the same type and color as removed from the fixture. T-12 and T-8 lamps require different ballasts. Using the wrong lamp in a fixture will cause the lighting system to not function properly and will lead to premature failure. Wherever possible, us energy efficient T-8 lamps and electronic ballasts.
9. If the ballast requires replacement, use only T-8 lamps and electronic ballasts as replacements. Replace ballasts in the entire fixture for uniform lighting appearance.

10. The disposal of old lamps may be regulated by state or local governments, depending on the number of lamps removed. Lamps should be disposed of as universal waste in accordance with local, state requirements. Refer to Appendix G for the Universal Waste Guide.
11. PCB fluorescent light ballasts must be removed and disposed of in accordance with 40 CFR 761, and state and local regulations.

Check Points:

1. Disassemble fixture. Wash all removable parts with warm water and a mild detergent. Rinse and allow to drip dry.
2. Damp wipe remaining body of fixture in place.
3. Remove old fluorescent lamps and install new lamps.
4. Test light fixtures. Replace starters and ballasts where necessary. Note and report any needed electrical repairs.
5. Reassemble all removable parts to fixture.
6. Clean up area and remove any trash.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic.
2. Ladder constructed in accordance with OSHA/ANSI standards. Check the ladder for defects. Do not use defective ladders.
3. Cleaning materials – consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

ELEC-LTG-02-05Y Frequency: 5-Year

Fluorescent Lighting Fixture, Relamping Only

Application:

This standard card applies to the group replacement of standard fluorescent lamps in office areas of a single building. Work performed by a two-person crew. Fixture height is such that the work can be accomplished with the use of an eight foot stepladder. Group relamping on a more frequent basis than once every five years must be justified and request for some submitted to Central Office through the regional office for approval.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Turn off branch circuit at panel or individual light switch in room as appropriate.
6. The disposal of old lamps may be regulated by state or local governments, depending on the number of lamps removed. Lamps should be disposed of as universal waste in accordance with local, state requirements. Refer to Appendix G for the Universal Waste Guide.
7. PCB fluorescent light ballasts must be removed and disposed of in accordance with 40 CFR 761, and state and local regulations.
8. Ensure that the replacement lamps are of the same type and color as removed from the fixture. T-12 and T-8 lamps require different ballasts. Using the wrong lamp in a fixture will cause the lighting system to not function properly and will lead to premature failure. Wherever possible, us energy efficient T-8 lamps and electronic ballasts.
9. If the ballast requires replacement, use only T-8 lamps and electronic ballasts as replacements. Replace ballasts in the entire fixture for uniform lighting appearance.

Check Points:

1. Remove louver or diffuser as necessary.

2. Remove all fluorescent lamps and install new lamps.
3. Test light fixture. Replace starters or ballasts where necessary.
4. Note and report any needed electrical repairs.
5. Reassemble louver or diffuser as required.
6. Clean up area and remove any trash.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic.
2. Ladder constructed in accordance with OSHA/ANSI standards. Check the ladder for defects. Do not use defective ladders.

ELEC-LTG-03-01Y

Frequency: Annually

Lighting, Special Feature

Application:

This standard card applies to special lighting fixtures such as found in lobbies, porticos, court rooms, and auditoriums, and for fixtures above 12 feet.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Clean fixture thoroughly.
2. Check all sockets, replace as needed.
3. Inspect anchors or anchoring device, tighten as needed.
4. Examine fixture glass, side panels, diffusers, etc., for cracks, breaks, etc. Replace if necessary.
5. If group relamping is due, change all lamps; otherwise, replace only those that are burned out.
6. Check operation.
7. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic.
2. Ladder constructed in accordance with OSHA/ANSI standards. Check the ladder for defects. Do not use defective ladders.

ELEC-LTG-04-06M

Frequency: Annually

Lighting, Outside Incandescent and Fluorescent

Application:

This standard card applies to parking lot, street, loading dock, and perimeter lighting, and provides for group relamping and maintenance of such fixtures outside the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Open and tag switch.
2. Remove old lamp and clean fixture including reflector, refractor, and globes.
3. Inspect condition of wiring, contacts, terminals, and sockets. Look for evidence of overheating.
4. Install new lamp and assemble checking gaskets for proper seat.
5. Test operation of automatic switches.
6. Inspect lamp standards and mounting devices.
7. Clean up work area and remove all trash.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic.
2. Ladder constructed in accordance with OSHA/ANSI standards. Check the ladder for defects. Do not use defective ladders.

ELEC-LTG-04-05Y

Frequency: 5-Year

Lighting, Outside Mercury Vapor , High Pressure Sodium or Metal Halide

Application:

This standard card applies to parking lot, street, loading dock, and perimeter lighting, and provides for group relamping and maintenance of such fixtures outside the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Open and tag switch.
2. Remove old lamp and clean fixture including reflector, refractor, and globes.
3. Inspect condition of wiring, contacts, terminals, and sockets. Look for evidence of overheating.
4. Install new lamp and assemble fixture checking gaskets for proper seat.
5. Test operation of automatic switches.
6. Inspect lamp standards and mounting devices.
7. Clean up work area and remove all trash.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic.
2. Ladder constructed in accordance with OSHA/ANSI standards. Check the ladder for defects. Do not use defective ladders.

ELEC-LTG-05-01M

Frequency: Monthly

Spotlights, Fixed and Portable

Application:

This standard card applies to both fixed and portable spotlights used in the lighting and highlighting of performers and stage areas in auditoriums and large conference rooms.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Keep record of hour usage of spotlight bulb, noting its estimated life and date of installation.

Check Points:

1. Check power supply cord and connection to plug.
2. Remove necessary access panels.
3. Check connection at, and operation of switch. Lubricate as needed.
4. Clean lens and reflector.
5. Lubricate and check operation of all slide rods, adjust rods and linkage.
6. Check bulb and socket, clean or change as required.
7. Clean housing interior.
8. Clean and check operation of color slides.
9. Replace removed access panels.
10. Lubricate wheels and pivot points as required.
11. Check mounting supports.
12. Clean exterior of unit.
13. Test.
14. Clean up work area.

Recommended Tools, Materials, and Equipment:

1. Tool Group A
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Ladder constructed in accordance with OSHA/ANSI standards. Check the ladder for defects. Do not use defective ladders.

ELEC-LTG-06-03M

Frequency: Quarterly

Emergency Lighting, Closed Systems

Application:

This standard card applies to closed system emergency lights and Exit lights, inclusive of fluorescent ballasts that contain battery backup.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Use acid-resistant gloves, apron and plastic face shield.
6. Do not spark battery terminals or smoke while performing maintenance.

Check Points:

1. Inspect for structural defects and deposits.
2. Clean off corrosion deposits and apply silicone grease to terminals.
3. Push test buttons and observe light operation. (See manufacturer's instructions.)
4. Check vent holes.
5. Clean exterior with dry cloth.
6. Disconnect power to check operation. The battery shall maintain the light output for 1.5 hours. If it does not, it needs to be replaced.
7. Record battery cell voltage. Replace cells below manufacturer's recommended low level.
8. If unit has to be discarded, review the Material Safety Data Sheet (MSDS) for proper disposal of battery and electrolyte.
9. Clean up work area.
10. For Exit lights check for proper arrow direction.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.

2. Cleaning equipment and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Direct Current Volt Meter.
4. Hydrometer.
5. Silicone grease.
6. Acid resistant apron, gloves, and plastic face shield.

ELEC-LTG-07-03M

Frequency: Quarterly

Emergency Lighting, Wet Cell

Application:

This standard card applies to wet cell emergency lights and Exit lights.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Do not spark battery terminals or smoke while performing maintenance.
6. Use acid-resistant gloves, apron and plastic face shield.
7. Consult the Material Safety Data Sheet (MSDS) for the electrolyte and proper personal protective equipment (PPE).
8. Review the Standard Operating Procedure for "Emergency Eyewash and Shower Equipment." Note the location of emergency eyewash and/or shower equipment.
9. When practicable, remove light units to shop area for inspection and maintenance.
10. Refer to the latest editions of the American National Standards Institute/National Fire Protection Associate (ANSI/NFPA) publication 70B, "Electrical Equipment Maintenance" and the Inter National Electrical Testing Association publication, "Maintenance Testing Specifications", as applicable.

Check Points:

1. Inspect for structural defects and deposits.
2. Clean off corrosion deposits and apply silicone grease to terminals.
3. Inspect battery water level and take specific gravity readings. If reading is less than specified by battery manufacturer, the battery should be replaced with a freshly charged one. The old battery should be charged and tested before discarding. Review the MSDS for proper disposal of battery and electrolyte.

4. Add distilled water to raise electrolyte to proper level.
5. Push test buttons and observe light operation. (See manufacturer's instructions.)
6. Check vent holes.
7. Clean exterior with dry cloth, paint if necessary with an appropriate type and color paint. **Caution:** Do not paint over any indicator lights.
8. Unplug unit to check operation. The battery should maintain the light output for 1.5 hours.
9. For Exit lights check for proper arrow direction.
10. Clean up work area.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Distilled water.
3. Cleaning equipment and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
4. Hydrometer.
5. Silicone grease.
6. Acid resistant apron, gloves, and plastic face shield.
7. Emergency eye wash that provides at least 0.4 gallons/minute for at least 15 minutes.
8. If unit has to be discarded, review the (MSDS) for proper disposal of battery and electrolyte.

ELEC-MCC-01-01Y

Frequency: Annually

Low Voltage Motor Starters

Application

This standard applies to thermographic survey of Low Voltage (1,000 Volts or less) Motor Starters as part of the electrical system located in the building. These are typically located in a Motor Control Center in an equipment or electrical room.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule thermographic survey with operating personnel.
3. Obtain and review manufacturer's instruction s
4. Perform motor starter thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-MCC-01-03Y

Frequency: 3-Year

Low Voltage Motor Starters

Application

This standard applies to maintenance testing of Low Voltage (1,000 Volts or less) Motor Starters as part of the electrical system located in the building. These are typically located in a Motor Control Center in an equipment or electrical room.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. Obtain and review manufacturer's instruction.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform motor starter maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.16.1.1 Motor Control, Motor starters, Low-Voltage.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.16.1.1.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-MCC-02-01Y

Frequency: Annually

Medium Voltage Motor Starters

Application

This standard applies to thermographic survey of the Medium Voltage (1,000 to 100,000 volts) Motor Starters as part of the electrical located in the building. These are typically located in a Motor Control Center in an equipment or electrical room.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule thermographic survey with operating personnel.
3. Perform motor starter thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-MCC-02-03Y

Frequency: 3-Year

Medium Voltage Motor Starters

Application

This standard applies to maintenance testing of Medium Voltage (1,000 to 100,000 volts) Motor Starters as part of the electrical system located in the building. These are typically located in a Motor Control Center in an equipment or electrical room.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. Obtain and review manufacturer's instruction.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform motor starter maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.16.1.2 Motor control, Motor Starters, Medium-Voltage.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.16.1.2.3 Test Values..

Safety requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-MCC-03-01Y

Frequency: Annually

Low Voltage Motor Control Center

Application

This standard applies to thermographic survey of Low Voltage (1,000 Volts or less) Motor Control Centers as part of the electrical system located in the building. These are typically located in an equipment or electrical room.

Special Instructions:

Refer to Standard ELEC-SWB-01-01Y for instructions, check points and safety requirements.

ELEC-MCC-03-03Y

Frequency: 3-Year

Low Voltage Motor Control Center

Application

This standard applies to maintenance tests of Low Voltage (1,000 Volts or less) Motor Control Centers as part of the electrical system located in the building. These are typically located in an equipment or electrical room.

Special Instructions:

Refer to Standard ELEC-SWB-01-03Y for instructions, check points and safety requirements.

ELEC-MCC-04-01Y

Frequency: Annually

Medium Voltage Motor Control Center

Application

This standard applies to thermographic survey of Medium Voltage (1,000 to 100,000 volts) Motor Control Centers as part of the electrical system located in the building. These are typically located in an equipment or electrical room.

Special Instructions:

Refer to Standard ELEC-SWB-01-01Y for instructions, check points and safety requirements.

ELEC-MCC-04-03Y

Frequency: 3-Year

Medium Voltage Motor Control Center

Application

This standard applies to maintenance tests of Medium Voltage (1,000 to 100,000 volts) Motor Control Centers as part of the electrical system located in the building. These are typically located in an equipment or electrical room.

Special Instructions:

Refer to Standard ELEC-SWB-01-03Y for instructions, check points and safety requirements.

ELEC-MOT-01-01M

Frequency: Monthly

Motors, Preventative Maintenance

Application

This standard is for induction, wound-rotor and synchronous motors in excess of 1 horsepower. The maintenance specified by this standard is not intended to require disassembly of the motor. This standard does not normally apply to motors rated less than 1 horsepower, for which maintenance is normally limited to cleaning and lubrication, and is done with the maintenance of the driven machine (Parent).

Special Instructions:

1. Schedule shutdown with operating personnel, as needed.
2. Review manufacturer's instructions.
3. The 2005 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.
4. In absence of manufacturer’s instructions, use NETA *Maintenance Testing Specifications* as a guide.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. All tests shall conform to the appropriate NETA test procedure and the values used as standards shall conform to the manufacturer's, NETA, and ANSI Standards specifications.

Check Points:

Perform Visual Inspection in accordance with NETA *Maintenance Testing Specifications* Section 7.15.1 for Induction Motors or Section 7.15.2 for Synchronous Motors. Test values for this maintenance item are also included in the respective NETA test section.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Gloves.

ELEC-MOT-01-01Y

Frequency: Annually

Motors, Preventative Maintenance

Application

This standard is for induction, wound-rotor and synchronous motors in excess of 1 horsepower. The maintenance specified by this standard is not intended to require disassembly of the motor. This standard does not normally apply to motors rated less than 1 horsepower, for which maintenance is normally limited to cleaning and lubrication, and is done with the maintenance of the driven machine (Parent).

Special Instructions:

1. Perform monthly visual inspections concurrently with annual maintenance and testing.
2. Schedule shutdown with operating personnel, as needed.
3. Review manufacturer's instructions.
4. The 2005 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.
5. In absence of manufacturer’s instructions, use NETA *Maintenance Testing Specifications* as a guide.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. All tests shall conform to the appropriate NETA test procedure and the values used as standards shall conform to the manufacturer's, NETA, and ANSI Standards specifications.

Mechanical Inspection:

Perform Mechanical Inspection in accordance with NETA *Maintenance Testing Specifications* Section 7.15.1 for Induction Motors or Section 7.15.2 for Synchronous Motors. Test values for this maintenance item are also included in the respective NETA test section.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Gloves.

ELEC-MOT-01-02Y

Frequency: 2-Year

Motors, Preventative Maintenance

Application

This standard is for induction, wound-rotor and synchronous motors in excess of 1 horsepower. The maintenance specified by this standard is not intended to require disassembly of the motor. This standard does not normally apply to motors rated less than 1 horsepower, for which maintenance is normally limited to cleaning and lubrication, and is done with the maintenance of the driven machine (Parent).

Special Instructions:

1. Perform monthly visual inspections and annual mechanical maintenance concurrently with 2-year electrical maintenance and testing.
2. Schedule shutdown with operating personnel, as needed.
3. Review manufacturer's instructions.
4. The 2005 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.
5. In absence of manufacturer’s instructions, use NETA *Maintenance Testing Specifications* as a guide.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. All tests shall conform to the appropriate NETA test procedure and the values used as standards shall conform to the manufacturer's, NETA, and ANSI Standards specifications.

Check Points:

Perform Electrical Inspection in accordance with NETA *Maintenance Testing Specifications* Section 7.15.1 for Induction Motors or Section 7.15.2 for Synchronous Motors. Test values for this maintenance item are also included in the respective NETA test section.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Tachometer

3. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
5. Vacuum with long bottle type brush attachment.
6. Safety goggles.
7. Gloves.

ELEC-MTR-01-01Y

Frequency: Annually

Metering Devices

Application

This standard applies to thermographic survey of all electric metering devices located in switchboards within the building.

Special Instructions:

1. Obtain and review manufacturer's instruction.
2. Perform meters thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category “Dangerous“ and perform operations in the following sequence:

3. De-energize equipment
4. Remove covers
5. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
6. Perform thermographic survey
7. De-energize equipment
8. Re-install covers
9. Re-energize equipment

ELEC-MTR-01-03Y

Frequency: 3-Year

Metering Devices

Application

This standard applies to maintenance testing of all electric metering devices located in switchboards within the building.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. Obtain and review manufacturer's instruction (including time current characteristic curve).
4. Perform metering device maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Sections 7.11.1 Metering Devices, Electromechanical and Solid-State or 7.11.2 Metering Devices, Microprocessor Based.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Sections 7.11.1.3 or 7.11.2.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-MTR-02-01Y

Frequency: Annually

Advanced Metering

Application

This standard applies to maintenance testing of advanced metering devices.

Special Instructions:

1. If meter is equipped with a service disconnect, remove power and check terminals and connectors for tightness
2. Verify that the wire is properly stripped and that there is no excessive bare wire or pinching of the insulation in the terminals
3. Install any firmware updates
4. Inspect for signs of moisture, corrosion, dirt or contaminants, wear or cracking of insulation, presence of nameplate and that the meter is correct class for service
5. Verify the control is firmly mounted, and that wiring is neat and orderly
6. Obtain a current one-line drawing and verify meter is connected to the proper circuit. A copy of the one-line should be mounted or in a document sleeve in the vicinity of the meter. Verify wiring is to correct legs. Verify CTs are mounted to the correct legs and have the correct polarity
7. Check the condition of any fuses
8. Check for visible signs of overheating on wiring and terminals
9. Perform thermal imaging
10. Verify that the RMS voltage indicated by the meter agrees with the reading on a calibrated handheld meter between phases and phase to ground

Check Points:

See Special Instructions.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-NWP-01-01Y

Frequency: Annually

Network Protectors, 600V Class

Application

This standard applies to Network Protectors, 600V class.

Special Instructions:

Refer to Standard ELEC-CKB-01-01Y and ELEC-CKB-01-03Y for instructions, check points and safety requirements.

ELEC-PVS-01-06M

Frequency: Semi-annually

Photovoltaic Systems

Application

This standard applies to maintenance testing of photovoltaic systems.

Special Instructions:

1. Remove any debris. Clean PV panels per manufacturer's recommendations. At a minimum, rinse with water to remove accumulated dust, etc.
2. Perform visual inspection of combiner boxes and control panels. Clean combiner boxes and control panels using compressed air and vacuum. Verify wiring is neat and orderly, Panduit and control covers are in place.
3. Test PV arrays voltage/current at the combiner boxes
4. Inspect components for moisture, verify proper operation of any panel temperature controls.
5. Grease actuator gears and top off hydraulic fluid on tracker components (if applicable).
6. Test of SCADA and meterological connections and signal strength.
7. Install any software, firmware updates.
8. Inspect cables for binding or wear (tracking systems).
9. Check and calibrate sensors, verify operation of wind sensors (tracking panels should "flatten" during high wind conditions).

ELEC-REG-01-01M

Frequency: Monthly

Step-Voltage Regulators

Application

This standard applies to visual inspections of Step Voltage Regulators located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Visually inspect physical and mechanical condition
4. Visually inspect anchorage, alignment, and grounding.
5. Visually inspect for oil leaks.
6. Visually verify correct oil level in all tanks and bushings.

Check Points:

All parameters shall be within manufacturer's recommended tolerances.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-REG-01-01Y

Frequency: Annually

Step-Voltage Regulators

Application

This standard applies to Step Voltage Regulators located in the building.

Special Instructions:

1. Schedule work with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Perform step-voltage regulator thermographic survey, following ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY
5. Perform visual and mechanical inspections following the ANSI/NETA MTS-2011 procedures outlined in Section 7.12.1.1.
6. Remove oil sample of insulating liquid from the main tank or common tank following the ANSI/NETA MTS-2011 procedures outlined in Section 7.12.1.1.12.

Check Points:

1. In regards to thermographic survey follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.
2. Visual and mechanical inspection parameters shall be in accordance with manufacturer's published data..
3. Results of insulating liquid tests shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.12.1.1.3 Test Values

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers

3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-REG-01-02Y

Frequency: 2-Year

Step-Voltage Regulators

Application

This standard applies to maintenance tests of Step Voltage Regulators located in the building.

Special Instructions:

1. Perform monthly and annual inspections concurrently with 3-year electrical maintenance testing.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
5. Review manufacturer's instructions for all system components.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Perform step voltage regulator maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.12.1.1 Regulating Apparatus, Voltage, Step-Voltage Regulators

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.12.1.1.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work

ELEC-REG-02-01M

Frequency: Monthly

Induction Regulators

Application

This standard applies to visual inspections of Induction Regulators located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Visually inspect physical and mechanical condition
4. Visually inspect anchorage, alignment, and grounding.
5. Visually inspect for oil leaks.
6. Visually verify correct oil level in all tanks and bushings.

Check Points:

All parameters shall be within manufacturer's recommended tolerances.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-REG-02-01Y

Frequency: Annually

Induction Regulators

Application

This standard applies to Induction Regulators located in the building.

Special Instructions:

1. Schedule work with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Perform induction regulator thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.
5. Perform visual and mechanical inspections following the ANSI/NETA MTS-2011 procedures outlined in Section 7.12.1.2.
6. Remove oil sample of insulating liquid from the main tank or common tank following the ANSI/NETA MTS-2011 procedures outlined in Section 7.12.1.2.12.

Check Points:

1. In regards to thermographic survey follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.
2. Visual and mechanical inspection parameters shall be in accordance with manufacturer's published data..
3. Results of insulating liquid tests shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.12.1.2.3 Test Values

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If none are provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary

4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-REG-02-03Y

Frequency: 3-Year

Induction Regulators

Application

This standard applies to maintenance tests of Induction Regulators located in the building.

Special Instructions:

1. Perform monthly and annual inspections concurrently with 3-year electrical maintenance testing.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
5. Review manufacturer's instructions for all system components.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Perform inductive regulator maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.12.1.2 Regulating Apparatus, Voltage, Induction Regulators.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.12.1.2.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-REG-03-01M

Frequency: Monthly

Load Tap-changers

Application

This standard applies to visual inspections of Load Tap-changers as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Visually inspect physical and mechanical condition
4. Visually inspect anchorage, alignment, grounding, and required clearances.
5. Visually inspect for oil leaks.
6. Visually verify correct oil level in all tanks.

Check Points:

All parameters shall be in accordance with manufacturer's published data.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-REG-03-01Y

Frequency: Annually

Load Tap-changers

Application

This standard applies to Load Tap-changers as part of the electrical system located in the building.

Special Instructions:

1. Perform monthly visual inspections concurrently with annual mechanical maintenance testing.
2. Schedule work with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Perform load tap changer thermographic survey, following ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY
6. Perform visual and mechanical inspections following the ANSI/NETA MTS-2011 procedures outlined in Section 7.12.3.1.
7. Remove oil sample of insulating liquid from the main tank or common tank following the ANSI/NETA MTS-2011 procedures outlined in Section 7.12.3.2.7.

Check Points:

1. In regards to thermographic survey follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.
2. Visual and mechanical inspection parameters shall be in accordance with manufacturer's published data..
3. Results of insulating liquid tests shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.12.3..3 Test Values

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If none are provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers

3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-REG-03-03Y

Frequency: 3-Year

Load Tap-changers

Application

This standard applies to maintenance tests of Load Tap-changers as part of the electrical system located in the building.

Special Instructions:

1. Perform monthly visual inspections and annual mechanical maintenance concurrently with 3-year electrical maintenance testing.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
5. Review manufacturer's instructions for all system components.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Perform load tap changer maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.12.3 Regulating Apparatus, Load Tap-Changers

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.12.3.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-RLY-01-01Y

Frequency: Annually

Protective Relays, Electrical Service, All Types

Application:
This standard card applies to all electrical system Protective Relays installed in the building.

Special Instructions:

1. Schedule and coordinate work with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Obtain and review manufacturer's instructions, circuit diagrams for relay and test set.
6. Perform protective relay maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.9.1 Protective Relays, Electromechanical and Solid-State or Section 7.9.2 Protective Relays, Microprocessor-Based whichever is applicable.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.9.1.3 Test Values or Section 7.9.2.3 Test Values whichever is applicable.

ELEC-SRG-01-01Y

Frequency: Annually

LV Surge Arresters

Application
This standard applies to thermographic survey of Low Voltage (1,000 Volts or less) Surge Arrester Devices as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Obtain and review manufacturer's instruction (including time current characteristic curve).
3. Perform surge arrester thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-SRG-01-03Y

Frequency: 3-Year

LV Surge Arresters

Application
This standard applies to maintenance tests of Low Voltage (1,000 Volts or less) Surge Arrester Devices as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. Obtain and review manufacturer's instruction (including time current characteristic curve).
5. Perform surge arrester maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.19.1 Surge Arrester, Low-Voltage Surge Protection Devices.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.19.1.3 Test Values.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SRG-02-01Y

Frequency: Annually

Medium Voltage Surge Arresters

Application
This standard applies to thermographic survey of Medium Voltage Surge Arrester Devices as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Obtain and review manufacturer's instruction (including time current characteristic curve).
3. Perform surge arrester thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-SRG-02-03Y

Frequency: 3-Year

Medium Voltage Surge Arresters

Application
This standard applies to maintenance tests of Medium Voltage Surge Arrester Devices as part of the electrical system located in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule outage with operating personnel.
4. Obtain and review manufacturer's instruction (including time current characteristic curve).
5. Perform surge arrester maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.19.2 Surge Arresters, Medium- and High-Voltage Surge Protection Devices.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.19.2.3 Test Values.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWB-01-01Y

Frequency: Annually

Switchgear and Switchboard Assemblies

Application:
This standard card applies to thermographic survey of electrical switchgear and switchboard assemblies located throughout the building or site.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Perform switchgear thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

1. Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-SWB-01-03Y

Frequency: 3-Year

Switchgear and Switchboard Assemblies

Application:
This standard card applies to maintenance tests of electrical switchgear and switchboard assemblies located throughout the building or site.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule and coordinate work with operating personnel.
4. Obtain and review manufacturer's instructions.
5. Perform switchgear maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.1 Switchgear and Switchboard Assemblies.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.1.3 Test Values.

Safety requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWT-01-01Y

Frequency: Annually

Low-Voltage Air Switches

Application
This standard applies to thermographic survey of Low-Voltage Air Switches.

Special Instructions:

1. Schedule work with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Perform switch thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-SWT-01-03Y

Frequency: 3-Year

Low-Voltage Air Switches

Application
This standard applies to maintenance testing of Low-Voltage Air Switches.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform switch maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.5.1.1 Switches, Air, Low-Voltage.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.5.1.1.3 Test Values.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWT-02-01Y

Frequency: Annually

Switches, Air, Medium-Voltage, Metal-Enclosed

Application
This standard applies to thermographic survey of Medium-Voltage Metal-Enclosed Switches.

Special Instructions:

1. Schedule work with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Perform circuit breaker thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:

1. Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-SWT-02-03Y

Frequency: 3-Year

Switches, Air Medium-Voltage, Metal-Enclosed

Application
This standard applies to maintenance testing of Medium-Voltage Metal-Enclosed Switches.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform switch maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.5.1.2 Switches, Air, Medium-Voltage, Metal-Enclosed.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.5.1.2.3 Test Values.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWT-03-01Y

Frequency: Annually

Medium- and High-Voltage Open Switches

Application
This standard applies to thermographic survey of Medium- and High-Voltage Open Switches.

Special Instructions:

1. Schedule work with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Perform switch thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-SWT-03-03Y

Frequency: 3-Year

Medium- and High-Voltage Open Switches

Application
This standard applies to maintenance testing of Medium- and High-Voltage Open Switches.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform switch maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.5.1.3 Switches, Air, Medium- and High-Voltage, Open.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.5.1.3.3 Test Values.

Safety requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWT-04-01M

Frequency: Monthly

Medium-Voltage Oil Switches

Application
This standard applies to visual inspection of Medium-Voltage Oil Switches.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Visually inspect physical and mechanical condition
4. Visually inspect anchorage, alignment, grounding, and required clearances.
5. Visually inspect for oil leaks.
6. Visually verify correct oil level in all tanks and bushings.
7. Verify that breather vents are clear.

Check Points:
All parameters shall be in accordance with manufacturer's published data.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWT-04-01Y

Frequency: Annually

Medium-Voltage Oil Switches

Application
This standard applies to Medium-Voltage Oil Switches.

Special Instructions:

1. Schedule work with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Perform soil switch thermographic survey, following ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY
5. Perform visual and mechanical inspections following the ANSI/NETA MTS-2011 procedures outlined in Section 7.5.2.1.
6. Remove oil sample of insulating liquid from the main tank or common tank following the ANSI/NETA MTS-2011 procedures outlined in Section 7.5.2.2.6.

Check Points:

1. In regard to thermographic survey follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.
2. Visual and mechanical inspection parameters shall be in accordance with manufacturer's published data..
3. Results of insulating liquid tests shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.5.2.3 Test Values

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If none are provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment

6. Re-install covers
7. Re-energize equipment

ELEC-SWT-04-03Y

Frequency: 3 -Year

Medium-Voltage Oil Switches

Application
This standard applies to maintenance testing of Medium-Voltage Oil Switches.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform oil switch maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.5.2 Switches, Oil, Medium-Voltage.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.5.2.3 Test Values.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWT-05-01Y

Frequency: Annually

Medium-Voltage Vacuum Switches

Application
This standard applies to thermographic survey of Medium-Voltage Vacuum Switches.

Special Instructions:

1. Perform these tests only if equipment is safely accessible for the survey.
2. Schedule work with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Perform vacuum switch thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-SWT-05-03Y

Frequency: 3-Year

Medium-Voltage Vacuum Switches

Application
This standard applies to maintenance tests of Medium-Voltage Vacuum Switches.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform vacuum switch maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.5.3 Switches, Vacuum, Medium-Voltage.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.5.3.3 Test Values.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWT-06-01M

Frequency: Monthly

Medium-Voltage SF-6 Switches

Application
This standard applies to visual inspections of Medium-Voltage SF-6 Switches.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Visually inspect physical and mechanical condition
4. Visually inspect anchorage, alignment, grounding, and required clearances.
5. Inspect SF6 gas pressure alarms.
6. Test for SF6 gas leaks in accordance with manufacturer's published data.

Check Points:
All parameters shall be in accordance with manufacturer's published data.

Safety Requirements
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWT-06-01Y

Frequency: Annually

Medium-Voltage SF-6 Switches

Application
This standard applies to thermographic survey of Medium-Voltage SF-6 Switches.

Special Instructions:

1. Perform these tests only if equipment is safely accessible for the survey.
2. Schedule work with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Perform switch thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-SWT-06-03Y

Frequency: 3-Year

Medium-Voltage SF-6 Switches

Application
This standard applies to maintenance testing of Medium-Voltage SF-6 Switches.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform switch maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.5.4 Switches, SF6, Medium-Voltage.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.5.4.3 Test Values.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-SWT-07-01Y

Frequency: Annually

Cutout, Switches

Application
This standard applies to thermographic survey of Cutout Switches.

Special Instructions:

1. Schedule work with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Perform switch thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-SWT-07-03Y

Frequency: 3-Year

Cutout, Switches

Application
This standard applies to maintenance testing of Cutout Switches.

Special Instructions:

1. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
2. Schedule outage with operating personnel.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
4. Review manufacturer's instructions for all system components.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Perform switch maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.5.5 Switches, Cutouts.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.5.5.3 Test Values.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-TRN-01-01Y

Frequency: Annually

Small Dry Transformers

Application:
This standard card applies to annual thermographic survey of small dry transformers with windings rated 600 volts or less and sizes equal to or less than 167 kVA single-phase or 500 kVA three-phase.

Special Instructions:

1. Perform these tests only if equipment is safely accessible for the survey.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Perform transformer thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category “Dangerous“ and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-TRN-01-03Y

Frequency: 3-Year

Small Dry Transformers

Application:
This standard card applies to maintenance testing of small dry transformers with windings rated 600 volts or less and sizes equal to or less than 167 kVA single-phase or 500 kVA three-phase.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule and coordinate work with operating personnel.
4. Obtain and review manufacturer's instructions.
5. Perform transformer maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.2.1.1 Transformers, Dry Type, Air-Cooled, Low-Voltage, Small.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.2.1.1.3 Test Values.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-TRN-02-01Y

Frequency: Annually

Large Dry Transformers

Application:
This standard card applies to annual thermographic survey of large dry transformers with windings rated higher than 600 volts and low-voltage transformers larger than 167 kVA single-phase or 500 kVA three-phase.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform these tests only if equipment is safely accessible for the survey.
3. Schedule and coordinate work with operating personnel.
4. Obtain and review manufacturer's instructions.
5. Perform transformer thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary
4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-TRN-02-03Y

Frequency: 3-Year

Large Dry Transformers

Application:
This standard card applies to maintenance testing of large dry transformers with windings rated higher than 600 volts and low-voltage transformers larger than 167 kVA single-phase or 500 kVA three-phase.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule and coordinate work with operating personnel.
4. Obtain and review manufacturer's instructions.
5. Perform transformer maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.2.1.2 Transformers, Dry Type, Air-Cooled, Large.

Check Points:
Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.2.1.2.3 Test Values.

Safety Requirements
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-TRN-03-01M

Frequency: Monthly

Transformers, Liquid-Filled

Application:
This standard card applies to visual inspections for liquid filled transformers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Visually inspect physical and mechanical condition
4. Visually inspect anchorage, alignment, and grounding.
5. Visually inspect for oil leaks.
6. Visually verify correct oil level in all tanks and bushings.
7. Verify that positive pressure is maintained on gas-blanketed transformers.

Check Points:
All parameters shall be in accordance with manufacturer's published data.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-TRN-03-01Y

Frequency: Annually

Transformers, Liquid-Filled

Application:

This standard card applies to the annual inspections and testing for liquid filled transformers.

Special Instructions:

1. Schedule work with operating personnel.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions for all system components.
4. Perform step-voltage regulator thermographic survey, following ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY
5. Perform visual and mechanical inspections following the ANSI/NETA MTS-2011 procedures outlined in Section 7.2.2.1.
6. Remove oil sample of insulating liquid following the ANSI/NETA MTS-2011 procedures outlined in Section 7.2.2.2.10 and 11.

Check Points:

1. In regard to thermographic survey follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.
2. Visual and mechanical inspection parameters shall be in accordance with manufacturer's published data..
3. Results of insulating liquid tests shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.2.2.3 Test Values

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work. Follow the equipment arc flash labeling indications of available incident energy and required PPE. If arc flash labeling is not provided, assume hazard risk category "Dangerous" and perform operations in the following sequence:

1. De-energize equipment
2. Remove covers
3. Re-energize equipment remotely with all personnel out of maximum arc flash protection boundary

4. Perform thermographic survey
5. De-energize equipment
6. Re-install covers
7. Re-energize equipment

ELEC-TRN-03-03Y

Frequency: 3-Year

Transformers, Liquid-Filled

Application:

This standard card applies to maintenance testing of liquid filled transformers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule and coordinate work with operating personnel.
4. Obtain and review manufacturer's instructions.
5. Perform transformer maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.2.2 Transformers, Liquid-Filled.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.2.2.3 Test Values.

Safety Requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-UPS-01-01M

Frequency: Monthly

Uninterruptible Power System

Application:
This standard card applies to Uninterruptible Power Systems as part of the building electrical system and the emergency power system found in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule and coordinate work with operating personnel.
3. Obtain and review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. The 2005 International Electrical Testing Association (NETA) Maintenance Testing Specifications has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.
6. All tests shall conform to the appropriate NETA test procedure and the values used as standards shall conform to the manufacturer's, NETA, and ANSI Standards specifications.

Check Points:
Perform Visual Inspection in accordance with NETA Maintenance Testing Specifications Section 7.22.2. Test values for this maintenance item are also included in the respective NETA test section.

ELEC-UPS-01-01Y

Frequency: Annually

Uninterruptible Power System

Application:
This standard card applies to Uninterruptible Power Systems as part of the building electrical system and the emergency power system found in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform monthly visual inspections concurrently with annual maintenance and testing.
3. Schedule and coordinate work with operating personnel.
4. Obtain and review manufacturer's instructions.
5. The 2005 International Electrical Testing Association (NETA) Maintenance Testing Specifications has been used as the guide for all Electrical Testing procedures. The NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in Appendix A for reference. Appendix B also contains the NETA schedule for the Frequency of Maintenance test as a reference.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. All tests shall conform to the appropriate NETA test procedure and the values used as standards shall conform to the manufacturer's, NETA, and ANSI Standards specifications.

Check Points:
Perform Mechanical and Electrical Inspections in accordance with NETA Maintenance Testing Specifications Section 7.22.2. Test values for this maintenance item are also included in the respective NETA test section.

ELEC-VFD-01-01Y

Frequency: Annually

Variable Frequency Drives

Application
This standard is for thermographic survey of variable frequency drives (VFD) for motors rated at 5 horsepower or greater. This maintenance standardis typically used in conjunction with the maintenance of the driven machine (Parent).

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform these tests only if equipment is safely accessible for the survey.
3. Schedule work with operating personnel, as needed.
4. Review manufacturer's instructions.
5. Perform VFD thermographic survey, following the ANSI/NETA MTS-2011 procedures outlined in Section 9. THERMOGRAPHIC SURVEY.

Check Points:
Follow-up with suggested actions outlined in ANSI/NETA MTS-2011 Table 100.18.

Safety Requirements:
Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

ELEC-VFD-01-03Y

Frequency: 3-Year

Variable Frequency Drives

Application

This standard is for maintenance testing of variable frequency drives (VFD) for motors rated at 5 horsepower or greater. This maintenance standard is typically used in conjunction with the maintenance of the driven machine (Parent).

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform annual thermographic survey prior to 3-year electrical maintenance testing.
3. Schedule shutdown with operating personnel, as needed.
4. Review manufacturer's instructions.
5. Perform VFD maintenance tests following ANSI/NETA MTS-2011 procedures, outlined in Section 7.17 Adjustable Speed Drive Systemc.

Check Points:

Test results shall conform to recommendations outlined in ANSI/NETA MTS-2011 Section 7.17.3 Test Values.

Safety requirements:

Only qualified personnel wearing proper Personal Protective Equipment must be allowed to perform this work.

FLSF-ALM-01-01M

Frequency: Monthly

Alarm Check Valves and Accessories

Application
This applies to all wet pipe sprinkler system's alarm check valves. When water flows in the sprinkler system due to the operation of one or more automatic fire sprinklers, the alarm check valve opens, allowing continuous flow of water into the system and transmittal of water pressure to electrical and/or mechanical water flow alarm devices.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel, as needed.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements.
7. Follow NFPA 25 (most recent version) for valve maintenance requirements.

Check Points:
Refer to NFPA 72 and NFPA 25.

Recommended Tools, Materials, and Equipment:
Standard Tools-Basic.

FLSF-ALM-02-03M

Frequency: Quarterly

Fire Supervisory Signals - Testing

Application:
This standard applies to all supervisory signals of fire protection equipment and systems. The fire supervisory signal must be displayed at a constantly attended location on the site or at an approved remote monitoring location. These signals come from valves, air pressure devices, temperature sensors or water tank floats which are monitored at the fire panel or a remote location.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. When feasible the position of valves, air pressure, temperature, or water level being monitored should be altered to actuate the signals.
6. Check all supervisory devices for damage, corrosion, and pitted electrical contacts.
7. Inspect conduit for loose joints, hangers, and clamps.
8. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
9. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment.
Standard Tools-Basic.

FLSF-ALM-03-01Y

Frequency: Annually

Automatic Fire Detection Smoke Detectors

Application:
This standard applies to all smoke detectors, including ionization, photoelectric, combination ionization/photoelectric, photoelectric projected beam, and air sampling. These detectors may provide open area protection or HVAC duct protection and are initiated with the presence of smoke in the area or HVAC system.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. Check detectors for physical damage, obstruction, or corrosion. Replace damaged detectors.
6. Check for any changes in partitions or floor plan since detector installation may need to be rearranged.
7. Functional tests are to be made in place to assure smoke entry. Test duct detectors to assure that the device will sample the air stream.
8. When it is both feasible and safe, the environmental conditions being monitored should be altered to actuate the device.
9. Before each test, clean the detectors according to the manufacturer's instruction. In addition, the frequency of cleaning and tests must be based on results of regular tests and local conditions.
10. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
11. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72

specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:
Standard Tools-Basic.

FLSF-ALM-04-03M

Frequency: Quarterly

Automatic Fire Detection Waterflow Alarms

Application:
This standard applies to all fire protection systems and equipment with waterflow alarms including mechanical water motor gongs, vane-type waterflow devices, and pressure switches that initiate audible or visual signals. These signals are initiated when water is flowing through the system indicating that a sprinkler of hose has been activated.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:
Standard Tools-Basic.

FLSF-ALM-05-01Y

Frequency: Annually

Automatic Fire Detection, Heat Detectors

Application:
This standard applies to all heat detectors, including:

1. Spot-type - Sensitive element is confined to a small area.
   a) Fixed-temperature (non-restorable).
   b) Rate-of-rise (restorable).
   c) Combination fixed-temperature and rate-of-rise (has both non-restorable and restorable elements)
2. Line-type - Sensitive element is in a continuous line.
   a) Cable type - fixed-temperature (non-restorable).
   b) Cable type - rate-of-rise (restorable).
   c) Sealed Pneumatic type - rate-of-rise (restorable).

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. Check detectors for physical damage, obstruction, corrosion, or painting. Painting slows or inhibits detector response to a fire. Replace damaged or painted detectors and cables.
6. Check for any changes in partitions or floor plans since detector installation may need to be rearranged.
7. When it is both feasible and safe, the environmental conditions being monitored should be altered to actuate the device.
8. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

9. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:
Standard Tools-Basic.

FLSF-ALM-06-06M

Frequency: Semi-annually

Smoke Control Systems -Operational Testing

Application:
This standard applies to all building smoke control systems. Smoke control for the building may be divided into separate zones which will control ventilation systems based on activation of a fire detection device in the zone. This maintenance standard is to ensure that the operation in smoke mode functions correctly.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure will cause activation of an alarm and/or supervisory signal. The field office manager, control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. Initiation of the smoke control system for each smoke control zone shall be accomplished by activation of a fire detection device that is programmed to initiate automatic smoke control within that smoke control zone.
6. Determine and list all programmed actions which should automatically occur upon activation of smoke control system for each smoke control zone. (Programmed actions are not standardized for the operation of air handling systems due to the various HVAC system design.)
7. The scheduling of the smoke control testing of the various smoke control zones should be evenly distributed during those months when outside temperatures are above freezing.
8. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
9. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Checkpoints:

Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:
Standard Tools-Basic.

FLSF-ALM-07-01Y

Frequency: Annually

Fire Alarm Control Panel and Remote Annunciators

Application:
This standard applies to all fire alarm panels and remote annunciators in both interior and exterior locations. These annunciators are for audio of voice notification during a fire event to the personnel in or around a building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure will cause the activation of the building fire alarm system and/or supervisory signals. The field office manager, control center, central station, and/or fire department must be notified prior to start and at completion of work.
5. When work requires the actuation of building evacuation systems, the work must be performed after hours and must be coordinated through the field office manager to prevent the unnecessary evacuation of building occupants.
6. Dispose of old batteries in accordance with all applicable Federal, state, and local regulations.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:
Standard Tools-Basic.

FLSF-ALM-08-01Y

Frequency: Annually

Fire Alarm Control Panel -Special Systems

Application:
This standard applies to control panels for specialized fire suppression systems such as Halon 1301, carbon dioxide, preaction, deluge, water spray systems, and other systems with special shutdown features.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of the building fire alarm system and/or supervisory signals. The field office manager, control center, central station, and/or fire department must be notified prior to start and at completion of work.
5. When work requires the actuation of building evacuation systems, the work must be performed after hours and must be coordinated through the field office manager to prevent the unnecessary evacuation of building occupants.
6. If a test that includes actual discharge of the system is desired, special precautions must be taken with the using agency to prevent shutdown and discharge during routine work performance causing subsequent equipment or software damage. If an actual discharge test is not desired, be sure to prevent gas discharge, ventilation system, and computer system or other equipment shutdown.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
8. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check Points.

Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:

Standard Tools-Basic.

FLSF-ALM-09-01Y

Frequency: Annually

Central Station Transmitter

Application:
This standard applies to all fire alarm system central station transmitters that are not maintained by a central station supervisory service. These transmitters are used to send a fire event notification for the building to a central monitoring station. They are not maintained by the monitoring station.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or supervisory signal. The field office manager, control center, central station, and/or the fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. When work requires the actuation of building evacuation systems, the work must be performed after hours and must be coordinated through the field office manager to prevent the unnecessary evacuation of building occupants.
6. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
7. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check Points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:
Standard Tools-Basic.

FLSF-ALM-10-01D

Frequency: Daily

Central Station - Receiver and Re-Transmission Equipment

Application:
This standard applies to equipment in Government-owned control centers providing proprietary supervisory station service. This standard ensures that the central monitoring station within the building sends and records the proper signals for a given fire event triggering the alarm(s).

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work on these devices and systems must be coordinated with the control center's operators and the fire department that will receive the alarm.
5. The work required by this procedure should be performed only by employees knowledgeable of the equipment and the procedures involved.
6. Once daily operational tests are completed, all circuits are to be returned to normal as soon as possible.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
8. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check Points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:
Standard Tools-Basic.

FLSF-ALM-11-01W

Frequency: Weekly

Fire Alarm System - Recorder

Application.
This standard applies to recorders in Government-owned buildings. Older fire systems use this paper spool type of device to record fire system events along with the associated date/time stamp.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. This procedure is to be accomplished once weekly during the daily test and inspection required in the standard.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:
Standard Tools - Basic.

FLSF-ALM-12-03M

Frequency: Quarterly

Fire Alarm System - Event Printer

Application:
This standard applies to fire alarm system event printers in Government owned buildings which are attached to the fire panel. These printers record all events which are reported into the fire panel and create a record for review,

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
5. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Soft cleaning cloths.
3. Alcohol or recommended cleaner. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Small stiff brush.
5. Small vacuum cleaner or cleaning brush.
6. Print mechanism lubricant. Consult the MSDS for hazardous ingredients.
7. Spare inked ribbon.

FLSF-ALM-13-01Y

Frequency: Annually

Fire Alarm System -Audio Control Panel

Application:
This standard applies to fire alarm system audio control panels in Government owned buildings. These audio panels contain the audio/voice alerts used during fire events to broadcast instructions to building occupants.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause activation of an alarm and/or a supervisory signal. The field office manager, control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment.:

1. Tool Group B.
2. Soft cleaning cloths.
3. Spark indicator light bulb or LED.

FLSF-ALM-14-01Y

Frequency: Annually

Fire Alarm System -Remote Controller

Application:
This standard applies to fire alarm system remote controllers in Government owned buildings.

Special Instruction:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause activation of an alarm and/or a supervisory signal. The field office manager, control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Soft cleaning cloths.
3. Compressed air or a vacuum cleaner.
4. Print mechanism lubricant. Consult the MSDS for hazardous ingredients.
5. Spare inked ribbon.

FLSF-ALM-15-01Y

Frequency: Annually

Fire Alarm System -Remote Amplifiers

Application:
This standard applies to fire alarm remote amplifiers in Government owned buildings.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
5. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Compressed air or a vacuum cleaner.

FLSF-ALM-16-01Y

Frequency: Annually

Manual Fire Alarm Stations -Coded and Uncoded

Application:
This standard applies to all manual fire alarm pull stations in both interior and exterior locations. These devices provide a signal the building fire control system when activated initiating building fire alarms and signal to the central monitoring station.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause activation of an alarm and/or a supervisory signal. The field office manager, control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. When alarm systems are connected to municipal systems, test signals to be transmitted to them will be limited to those acceptable to that authority.
6. Record all test results.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
8. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Cleaning materials - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

FLSF-ALM-17-01Y

Frequency: Annually

Fire Life Safety Fire Alarm

Application:
This standard applies to “Fire Alarms” only and should follow NFPA 72 National Fire Alarm Code (most recent addition), defined by Chapter 10-Inspection, Testing and Maintenance.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Fire Life Safety (Fire Alarm) system testing shall be performed by a licensed and certified testing company as required to maintain the building UL certification.
3. Notify building occupants, alarm monitoring company, and/or local fire department prior to work.
4. Complete and file NFPA Inspection Testing and Maintenance Form (four pages)

Check Points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:
Standard Tools - Basic.

FLSF-ALM-17-05Y

Frequency: 5-Year

Fire Life Safety Fire Alarm

Application:
This standard applies to “Fire Alarms” only and should follow NFPA 72 National Fire Alarm Code (most recent addition), defined by Chapter 10-Inspection, Testing and Maintenance.

Special Instructions:
Fire Alarm System needs UL certification every five years.

Check Points:
1. Refer to NFPA 72.

FLSF-DOR-01-03M

Frequency: Quarterly

Fire Doors – Stairwells and Exitways, Swinging

Application:
This standard applies to all swinging fire doors located in stairwells and exitways, sliding and vertical rolling doors located in fire walls in the building. These doors are required to shut during a fire event protecting against the spread of fire and/or smoke into other parts of the building or into vertical shafts such as elevators.

Some doors will be alarmed, others will not. Proper maintenance will ensure that the stairwells and exitways remain safe for personnel egress during a fire event.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or supervisory signal. The field office manager and the control center, central station or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 80 for operation and maintenance requirements.

Check points.
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

FLSF-EPR-01-01Y

Frequency: Annually

Emergency Generators, Gasoline, or Natural Gas Engines

Application:
This standard applies to all permanently installed electric generators used for providing emergency electrical power whose engines are powered by gasoline or natural gas. See electrical standards for the maintenance required on the electric generator side.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review and follow manufacturer's instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. A written record of all inspections, service, tests, operation, and repairs to the emergency generator shall be maintained in an equipment log book and kept on the premises. This record shall include the date of maintenance, identity of service personnel, and notation of any unsatisfactory condition and the corrective action taken, including parts replaced.
5. Have a properly serviced fire extinguisher in proper working order on hand.
6. Allow no open flames or smoking in the area.
7. If the unit has a self-contained fuel tank, use only Underwriters Laboratories listed safety cans for fuel transfer.
8. Test medium and high voltage circuit breakers in accordance with circuit breaker maintenance standards.
9. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
10. Follow NFPA 110 and 111 for operation and maintenance requirements.

Parent of this Piece of Equipment
Emergency Generator, Electrical

Children of this Piece of Equipment

The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other sections of this standard for the detailed PM requirements for the children equipment.

1. Pumps for fuel and/or coolant
2. Fans or air handler for ventilation and/or combustion air
3. Valves on fuel lines
4. DDC and Pneumatic Controls

Check Points:

Refer to NFPA 110

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Engine Tune-up Kit.
3. Belts (fan, water pump, alternator).
4. Engine oil. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients.
5. Oil filters.
6. Governor oil. Consult the MSDS for hazardous ingredients.
7. Coolant. Consult the MSDS for hazardous ingredients.
8. Generator bearing grease. Consult the MSDS for hazardous ingredients.
9. Megger
10. Cleaning materials. Consult the MSDS for hazardous ingredients and proper Personal Protective Equipment.

FLSF-EPR-02-03M

Frequency: Quarterly

Electric Emergency Generators, Diesel Engine Powered

Application:
This standard applies to all permanently installed electric generators used for providing emergency electrical power whose prime movers are diesel engines. See electrical standards for the maintenance required on the electric generator side.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review and follow manufacturer's instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. A written record of all inspections, service, tests, exercising, operation, and repairs to the emergency generator shall be maintained in an equipment log book and kept on the premises. This record shall include the date of maintenance, identification of service personnel, and notation of any unsatisfactory condition and the corrective action taken, including parts replaced.
5. Have a properly serviced fire extinguisher in proper working order on hand.
6. Allow no open flames or smoking in the area.
7. If the unit has a self-contained fuel tank, use only Underwriters Laboratories listed safety cans for fuel transfer.
8. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
9. Follow NFPA 110 and 111 for operation and maintenance requirements.

Parent of this Piece of Equipment
Emergency Generator, Electric

Children of this Piece of Equipment
The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other

sections of this standard for the detailed PM requirements for the children equipment.

1. Pumps for fuel and/or coolant
2. Fans or air handler for ventilation and/or combustion air
3. Valves on fuel lines
4. DDC and Pneumatic Controls

Check Points:
Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Hearing protection.
3. Engine oil. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients. Unused engine oil is not hazardous.
4. Oil filters.
5. Cleaning materials. Consult the MSDS for hazardous ingredients and proper Personal Protective Equipment.

FLSF-EPR-02-01Y

Frequency: Annually

Electric Emergency Generators, Diesel Engine Powered

Application:
This standard applies to all permanently installed electric generators used for providing emergency electrical power whose prime movers are diesel engines. See electrical standards for the maintenance required on the electric generator side.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. A written record of all inspections, service, tests, exercising, operation, and repairs to the emergency generator shall be maintained in an equipment log book and kept on the premises. This record shall include the date of maintenance, identification of service personnel, and notation of any unsatisfactory condition and the corrective action taken, including parts replaced.
5. Have a properly serviced fire extinguisher in proper working order on hand.
6. Allow no open flames or smoking in the area.
7. If the unit has a self-contained fuel tank, use only Underwriters Laboratories listed safety cans for fuel transfer.
8. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
9. Follow NFPA 110 and 111 for operation and maintenance requirements.

Parent of this Piece of Equipment
Emergency Generator, Electric

Children of this Piece of Equipment
The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other

sections of this standard for the detailed PM requirements for the children equipment.

1. Pumps for fuel and/or coolant
2. Fans or air handler for ventilation and/or combustion air
3. Valves on fuel lines
4. DDC and Pneumatic Controls

Check Points:
Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Belts (fan, water pump, alternator).
3. Fuel filters.
4. Governor oil. Consult the MSDS for hazardous ingredients.
5. Coolant. Consult the MSDS for hazardous ingredients.
6. Hoses.
7. Generator bearing grease. Consult the MSDS for hazardous ingredients.
8. Hearing protection.
9. Cleaning materials. Consult the MSDS for hazardous ingredients and proper Personal Protective Equipment.

FLSF-EPR-03-01W

Frequency: Weekly

Emergency Generators

Application:
This standard applies to all permanently installed emergency generators used for providing emergency electrical power. This standard applies primarily to the engine side of the generator. See electrical standards for the maintenance required on the electric generator side.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. A written record of all inspections, service, tests, exercising, operation, and repairs to the emergency generator shall be maintained in an equipment log book and kept on the premises. This record shall include the date of maintenance, identification of service personnel, and notation of any unsatisfactory condition and the corrective action taken, including parts replaced.
5. Have a properly serviced fire extinguisher in proper working order on hand.
6. Allow no open flames or smoking in the area.
7. If the unit has a self-contained fuel tank, use only Underwriters Laboratories listed safety cans for fuel transfer.
8. Hearing protection is required whenever the engine is running.
9. If the unit has a self-contained fuel tank, use only Underwriters Laboratories listed safety cans for fuel transfer.
10. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
11. Follow NFPA 110 and 111 for operation and maintenance requirements.

Children of this Parent Piece of Equipment
The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other sections of this standard for the detailed PM requirements for the children equipment.

1. Pumps for fuel and/or coolant
2. Fans or air handler for ventilation and/or combustion air
3. Valves on fuel lines
4. DDC and Pneumatic Controls

Check Points:
Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Spare air cleaner/filter.
3. Battery tester.
4. Engine oil.
5. Cleaning equipment and materials.

FLSF-EPR-03-01M

Frequency: Monthly

Emergency Generators

Application:
This standard applies to all permanently installed emergency generators used for providing emergency electrical power. This standard applies primarily to the engine side of the generator. See electrical standards for the maintenance required on the electric generator side.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. The weekly maintenance checks shall be performed in conjunction with this monthly maintenance.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start and at the completion of work.
5. Qualified operating personnel shall be in attendance during the monthly generator operation.
6. Hearing protection is required whenever the engine is running.
7. Records of changes to the emergency electrical system should be maintained so that the demand likely to be produced by the connected load will be within the available capacity.
8. Review the Standard Operating Procedure for "Emergency Eyewash and Shower Equipment". Note the location of emergency eyewash and/or shower equipment.
9. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
10. A written record of all inspections, service, tests, exercising, operation, and repairs to the emergency generator shall be maintained in an equipment log book and kept on the premises. This record shall include the date of maintenance, identification of service personnel, and notation of any

unsatisfactory condition and the corrective action taken, including parts replaced.

11. Have a properly serviced fire extinguisher in proper working order on hand.
12. Allow no open flames or smoking in the area.
13. If the unit has a self-contained fuel tank, use only Underwriters Laboratories listed safety cans for fuel transfer.
14. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
15. Follow NFPA 110 and 111 for operation and maintenance requirements.
16. If applicable, ensure the air quality/emmissions permit is current and all requirements associated with the permit are followed.

Children of this Parent Piece of Equipment
The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other sections of this standard for the detailed PM requirements for the children equipment.

1. Pumps for fuel and/or coolant
2. Fans or air handler for ventilation and/or combustion air
3. Valves on fuel lines
4. DDC and Pneumatic Controls

Check Points:
Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Engine oil.
3. Hydrometer.
4. Distilled water.
5. Tachometer.
6. Acid resistant apron, gloves, and plastic face shield.
7. Cleaning equipment and materials. Consult the Material Safety Data Sheet for hazardous ingredients and proper Personal Protective Equipment.
8. Emergency eye wash that provides at least 0.4 gallons/minute for at least 15 minutes.

9. Hearing protection.

FLSF-EPR-03-03M

Frequency: Quarterly

Emergency Generators

Application:
This standard applies to all permanently installed emergency generators used for providing emergency electrical power. This standard applies primarily to the engine side of the generator. See electrical standards for the maintenance required on the electric generator side.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start and at the completion of work.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Qualified operating personnel shall be in attendance during the monthly generator operation.
6. Hearing protection is required whenever the engine is running.
7. Records of changes to the emergency electrical system should be maintained so that the demand likely to be produced by the connected load will be within the available capacity.
8. Review the Standard Operating Procedure for "Emergency Eyewash and Shower Equipment". Note the location of emergency eyewash and/or shower equipment.
9. A written record of all inspections, service, tests, exercising, operation, and repairs to the emergency generator shall be maintained in an equipment log book and kept on the premises. This record shall include the date of maintenance, identification of service personnel, and notation of any unsatisfactory condition and the corrective action taken, including parts replaced.
10. Have a properly serviced fire extinguisher in proper working order on hand.

11. Allow no open flames or smoking in the area.
12. If the unit has a self-contained fuel tank, use only Underwriters Laboratories listed safety cans for fuel transfer.
13. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
14. Follow NFPA 110 and 111 for operation and maintenance requirements.

Children of this Piece of Equipment

The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other sections of this standard for the detailed PM requirements for the children equipment.

1. Pumps for fuel and/or coolant
2. Fans or air handler for ventilation and/or combustion air
3. Valves on fuel lines
4. DDC and Pneumatic Controls

Check Points:

Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Spare crankcase breather.
3. Cleaning equipment and materials.

FLSF-EPR-03-06M

Frequency: Semi-annually

Emergency Generators

Application:
This standard applies to all permanently installed electric generators used for providing emergency electrical power. See electrical standards for the maintenance required on the electric generator side.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start and at the completion of work.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Qualified operating personnel shall be in attendance during the monthly generator operation.
6. Hearing protection is required whenever the engine is running.
7. Records of changes to the emergency electrical system should be maintained so that the demand likely to be produced by the connected load will be within the available capacity.
8. Review the Standard Operating Procedure for "Emergency Eyewash and Shower Equipment". Note the location of emergency eyewash and/or shower equipment.
9. A written record of all inspections, service, tests, exercising, operation, and repairs to the emergency generator shall be maintained in an equipment log book and kept on the premises. This record shall include the date of maintenance, identification of service personnel, and notation of any unsatisfactory condition and the corrective action taken, including parts replaced.
10. Have a properly serviced fire extinguisher in proper working order on hand.
11. Allow no open flames or smoking in the area.

12. If the unit has a self-contained fuel tank, use only Underwriters Laboratories listed safety cans for fuel transfer.
13. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
14. Follow NFPA 110 and 111 for operation and maintenance requirements.

Children of this Parent Piece of Equipment

The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other sections of this standard for the detailed PM requirements for the children equipment.

1. Pumps for fuel and/or coolant
2. Fans or air handler for ventilation and/or combustion air
3. Valves on fuel lines
4. DDC and Pneumatic Controls
5. DC Battery Charger
6. DC Batteries

Check Points:

Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Coolant tester.
3. Coolant. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients.
4. Spare air cleaner/filter.
5. Cleaning equipment and materials.

FLSF-EPR-04-03M

Frequency: Quarterly

Emergency Pumps and Ventilators

Application:
The purpose of this standard is to test the operation of emergency pumps and ventilating blowers. The standard applies to portable emergency pumps and ventilating blowers driven by electric, LP gas, gasoline and pneumatic drive motors.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Have the proper fire extinguisher on hand. Ensure that the fire extinguisher is properly serviced and in proper working order.
4. Notify all tenants before testing pumps and ventilators as the test may activate an alarm.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points:
Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:
Standard tools - Basic.

FLSF-EPR-04-01Y

Frequency: Annually

Emergency Pumps and Ventilators

Application:
This standard applies to portable emergency pumps and ventilating blowers and includes electric, LP gas, gasoline and pneumatic drive motors. This annual maintenance is to ensure that the equipment is in good operating order when needed in an emergency.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Have the proper fire extinguisher on hand. Ensure that the fire extinguisher is properly serviced and in proper working order.
4. Refer to appropriate standard and manufacturer's instructions for pump and motor maintenance.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points:
Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Standard tools - Basic.
2. Grease. Consult the MSDS for hazardous ingredients.
3. Oil. Consult the MSDS for hazardous ingredients. Unused oil is not hazardous.

FLSF-EPR-05-06M

Frequency: Semi-annually

Fuel Oil Filter/Strainer

Application:
This standard card applies to inline cartridge filters used on light fuel oils No. 1, 2, or 4, as well as the larger basket type used on heavier oils (#5 or #6).

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Flammable liquids are being handled. Use all applicable safety precautions.
5. Check with operating personnel before starting work.
6. Secure and tag pumps, burners, and other necessary equipment.
7. Shut off and tag inlet and outlet valves.
8. Wear gloves while cleaning strainer. Consult the Material Safety Data Sheets (MSDS) for proper personal protective equipment (PPE).
9. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points:
Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Gaskets and filters
3. Solvents approved for use with fuel oils. Consult the MSDS for hazardous ingredients and proper PPE.

FLSF-EPR-06-01Y

Frequency: Annually

Fuel Oil Heater

Application
This standard applies to inline heaters as part of the fuel oil system supplying generator or boilers. These heaters are used to heat heavy oils as it passes from the tank and to the burners.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule outage with operating personnel.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. If the insulation is known or suspected to contain asbestos, check the building's asbestos management plan to see it has been tested for asbestos. If it is suspect but has not been tested, have it tested. Manage asbestos in accordance with the plan.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points:
Refer to NFPA 110.

Recommended Tools and Equipment:

1. Standard Tools - Basic
2. Varsol and rags. Use Varsol in well ventilated areas; do not pour used Varsol down drain. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients, disposal, and proper personal protective equipment (PPE).
3. Tube cleaning material. Consult the MSDS for hazardous ingredients and proper PPE.
4. Gasket material.
5. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.

FLSF-EPR-07-01M

Frequency: Monthly

Emergency Generator Steam Turbine Driven

Application:
This standard applies to all permanently installed electric generators that are driven by steam turbines and used for providing emergency electrical power for the steam plant. See electrical standards for the maintenance required on the electric generator equipment.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Obtain and review manufacturer's operating instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. Check fire extinguishers for location and type. Ensure that the fire extinguishers are properly serviced and in proper working order.
4. A written record of all inspections, service, tests, exercising, operation, and repairs to the emergency generator shall be maintained in an equipment log book and kept on the premises. This record shall include the date of maintenance, identification of service personnel, and notation of any unsatisfactory condition and the corrective action taken, including parts replaced.
5. Check log to see if any abnormal condition has been noted.
6. Check with operating personnel before starting equipment.
7. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
8. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
9. Follow NFPA 110 and 111 for operation and maintenance requirements.

Parent of this Piece of Equipment
Steam Turbine

Children of this Parent Piece of Equipment
The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other

sections of this standard for the detailed PM requirements for the children equipment.

1. DDC and Pneumatic Controls (if applicable).
2. Exhaust and inlet air dampers and actuators (if applicable).

Check Points:
Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic.
2. Tachometer.
3. Cleaning equipment. Consult the Material Safety Data Sheet for hazardous ingredients and proper Personal Protective Equipment.

FLSF-EPR-07-01Y

Frequency: Annually

Emergency Generator Steam Turbine Driven

Application:
This standard applies to all permanently installed electric generators that are driven by steam turbines and used for providing emergency electrical power for the steam plant. See electrical standards for the maintenance required on the electric generator equipment.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Obtain and review manufacturer's operating instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. Check fire extinguishers for location and type. Ensure that the fire extinguishers are properly serviced and in proper working order.
4. A written record of all inspections, service, tests, exercising, operation, and repairs to the emergency generator shall be maintained in an equipment log book and kept on the premises. This record shall include the date of maintenance, identification of service personnel, and notation of any unsatisfactory condition and the corrective action taken, including parts replaced.
5. Check logs to see if any abnormal condition has been noted.
6. Schedule PM on the steam turbine in conjunction with this PM.
7. Check with operating personnel before starting equipment.
8. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
9. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
10. Follow NFPA 110 and 111 for operation and maintenance requirements.

Parent of this Piece of Equipment
Steam Turbine

Children of this Parent Piece of Equipment

The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other sections of this standard for the detailed PM requirements for the children equipment.

1. DDC and Pneumatic Controls (if applicable).
2. Exhaust and inlet air dampers and actuators (if applicable).

Check Points:
Refer to NFPA 110.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic.
2. Tachometer.
3. Cleaning equipment. Consult the Material Safety Data Sheet for hazardous ingredients and proper Personal Protective Equipment.

FLSF-EPR-08-01Y

Frequency: Annually

Load Bank Testing

Application:
This standard applies to load bank testing. Load banks shall be of the reactive type rather than the resistive only type.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Obtain and review manufacturer's operating instructions. One copy of the instruction manual(s) shall be kept in a secure, convenient location near the equipment and another kept in a different location.
3. Check fire extinguishers for location and type. Ensure that the fire extinguishers are properly serviced and in proper working order.
4. Load shall be at a minimum of 75% of rated capacity.
5. Where practical, load bank testing shall include transfer switches.
6. The recommended duration of the test is eight (8) hours; minimum of two (2) hours is required.

Check Points:
Refer to NFPA 110.

FLSF-EPR-08-03Y

Frequency: 3-Year

Load Bank Testing

Application:
This standard applies to load bank testing where failure of EPSS to perform could result in loss of human life, health hazards or serious injuries. Health care facilities or assembly of occupancy greater than 1,000 people requires NFPA Level 1 testing.

Special Instructions:
Level 1 systems are required to test generator under load for the duration of their class rating OR a minimum of four hours, whichever is greater, every three (3) years.

Check Points:
Refer to NFPA 110.

FLSF-FEX-01-01M

Frequency: Monthly

Fire Extinguishers - Inspection

Application:
This standard is for a monthly visual inspection of all fire extinguishers, and is in addition to the annual maintenance requirements.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Remove from service and discard all inverting-type fire extinguishers, including soda-acid, chemical foam, water cartridge-operated, and loaded stream cartridge-operated extinguishers.
5. Whenever an extinguisher is removed from service, immediately replace it with an extinguisher of a size and extinguishing agent appropriate for the hazard protected.
6. Each extinguisher shall have an inspection tag securely attached that indicates the month and year the inspection was performed and the initials of the person performing the inspection shall be recorded.
7. Records are to be kept of those extinguishers that were found to require correction, with an notation of when and how the corrections were made.
8. The requirement for an inspection tag and the recording of the inspector's initials does not preclude the use of electronic record keeping utilizing bar codes or some other method of insuring that the extinguishers were actually inspected.
9. In addition to the required tags and/or labels, a permanent file record is to be kept for each extinguisher. This file record should include the following information as applicable:
   a) The date when each extinguisher was purchased and installed.
   b) The maintenance date and the name of the person or agency performing the maintenance.
   c) The date when last recharged and the name of the person or agency performing the maintenance.

d) The hydrostatic re test date and the name of the person or agency performing the maintenance.

e) Description of dents remaining after passing a hydrostatic test.

f) The date of the six-year maintenance for stored pressure dry chemical and Halon extinguishers.

g) The date when non rechargeable extinguishers are to be removed from service and discarded.

10. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
A visual inspection is a quick check to see that the fire extinguisher is in its proper location, that it is not blocked, is fully charged, and that it appears to be in good working order.

1. Refer to NFPA 10 and NPFA 25.

Recommended Tools, Materials, and Equipment:

1. Seals or tamper indicators.
2. Inspection tags.

FLSF-FEX-01-05Y

Frequency: 5-Year

Fire Extinguishers, Hydrostatic Testing

Carbon Dioxide, Stored Pressure and AFFF

Application:
This standard applies to the following types of extinguishers in service except for the non chargeable type:

1. Stored Pressure Water, Loaded Stream, or Antifreeze
2. AFFF (Aqueous Film Forming Foam)
3. FFFP (Film Forming Fluoroprotein Foam)
4. Dry Chemical with stainless steel shells
5. Carbon Dioxide

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Hydrostatic testing of extinguishers requires experienced personnel and suitable testing equipment. It is recommended that this service be performed by a fire equipment company specializing in this type of service.
5. If the hydrostatic testing is to be accomplished on the premises, it should be limited only to non compressed gas type extinguishers (water base, dry chemical, and dry powder). Compressed gas extinguishers (carbon dioxide) require special internal inspections and high test pressures.
6. Wheeled extinguisher testing is beyond the scope of this standard. Utilize a fire equipment company if wheeled extinguishers are on the premises.
7. Discharge and discard extinguishers when the cost of new extinguishers is cheaper than the cost of extinguishing agent and a hydrostatic test.
8. Refer to National Fire Protection Association Standard No. 10, "Portable Fire Extinguishers" for additional detailed information about hydrostatically testing extinguishers.

In addition, anytime an extinguisher shows evidence of physical injury or corrosion, and extinguishers with aluminum cylinders or shells are suspected of

being exposed to temperatures in excess of 350°F, they are to be immediately discharged and hydrostatically tested.

1. Extinguishers that are required to be returned to the manufacturer for recharging, are to be hydrostatically tested by the manufacturer.
2. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 10 and NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Seals or tamper indicators.
3. Hydrostatic test labels.
4. Scale for gas cartridges.
5. Appropriate testing equipment.

FLSF-FEX-01-12Y

Frequency: 12-Year

Fire Extinguishers, Hydrostatic Testing

Halon, Dry Powder, Stored Pressure, Cartridge Operated

Application:

This standard applies to the following types of extinguishers in service except for the non chargeable type:

1. Dry Chemical, Stored Pressure with mild steel shells, brazed brass shells, or aluminum shells
2. Halon 1211 and 1301
3. Dry Powder, Stored Pressure, Cartridge-or Cylinder Operated, with mild steel shells

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Hydrostatic testing of extinguishers requires experienced personnel and suitable testing equipment. It is recommended that this service be performed by a fire equipment company specializing in this type of service.
5. If the hydrostatic testing is to be accomplished on the premises, it should be limited only to non compressed gas type extinguishers (water base, dry chemical, and dry powder). Compressed gas extinguishers (Halon 1211 and 1301) require special internal inspections and high test pressures.
6. Wheeled extinguisher testing is beyond the scope of this standard. Utilize a fire equipment company if wheeled extinguishers are on the premises.
7. Discharge and discard extinguishers when the cost of new extinguishers is cheaper than the cost of extinguishing agent and a hydrostatic test.
8. Refer to National Fire Protection Association Standard No. 10, "Portable Fire Extinguishers" for additional detailed information about hydrostatically testing extinguishers.

In addition, anytime an extinguisher shows evidence of physical injury or corrosion, and extinguishers with aluminum cylinders or shells are suspected of

being exposed to temperatures in excess of 350°F, they are to be immediately discharged and hydrostatically tested.

1. Halon extinguishers requiring hydrostatic testing are to be returned to a fire equipment company so that the agent can be recovered.
2. Extinguishers that are required to be returned to the manufacturer for recharging, are to be hydrostatically tested by the manufacturer.
3. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 10 and NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Seals or tamper indicators.
3. Hydrostatic test labels.
4. Scale for gas cartridges.
5. Appropriate testing equipment.

FLSF-FEX-02-01Y

Frequency: Annually

Fire Extinguishers, Stored Pressure with Gauge

Application:
This standard applies to fire extinguishers that use stored air or nitrogen pressure to expel the extinguishing agent. This includes extinguishers containing water, foam, dry chemical, dry powder, and Halon 1211. This standard does not apply to carbon dioxide extinguishers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. This procedure is to be accomplished in conjunction with the monthly inspections required in this standard and the 5 year hydrostatic testing.
5. Every six years, stored pressure extinguishers with gauges and shells of non-stainless steel require additional maintenance procedures
6. Do not pressurize any extinguisher that shows signs of mechanical damage, corrosion, or burned in a fire. Relieve the pressure as indicated below and destroy the extinguisher.
7. Whenever an extinguisher is removed for servicing, a replacement extinguisher is to be provided of the same type and at least equal rating.
8. Each extinguisher shall have a tag or label securely attached that indicates the month and year the inspections, maintenance, and recharging were performed and shall identify the person and firm performing the service.
9. Always recharge an extinguisher with the same type of extinguishing agent as specified on the name plate.
10. No extinguisher shall be converted from one type to another nor be converted to use a different type of extinguishing agent.
11. Never mix multipurpose dry chemical agents with any other dry chemical agents.
12. Compressed air is satisfactory to pressurize water type extinguishers. Use standard industrial-grade nitrogen for pressurizing all other extinguishers.

13. When the discharging and recharging of Halon 1211 extinguishers is necessary as part of the required maintenance, an experienced fire equipment firm should perform the maintenance so that the Halon can be captured with a closed recovery system. Discharge Halon in accordance with Clean Air Act regulations.
14. Refer to Non rechargeable Fire Extinguishers Standard for maintenance on non rechargeable stored pressure extinguishers.
15. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 10 and NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Spare hoses and couplings.
3. Seals or tamper indicators.
4. Inspection Tags.
5. Cleaning materials - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

FLSF-FEX-02-06Y

Frequency: 6-Year

Fire Extinguishers - Stored Pressure With Gauge

(Non-Stainless Steel Shell)

Application:
This standard contains additional procedures to the annual maintenance required in Standard FLSF-FEX-02-01Y and applies to fire extinguishers that use stored air or nitrogen pressure to expel the extinguishing agent and have non-stainless steel shells of mild steel, brazed brass, or aluminum. This includes extinguishers containing water, foam, dry chemical, dry powder, and Halon 1211 and 1301. This standard does not apply to carbon dioxide extinguishers.

This standard shall be used in conjunction with Standard FLSF-FEX-02-01Y whenever stored pressure fire extinguishers are discharged and have to be recharged.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. This procedure is to be accomplished in conduction with the monthly extinguisher inspections and the 12 year hydrostatic testing as required.
5. Review manufacturer's instructions, if available.
6. An experienced fire equipment firm should perform the maintenance of Halon 1211 and 1301 extinguishers so that the Halon can be captured with a closed recovery system.
7. Release pressure on extinguisher, without discharging extinguisher agent, and dismantle extinguisher.
8. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points:
Refer to NFPA 10 and NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.

2. Spare hoses, couplings, and nozzles.
3. Seals or tamper indicators.
4. "O" rings and lubricant.
5. Inspection tags.
6. Six year maintenance tags.
7. Pull pins.
8. Cleaning materials - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

FLSF-FEX-03-01Y

Frequency: Annually

Fire Extinguishers -Non rechargeable

Application:
This standard applies to dry chemical and Halon extinguishers that cannot be recharged and are intended to be disposed of after use.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Non rechargeable extinguishers shall be removed from service and disposed of at a maximum interval of 12 years from the date of manufacture.
5. When a non rechargeable dry chemical extinguisher is to be disposed of, it is to be discharged before discarding.
6. When a non rechargeable Halon extinguisher is to be disposed of, it is to be returned to the manufacturer, fire equipment dealer, or fire equipment distributor **without** being discharged so that the Halon can be recovered.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points:
Refer to NFPA 10 and NFPA 25.

Recommended Tools, Materials, and Equipment:
Standard Tools - Basic

FLSF-FEX-04-01Y

Frequency: Annually

Fire Extinguishers , Gas Cartridge or Cylinder (No Gauge)

Application:
This standard applies to fire extinguishers that use a nitrogen cartridge to expel the extinguishing agent or the agent is self-expelled due to the agent being a compressed gas. This includes dry chemical, dry powder, Halon 1301, and carbon dioxide extinguishers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. This procedure is to be accomplished in conjunction with the monthly inspection as required and required hydrostatic testing
5. Whenever an extinguisher is removed for servicing, a replacement extinguisher is to be provided of the same type and at least equal rating.
6. Each extinguisher shall have a tab or label securely attached that indicates the month and year the inspections, maintenance, and recharging were performed and shall identify the person and firm performing the service.
7. Always recharge an extinguisher with the same type of extinguishing agent as specified on the name plate.
8. No extinguisher shall be converted from one type to another nor be converted to use a different type of extinguishing agent.
9. Never mix multipurpose dry chemical agents with any other dry chemical agents.
10. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 10 and NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Spare hoses, couplings, nozzles and horns.

3. Seals or tamper indicators.
4. "O" rings and lubricant.
5. Scales for gas cartridge and extinguishers.
6. Inspection Tags.
7. Pull Pins.
8. Cleaning materials - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

FLSF-FEX-05-01M

Frequency: Monthly

Water Spray Extinguishing Systems

Application:
This standard applies to water spray extinguishing systems. These systems are similar to automatic sprinkler systems except that they use open heads that are specifically designed to project a particular water pattern to a precisely defined area and are used to provide protection to special hazards such as cooling towers, electrical transformers, and cable trays.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. When extinguishing system service is required, use a fire service equipment company experienced in water spray extinguishing system service.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 25 for system operation and maintenance requirements.

Check Points:
Refer to NFPA 10 and NFPA 25.

Recommended Tools, Materials, and Equipment:
1. Standard Tools - Basic

FLSF-FEX-05-01Y

Frequency: Annually

Water Spray Extinguishing Systems

Application:
This standard applies to water spray extinguishing systems. These systems are similar to automatic sprinkler systems except that they use open heads that are specifically designed to project a particular water pattern to a precisely defined area and are used to provide protection to special hazards such as cooling towers, electrical transformers, and cable trays.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Due to the special requirements for maintaining this type of extinguishing system, it is recommended that the servicing of the system be provided by a fire equipment company experienced in water spray extinguishing system service.
5. Review manufacturer's instructions.
6. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager, control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start as well as at the completion of work.
7. Annual preventive maintenance should be scheduled for the deluge valve, the detection system, the control panel, and the item being protected at this time.
8. Take necessary steps to prevent water damage during full flow drain test.
9. Prior to water flow test, install a pressure gauge at the hydraulically most remote spray nozzle. This can be done by removing the most remote nozzle, installing a tee with a pressure gauge attached and replacing the spray nozzle.
10. Perform these procedures in the spring after there is no danger of freezing.
11. Open and close all control valves slowly.

12. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
13. Follow NFPA 25 for system operation and maintenance requirements.

Check Points:
Refer to NFPA 10 and NFPA 25.

Recommended Tools, Materials, and Equipment:
Standard Tools - Basic

FLSF-FEX-06-01M

Frequency: Monthly

Fire Extinguishing Systems - Inspection

Carbon Dioxide (High Pressure)Halon, Dry Chemical

Application:
This standard applies to all fixed fire extinguishing systems utilizing carbon dioxide, Halon 1211 or 1301, or dry chemical and includes both total flooding and local application types.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. When extinguishing system service is required, use a fire equipment company experienced and certified in fire extinguishing system service.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 12, 13, 17,17A for system operation and maintenance requirements.

Check points:
Refer to NFPA 10,NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Seals or tamper indicators.
2. Inspection tags.

FLSF-FEX-06-06M

Frequency: Semi-annually

Fire Extinguishing Systems - Inspection

Carbon Dioxide (High Pressure)Halon, Dry Chemical

Application:
This standard applies to all fixed fire extinguishing systems utilizing carbon dioxide, Halon 1211 or 1301, or dry chemical and includes both total flooding and local application types.

Special Instructions:

1. The procedures in this standard are in addition to the monthly inspection procedures.
2. Due to the special requirements for maintaining these extinguishing systems, it is recommended that the servicing of the systems be provided by a fire equipment company experienced and certified in fire extinguishing system service.
3. Follow manufacturer's instructions.
4. Whenever heat or smoke detection systems are used to activate an extinguishing system, coordinate the procedures of this standard with maintenance of those sensing systems as appropriate.
5. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start of work.
6. When replacement cylinders are received from supplier, check that hydrostatic test date is current.
7. In addition to the required tags and/or labels, a permanent file record is to be kept for each extinguishing system. This file record should include the following information as applicable:
   a) The date when each extinguishing system was purchased and installed.
   b) The dates when maintenance was done and the name of the person or agency performing the maintenance.
   c) The date when cylinders were last recharged and the name of the person or agency performing the maintenance.
   d) The hydrostatic test date and the name of the person or agency performing the maintenance.

8. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Follow NFPA 12, 13, 17,17A for system operation and maintenance requirements.

Check Points:
Refer to NFPA 10, NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Seals or tamper indicators.
3. Inspection Tags.
4. Scale for gas cartridge or cylinders.

FLSF-FSD-01-02Y

Frequency: 2-Year

Fire and Smoke Dampers

Application:
This standard applies to all fire and smoke dampers in HVAC systems. These dampers are used to isolate the HVAC system form the fire event to preclude spreading smoke in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Verify that dampers are not installed backwards. Air movement should always tend to close the damper.
5. Verify that dampers are not held open by the air stream.
6. NEVER replace the fusible link with a piece of wire.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points:
Refer to NFPA 72.

Recommended Tools, Materials, and Equipment:

8. Standard Tools - Basic
9. Lubricants - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

FLSF-FSP-01-01Y

Frequency: Annually

Sprinkler Heads -Sprinklered Areas

Application:
This standard applies to all of the various types of sprinkler heads installed in the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Inspect sprinkler heads immediately prior to the scheduled maintenance on dry pipe valves, deluge valves, or alarm check valves in wet pipe systems.
5. Replace any damaged sprinkler heads prior to performing maintenance on dry pipe, deluge, or alarm check valves.
6. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
7. Follow NFPA 25 for system operation and maintenance requirements.

Check Points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Spare sprinkler heads of proper temperature ratings.
3. Ladder - Check ladder for defects. Do not use defective ladders.

FLSF-FSP-02-01Y

Frequency: Annually

Antifreeze Solution in Sprinkler Systems

Application:
This standard applies to those small portions of wet pipe sprinkler systems that are in unheated areas and are subject to freezing that use an antifreeze solution to protect the system from freezing.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Review manufacturer's instructions.
5. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager, control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start of work and at the completion of work.
6. Whenever the valve is closed, a clearly visible impairment tag is to be installed on the valve and the fire department connection. A typical impairment tag is illustrated in the National Fire Protection Association Standard 25, "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems."
7. The use of antifreeze solutions in sprinkler systems is only intended for limited portions of wet pipe systems typically containing less than forty gallons of water in small unheated areas such as loading docks. Dry pipe sprinkler systems are to be installed to protect larger areas.
8. Prepare the antifreeze solution with a freezing point below the expected minimum temperature for the locality.
9. Sprinklers with antifreeze solution must be located below the interface between the water and antifreeze solutions so that the heavier antifreeze solution will prevent the lighter water from migrating into the unheated area.
10. Beyond certain limits, increasing the proportion of antifreeze does not lower the freezing point of the solution.

11. Always mix glycerin, diethylene glycol, ethylene glycol, and propylene glycol with water in the proper proportions before putting the solution into the piping because these materials tend to thicken near 32· F.
12. Protect chlorinated polyvinyl chloride (CPVC) pipe from freezing only with glycerin.
13. A potable water system is one that is suitable for drinking.
14. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
15. Follow NFPA 25 for system operation and maintenance requirements.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Hydrometer or refractometer.

FLSF-HSE-01-01M

Frequency: Monthly

Fire Hose – 1.5 inch. Racked in Buildings

Application:
This standard applies to all 1½ in. fire hose in hose cabinets or racks used for interior fire fighting.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. In general, GSA has eliminated racked fire hose in office type buildings. However, such hose may be maintained in storage facilities and other facilities such as Federal Record Centers, where persons are trained in hose use.
5. The following work is to be performed in conjunction with maintenance on Fire Department Hose Connections.
6. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
Standard Tools - Basic.

FLSF-HSE-01-01Y

Frequency: Annually

Fire Hose – 1.5 inch. Racked in Buildings

Application:
This standard applies to all 1½ in. fire hose in hose cabinets or racks used for interior fire fighting.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. In general, GSA has eliminated racked fire hose in office type buildings. However, such hose may be maintained in storage facilities and facilities such as Federal Record Centers, where persons are trained in hose use. When replacement is made, the new hose shall be of woven synthetic fiber, single jacketed, with lining, equipped with a plastic combination straight stream-fog nozzle with shutoff. Hose and nozzle are available through the Federal Supply Schedule, Class 4210.
5. The following work is to be performed in conjunction with annual maintenance on Fire Department hose Connections.
6. A flow test is to be conducted every five years by flowing the required volume of water at the design pressures to the hydraulically most remote, highest, or dead-end hose connection of each zone of the standpipe system. Contact the regional Safety & Environmental Management Branch for the correct procedures for the test.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Hose testing equipment.
3. Water flow testing equipment.

FLSF-HSE-02-03M

Frequency: Quarterly

Fire Department Hose Connections - Standpipe Outlets

Application:
This standard applies to the standpipe system and hose connections in the building for use by the fire department. These components are typically located in stairwells and on the exterior of the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. Perform this work in conjunction with fie hose maintenance, where applicable.
6. When cracking the valve, do not stand directly in front of the opening.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
Tool Group C.

FLSF-HSE-02-05Y

Frequency: 5-Year

Fire Department Hose Connections - Standpipe Outlets

Application:
This standard applies to the fire standpipe system and fire hose connections in the building for use by the fire department. These system components are typically located in stairwells and on the exterior of the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or supervisory signal. The field office manager and the control center, central station or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. The following work is to be performed in conjunction with fire hose maintenance.
6. When opening the valve, do not stand directly in front of the opening.
7. Hydrostatic testing requires experienced personnel and proper water flow testing equipment. Contact the regional Safety and Environmental (S&EM) Branch for correct procedure and assistance. The S&EM Branch may decide to contract for this service.
8. Record the results of these checks in an appropriate format.
9. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Tool Group C.
2. Water flow testing equipment

FLSF-HSE-03-01M

Frequency: Monthly

Fire Department Pumper Connections - Standpipe or Sprinkler

Application:
This standard applies to all fire department pumper connections to the building standpipe and sprinkler systems. Fire departments will connect a large hose to these connections and utilized there equipment to pressurize and delver water for fire fighting purposes.

Special Instructions:
1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Never stand directly in front of connection when removing cap.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
Standard Tools - Basic.

FLSF-HYD-01-05Y

Frequency: 5-Year

Fire Hydrant Flow Test-Dry Barrel and Wet Barrel

Application:
This standard applies to all fire hydrants, including wall and flush hydrants, in both interior and exterior locations.

Special Instructions.

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. All hydrants are to be inspected after each operation.
5. Dry barrel (frost proof) hydrants are always to be checked in the fall before the first frost.
6. Wet barrel hydrants only have to be inspected annually.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points.
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Hydrant wrench.
3. Lubricants - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

FLSF-HYD-01-06M

Frequency: Semi-annually

Fire Hydrants -Dry Barrel and Wet Barrel

Application:
This standard applies to all fire hydrants, including wall and flush hydrants, in both interior and exterior locations.

Special Instructions:
1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Flow test dry barrel (frost proof) hydrants in the fall before the first frost.
5. When flow testing hydrants in interior locations, use fire hose to direct the flow of water outside of the building.
6. Hydrant flow testing requires the use of at least two hydrants:
7. Pressure hydrant - The hydrant closest to the building.
8. Flow hydrant - The next closest hydrant from the pressure hydrant on the downstream side of the water supply.
9. Although hydrant flow testing is fairly simple and straight forward, guidance and assistance can be obtained from the Chief, Safety and Environmental Management Branch/Division if needed.
10. Coordinate flow testing with the regular semi-annual hydrant inspection of this standard.
11. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check Points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
1. Standard Tools - Basic
2. Pitot tube with pressure gauge.
3. Hydrant cap with gauge and bleeder petcock.
4. Tape marked in 16ths of an inch.

5. Hydrant wrench.

FLSF-PMP-01-01W

Frequency: Weekly

Fire Pump – Diesel Engine Driven

Application:
This standard applies to all fire pumps powered by a diesel engine. The fire pumps are required to start automatically to provide water pressure into mid-rise and high-rise buildings.

Special Instructions:
1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at the completion of work.
5. Qualified operating personnel shall be in attendance during the weekly pump operation.
6. Hearing protection is required whenever the diesel engine is running.
7. Tests of diesel engine driven pumps shall be conducted without flowing water.
8. First Test - On systems that do not have a manual start button, close starting circuit mechanically. Run long enough to ensure engine is running properly.
9. Second Test - Test shall be conducted by allowing automatic starting of the pump to occur. The diesel pump shall run a minimum of 30 minutes.
10. The following items shall be checked and tested in order to ensure that the pump assembly is in operating condition and is free from physical damage.
11. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
1. Tool Group B.
2. Battery tester.

3. Hearing protection.

Frequency: Monthly

FLSF-PMP-01-01M

Fire Pump – Diesel Engine Driven

Application:
This standard applies to all fire pumps powered by a diesel engine. The fire pumps are required to start automatically to provide water pressure into mid-rise and high-rise buildings.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at the completion of work.
5. This standard establishes three extra check points to be performed once each month on all fire pumps that are equipped with automatic starting features.
6. Hearing protection is required whenever the diesel engine is running.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Tool Group C.
2. Battery Tester
3. Hearing protection.

Frequency: Quarterly

FLSF-PMP-01-03M

Fire Pump – Diesel Engine Driven

Application:
This standard applies to all fire pumps powered by a diesel engine. The fire pumps are required to start automatically to provide water pressure into mid-rise and high-rise buildings. These checks are in addition to the weekly and monthly checks required by this standard and NFPA.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. This standard establishes six extra check points to be performed once each quarter on all fire pumps that are powered by diesel engines.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check point:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Battery tester.

FLSF-PMP-01-01Y

Frequency: Annually

Fire Pump – Diesel Engine Driven

Application:
This standard applies to all fire pumps powered by a diesel engine. The fire pumps are required to start automatically to provide water pressure into mid-rise and high-rise buildings. These checks are in addition to the weekly and monthly checks required by this standard and NFPA.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. A yearly test shall be made at full pump capacity and over to make sure that neither pump nor suction pipe is obstructed. Guidance and assistance should be obtained from the Chief, Safety and Environmental Management Branch/Division.
6. Hearing protection is required whenever the diesel engine is running.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Tool Group C.
2. Coolant. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients.
3. Engine oil. Consult the MSDS for hazardous ingredients.
4. Oil, air, fuel filters.

5. Cleaning equipment and materials. Consult the MSDS for hazardous ingredients and proper PPE.
6. Tune-up kit.
7. Hearing Protection.

FLSF-PMP-02-01W

Frequency: Weekly

Fire Pump – Electric Motor Driven

Application:

This standard applies to all fire pumps powered by an electric motor. This fire pump is required to start automatically when receiving a signal form the fire alarm panel or activated by fire department personnel.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at the completion of work.
5. Qualified operating personnel shall be in attendance during the weekly pump operation.
6. Tests of electric motor driven pumps shall be conducted without flowing water.
7. First Test - On systems which do not have a manual start button, close starting circuit mechanically. Run long enough to ensue motor is running smoothly.
8. Second Test - Test shall be conducted by allowing automatic starting of the pump to occur. The electric pump shall run a minimum of 10 minutes.
9. The following items shall be checked and tested in order to ensure that the pump assembly is in operating condition and is free from physical damage.
10. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:

Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Battery tester.

FLSF-PMP-02-01M

Frequency: Monthly

Fire Pump – Electric Motor Driven

Application:

This standard applies to all fire pumps powered by an electric motor. This fire pump is required to start automatically when receiving a signal form the fire alarm panel or activated by fire department personnel. These checks are in addition to the weekly checks required by this standard and NFPA.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at the completion of work.
5. This standard establishes two extra check points to be performed once each month on all fire pumps that are equipped with automatic starting features. (See Standard No. FLSF-PMP-02).
6. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check point:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
Standard Tools - Basic.

FLSF-PMP-02-01Y

Frequency: Annually

Fire Pump – Electric Motor Driven

Application:

This standard applies to all fire pumps powered by an electric motor. This fire pump is required to start automatically when receiving a signal form the fire alarm panel or activated by fire department personnel. These checks are in addition to the weekly and monthly checks required by this standard and NFPA.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. A yearly test shall be made at full pump capacity and over to make sure that neither pump nor suction pipe is obstructed. Guidance and assistance should be obtained from the Chief, Safety and Environmental Management Branch/Division.
6. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.

Check points:

Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

Tool Group C.

FLSF-VLV-01-01W

Frequency: Weekly

Dry Pipe, Deluge and Preaction Valves

Application:
This standard applies valves which are exposed to cold weather. These valve operate to provide water into the piping when a fire event requires activation.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
5. Follow NFPA 25 for system operation and maintenance requirements.

Check points
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
1. Standard Tools - Basic.

FLSF-VLV-01-01M

Frequency: Monthly

Dry Pipe, Deluge and Preaction Valves

Application:
This standard applies to all dry pipe, deluge, and preaction sprinkler valves. These valve operate to provide water into the piping when a fire event requires activation.

Special Instructions:

1. Due to the special requirements for maintaining these types of valves, it is recommended that the servicing of these valves be provided by a fire equipment company experienced in this type of service.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions.
4. The work required by this procedure may cause activation of an alarm and/or a supervisory signal. The field office manager, control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start of work and at the completion of work.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. If drains are not piped to the outside of the building, take necessary steps to prevent water damage during water flow alarm test. Rate of discharge may exceed capacity of floor drain.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
8. Follow NFPA 25 for system operation and maintenance requirements.

Check Points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
Standard Tools - Basic.

FLSF-VLV-01-01Y

Frequency: Annually

Dry Pipe, Deluge and Preaction Valves

Application:
This standard applies to all dry pipe, deluge, and preaction sprinkler valves. These valve operate to provide water into the piping when a fire event requires activation.

Special Instructions:

1. Due to special requirements for maintaining these types of valves, it is recommended that the servicing of these valves be provided by a fire equipment company experienced in this type of service.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions.
4. The work required by this procedure may cause activation of an alarm and/or a supervisory signal. The field office manager, control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start of work and at the completion of work.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. If drains are not piped to the outside of the building, take necessary steps to prevent water damage during water flow alarm test. Rate of discharge may exceed capacity of floor drain.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
8. Follow NFPA 25 for system operation and maintenance requirements.

Check Points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
1. Standard Tools - Basic.

FLSF-VLV-01-05Y

Frequency: 5-Year

Dry Pipe, Deluge and Preaction Valves: Strainers, Filters and Orifices

Application:
This standard applies to all strainers, filters and orifices. Dry pipe, deluge and preaction valves operate to provide water into the piping when a fire event requires activation.

Special Instructions:

1. Due to special requirements for maintaining these types of valves, it is recommended that the servicing of these valves be provided by a fire equipment company experienced in this type of service.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions.
4. The work required by this procedure may cause activation of an alarm and/or a supervisory signal. The field office manager, control center, central station, and/or fire department that will receive the alarm and/or signal must be notified prior to start of work and at the completion of work.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. If drains are not piped to the outside of the building, take necessary steps to prevent water damage during water flow alarm test. Rate of discharge may exceed capacity of floor drain.
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
8. Follow NFPA 25 for system operation and maintenance requirements.

Check Points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
1. Standard Tools - Basic.

FLSF-VLV-02-01M

Frequency: Monthly

Post Indicator Valves

Application:

This standard applies to all valves controlling water-based fire protection systems that have an indicating post that tells whether the valve is open or shut.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start of work and at the completion of work.
5. This work should be done when other scheduled maintenance is being performed that involves other water flow control valves. (See Standard Nos. FLSF-ALM-01, FLSF-VLV-01, and FLSF-VLV-03).
6. Whenever the valve is closed, a clearly visible impairment tag is to be installed on the valve and the fire department connection. A typical impairment tag is illustrated in the National Fire Protection Association Standard 25, "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems."
7. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
8. Follow NFPA 25 for system operation and maintenance requirements.

Check points:

Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Tool Group C.
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

3. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.

FLSF-VLV-03-01W

Frequency: Weekly

Fire Control Valves

Application:
This standard card applies to all valves controlling water-based fire protection systems, including outside control valves and post indicating valves. This is for visual inspection only.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule shutdown with operating personnel, as needed.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 25 for system operation and maintenance requirements.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment.
Tool Group C.

FLSF-VLV-03-01M

Frequency: Monthly

Fire Control Valves

Application:
This standard card applies to all valves controlling water-based fire protection systems, including outside control valves and post indicating valves.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule shutdown with operating personnel, as needed.
5. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
6. Follow NFPA 25 for system operation and maintenance requirements.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment.
Tool Group C.

FLSF-VLV-03-01Y

Frequency: Annually

Fire Control Valves

Application:
This standard card applies to all valves controlling water-based fire protection systems, including outside control valves and post indicating valves.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The work required by this procedure may cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
5. Whenever the valve is closed, a clearly visible impairment tag is to be installed on the valve and the fire department connection. A typical impairment tag is illustrated in the National Fire Protection Association Standard 25, "Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems." Most fire system control valves are normally in the open position.
6. This work should be done when other annually scheduled maintenance is being performed that involves water flowing through valve(s).
7. See other portions of this standard for special annual maintenance requirements for post indicator valves.
8. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
9. Follow NFPA 25 for system operation and maintenance requirements.

Check points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:
Tool Group C.

FLSF-VLV-04-01Y

Frequency: Annually

Valves, Fire System Pressure Regulating

Application:
This applies to all pressure regulating type valves located in automatic sprinkler systems, fire department standpipe hose connections, and standpipe connections with 1.5 in. racked fire hose. These valves are found in combined automatic sprinkler and standpipe systems as well as in standpipe systems. Refer to an appropriate diagram of a typical system as necessary.

Special Instructions:

1. Due to the special requirements for maintaining these types of valves, it is recommended that the servicing of these valves be provided by a fire equipment company experienced in this service.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. The purpose of this flow test is to determine if the system design water flow can be met with the current valve pressure settings.
6. The work required by this procedure may cause the activation of an alarm and/or supervisory signal. Tamper switches may be provided. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
7. This work should be done when other annually scheduled maintenance is being performed involving water flowing through valve(s).
8. Check what the design pressure downstream from the pressure regulating valve is from the automatic sprinkler system design documents so that the pressure can be verified during the flow test. This design pressure will have been determined for the monthly inspections
9. A pressure gage is required on both the upstream and downstream sides of the pressure reducing valve in order to accomplish this flow test.
10. Some valves can be adjusted in the field while others are preset and must be returned to the factory for adjustment. To establish the pressure setting, the following three variables must be known: (1) valve inlet pressure, (2)

required outlet design pressure, and (3) required flow. Contact the Regional S&EM Office for assistance if you have any questions or if test procedures are not clear.

11. When valves are returned to the factory for testing or adjustment, care must be taken to reinstall them on the same floor from which they were removed. This is to ensure that valves with the proper pressure settings are reinstalled according to the system design. Design pressure settings will vary from floor to floor.
12. Waterflow testing requires experienced personnel and proper water flow testing equipment. Contact the regional Safety and Environmental S&EM Branch for correct procedure and assistance. The S&EM Branch may decide to contract out for this service.
13. Follow NFPA 72 National Fire Alarm Code (most recent version) for fire alarm system operation and maintenance requirements. Chapter 10 of NFPA 72 specifically covers the testing, maintenance and inspection of fire alarm systems.

Check Points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Water flow testing equipment.

FLSF-VLV-04-05Y

Frequency: 5-Year

Valves, Fire System Pressure Regulating

Application:
This applies to all pressure regulating type valves located in automatic sprinkler systems, fire department standpipe hose connections, and standpipe connections with 1.5 in. racked fire hose. These valves are found in combined automatic sprinkler and standpipe systems as well as in standpipe systems. Refer to an appropriate diagram of a typical system as necessary.

Special Instructions:

1. Due to the special requirements for maintaining these types of valves, it is recommended that the servicing of these valves be provided by a fire equipment company experienced in this service.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
3. Review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. The purpose of this flow test is to determine if the system design water flow can be met with the current valve pressure settings.
6. The work required by this procedure may cause the activation of an alarm and/or supervisory signal. Tamper switches may be provided. The field office manager and the control center, central station, or fire department that will receive the alarm and/or signal must be notified prior to start and at completion of work.
7. This work should be done when the standpipe systems are flow tested.
8. Check what the design pressure downstream from the pressure regulating valve is from the automatic sprinkler system design documents so that the pressure can be verified during the flow test. This design pressure will have been determined for the monthly inspections
9. A pressure gage is required on both the upstream and downstream sides of the pressure reducing valve in order to accomplish this flow test.
10. Some valves can be adjusted in the field while others are preset and must be returned to the factory for adjustment. To establish the pressure setting, the following three variables must be known: (1) valve inlet pressure, (2) required outlet design pressure, and (3) required flow. Contact the

Regional S&EM Office for assistance if you have any questions or if test procedures are not clear.

11. When valves are returned to the factory for testing or adjustment, care must be taken to reinstall them on the same floor from which they were removed. This is to ensure that valves with the proper pressure settings are reinstalled according to the system design. Design pressure settings will vary from floor to floor.
12. Waterflow testing requires experienced personnel and proper water flow testing equipment. Contact the regional Safety and Environmental S&EM Branch for correct procedure and assistance. The S&EM Branch may decide to contract out for this service.
13. The inspection, testing, repairs, and maintenance of all fire protection equipment and systems shall be in accordance with the requirements in the applicable NFPA code or standard.
14. Follow NFPA 25 for system operation and maintenance requirements.

Check Points:
Refer to NFPA 25.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Water flow testing equipment.

HVAC-ACR-01-01M

Frequency: Monthly

Computer Room Air-Conditioning Unit, Package: or Special Systems

Application:
This PM standard applies to air conditioning units that may have the evaporator, compressor, fan unit components, and condenser within a single housing or may have the condenser separate from the housing. These units can be fan coils, heat pumps or spilt A/C units. This equipment is typically found in computer rooms, but may also be found in special purpose rooms such as CAD rooms or laboratories.

Special Instructions:

1. Review manufacturer's instructions.
2. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
3. Perform any required drycooler or air cooled condenser maintenance simultaneously with this PM.
4. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
5. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
6. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
7. Recover, recycle, or reclaim the refrigerant as appropriate.
8. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the equipment.
9. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
10. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
11. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check points:

1. Thoroughly inspect and clean interior and exterior of machine with wet/ dry vacuum, (remove panels).

2. Clean drain pan and note excessive corrosion, prepare and paint necessary. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less.
3. Perform checks according to the type of unit.
   a) Chilled water/Condenser Water units:
      i. Check for water leaks on all lines, valves, strainers, coils, etc. If leaks are not able to be stopped or corrected, report leak status to supervisor.
      ii. Clean strainer on chilled water unit.
   b) Direct expansion units:
      i. Check for refrigeration leaks on all lines, valves, fittings, coils, etc., using a halogen leak detector or similar testing device. If leaks are not able to be stopped or corrected, report leak status to supervisor.

4. Check refrigerant levels and recharge if needed. Consult the MSDS for disposal requirements. Reclaimed and recycled CFCs are exempt from hazardous waste regulations (Consult 40 CFR Part 261).
5. Check condition of cooling and reheat coils. Use fin comb if needed to straighten fins.
6. A dirty coil surface can be cleaned using a coil cleaner solution and warm water.
7. Drain and clean humidifier drip pan, replace pan if applicable. Remove scale and paint if necessary.
8. Lubricate motor and fan bearings, if not sealed. Check alignment of motor and fan. Clean fan or blower.
9. Check belt tension and condition. Adjust or replace as required.
10. Replace prefilters if needed.
11. Replace final filters if needed.
12. Check compressor oil level if compressor has a sight glass.
13. Run machine, check action of controls, relays, switches, etc. to see that:
    a) compressor(s) run at proper settings.
    b) reheat coils activate properly.
    c) humidistat activates humidifier.
    d) suction and discharge pressures are proper.

e) discharge air temperature is set properly.

14. Check and adjust vibration eliminators. Replace if required.
15. Check and tighten all electrical terminals, connections, and disconnect switches.
16. Remove all trash or debris from work area. Consult the MSDS for proper personal protective equipment (PPE).
17. If applicable, clean and test condensate pump and alarm.

Recommended Tools, Materials, and Equipment:

1. Tool Group A
2. Cleaning tools and materials, vacuum, fin comb, grease gun and oil, filters and prefilters, spare belts.
3. Clamp meter (volt-ohm-amp meter).
4. Paint and brushes as required. Consult the MSDS to ensure that the paint lead level is 0.06% or less.
5. Self sealing quick disconnect refrigerant hose fittings
6. Refrigerant recovery/recycle unit
7. EPA/DOT approved refrigerant storage tanks.
8. Safety goggles.
9. Gloves.
10. Electronic leak detector.

HVAC-ACR-02-01Y

Frequency: Annually

Heat Pumps, Water Cooled (WSHP)

Application:
This standard card applies to those air conditioning machines that are designed to heat as well as cool a space or building with a water cooled condenser. Like package unit air conditioning machines, these have a evaporator, compressor, fan unit components, and a water cooled condenser. These will be split systems. For package type heat pumps, refer to the standard for package air handlers. The unit may contain supplemental electric heating elements to aid in heating the space if temperatures fall below 40F The other portion of a split system, i.e., a refrigeration condensing unit, is to be serviced in conjunction with this PM activity.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
5. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
6. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
7. Recover, recycle, or reclaim the refrigerant as appropriate.
8. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the equipment.
9. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
10. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
11. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check points:

1. Inspect piping for evidence of leaks and vibration. If leaks are not able to be stopped or corrected, report leak status to supervisor.
2. Inspect all wiring for deterioration, and tighten electrical contacts. Check for corrosion, clean, prime, and paint as necessary.
3. Check mounting bolts and tighten if needed.
4. Check crankcase heater.
5. Check fan for vibration or excessive noise. Lubricate fan and motor if required.
6. Check refrigerant levels, recharge if necessary. Check for leaks if loss of refrigerant is detected, using halide leak detector and soap bubbles. If leaks are not able to be stopped or corrected, report leak status to supervisor. Consult the Material Safety Data Sheets (MSDS) for disposal requirements. Reclaimed and recycled CFCs are exempt from hazardous waste regulations (Consult 40 CFR Part 261).
7. Check temperature drop across condensing coil.
8. Check condensing coil and connected hoses for water leaks.
9. Clean air intake and screens; change filters as necessary.
10. Brush or pressure wash coil surfaces. Straighten fins with fin comb.
11. Check that reversing valve is energized in the "heat" mode and deenergized in the "cool" mode. Replace defective valves.
12. Check all electrical connections and fused disconnect switches.
13. Check electrical resistance heat if present for proper operation and cycling.
14. Check all controls, indoor and outdoor thermostats, timers, and control delays, especially for units with electric supplemental heaters. Repair or replace as necessary.
15. Check oil if compressor is equipped with a sight glass.
16. Clean up work area.
17. If applicable, clean and test condensate pump and alarm.

Recommended Tools, Materials, and Equipment:

1. Tool Group A
2. Lubricants. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
3. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.

4. Fin comb
5. Vacuum or pressure washer.
6. Self sealing quick disconnect refrigerant hose fittings
7. Refrigerant recovery/recycle unit
8. EPA/DOT approved refrigerant storage tanks.
9. Safety goggles.
10. Gloves.
11. Approved refrigerant.
12. Electronic leak detector.

HVAC-ACR-03-01Y

Frequency: Annually

Air Conditioning Unit or Heat Pump Split System,

Application:
This standard card applies to air conditioning units and heat pumps that have remote condensers (split systems). The other portion of the split system, i.e., a refrigeration condensing unit, air or water cooled, or a packaged type chilled water unit, is to be serviced in conjunction with this PM activity.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. A/C machine maintenance should be scheduled to coincide with condensing unit or package chiller maintenance as noted above.
5. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
6. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
7. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
8. Recover, recycle, or reclaim the refrigerant as appropriate.
9. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal.
10. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
11. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
12. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check Points:

1. Thoroughly inspect and clean interior and exterior of machine with vacuum (remove panels).
2. Clean drain pan and note excessive corrosion. Treat rusted areas with rust inhibitor. Ensure that the rust inhibitor chemical does not add volatile organic compounds or contaminants to the drain pan. If possible, rinse well after application or choose a less hazardous material. Consult the chemicals Material Safety Data Sheet (MSDS) for this information.
3. Perform checks according to the type of unit.
    a) Chilled water units:
        i. 1). Check for chilled water leaks on all lines, valves, strainers, coils, etc. If leaks are not able to be stopped or corrected, report leak status to supervisor.
        ii. 2). Clean strainer on chilled water unit.
    b) Direct expansion units:
        iii. Check for refrigeration leaks on all lines, valves, fittings, coils, etc., using a halogen leak detector or similar testing device. If leaks are not able to be stopped or corrected, report leak status to supervisor.
4. Check condition of cooling and reheat coils. Use fin comb if need to straighten fins.
5. Clean coils. Use detergent solution and warm water if coil is heavily soiled.
6. Drain and clean humidifier pan or pad, whichever applies. Replace pad if required. Remove corrosion as needed.
7. Clean and lubricate motor and squirrel cage fan(s). Check alignment of motor and fan. Check bearings for excessive wear.
8. Check belt tension and condition. Adjust or replace as required.
9. Replace pre-filters if needed.
10. Replace final filter if needed.
11. Run machine, check action of controls, relays, switches, etc., to see that:
    a) Chilled water units:
        i. Chilled water valve(s) are operating properly.
        ii. Reheat coils activate properly.
        iii. Humidistat activates humidifier.
        iv. Valves regulating water pressure are proper on cooling.
        v. discharge air temperature is set properly.

vi. 6). Check and record chilled water inlet and outlet temperatures.

b) Direct expansion units:

i. Humidistat activates humidifier.

ii. Reheat coils activate properly.

iii. Discharge air temperature is set properly.

12. Check and adjust vibration eliminator mountings if equipped. Repair or replace if required.

13. If applicable, clean and test condensate pump and alarm

<u>Recommended Tools, Materials, and Equipment</u>:

1. Tool Group A.
2. Cleaning tools, grease gun, oil and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
3. Vacuum
4. Fin comb
5. Filters
6. Spare V-belts
7. Self-sealing quick disconnect refrigerant hose fittings, if applicable.
8. Refrigerant recovery/recycling unit, if applicable.
9. EPA/DOT approved refrigerant storage tanks.
10. Safety goggles
11. Gloves
12. Approved refrigerant.
13. Electronic leak detector.

HVAC-ACR-04-01Y

Frequency: Annually

Air Conditioning Unit, Ceiling/Wall/Window Mounted

Application:
This standard card applies to special purpose or critical use, ceiling or wall mounted air conditioning units, i.e., mini-mates or ductless split type units. The unit may be either air cooled or water cooled. Humidifiers will be operated on those units serving computer space and will be inventoried and serviced under this standard card.

Special Instructions:

1. Schedule outage with operating personnel.
2. Schedule PM on associated equipment in conjunction with this standard, i.e., air cooled condensers, glycol dry coolers, cooling tower, etc.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
5. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
6. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
7. Recover, recycle, or reclaim the refrigerant as appropriate.
8. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the equipment.
9. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
10. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
11. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check Points:

1. Thoroughly inspect and clean interior and exterior of machine with vacuum (remove panels).
2. Clean drain pan and note excessive corrosion. Correct as necessary.

3. Check for refrigerant leaks using a halogen leak detector, soap bubbles, or similar testing device. If leaks are not able to be stopped or corrected, report leak status to supervisor. Consult the Material Safety Data Sheets (MSDS) for disposal requirements. Reclaimed and recycled CFCs are exempt from hazardous waste regulations (Consult 40 CFR Part 261).
4. Check refrigerant levels and recharge if necessary.
5. Check condition of cooling and reheat coils. Use fin comb as needed.
6. Clean coils using detergent solution and warm water if coil is heavily soiled.
7. Drain and clean humidifier pan or pad, whichever applies. Replace pad if required. Remove corrosion, prime, and paint as needed.
8. Lubricate motor and fan bearings, if not sealed. Check alignment of motor and fan. Clean all fans or blowers.
9. Check belt tension and condition. Adjust or replace as required if belt driven.
10. On direct drive units, check set screws on fan shaft to make sure they are tight.
11. Replace filters as needed.
12. Check compressor oil level (not on hermetically sealed
13. units) if compressor is equipped with a sight glass.
14. Run machine. Check action of controls, relays, switches, including fused disconnect type, etc., to see that:
15. compressor(s) run at proper setting.
16. reheat coils activate properly (if applicable).
17. humidistat activates humidifier (if applicable).
18. suction and discharge pressures are proper.
19. discharge temperature is set properly.
20. If applicable, clean and test condensate pump and alarm.
21. Clean up work area.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Tool Group A.
2. Cleaning tools and materials.
3. Vacuum.
4. Fin comb.

5. Grease gun and oiler.
6. Ladder constructed according to OSHA/ANSI standards - ceiling mounted units. Check ladder for defects. Do not use defective ladders.
7. Self sealing quick disconnect refrigerant hose fittings.
8. Refrigerant recovery/recycle unit.
9. EPA/DOT approved refrigerant storage tanks.
10. Safety goggles.
11. Gloves.
12. Approved refrigerant.
13. Electronic leak detector.

HVAC-ACR-05-01Y

Frequency: Annually

Air-Cooled Condenser

Application:
This PM standard applies to equipment which has the condenser, fan(s), and fan motor(s) enclosed within the same housing. The compressor and other components are at a separate location. PM of these other devices should be scheduled simultaneously with the units serviced by the condenser. If the condenser motor(s) is/are rated at 1 HP or higher, schedule PM of motor(s) with this PM.

Special Instructions:

1. Review manufacturer's instructions.
2. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
3. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
4. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
5. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
6. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
7. Recover, recycle, or reclaim the refrigerant as appropriate.
8. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the equipment.
9. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
10. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
11. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check points:

1. Remove debris from air screen and clean underneath unit.
2. Pressure wash coil with coil cleaning solution.

3. Straighten fin tubes with fin comb.
4. Check electrical connections for tightness.
5. Check mounting for tightness.
6. Check for and remove all corrosion or rust from unit and supporting steel, prime and paint as necessary. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less. Consult the MSDS for proper personal protective equipment (PPE).
7. Check fan blades and belts. Clean fan blades as necessary.
8. Check wires at condenser electrical fused safety switches for tightness and burned insulation. Repair as necessary.
9. Clean up work area.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. High pressure washer
3. Fin comb
4. Paint brushes
5. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.
6. Respirator
7. Safety goggles
8. Gloves.
9. Self sealing quick disconnect refrigerant hose fittings
10. Refrigerant recovery/recycle unit
11. EPA/DOT approved refrigerant storage tanks.

HVAC-ACR-06-01Y

Frequency : Annually

Evaporative Condenser

Application:
An evaporative condenser is similar to a cooling tower except the heated refrigerant is piped into the unit where water is sprayed over the coils and a fan blows air through the coils. The air flow increases the evaporation rate of the water thereby cooling the coils. The left over water in the basin (sump) is recirculated through the unit. Makeup water is added to the system to counteract water lost due to evaporation.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Perform cleaning of the condenser in accordance with the PM standard for "Cooling Tower – Cleaning" before performing this PM activity
4. Schedule performance of this PM activity prior to seasonal start-up.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations regarding refrigerant, as they apply to protection of stratospheric ozone.
7. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
8. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
9. Recover, recycle, or reclaim the refrigerant as appropriate.
10. If disposal of the appliance is required, follow regulations concerning removal of refrigerants and disposal of the appliance.
11. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
12. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.

13. For refrigerant type units, closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.
14. Properly dispose of any debris, excess oil, and grease.
15. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.

Children of this Piece of Equipment

1. Fan Motors
2. Variable Frequency Drive
3. Control Valves

Check points:

1. Exterior Structural:
   a. Inspect louvers for correct position and alignment, missing or defective items, and supports. Examine for ice damage.
   b. Inspect casings and attaching hardware for leaks or defects.
   c. Inspect condition of access doors and hinges. Repair as necessary.
   d. Inspect the distribution system, including flange connectors and gaskets, caulking of headers, deterioration in distribution basins, splash guards, and associated piping.
   e. Check screens.
   f. Inspect stairways (if applicable), including handrails, knee rails, stringers, structure, and fasteners for rot, corrosion, security, and acid attack.
   g. Shake ladders (if applicable) to verify security. Check all rungs. Verify compliance with Occupational Safety and Health (OSHA) regulations regarding height requirements.
   h. Fan cylinders must be securely anchored. Check fastening devices. Note any damaged, corroded, or missing items. Verify proper tip clearance between the fan blade and interior of the cylinder. Verify compliance with OSHA requirements regarding height. Check its condition.
   i. Apply protective coatings as needed on metal surfaces. Be sure rust and dirt have been removed first.
2. Interior Structural:
   a. Inspect the distribution system piping for decay, rust, or acid attack. Check the condition and tightness of water and coil connections. Observe spray pattern of nozzles if possible and note missing and defective nozzles.
   b. Inspect mechanical equipment supports and fasteners for corrosion. Check condition of springs or rubber vibration absorption pads, including adjusting bolts, ferrous members, and rubber pads.

c. Check valves, float valve, and continuous bleed line (should be open). Check operating condition of fire detection system, if installed. Check for corrosion of pipes and connectors. Check wiring of any thermocouple installed.
d. Inspect condenser fill for damage, ice breakage, deterioration, or misplaced, missing, or defective splash bars.
e. Examine interior structural supports. Look for iron rot of metal fasteners. Check condition of steel internals. Check condition and tightness of bolts.
f. Inspect the nuts and bolts in partitions for tightness and corrosion. Check condition of steel supports for rot and corrosion.
g. Check steel cold water basins for corrosion and general condition.
h. Check all sumps for debris, condition of screens, anti-turbular plates, and freely operating drain valves.

3. Mechanical:
   a. Check alignment of gear, motor, and fan(s).
   b. Check fan(s) and air inlet screens. Remove any dirt or debris.
      1). Check hubs and hub covers for corrosion and condition of attaching hardware.
      2). Inspect blade clamping arrangement for tightness and corrosion.
   c. Gear box:
      1) Clean out any sludge.
      2) Change oil in gear reducer. Be sure gear box is full to avoid condensation.
      3) Rotate input shaft manually back and forth to check for backlash.
      4) Attempt to move the shaft radially to check for wear on the input pinion shaft bearing.
      5) Look for excessive play of the fan shaft bearings by applying force up and down on the tip of a fan blade. (Note: Some output shafts have a running clearance built into them.)
   d. Power transmission:
      1) Check that the drive shaft and coupling guards are installed and that there are no signs of rubbing. Inspect the keys and set screws on the drive shaft and check the connecting hardware for tightness. Tighten or install as required.
      2) Look for corrosion, wear, or missing elements on the drive shaft coupling.
      3) Examine the exterior of the drive shaft for corrosion. Check the interior by tapping and listening for dead spots.
      4) Observe flexible connectors of both ends of the shaft.
      5) Inspect bearings, belts, and pulleys for excessive noise, wear or cracking, alignment, vibration, looseness, surface glazing, tension. Replace or repair as necessary.
   e. Inspect condenser coil, fins, sprays, connections, etc. Clean if required.

f. Check water distribution. Adjust water level and flush out troughs if necessary. Check all piping, connections, and brackets for looseness. Tighten loose connections and mounting brackets. Replace bolts and braces as required.
g. Check nozzles for clogging and proper distribution.
h. Check pump. Lubricate as required.
i. Check water treatment equipment for proper operation and condition. Clean and paint as necessary.

4. Electrical:
   a. Check electrical motor for excessive heat and vibration.
   b. Inspect wiring, conduit, and electrical controls for loose connections, charred or broken insulation, or other defects. Tighten, repair, or replace as necessary.
   c. Remove dust from air intakes and check for corrosion. Check TEFC motors for condition of air passages and fans.
   d. If there is a drain moisture plug installed, see if it is operational.
   e. Check motor and starters. Check amps and volts at operating loads.
   f. Look for corrosion and security of mounting bolts and attachments.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Tool Groups A and C.
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.
4. Safety goggles.
5. Work gloves.
6. Ladders of appropriate size constructed in accordance with OSHA/ANSI standards or scaffolding. Check ladders for defects. Do not use defective ladders.
7. Volt-amp meter.
8. High pressure washer.
9. Protective coatings, brushes, solvents, etc. Consult the MSDS for hazardous ingredients and proper PPE.

Frequency: Bi-Monthly

HVAC-AHU-01-02M

Built Up Air Handler, Predictive Maintenance

Application

This standard applies to predicatively changing out filters for built-up air handlers over 5,000 CFM with chilled water and/or hot water and/or steam coils that are fed from central plant(s). This is accomplished by calculating the pressure drop across filters.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions
3. Follow lock out.tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule shutdown with operating personnel as needed.
5. Preventative maintenance on associated equipment should be accomplished at this time.

Check Points

1. Differential pressure sensors should be installed across each filter bank and should report values to Building Automation System.
2. Determine the set point for each differential pressure sensor that should trigger a filter change. Some of the factors that should be considered include:
   a. Manufacturer's recommendations for filter changes
   b. Operational issues (indoor air quality, number of service calls, etc.)
   c. Cost of filter replacement
   d. Cost of increased energy usage due to filter loading
3. Enter the determined operational set point into the system as a maintenance alarm or signal to the CMMS system to generate a work order.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Filter replacement
3. Vacuum
4. Respirator

HVAC-AHU-01-01Y: Frequency: Annually

Built Up Air Handler

Application
This standard applies to built-up air handlers over 5,000 CFM with chilled water and/or hot water and/or steam coils that are fed from central plant(s).
O&M contractors may propose changes to this standard. Such changes are subject to GSA approval. Proposed changes to standards must be submitted showing markups of changes for GSA approval.

Special Instructions:
1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule shutdown with operating personnel, as needed.
5. Preventive maintenance on associated equipment should be accomplished at this time.

Parent of this Piece of Equipment
None

Children of this Piece of Equipment
The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other sections of the GSA standard for the detailed PM requirements for the children equipment.
1. Supply and Return Fan Motors, ELEC-MOT-01-01Y.
2. Variable Frequency Drives ELEC-VFD-01-01Y.
3. Filters HVAC-FLT-"XX"-03M (XX depending on the type of filter used)
4. Dampers HVAC-DMP-01-01Y.
5. Control Valves HVAC-VLV-01-01Y

Check Points:
1. Check fan blades for dust buildup and clean if necessary.
2. Check fan blades and moving parts for cracks and excessive wear.
3. Check fan RPM against design specifications.
4. Check running motor amperatures on all three phases. Compare with manufacturer's specifications.
5. Tighten all electrical connectors/lugs to proper torque.
6. If unit is a multi-zone air handler, then check each individual zone damper and associated controls.
7. Check bearing collar set screws on fan shaft to make sure they are tight.
8. Check dampers for dirt accumulations, clean as necessary. Check belt, repair or replace as necessary.

9. Check damper actuators and linkage for proper operation. Adjust linkage on dampers if out of alignment.
10. Lubricate mechanical connections of dampers sparingly.
11. Clean coils by brushing, blowing, vacuuming, or pressure washing.
12. Check coils for leaking, tightness of fittings.
13. Use fin comb to straighten coil fins.
14. Flush and clean condensate pans and drains, remove all rust prepare metal and paint. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less. Hose down coils and drain pans and wash with an appropriate EPA approved solution approved solution. Treat condensate pans with an EPA approved biocide.
15. Check belts for wear and cracks, adjust tension or alignment. Replace belts when necessary. Multi-belt drives shall only be replaced with matched sets.
16. Check rigid couplings for alignment on direct drives, and for tightness of assembly. Check flexible couplings for alignment and wear.
17. Before heating season (chilled water coils only): Drain cooling coils; blow down to remove moisture; refill with antifreeze and water solution; drain.
18. Check freezestat for proper temperature setting and operation.
19. Vacuum interior of unit.
20. Blow out motor air vents with compressed air only.
21. Check filter doors and access doors for proper gasketing and air leaks. Correct as necessary.
22. Lubricate fan shaft bearings while unit is running. Add grease slowly until slight bleeding is noted from the seals. Do not over lubricate. Remove old or excess lubricant.
23. Ensure that drains are clear and running. If applicable, test and clean condensate pump.
24. Clean up work area.

The maintenance contractor may propose a predictive maintenance program that would replace the above check points for preventative maintenance. The proposed predictive maintenance program would need to be approved by the contracting officer's representative (COR) and included in the Building Operating Plan.

<u>Check Points for Equipment Functional Testing (Air Handlers controlled by Direct Digital Controls (DDC) Only)</u>

1. Review sequence of operation for air handler.
2. Use government approved persistence commissioning tool (for example PACRAT) to verify that the air handler is operating according to the correct sequences of operation. Use approved persistence commissioning tool to also ensure that control loops are stable and sensors are reading correctly. Document anomaly reports from the persistence commissioning tool. Document resolution of anomaly reports through work orders on the Computerized Maintenance Management System (CMMS).
3. If an approved persistence commissioning tool is NOT installed then:

i. Set up trends on the building automation system for a minimum of two (2) weeks and trend the following points as appropriate for the subject air handler: supply air temperature, supply air enthalpy/ humidity, mixed air temperature, mixed air enthalpy/ humidity, return air temperature, return air enthalpy/ humidity, outside air temperature, outside air enthalpy/ humidity, supply air temperature setpoint, chilled water valve position, hot water valve position, economizer damper position, minimum outside air damper position, outside air CFM, supply air CFM, supply and return fan VFD speed, supply and return fan kW, supply air static pressure, supply air static pressure setpoint, other DDC points critical to air handler operation.
ii. Review the trend data and check for stability of control loops.
iii. Review the trend data and confirm air handler is operating according to all the correct sequences. Typical air handler sequences that should be verified include: start/stop, optimum start, economizer operation, supply air temperature setpoint, supply air temperature re-set, static pressure re-set, demand controlled ventilation.
iv. Document results of functional testing.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Tool Group A
2. Tachometer
3. Grease gun and oiler
4. Pressure washer
5. Vacuum.
6. Fin comb
7. Cleaning tools and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
8. Safety goggles.
9. Gloves.
10. Data processing software, for example Microsoft Office.

HVAC-AHU-03-01Y

Frequency: Annually

Built Up Air Handler, Predictive Maintenance

Application

This standard applies to built-up air handlers 5,000 CFM and greater with chilled water and/or hot water and/or steam coils that are fed from central plant(s). This standard includes some predictive maintenance Tasks and can be used as an alternative to the purely preventive maintenance standard. If the facility elects to use this standard as a substitute for the preventive maintenance air handler standard, then it is not necessary to follow the relevant air filter maintenance preventive standard.

O&M contractors may propose changes to this standard. Such changes are subject to GSA approval. Proposed changes to standards must be submitted showing markups of changes for GSA approval.

This standard may be used in lieu of standard HVAC-AHU-01-01Y.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule shutdown with operating personnel, as needed.
5. Preventive maintenance on associated equipment should be accomplished at this time.

Children of this Piece of Equipment

The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other sections of the GSA standard for the detailed PM requirements for the children equipment.

1. Supply and Return Fan Motors, ELEC-MOT-01-01Y.
2. Variable Frequency Drives ELEC-VFD-01-01Y.
3. Filters HVAC-FLT-"XX"-03M (XX depending on the type of filter used)
4. Dampers HVAC-DMP-01-01Y.
5. Control Valves HVAC-VLV-01-01Y

Check Points:

1. Check fan blades for dust buildup and clean if necessary.
2. Check fan blades and moving parts for cracks and excessive wear.
3. Check fan RPM against design specifications.
4. Check running motor amps on all three phases. Compare with manufacturer's specifications.
5. Check belt, repair or replace as necessary.
6. Lubricate mechanical connections of dampers sparingly.

7. Clean coils by brushing, blowing, vacuuming, or pressure washing.
8. Check coils for leaking, tightness of fittings.
9. Use fin comb to straighten coil fins.
10. If unit is a multi-zone air handler, then check each individual zone damper and associated controls.

DDC:

11. Check to see that the operating control sensor activates the damper per design specifications. If not, recalibrate or replace the operating control sensor with the same temperature range sensor.
12. Check damper linkage for tightness or damage. Lightly oil moving parts using an approved lubricant.
13. Inspect damper(s) for free movement. Replace felt or other type seals as required.
14. Inspect connecting ductwork for air leaks. Correct leaks with approved duct tape or tighten connections, as required.
15. Tighten electrical connections to all servo-motor actuators, and test as applicable.
16. Check the heating or cooling valve (if present) for leakage around the stem or between the seat and disk. Repair or replace as needed.
17. Check velocity sensor tubing for cracks, tightness, or holes if applicable.

Pneumatic:

18. Check damper linkage for tightness or damage. Lightly oil moving parts using an approved lubricant for pneumatic systems.
19. Inspect damper(s) for free movement. Replace felt or other type seals as required.
20. Inspect mixing box and connecting ductwork for air leaks. Correct leaks with approved duct tape or tighten connections, as required.
21. Inspect damper actuator(s) for tightness to mounting brackets.
22. Inspect damper actuator diaphragm for leaks by performing a pressure test of the diaphragm.
23. Check the damper actuator spring range. Replace spring, adjust pilot positioner, or add pilot positioner as needed.
24. If pneumatic actuator does not stroke properly, correct sticking valve stem or binding linkage. Replace or repair the diaphragm or actuator if necessary.
25. Check the heating or cooling valve for leakage around the stem or between the seat and disk. Repair or replace as needed.
26. Inspect the valve actuator for leaks by performing a pressure test of the diaphragm. Repair or replace as needed.
27. Check the spring range of the valve actuator. Replace spring, adjust pilot positioner or add pilot positioner as needed.
28. Inspect for air leaks around actuator and in the air line between controller and pneumatic actuator.

29. Inspect operating control thermostat and/or pressure sensor for proper location and check main and branch air lines at thermostat for crimps, breaks, etc. Repair or replace if needed.
30. Check all inline filters for oil and/or moisture. Replace as needed.
31. Check all installed pressure gages for proper range and operability as applicable. Replace if needed.
32. Perform a spring range check for all remaining end devices.
33. Calibrate the operating control thermostat. Replace if it is defective with the same type action (direct or reverse action) and temperature range.
34. Check to see that the operating control thermostat activates the damper per design specifications. If not, recalibrate the operating control thermostat.

35. Flush and clean condensate pans and drains, remove all rust prepare metal and paint. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less. Hose down coils and drain pans and wash with an appropriate EPA approved solution approved solution. Treat condensate pans with an EPA approved biocide. If applicable, test and clean condensate pumps.
36. Check rigid couplings for alignment on direct drives, and for tightness of assembly. Check flexible couplings for alignment and wear.
37. Before heating season (chilled water coils only): Drain cooling coils; blow down to remove moisture; refill with antifreeze and water solution; drain.
38. Check freezestat for proper temperature setting and operation.
39. Vacuum interior of unit.
40. Blow out motor air vents with compressed air only.
41. Check filter doors and access doors for proper gasketing and air leaks. Correct as necessary.
42. Lubricate fan shaft bearings while unit is running. Add grease slowly until slight bleeding is noted from the seals. Do not over lubricate. Remove old or excess lubricant.
43. Ensure that drains are clear and running.
44. Clean up work area.

<u>Predictive Maintenance Checkpoints</u>

Vibration Analysis on Fans

1. For each fan take baseline readings on all permanently installed vibration transducers.
2. Monitor permanently installed vibration transducers with BAS.
3. An on-staff or contracted Vibration Analysis Technician using specialized software will need to determine criteria for unacceptable vibration signals.
4. Set up maintenance alarms or signal CMMS to issue a work order when transducer output exceeds acceptable levels based on baseline readings.
5. Take corrective action by:

a. Having a full set of vibration readings taken by a qualified on-staff or contracted vibration analyst.
b. Following the analyst's diagnostic recommendations.

Filters

1. Differential pressure sensors should be installed across each filter bank and should report values to Building Automation System.
2. Determine the setpoint for each differential pressure sensor that should trigger a filter change. Some of the factors that should be considered include:
   a. Manufacturer's recommendations for filter changes
   b. Operational issues (indoor air quality, number of service calls, etc.)
   c. Cost of filter replacement
   d. Cost of increased energy usage due to filter loading
3. Enter the determined operational set point into the system as a maintenance alarm or signal to the CMMS system to generate a work order.

<u>Check Points for Equipment Functional Testing (Air Handlers controlled by Direct Digital Controls (DDC) Only)</u>

1. Review sequence of operation for air handler.
2. Use government approved persistence commissioning tool (for example PACRAT) to verify that the air handler is operating according to the correct sequences of operation. Use approved persistence commissioning tool to also ensure that control loops are stable and sensors are reading correctly. Document anomaly reports from the persistence commissioning tool. Document resolution of anomaly reports through work orders on the Computerized Maintenance Management System (CMMS).
3. If an approved persistence commissioning tool is NOT installed then:
   a. Set up trends on the building automation system for a minimum of two (2) weeks and trend the following points as appropriate for the subject air handler: supply air temperature, supply air enthalpy/ humidity, mixed air temperature, mixed air enthalpy/ humidity, return air temperature, return air enthalpy/ humidity, outside air temperature, outside air enthalpy/ humidity, supply air temperature setpoint, chilled water valve position, hot water valve position, economizer damper position, minimum outside air damper position, outside air CFM, supply air CFM, supply and return fan VFD speed, supply and return fan kW, supply air static pressure, supply air static pressure setpoint, other DDC points critical to air handler operation.
   b. Review the trend data and check for stability of control loops.
   c. Review the trend data and confirm air handler is operating according to all the correct sequences. Typical air handler sequences that should be verified include: start/stop, optimum start, economizer operation, supply air temperature setpoint, supply air temperature re-set, static pressure re-set, demand controlled ventilation.

d. Document results of functional testing.

Recommended Tools, Materials, and Equipment:

1. Tool Group A
2. Tachometer
3. Grease gun and oiler
4. Pressure washer
5. Vacuum.
6. Fin comb
7. Cleaning tools and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
8. Safety goggles.
9. Gloves.
10. Data processing software, for example Microsoft Office.

HVAC-AHU-04-01Y

Frequency: Annually

Packaged Air Handler

Application

This standard applies to packaged air handlers with A/C compressor(s) and/or a natural gas fired heating section. This includes A/C units with gas heat, A/C units only, Heat Pumps with air cooled condensers or any other type of packaged air handler with air conditioning. These units include all the components in one factory assembled unit, although may be comprised of different sections.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule shutdown with operating personnel, as needed.
5. Preventive maintenance on associated equipment should be accomplished at this time.
6. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
7. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
8. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
9. Recover, recycle, or reclaim the refrigerant as appropriate.
10. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal.
11. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
12. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
13. Closely follow all safety procedures described in the
14. Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check Points:

1. Check fan blades for dust buildup and clean if necessary.
2. Check fan blades and moving parts for cracks and excessive wear.
3. Check fan RPM against design specifications.
4. Check running motor amperatures on all three phases. Compare with manufacturer's specifications.

5. Check dampers for dirt accumulations, clean as necessary. Check belt, repair or replace as necessary.
6. Check damper actuators and linkage for proper operation. Adjust linkage on dampers if out of alignment.
7. Lubricate mechanical connections of dampers sparingly.
8. If unit is a multi-zone air handler, then check each individual zone damper and associated controls.

Condenser

9. Remove debris from air screen and clean underneath unit.
10. Pressure wash coil with proper cleaning solution.
11. Straighten fin tubes with fin comb.
12. Check electrical wiring and tighten loose connections. Check fused disconnect switches for condition and operation.
13. Check mounting for tightness.
14. Check for corrosion. Clean and treat with inhibitor as needed.
15. Check fan or blower for bent or damaged blades and imbalance.
16. Lubricate shaft and motor bearings on fans and remove old or excess lubricant.
17. Inspect pulleys, belts, couplings, etc.; adjust tension and tighten mountings as necessary. Change badly worn belts. Multi-belt drives should be replaced with matched sets.
18. Condenser tubes should be inspected and cleaned. Condenser tubes from open tower systems may have contamination or hard scale. Excessive corrosion, scaling, erosion and algae typically indicate improper or lack of an adequate water treatment program. Consult water treatment standard for proper procedures.
19. Clean coils by brushing, blowing, vacuuming, or pressure washing.

Evaporator

20. Evaporator tubes should be inspected and cleaned of scale. Inspect and clean temperature sensors and flow switches.
21. Inspect plumbing, valves and flanges for leaks and correct.
22. Check coils for leaking, tightness of fittings:
    a. Check for refrigerant leaks using a halogen detector or similar testing device. If leaks are not able to be stopped or corrected, report leak status to supervisor. Consult the Material Safety Data Sheets (MSDS) for disposal requirements. Reclaimed and recycled CFCs are exempt from hazardous waste regulations (Consult 40 CFR Part 261).
    b. Check refrigerant levels and recharge if needed.

23. Use fin comb to straighten coil fins.
24. Remove debris from air screen and clean underneath unit.
25. Inspect gaskets. Look for leaks between unit and structure, caulk as necessary.
26. Clean condenser, cooling coil fins, and fans.
27. Remove dirt or dust from all interior parts.
28. Replace filter.
29. Inspect and adjust damper.
30. Lubricate motor and fan bearings.
31. Check fan RPM to design specifications.
32. Check bearing collar set screws on fan shaft to make sure they are tight.
33. Check dampers for dirt accumulations. Check felt. Repair or replace as necessary.
34. Check damper motors and linkage for proper operation.
35. Lubricate mechanical connections of dampers sparingly.

<u>Compressor(s)</u>

36. Lubricate drive coupling.
37. Lubricate motor bearings (non-hermetic).
38. Check and correct alignment of drive couplings.
39. Inspect evaporator tubes for scale. Clean if required. Leak test tubes using a halogen leak detector or suitable substitute.
40. Add refrigerant per manufacturer's instructions if needed.
41. Check compressor oil level.
42. Run machine; check action of controls, relays, switches, etc. to see that:
    a. Compressor(s) run at proper settings.
    a. Check compressor oil level.
    b. Run machine, check action of controls, relays, switches, etc., to see that:
    c. compressor(s) run at proper settings.
    d. reheat coils activate properly.
    e. crankcase heater is operating properly. Gas and/or oil fired (if equipped).
        i. Check burner for flashback and tight shutoff of fuel.
        ii. Check operation of controls. Clean and adjust if necessary.
        iii. Clean burner, chamber, thermocouple and control. (Use a high suction vacuum and/or brush.) Check combustion chamber for cracks, holes, or other defects.
        iv. Adjust pilot or electric ignition device.
        v. Inspect vent and damper operation.
        vi. Operate unit and adjust burner.

vii. Check operation of safety pilot, gas shutoff valve, and other burner safety devices.
viii. Check temperature differential and controls.
ix. Check frame of unit with ohmmeter for proper electric ground.
x. Replace covers (if any) and clean area.

f. Electrical (if equipped).
i. Visually inspect for broken parts, contact arcing or any evidence of overheating. Inspect all wiring for deterioration.
ii. Check name plate for current rating and controller manufacturer's recommended heater size. (Heater size shall not be changed without the regional design engineer's approval.)
iii. Check line and load connections and heater mounting screws for tightness.

g. suction and discharge pressures are proper.
h. discharge air temperature is set properly.

43. Check and adjust vibration eliminators. Replace as necessary.
44. Sample test the refrigerant and oil to verify compliance with the Air Conditioning and Refrigeration Institute standards. Based on the results, refrigerant may need to be replaced or recycled, and oil replaced.
45. Check and calibrate safety controls.

<u>Gas Burner</u>

46. Check operation of all gas controls and valves including: manual gas shutoff; petal gas regulator; safety shutoff valve (solenoid); automatic gas valve; petal solenoid valve; butterfly gas valve, motor, and safety petal solenoid (if used.)
47. Check flue connections for tight joints and minimum resistance to air flow. (combustion chamber, flues, breaching, and chimney are clear before firing.)
48. Draft regulators require slightly negative pressure in the combustion chamber at maximum input.
49. On forced draft burners, gas manifold pressure requirements should correspond with modulating (butterfly) valve in full open position and stable at all other firing rates.
50. At high and low fire rates on burners equipped with OFF/LOW FIRE/HIGH FIRE control.
51. At single firing load point on boilers equipped with OFF/ON controls only.
52. Check burner for flashback and tight shutoff of fuel.
53. Check operation of automatic controls and combustion flame safeguards. Clean and adjust, if necessary.

54. Operation and adjustments should conform with manufacturer's instructions.

55. Flush and clean condensate pans and drains, remove all rust prepare metal and paint. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less. Hose down coils and drain pans and wash with an appropriate EPA approved solution approved solution. Treat condensate pans with an EPA approved biocide. If applicable, test and clean condensate pumps.
56. Check rigid couplings for alignment on direct drives, and for tightness of assembly. Check flexible couplings for alignment and wear.
57. Vacuum interior of unit.
58. Blow out motor air vents with compressed air only.
59. Check filter doors and access doors for proper gasketing and air leaks. Correct as necessary.
60. Lubricate fan shaft bearings while unit is running. Add grease slowly until slight bleeding is noted from the seals. Do not over lubricate. Remove old or excess lubricant.
61. Ensure that drains are clear and running.
62. Clean up work area.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Tool Group A
2. Tachometer
3. Grease gun and oiler
4. Pressure washer
5. Vacuum.
6. Fin comb
7. Cleaning tools and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
8. Safety goggles.
9. Gloves.
10. Data processing software, for example Microsoft Office.

HVAC-AHU-05-01Y

Frequency: Annually

Packaged Air Handler, Predictive Maintenance

Application

This standard applies to packaged air handlers with compressors and/or gas burners. This standard includes some predictive maintenance Tasks and can be used as an alternative to the purely preventive maintenance standard. If the facility elects to use this standard as a substitute for the preventive maintenance air handler standard, then it is not necessary to follow the relevant air filter maintenance preventive standard.

O&M contractors may propose changes to this standard. Such changes are subject to GSA approval. Proposed changes to standards must be submitted showing markups of changes for GSA approval.

This standard may be used in lieu of standard HVAC-AHU-04-01Y.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule shutdown with operating personnel, as needed.
5. Preventive maintenance on associated equipment should be accomplished at this time.

Check Points:

1. Check fan blades for dust buildup and clean if necessary.
2. Check fan blades and moving parts for cracks and excessive wear.
3. Check fan RPM against design specifications.
4. Check running motor amperatures on all three phases. Compare with manufacturer’s specifications.
5. Check dampers for dirt accumulations, clean as necessary. Check belt, repair or replace as necessary.
6. Check damper actuators and linkage for proper operation. Adjust linkage on dampers if out of alignment.
7. Lubricate mechanical connections of dampers sparingly.

8. If unit is a multi-zone air handler, then check each individual zone damper and associated controls.

Condenser

1. Remove debris from air screen and clean underneath unit.
2. Pressure wash coil with proper cleaning solution.
3. Straighten fin tubes with fin comb.
4. Check electrical wiring and tighten loose connections. Check fused disconnect switches for condition and operation.
5. Check mounting for tightness.
6. Check for corrosion. Clean and treat with inhibitor as needed.
7. Check fan or blower for bent or damaged blades and imbalance.
8. Lubricate shaft and motor bearings on fans and remove old or excess lubricant.
9. Inspect pulleys, belts, couplings, etc.; adjust tension and tighten mountings as necessary. Change badly worn belts. Multi-belt drives should be replaced with matched sets.
10. Condenser tubes should be inspected and cleaned. Condenser tubes from open tower systems may have contamination or hard scale. Excessive corrosion, scaling, erosion and algae typically indicate improper or lack of an adequate water treatment program. Consult water treatment standard for proper procedures.
11. Clean coils by brushing, blowing, vacuuming, or pressure washing.

Evaporator

1. Evaporator tubes should be inspected and cleaned of scale. Inspect and clean temperature sensors and flow switches.
2. Inspect plumbing, valves and flanges for leaks and correct.

Compressor(s)

1. Lubricate drive coupling.
2. Lubricate motor bearings (non-hermetic).
3. Check and correct alignment of drive couplings.
4. Inspect evaporator tubes for scale. Clean if required. Leak test tubes using a halogen leak detector or suitable substitute.
5. Add refrigerant per manufacturer's instructions if needed.
6. Check compressor oil level.
7. Run machine; check action of controls, relays, switches, etc. to see that:
8. Compressor(s) run at proper settings.
9. Suction and discharge pressures are proper.
10. Check and adjust vibration eliminators. Replace as necessary.

11. Sample test the refrigerant and oil to verify compliance with the Air Conditioning and Refrigeration Institute standards. Based on the results, refrigerant may need to be replaced or recycled, and oil replaced.
12. Check and calibrate safety controls.

Gas Burner

1. Check operation of all gas controls and valves including: manual gas shutoff; petal gas regulator; safety shutoff valve (solenoid); automatic gas valve; petal solenoid valve; butterfly gas valve, motor, and safety petal solenoid (if used.)
2. Check flue connections for tight joints and minimum resistance to air flow. (combustion chamber, flues, breaching, and chimney are clear before firing.)
3. Draft regulators require slightly negative pressure in the combustion chamber at maximum input.
4. On forced draft burners, gas manifold pressure requirements should correspond with modulating (butterfly) valve in full open position and stable at all other firing rates.
5. At high and low fire rates on burners equipped with OFF/LOW FIRE/HIGH FIRE control.
6. At single firing load point on boilers equipped with OFF/ON controls only.
7. Check burner for flashback and tight shutoff of fuel.
8. Check operation of automatic controls and combustion flame safeguards. Clean and adjust, if necessary.
9. Operation and adjustments should conform with manufacturer's instructions.
10. Flush and clean condensate pans and drains, remove all rust prepare metal and paint. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less. Hose down coils and drain pans and wash with an appropriate EPA approved solution approved solution. Treat condensate pans with an EPA approved biocide. If applicable, test and clean condensate pumps.
11. Check rigid couplings for alignment on direct drives, and for tightness of assembly. Check flexible couplings for alignment and wear.
12. Vacuum interior of unit.
13. Blow out motor air vents with compressed air only.
14. Check filter doors and access doors for proper gasketing and air leaks. Correct as necessary.
15. Lubricate fan shaft bearings while unit is running. Add grease slowly until slight bleeding is noted from the seals. Do not over lubricate. Remove old or excess lubricant.
16. Ensure that drains are clear and running.
17. Clean up work area.

Recommended Tools, Materials, and Equipment:

1. Tool Group A
2. Tachometer
3. Grease gun and oiler
4. Pressure washer
5. Vacuum.
6. Fin comb
7. Cleaning tools and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
8. Safety goggles.
9. Gloves.
10. Data processing software, for example Microsoft Office.

HVAC-AHU-06-01Y

Frequency: Annually

Air Washer or Wet Coil System

Application:
This standard card applies to those installations that utilize an air washer or a wet coil system on their air handler units. Air washers consist of a spray chamber, without coils, into which chilled water is sprayed for the purpose of cooling the air flowing through it. In a wet coil system, water is sprayed onto a chilled water coil for the purpose of providing better heat transfer between the coil and air. The air handler will be serviced using the standard for Air Handlers and the air washer or wet coil system should be scheduled for accomplishment at the same time. Direct or Indirect Evaporative Cooling Units shall be serviced under their specific Maintenance Standards.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule outage with operating personnel.
5. Open, lock, and tag out electric circuits serving motors for the air handler and spray pump.
6. Preventive maintenance on associated equipment should be accomplished at this time.
7. Secure and tag all water valves supplying the pan or sump.

Check Points:

1. Examine and wire brush all structural elements including doors, chamber, piping, supports, pans, sumps, and framing.
2. Clean tank or sump and examine for leaks.
3. Treat with rust inhibitor and paint as required. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less.
4. Clean suction screens.
5. Remove nozzles and clean. Replace as required.
6. Check piping for blockage or buildup. Clean or replace as required.
7. Check operation of float valve, mixing or automatic control valves and thermometers.
8. Check lights for water seal and operation. Replace as necessary.
9. Pumps and motors less than 1 HP will be serviced as part of this PM. Pumps and motors 1 HP and larger will be serviced using PM standard cards HVAC-PMP-01 and ELEC-MOT-01 respectively.
    a. Clean and lubricate pump. Check and replace packing if applicable.
    b. Blow out or vacuum motor windings and lubricate if required.

10. Remove tags and lockout from circuits for spray pump only.
11. Check with operating personnel before restoring circuits to the air handlers, to be certain personnel are not working on the unit.

Note: Pans and sumps should remain dry during winter operation. Tags should be removed from supply valves at the completion of this work, but the valves should be opened by operating personnel only when the unit is to be filled and placed in service.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Cleaning tools and materials, vacuum, grease gun and oil.
3. Rust inhibitor and paint. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
4. Gasket material
5. Goggles

HVAC-AHU-07-01Y

Frequency: Annually

Hot Air Furnace

Application

Hot air furnaces are used primarily to heat, but can be used with refrigerant coils to cool or as a backup for heat pump applications using multi-speed fan motors. These units can be horizontal or vertical, heating only or heating/cooling.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection."
4. Schedule shutdown with operating personnel.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Coordinate other related preventive maintenance items, such as, motors, burners, fuel tank, humidifier, or other equipment.

Check Points:

1. Remove furnace ends and access panels if applicable.
2. Check the fire box liner or refractory for cracks and leaks.
3. Check smoke stack for obstructions, leaks, etc.
4. Clean bottom of smoke stack (breaching).
5. Clean all fans and motors.
6. Check operation of controls and safeties.
7. Lubricate as required.
8. Check and clean plenum (clean cooling coils and check for leaks, if equipped.)
9. Replace furnace and access panels ends if removed.
10. Check all motors, belts, pulleys, shafts, etc. for alignment.
11. Treat all rusted areas with rust inhibitor and touch up paint.
12. Remove lock outs and tags. Restore fuel and power supply.

Recommended Tools and Equipment:

1. Tool Group A and B
2. Vacuum cleaner and attachments

3. Rust inhibitor, paint, brushes. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper personal protective equipment (PPE). Consult the MSDS to ensure that the paint lead level is 0.06% or less.
4. Cleaning and patching materials. Consult the MSDS for hazardous ingredients and proper PPE.
5. Respirator, goggles and gloves.
6. Flue and stack cleaning brushes.

HVAC-AHU-08-01Y

Frequency: Annually

AHU UV Treatment System

Application

Ultra-Violet (UV) Light systems are installed in the central air system where it suppresses mold grown on the cooling coils and surrounding areas to improve indoor air quality.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Review manufacturer's instructions.
3. UV lights shall be replaced at a maximum of 10,000 run time or based on measuring intensity. Replace if below manufacturers recommended limit.
4. Avoid exposure to UV light, there is potential for eye or skin damage.
5. Schedule shutdown with operating personnel.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Coordinate other related preventive maintenance items, such as, motors, burners, fuel tank, humidifier, or other equipment.

Check Points:

1. Check for evidence of loose connections.
2. Replace all lamps if exceeding 10,000 hours use or below manufacturers minimum intensity level. Note that lamps may not appear to be degraded, but still require replacement.

Recommended Tools and Equipment:

1. Tool Group A and B
2. Manufacturer's recommended PPE for UV light

HVAC-AIR-01-06M

Frequency: Semi-annually

Air Dryer, Refrigerated or Regenerative Desiccant Type

Application:

This standard card applies to refrigerated or regenerative desiccant type air dryers with a capacity of 10 SCFM or greater. Those units with a capacity of less than 10 SCFM will be maintained in conjunction with the air compressor that they are associated with.

Special Instructions:

1. Schedule this maintenance in conjunction with the maintenance on the associated air compressor.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
5. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
6. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
7. Recover, recycle, or reclaim the refrigerant as appropriate.
8. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the item.
9. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
10. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
11. For refrigerant type units, closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check Points:

1. Lubricate valves and replace packing, if necessary.
2. Check dryer operating cycle.
3. Inspect and clean heat exchanger.
4. Check outlet dew point.
5. Clean and lubricate blower.

6. Check automatic blow down devices.
7. Inspect and replace or reinstall inlet filters.
8. Refrigerated Type:
    a. Check traps.
    b. Check refrigerant level and moisture content. If low level or moisture is indicated, check for refrigerant leaks using a halogen leak detector or similar device. If leaks are not able to be stopped or corrected, report leak status to supervisor.
    c. Clean and lubricate condenser fan motor.
9. Desiccant Type:
    a. Replace filter cartridges, both prefilter and afterfilter.
    b. Check the inlet flow pressure, temperature and purge rate.
    c. Check the desiccant and replace if necessary.
    d. Inspect and clean solenoids, purge valves, and strainers.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Tool Group A
2. Cleaning equipment, lubricants, approved refrigerants if applicable, and materials. Consult the Material Safety Data Sheets (MSDS) and container labels for hazardous ingredients and proper personal protective equipment (PPE).
3. Filter cartridges (for desiccant type dryer)
4. Gasket and packing material
5. Fin comb
6. Self sealing quick disconnect refrigerant hose fittings
7. Refrigerant recovery/recycle unit
8. EPA/DOT approved refrigerant storage tanks

HVAC-AIR-02-06M

Frequency: Semi-annually

Air Compressor

Application:

This standard card applies to air compressors which supply system air or Building Automation control air to a building. Compressors may come equipped with air dryers or be installed in multiples. Significant energy can be lost through leaks in the system.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions and equipment history record.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Coordinate motor PM on an annual basis.
5. Tank should be inspected and tested by qualified inspector.

Check points:

1. Perform normal tour checks and operations. Perform a visual inspection of the air system, noting any obvious leaks or portions of the air distribution network that may be subject to physical damage.
2. Change compressor crankcase oil.
3. Clean or replace air intake filter.
4. Check air dryer, automatic condensate drains, and air tank for proper operation. Clean condenser coils and cover grills.
5. Inspect oil separators for any sign of oil entering the system.
6. Inspect belt alignment and condition. Adjust or replace belts as required. Belts should be replaced in complete sets.
7. Check for corrosion and scale on water cooled units.
8. Clean heat exchange surfaces.
9. Check accuracy of gauges with calibrated test gauge.
10. On two stage compressor, check intermediate pressure.
11. Test relief valves, replace if leaking or the relief range is incorrect. Do not readjust safety relief valves in the field.
12. Check operation of compressor unloaders, repair or replace if not loading and unloading properly.
13. Check compressor suction and discharge valves for proper operation. Replace leaking valves.

14. Check cut in and cut out of compressor pressure controller, readjust if necessary for proper air pressure requirements. Do not exceed ASME maximum tank pressure.
15. Check to make sure belt guard is installed prior to putting air compressor back in service.
16. No pressure vessel is to have its hand hole or man hole covers removed unless the vessel is at atmospheric pressure.
17. Ensure the pressure vessel inspection certificate is posted at machine.
18. Check if air compressor is running excessively or frequently cycling on and off (possible leaks). Log hour meter readings.
19. Perform an air leak check of the compressor and air distribution network in the equipment room, using an appropriate ultrasonic scanning device. Check hoses, hose connections, hose fittings, quick couplers, filters, regulators and lubricators. Correct or schedule repair as a work item. Tag location and date of leaks. Repair air leaks as soon as possible.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Belts
3. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Fin comb
5. Vacuum cleaner commercial type
6. Test gauge
7. Ultrasonic scanner with trisonic and contact scanning modes.

HVAC-AIR-03-06M

Frequency: Semi-annually

Glycol Dry Cooler, Special Purpose

Application:

These units will be associated with special purpose or critical use packaged air conditioning units and refrigeration units, or would stand alone when utilized in free cooling.

Special Instructions:

1. Schedule outage with operating personnel.
2. Obtain and review manufacturer's instructions for starter to be tested (including the time current characteristic curve).
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection."

Check points:

1. Dry Cooler Check Points:
    a. Remove debris from air screen and clean underneath unit.
    b. Pressure wash coil with coil cleaning solution. Check the Material Safety Data Sheets (MSDS) to ensure that the coil cleaner does not contain hydrofluoric acid or another irritating or hazardous compound.
    c. Straighten fin tubes with fin comb.
    d. Check electrical connections for tightness.
    e. Check mounting for tightness.
    f. Check for corrosion. Clean and treat with rust inhibitor and touch up paint as needed. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
2. Motors and Fans Check Points:
    a. Inspect pulleys, belts, couplings, etc.; adjust tension and tighten mountings as required. Change badly worn belts. Multi-belt drives should be replaced with matched sets.
    b. Perform required lubrication and remove old or excess lubricant.
    c. Clean motor with vacuum or low pressure air (less than 40 psi). Check for obstructions in motor cooling and air flow.
3. Expansion Tank Check Points:
    a. Examine exterior of tank, including fittings, manholes, and handholes for leaks, signs of corrosion. Repair/paint as necessary.

   b. Inspect structural supports and repair or replace damaged insulation or covering.
   c. Clean, test, and inspect sight glasses, valves, fittings, drains, and controls.
   d. Perform hydrostatic test if required.
   e. Check antifreeze level with hydrometer and add glycol base antifreeze as required for protection to minus 40 degrees Fahrenheit.

4. Electrical Controls Check Points:
   a. Visually inspect for broken parts, contact arcing, or any evidence of overheating.
   b. Check motor name plate for current rating and controller manufacturer's recommended heater size. (Heater size shall not be changed without the Regional Design Engineer's approval.)
   c. Check line and load connections and heater mounting screws for tightness.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Standard tools - basic.
2. Pressure washer
3. Fin comb
4. Paint brush
5. Cleaning materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
6. Respirator
7. Safety goggles
8. Antifreeze - glycol base
9. Rust inhibitor. Consult the MSDS for hazardous ingredients and proper PPE.
10. Vacuum cleaner
11. Hydrometer (to check antifreeze level)

HVAC-AIR-04-06M

Frequency: Semi-annually

After-Cooler/Separator

Application:

This standard card applies to the after-cooler/separator utilizing chilled water to condense moisture from large compressed air systems. These differ from mechanical/chemical type air dryers. Maintenance on this item should be performed with air compressors which supply the air through the after cooler.

Special Instructions:

1. Schedule outage with operating personnel.
2. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
3. Provide an alternate source of air, if necessary.
4. Schedule Preventive Maintenance (PM) on associated equipment if possible.
5. Secure air and chilled water valves and tag them.
6. Wear appropriate protective equipment.
7. Use caution when disassembling. Check for and relieve pressure where found.

Check Points:

1. Unbolt and remove supply and discharge water lines.
2. Unbolt supply and discharge air flanges and lower assembly.
3. Remove tube bundle assembly.
4. Check tube bundle for deterioration or ruptured tubes.
5. Clean exterior of the tube of all scale buildup.
6. Flush out the tube bundle shell.
7. Visually inspect the shell, flanges, piping, etc. for deterioration, cracks, etc.
8. Clean the trap orifice of all carbon and heavy grease buildup.
9. Reassemble the tube bundle in the shell using new gaskets and seals.
10. Replace assembly and separator in pipe line, using new gaskets.
11. Reconnect the supply and discharge water lines.
12. Remove tags, open air and water valves, restore power, and start air compressor.
13. Check operation of unit. Check the air and water inlet and outlet temperatures.
14. Check all connections for leaks.
15. Wire brush, treat with rusticide and primer rusted areas. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper personal protective equipment (PPE). Consult the Material Safety Data Sheet to ensure that the paint lead level is 0.06% or less.

Recommended Tools, Materials, and Equipment:

1. Tool Group - C.
2. Ladder constructed according to OSHA/ANSI standards. Check ladder for defects. Do not use defective ladders.
3. Vacuum and Tube Cleaning Equipment
4. Gasket material and Seals
5. Lifting device (hoist, come-a-long, hydraulic lift etc.)
6. Length of garden hose.
7. Rusticide, primer and paint supplies. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).

HVAC-BLR-01-01Y

Frequency: Annually

Boiler, Natural Gas and Oil Fired

Application:

This standard card applies to both heating boilers and power boilers which use either natural gas or fuel oil for their fuel source. The standard card will identify which information applies to only one of these two boilers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform boiler external inspection with internal inspection and annual preventive maintenance.
3. Review manufacturer's instructions and ASME Boiler and Pressure Vessel Codes for boilers.
4. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Protection."
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. All automatically and manually operated control devices provided for controlling operation and safety of the vessel, steam or water pressure, hot water temperature, combustion, and boiler water level shall be inspected under operating conditions.
7. All associated valves and piping, pressure and temperature indicating devices, metering and recording devices, and all boiler auxiliaries shall be inspected under operating conditions.
8. All combustion controls attached to the boiler regardless of the fuel being fired must be in good working order or the inspection certificate shall be withheld.
9. Close and tag all hand or motorized valves required to isolate the boiler. Chain and lock all valves that are closed for safety. These valves shall not be unlocked and reopened unless authorized by the originator of the work authorization. Enter this information in the boiler log and sign.
10. Wear appropriate respirator, goggles, and gloves while in contact with hazardous materials. Contact the Safety and Environmental Management Division/Branch if you have questions.
11. Lighting: Flashlight should be used in preference to an extension light. When a portable extension light is used in a confined space, it shall not be operated at more than 12 volts.

12. Perform internal boiler inspection in accordance with requirements of American Society of Mechanical Engineers (ASME), Section VI, Recommended Rules for Care and Operation of Heating Boilers, and Section VII, Recommended Rules for Care of Power Boilers; and National Board Inspection Code ANSI/NB-23, A Manual for Boiler and Pressure Vessel Inspectors.
13. Inspection shall be performed by inspectors certified by the National Board of Boiler Pressure Vessel Inspectors.
14. Prepare boiler for internal inspection in the following manner:
    a. Fuel supply and ignition system shall be locked out.
    b. Water shall be drawn off and water side thoroughly washed out.
    c. Manhole and handhole plates, washout plugs, inspection plugs in water column connections shall be removed.
    d. The boiler shall be cooled and thoroughly cleaned.
    e. All grates of internally fired boilers shall be removed.
    f. Insulation and brickwork shall be removed as required to determine condition of boiler, headers, furnace, supports or other parts.
    g. Pressure gage(s) shall be removed and tested.
    h. Any leakage of steam or hot water into the boiler shall be prevented by disconnecting the pipe or valve at the most convenient point.
    i. Before opening the manhole and entering any part of the boiler, the required steam or water system stop valves must be closed, tagged, and padlocked. All drain valves or cocks located between the two valves shall be opened.
15. Inspector will not enter boiler until satisfied that necessary safety precautions and pre inspection preparations have been made.
16. If a boiler has not been properly prepared for an internal inspection, the inspector should decline to make the inspection.
17. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.
18. Account for all tools, materials, and equipment before closing boiler.

<u>Children of this Piece of Equipment</u>

The following equipment items are the children of this piece of equipment and the PMs for these items should be completed at the same time. See other sections of this standard for the detailed PM requirements for the children equipment.

1. Forced Draft Fan Blower motor.
2. Burner, Gas or Oil.
3. Boiler and Boiler Room Controls.
4. Heat Recovery Unit (i.e. feedwater economizer)

a. Visually inspect for corrosion and/or soot accumulation. Note: the temperature differential across the economizer can be taken to determine combustion efficiency.

Check points:

External Inspection Procedure:

1. Inspect overall cleanliness and accessibility of boiler and auxiliary equipment. Boiler fittings, valves and piping should be checked for compliance with ASME code and jurisdictional requirements.
2. Pressure Gages: Note the pressure reading indicated on pressure gage and compare it with another gage on the same system or with a standard test gage.
3. Water Level Gage Steam Boilers:
    a. Observe the blowdown of the water gage in its normal manner and the promptness of the return of water in the gage should be noted.
    b. During the test of the water level gage, water and steam connections should be blown separately to ensure both are clear.
4. Safety and Safety Relief Valves:
    a. Safety valves should be tested by allowing the pressure in the boiler to rise to the popping pressure, and subsequent fall, to check the actual popping pressure and blowdown. If this is not practical, the valve should be tested by the boiler operator for free operation by use of the lifting lever, provided the boiler pressure is 75% or more of the set pressure.
    b. Inspect valve discharge pipe to determine if discharge pipe is free and in accordance with ASME Code requirements.
    c. When inspections reveal that a safety valve is not operating properly, the boiler shall be taken out of service and the valve shall be replaced or repaired.
5. Low Water Fuel Cutoff or Feed Controls: Observe the test of these controls after the drain has been opened. Close the drain and observe the promptness of the return to normal such as the silencing of an alarm or stopping of a feed pump should be noted. The float linkage and connections should be examined for wear and the float chamber should be free of sludge or other accumulation.
6. Blowoff Piping Power Boilers: Observe blowdown of the boiler in normal manner, check for freedom of piping to expand and contract and ensure there is no excessive vibration.
7. Flame Failure Cutoff and Alarm.: Test flame failure shutdown and alarm on both pilot failure and main flame failure by securing fuel source. Ensure shutdown and alarm occurs in accordance manufacturers and ASME requirements.
8. Piping, Connections and Fittings:

   a. Inspect piping to ensure there is provision for expansion and adequate support.
   b. Piping and fittings should be examined for evidence of leakage and excessive vibration. Also closely examined to determine that they are properly rated for the service conditions to which they are subjected.
9. Scale, oil, etc.:
   a. Examine all surfaces of exposed metal on waterside of boiler for deposits caused by water treatment, scale, oil, or other substances.
   b. The smallest amount of oil is dangerous and immediate steps should be taken to clean affected surfaces and prevent further contamination, excess scale or other deposits should be removed by appropriate chemical or mechanical means.
10. Pressure controls (heating steam boilers): Verify that each automatically fired steam boiler is protected from over pressure by not less than two pressure operated controls one of which may be an operating control.
11. Determine if there is ample provision for expansion between the sections.
12. Check for excessive rust build-up between sections (cast iron type).
13. Examine all steam and water line to controls to determine that they are clear of scale and arranged to insure proper control operations.
14. Clean stems and shafts, and tighten packing nuts on valves and pumps.
15. Flush fuel oil strainer baskets and oil solenoid valve seats.
16. Dismantle low water fuel cut offs and water feeders to insure freedom from obstructions and proper functioning of the working parts. Always replace old gaskets before reassembling.
17. Inspect connecting lines to boiler for accumulations of mud, scale, etc., and clean as needed.
18. Examine all visible wiring for brittle or worn insulation, and make sure electrical contacts are clean, adequately tightened, and functioning properly.
19. On electrical type detection devices, replace vacuum tubes annually, and replace defective solid state devices.
20. Replace fusible plugs, if applicable.

<u>Hydrostatic Test</u>

1. Hydrostatic Test:
   a. The test pressure should not exceed 1½ times the maximum allowable working pressure.
   b. The safety valve or valves should be removed or each disk shall be held down by means of a testing clamp.
   c. While at test pressure, time should be given to examine the complete pressure vessel for leaks prior releasing pressure.
2. Safety and Safety Relief Valves:

   a. Check valves for correct pressure setting and adequate discharge pipe supports.
   b. The safety or safety relief valve on a steam or hot water heating boiler should be tested manually once each month and pressure tested once each year.
3. Pressure Gages:
   a. When required, pressure gages shall be tested and calibrated.
   b. Location of steam pressure gage(s) should be noted to determine whether it is exposed to high temperature from an external source or to internal heat due to lack of protection by a proper siphon or trap.

Internal Inspection

1. When the boiler has cooled to the ambient boiler room temperature, wash out mud legs, and flush boiler.
2. To protect the boiler from unnecessary stresses the boiler water temperature should be allowed to reach the boiler room temperature before draining the boiler. Drain boiler, tag valves and controls. NEVER attempt to remove a manhole or handhole cover without first properly venting the water or steam side of a boiler to the atmosphere. Prior to opening or entering a boiler it must be at atmospheric pressure.
3. Inspect the boiler tube surfaces for rust and soot buildup. Rust is an indicator of condensation. The tubes should be brushed. Vacuum debris from all surfaces.
4. Clean breaching, ducts, fireboxes, or main fire tube, and flue passages. Vacuum debris from all surfaces.
5. Check and replace worn or damaged insulation. Repair the damage and remove the debris. If the insulation contains asbestos, refer to Appendix G for the Universal Waste Guide.
6. Check refractory and brick work; if damaged notify supervisor and enter this data in boiler log.
7. Stays and stay bolts:
   a. Examine stays to determine whether or not they are in even tension. All fastened ends should be examined to determine whether cracks exist where stays are punched or drilled for rivets or bolts.
   b. Test firebox stay bolts by tapping one end of each bolt with a hammer and, where practical, a hammer or other heavy tool should be held on the opposite end to make the test more effective. An unbroken bolt should give a ringing sound while a broken bolt will give a hollow sound. Replace broken stay bolts.
8. Examine manholes, reinforcing plates and nozzles or other connections flange or screwed into the boiler for evidence of defects both internally and externally. If possible, observation should be made from the inside of the boiler as to whether connections are properly made to the boiler. Examine all openings

leading to external attachments, such as water column connections, low water fuel cutoff devices, openings in dry pipes and openings to safety valves to ensure they are free from obstruction.

9. Fire Surfaces:
    a. Examine for bulging and blistering:
    b. Inspect all plate or tube surfaces exposed to the fire also check whether any part of the boiler has become deformed by bulging and blistering.
10. Cracks:
    a. Examine vulnerable areas such as ligaments between the holes on watertube boiler drums, between tube holes on tube sheet of firetube boilers, at any flange where repeated flexing of the plate occurs during operation and around welded pipe and tube connections.
    b. Lap joint boilers are subject to cracking where plates lap in the longitudinal seam. If there is any evidence of leakage or other distress at this point, the inspector should thoroughly examine the area to determine whether cracks exist in seams. REPAIR OF LAP JOINT CRACKS ON LONGITUDINAL SEAMS IS PROHIBITED.
11. Corrosion:
    a. Inspect for corrosion.
    b. When active corrosion is found, provide advice to correct as necessary.
12. Grooving:
    a. Inspect for grooving. Examine as construction permits all flange surfaces, particularly the flanges of unstayed heads.
    b. Provide corrective advice for any defects found.
13. Firetubes: Examine closely for reduction in thickness near or at tube ends.
14. Watertubes:
    a. Inspect for corrosion, erosion, bulges, cracks, or any evidence of defective welds.
    b. Examine short tubes and nipples used to join drums and headers, there is a tendency for fuel and ash to lodge in these areas and corrosion is likely in the presence of moister.
15. Blowoff Piping:
    a. Inspect blowoff piping connections and fittings.
    b. Determine that blowout piping is properly secured and discharges at a safe point.
16. Brush all tubes clean of scale.
17. Brush plate surfaces clean, use vacuum cleaner.
18. Refill boiler with water and chemicals if boiler is to be put back in service or if wet-lay-ups are to be employed.

<u>Check Points for Equipment Functional Testing</u>

All safeties, interlocks, and alarms operate correctly in both automatic and manual operating modes. Verify proper sensor installation and calibration. The DDC control system relies on input from various sensors (such as temperature, pressure, and flow) in order to achieve the desired system operation. If sensors are not located correctly, or the measured value from any sensor to the control algorithm is incorrect, the system will not respond as intended.

1. Actuation and Sequencing
    A. Verify that automatic isolation valves are installed and operate correctly, if applicable. (Automatic isolation valves are typically installed when multiple boilers are connected to a common supply header. Boilers with dedicated pumps generally do not have automatic isolation valves.) When an individual boiler is not operating, the isolation valve should be closed to prevent water from circulating through the unit.
    B. Verify proper boiler staging under normal operation, as well as under all failure and emergency operating modes, especially if multiple units are installed which are unequal in size.
    C. Verify that the boilers and primary/feed water pumps stage up and down per the sequence of operations under all operating modes.
    D. Verify that the time delay between boiler start/stop commands are per design.
    E. To remove residual heat from the boiler, the primary/feed water pump operation time delay, after the boiler is commanded OFF, is per design.
2. Setpoints and Reset Controls
    A. Verify that the system operates and maintains hot water supply temperature setpoint under all operating modes, including automatic, manual, and failure/emergency modes.
    B. Verify proper coordination between individual setpoints and reset strategies.
    C. Verify that the control algorithms generate the proper water temperature setpoint based on the reset parameters specifies in the sequence of operations.
    D. Verify that the reset parameters are optimized for the system. In addition, ensure the reset control strategy does not result in a return water temperature from the building loads, which can cause the flue gasses to condense in non-condensing boiler systems.
    E. Verify that the O2 trim controls, if applicable, operate to ensure that excess oxygen in flue gas is maintained at setpoint. If O2 trim controls are not installed, review flue gas report and verify the boiler was tuned at high-fire and at least one intermediate part-load operating point.

3. Control Accuracy and Stability
    A. Verify that all control loops stabilize within a reasonable amount of time (typically 2 to 5 minutes) after a significant load change such as start-up or automatic/manual recovery from shut down.
4. Document results of functional testing.

Reporting:

1. During all tests the actual operating and maintenance practices should be noted by the Inspector and a determination made as to their acceptability.
2. Record Review: Review the boiler log and records of maintenance and feed water treatment to insure that regular and adequate tests have been made on the boiler and controls.
3. Reports and Records:
    a. GSA Form 349, Inspection Report of Boiler, shall be prepared for each boiler when it is inspected.
    b. GSA Form 1034, Certification of Inspection, shall be issued when the boiler has been approved for operation. The original and one copy is required. The original is posted on or near the equipment and the copy is forwarded to the regional office, if required.
4. Conclusions: Any defects or deficiencies in condition, operating and maintenance practices of the boiler and auxiliary equipment should be discussed by the inspector with the owner or user at this time.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Scrapers, wire brush, cleaning materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Combustion testing equipment
4. Hydrostatic pump and safety valve gag
5. Respirator
6. Safety goggles
7. Safety signs
8. Suitable chain and locks for securing isolation valves.
9. Boiler chemicals as directed by a competent water treatment company. Consult the MSDS for hazardous ingredients and proper PPE.
10. Vacuum cleaner wet/dry type.

HVAC-BLR-02-01Y

Frequency: Annually

Boiler, Electric

Application
This standard applies to any boilers that use only electricity to heat the water for use. Generally, these units are smaller than the gas or oil fired boilers, unless there is no gas or oil available at the location.

Special Instructions:

1. Perform boiler external inspection with internal inspection and annual preventive maintenance.
2. Review manufacturer's instructions and ASME Boiler and Pressure Vessel Codes for boilers.
3. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Protection."
4. Review boiler wiring diagram.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. All automatically and manually operated control devices provided for controlling operation and safety of the vessel, steam or water pressure, hot water temperature, combustion, and boiler water level shall be inspected under operating conditions.
7. All associated valves and piping, pressure and temperature indicating devices, metering and recording devices, and all boiler auxiliaries shall be inspected under operating conditions.
8. Close and tag all hand or motorized valves required to isolate the boiler. Chain and lock all valves that are closed for safety. These valves shall not be unlocked and reopened unless authorized by the originator of the work authorization. Enter this information in the boiler log and sign.
9. Wear appropriate respirator, goggles, and gloves while in contact with hazardous materials. Contact the Safety and Environmental Management Division/Branch if you have questions.
10. Lighting: Flashlight should be used in preference to an extension light. When a portable extension light is used in a confined space, it shall not be operated at more than 12 volts.
11. Perform internal boiler inspection in accordance with requirements of American Society of Mechanical Engineers (ASME), Section VI, Recommended Rules for Care and Operation of Heating Boilers, and Section VII, Recommended Rules for Care of Power Boilers; and National Board Inspection Code ANSI/NB-23, A Manual for Boiler and Pressure Vessel Inspectors.

12. Inspection shall be performed by inspectors certified by the National Board of Boiler Pressure Vessel Inspectors.
13. Prepare boiler for internal inspection in the following manner:
14. Fuel supply and ignition system shall be locked out.
15. Water shall be drawn off and water side thoroughly washed out.
16. Manhole and handhole plates, washout plugs, and inspection plugs in water column connections shall be removed.
17. The boiler shall be cooled and thoroughly cleaned.
18. All grates of internally fired boilers shall be removed.
19. Insulation and brickwork shall be removed as required to determine condition of boiler, headers, furnace, supports or other parts.
20. Pressure gage(s shall be removed and tested.
21. Any leakage of steam or hot water into the boiler shall be prevented by disconnecting the pipe or valve at the most convenient point.
22. Before opening the manhole and entering any part of the boiler, The required steam or water system stop valves must be closed, tagged, and padlocked. All drain valves or cocks located between the two valves shall be opened.
23. Inspector will not enter boiler until satisfied that necessary safety precautions and pre inspection preparations have been made.
24. If a boiler has not been properly prepared for an internal inspection, the inspector should decline to make the inspection.
25. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.
26. Account for all tools, materials, and equipment before closing boiler.

<u>Check points</u>:

1. Inspect overall cleanliness and accessibility of boiler and auxiliary equipment. Boiler fittings, valves and piping should be checked for compliance with ASME code and jurisdictional requirements.
2. Pressure Gages: Note the pressure reading indicated on pressure gage and compare it with another gage on the same system or with a standard test gage.
3. Clean boiler by:
    a. Placing boiler cleaning compound through appropriate opening in top of boiler. (Compound must not react against copper elements).
    b. Operate boiler according to instructions.
    c. Shut-off power by turning off pilot switch.
    d. Open bottom blow-down valve to full open to let sludge and scale blow out of boiler.
    e. Refill with water and close pilot switch.

4. Check nameplate for KW rating, voltage and amperage. Check electrical supply voltage to verify it conforms to boiler requirements.
5. Safety and Safety Relief Valves:
    a. Safety valves should be tested by allowing the pressure in the boiler to rise to the popping pressure, and subsequent fall, to check the actual popping pressure and blowdown. If this is not practical, the valve should be tested by the boiler operator for free operation by use of the lifting lever, provided the boiler pressure is 75% or more of the set pressure.
    b. Inspect valve discharge pipe to determine if discharge pipe is free and in accordance with ASME Code requirements.
    c. When inspections reveal that a safety valve is not operating properly ,the boiler shall be taken out of service and the valve shall be replaced or repaired.
6. Clean stems and shafts, and tighten packing nuts on valves and pumps.
7. Inspect connecting lines to boiler for accumulations of mud, scale, etc., and clean as needed.
8. Examine all visible wiring for brittle or worn insulation, and make sure electrical contacts are clean, adequately tightened, and functioning properly.
9. On electrical type detection devices, replace vacuum tubes annually, and replace defective solid state devices.
10. Replace fusible plugs, if applicable.

Reporting:

1. During all tests the actual operating and maintenance practices should be noted by the Inspector and a determination made as to their acceptability.
2. Record Review: Review the boiler log and records of maintenance and feed water treatment to insure that regular and adequate tests have been made on the boiler and controls.
3. Reports and Records:
    a. GSA Form 349, Inspection Report of Boiler, shall be prepared for each boiler when it is inspected.
    b. GSA Form 1034, Certification of Inspection, shall be issued when the boiler has been approved for operation. The original and one copy is required. The original is posted on or near the equipment and the copy is forwarded to the regional office, if required.
4. Conclusions: Any defects or deficiencies in condition, operating and maintenance practices of the boiler and auxiliary equipment should be discussed by the inspector with the owner or user at this time.

Recommended Tools, Materials, and Equipment:

1. Tool Group C.

2. Scrapers, wire brush, cleaning materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Combustion testing equipment.
4. Hydrostatic pump and safety valve gag.
5. Respirator.
6. Safety goggles.
7. Safety signs.
8. Suitable chain and locks for securing isolation valves.
9. Boiler chemicals as directed by a competent water treatment company. Consult the MSDS for hazardous ingredients and proper PPE.
10. Vacuum cleaner wet/dry type.

HVAC-BLR-03-01Y

Frequency: Annually

Burner, Gas

Application

This standard applies to any boilers with burners that use Natural Gas as their fuel source. These can be either natural draft or forced draft type of boilers.

Special Instructions

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Verify that the annual inspections for the boiler have been satisfactorily performed.
4. As part of the combustion gas analysis, Nitrous Oxide (NOX) should be checked and compared with the local authority's requirements. Many areas now have maximum standards for NOX to assist in reducing pollution. Depending on the age of the boiler and burner, specific requirements may exist.
5. Some jurisdictions may require 3rd party (independent) combustion and operational testing to verify boiler and burner operation.

Parent of this Piece of Equipment

Boiler, Gas or Oil Unit Heater

Check points:

1. Check boiler room for ventilation in accordance with the American Gas Association (AGA) burner requirements.
2. Check operation of all gas controls and valves including: manual gas shutoff; petal gas regulator; safety shutoff valve (solenoid); automatic gas valve; petal solenoid valve; butterfly gas valve, motor, and linkage to air louver; safety petal solenoid (if used.)
3. Check flue connections for tight joints and minimum resistance to air flow. (combustion chamber, flues, breaching, and chimney are clear before firing.)
4. Draft regulators require slightly negative pressure in the combustion chamber at maximum input.
5. On forced draft burners, gas manifold pressure requirements should correspond with modulating (butterfly) valve in full open position and stable at all other firing rates.

6. Take and record and record flue gas readings to determine boiler efficiency. Use manufacturer's instructions if available. If not, use attached table as a guide for performance criteria. If efficiency is low, check baffling and passes for short circuiting, and boiler for air infiltration. Adjust dampers and controls to optimize efficiency. Run test at following load points.
7. 100%, 70%, and 40% of rated full load for boilers having metering controls or modulation capacity at these load points.
8. At high and low fire rates on boilers equipped with OFF/LOW FIRE/HIGH FIRE control.
9. At single firing load point on boilers equipped with OFF/ON controls only.
10. Check burner for flashback and tight shutoff of fuel.
11. Check operation of automatic controls and combustion flame safeguards. Clean and adjust, if necessary.
12. Operation and adjustments should conform with manufacturer's instructions.

Recommended Tools, Materials, and Equipment:

1. Tool Group C.
2. Flue gas analyzer.
3. Clean wiping cloths.

HVAC-BLR-04-01Y

Frequency: Annually

Burner, Oil

Application

This standard applies to any boilers that use Fuel Oil as their fuel source. These can be either natural draft or forced draft type of boilers.

Special Instructions.

1. Review manufacturer's instructions.
2. Verify that the annual inspections for the boiler have been satisfactorily performed.
3. As part of the combustion gas analysis, Nitrous Oxide (NOX) should be checked and compared with the local authority's requirements. Many areas now have maximum standards for NOX to assist in reducing pollution. Depending on the age of the boiler and burner, specific requirements may exist.
4. Some jurisdictions may require 3rd party (independent) combustion and operational testing to verify boiler and burner operation.

Parent of this Piece of Equipment

Boiler, Gas or Oil Unit Heater

Check points:

1. Test and inspect burner (with or without firing) at rated pressure for leaks.
2. Perform timed trial for ignition on pilots and burners in accordance with instructions in the programmer timer.
3. Check automatic controls and combustion flame safeguards for normal operation. There should be no presence of oil discharge, ignition or flame.
4. Check pre-ignition purging capability of burner, combustion chamber, boiler passes, and breaching. Stack dampers should be fully open during purge and light off period.
5. Check delivery of fuel in relation to its response to the ignition system. Examine electrodes for carbon buildup, discoloration, distortion, and burning of parts, clean and adjust as necessary.
6. Check ignition transformer to supply dependable arc, adjust and regulate as required for clearance and air gap.
7. Clean and adjust draft regulator and air shutter on a natural draft burner to ensure excess air quantities are minimum for complete combustion. Test with flue gas analyzer.
8. On mechanical draft burners clean and check power driven fan blower.

9. Check out forced draft fan, clean fan and fan housing, check bearings, pulleys and or couplings and adjust belt tension if required replace worn belts and lubricate pivot points on linkages as necessary.
10. Check and replace filters. Check and clean water separators, primary and secondary filters.
11. Clean, check operation, and adjust controls and safeties.
12. Burners designed to change firing rates automatically should be checked for adequate proportioning changes in fuel and air rates.
13. Check oil level sight glass to see that burner maintains proper oil level (within 1/3") at rated output.
14. Check to ensure that power cannot feedback and energize ignition devices or feed valves after a control shuts off burner.
15. Clean or replace nozzles or cups, and check for tight shutoff of fuel.
16. Check stacks for smoke or haze and adjust burner accordingly.
17. Take and record flue gas readings to determine boiler efficiency. Use manufacturer's instructions if available If not, use attached table as a guide for performance criteria. If efficiency is low, check baffling and passes for short circuiting, and boiler for air infiltration. Adjust dampers and controls to optimize efficiency. Tests should be run at the following load points:
    a. 100%, 70%, and 40% of rated full load for boilers having metering controls or modulation capacity at these load points.
    b. At the high and low fire rates on boilers equipped with OFF/LOW FIRE/HIGH FIRE control.
    c. At the single firing load point on boilers equipped with OFF/ON controls only.

Performance Criteria for Oil Burners

LIGHT OILS, Grade 2, Diesel Fuel, JP5, Navy Distillate			
Percent Load	40.0%	70.0%	100.0%
Carbon Dioxide (CO_2)	10.5%	11.0%	12.5%
Carbon Monoxide (CO)	0	0	0
Oxygen (O_2)	6.0%	5.0%	4.0%
Excess Air (XA)	40.0%	30.0%	20.0%
Smoke Scale No.	2	2	2
MEDIUM OILS, Grade 4, NFSO			
Percent Load	40.0%	70.0%	100.0%
Carbon Dioxide (CO_2)	11.0%	12.0%	13.0%
Carbon Monoxide (CO)	0	0	0
Oxygen (O_2)	6.0%	5.0%	4.0%
Excess Air (XA)	40.0%	30.0%	20.0%
Smoke Scale No.	3	3	3
HEAVY OIL, Grades 5 & 6			
Percent Load	40.0%	70.0%	100.0%
Carbon Dioxide (CO_2)	12.0%	12.6%	13.6%
Carbon Monoxide (CO)	0	0	0
Oxygen (O_2)	6.0%	5.0%	4.0%
Excess Air (XA)	40.0%	30.0%	20.0%
Smoke Scale No.	0	0	0

Table continued below:

Performance Criteria for Oil Burners, continued

1. Combustibles zero or negligible percent in flue gas.
2. Output (steam flow or water flow) where meters are available to correspond with combustion level not less than 100% of rated capacity at rated load.
3. Boiler section outlet flue gas temperature is not more than 30°F (17°C) higher than rated. When expected gas temperature is not known, manufacturer should be contacted for typical conditions for type boiler being tested.
4. Boiler section outlet flue gas temperature should not be more than 150°F to 180°F (84°C to 100°C) higher than corresponding saturated steam temperature for water tube boilers and 100°F to 125°F (56°C to 70°C) for firetube boilers.
5. Excess air within 5 percent of manufacturer's expected performance level.
6. Feedwater temperature, burner atomizing pressure, fuel oil viscosity at the burner, draft loss and combustion appearance in accordance with manufacturer's data or be close to industry standards.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Flue gas analyzer.
3. Varsol and rags. Use Varsol in well ventilated area! Varsol must be disposed of as a hazardous waste. Refer to Appendix G for the Universal Waste Guide.
4. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
5. Clean wiping cloths.

HVAC-BLR-05-01Y

Frequency: Annually

Boiler, Instrument Controls

Application:

This standard card applies to large boiler room operations where the boiler PM standards do not sufficiently cover the maintenance required for the boiler room controls. These boiler controls include such items as boiler masters, draft and oil controllers, level meters, flow transmitters and recorders, ratio transmitters and totalizers, recorders and indicators.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Read and understand manufacturer's instructions before making any adjustments or calibrations.
3. Schedule work with operating personnel, as needed.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Review control wiring and piping diagrams.
6. Review and understand sequence of operation prior to testing.
7. Ensure appropriate site personnel are notified that alarms that may result from testing and to disregard them until testing is completed.

Check Points:

1. Visually check equipment sensing lines, operating valves, and internal assembly for leaks.
2. Perform friction test.
3. Zero meter to scale, check pen(s) for zero indication, make necessary adjustments.
4. Simulate flow by use of check weights, provided water column, or other appropriate external simulation devices.
5. Check pen or indicator for proper chart or scale percentage at recommended check points; (or discretionary check points, if none are recommended) record actual indication; make minor adjustments as necessary.
6. Check control over full range. Set zero and full range stops as necessary.
7. Mark integrator or counter checks by simulating flow (usually 50% of full scale) and check number of counts over specific time period (minimum period of 30 minutes is recommended). Calculate correct number of counts for time period

used and make necessary minor adjustments. Re-check after any adjustments, ascertain that the integrator or counter does not count at zero.

8. Repeat step #6.
9. Open meter supply line to check for plugging. Put meter back in service.
10. Check electronic stations for proper electrical connections and pneumatic stations for any leaks by using a leak detector (soap solution).
11. Check operation of station panel switch and manual control for excessive friction and looseness of control knobs.
12. Check for correct supply pressure or voltage to the station.
13. Compare sender over it's range of control with an accurate external measuring device such as a U-tube, pneumatic calibrator, or electronic calibrator (all other measurements in the control loop should be made with the same device).
14. Check all indicators by simulating pneumatic or electronic signals to the appropriate port of terminal for proper indication to the related gauge or indicator (in most cases, mathematical calculations will be necessary to determine the proper indication at each test point).
15. Ascertain that the automatic signal is not restricted when the station is activated.
16. Record and report all deficiencies.
17. Notify management that services are complete.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Calibration device for meter being checked.
3. Differential flow meter and indicator.
4. Soap solution for air leak test, accurate test gauges (check before use).

HVAC-BSB-01-02Y

Frequency: 2-Year

Radiant Baseboards/Convectors (Steam, Hot Water, or Electric, per section)

Application

This standard applies to baseboard radiator and convector heating units using hot water, steam, or electricity as the heating medium. These units are found in offices, entrance lobbies, vestibules, etc. They vary from simple finned tube baseboard units with no controls to zoned or individually controlled units. Valves can be on/off type or automatic temperature regulating valve.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.
4. Review building plans for special instructions where removal of wall panels is necessary.
5. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Rope off or post signs at vestibules or entrances where work involves these areas.

Check Points:

1. Check radiator valve for free turning and seating. Check packing.
2. Remove covers or wall panels. Note: Extreme care must be taken when removing marble or granite wall panels. These panels are extremely heavy and very fragile.
3. Check housing, braces, supports, hangers, and hardware for signs of deterioration or damage.
4. Check temperature or flow controls, shutoff valves, vents and traps for proper operation.
5. If radiator has automatic temperature regulating valve, remove valve cover and remove dirt by vacuuming.
6. For hot water radiators, check air bleed valve.

7. Remove and inspect seat of steam trap. Clean out trap. Follow other steam trap procedures as listed in trap maintenance standards.
8. Wire brush and treat with rust inhibitor all rusted areas.
9. Check coils, piping, and fin material for damage, leaks or looseness. Straighten finned material as necessary.
10. Vacuum or blow out finned tube area and interior housing.
11. Clean and replace covers or wall panels and caulk wall panels as required. Clean work area.

Recommended Tools, Materials, and Equipment:

1. Standard Tools – Basic
2. Vacuum and/or portable air tank
3. Goggles, respiratory protection, and gloves
4. Rope and/or out of service signs
5. Rust inhibitor and appropriate paints. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less and for the proper personal protective equipment (PPE)

HVAC-CLR-01-03M

Frequency: Quarterly

Central Chilled Water Package Unit:

Application:

This standard card applies to chilled water producing units that are self-contained, consisting of refrigeration compressors, condensers either air or water cooled, evaporator coils, refrigerant receivers, fan and motor, etc., contained in a common housing or assembly. This standard is for special purpose or critical use units.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
5. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
6. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
7. Recover, recycle, or reclaim the refrigerant as appropriate.
8. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the item.
9. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
10. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
11. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.
12. Remove access covers prior to accomplishing check points.

Check Points:

Condenser

1. Remove debris from air screen and clean underneath unit.
2. Straighten fin tubes with fin comb.

3. Check electrical wiring and tighten loose connections. Check fused disconnect switches for condition and operation.
4. Check mounting for tightness.
5. Check for corrosion. Clean and treat with inhibitor as needed.
6. Check fan or blower for bent or damaged blades and imbalance.
7. Lubricate shaft and motor bearings on fans and remove old or excess lubricant.
8. Inspect pulleys, belts, couplings, etc.; adjust tension and tighten mountings as necessary. Change badly worn belts. Multi-belt drives should be replaced with matched sets.

Evaporator

1. Evaporator tubes should be inspected and cleaned of scale. Inspect and clean temperature sensors and flow switches.
2. Inspect plumbing, valves and flanges for leaks and correct.

Compressor(s)

1. Lubricate drive coupling.
2. Lubricate motor bearings (non-hermetic).
3. Check and correct alignment of drive couplings.
4. Inspect evaporator tubes for scale. Clean if required. Leak test tubes using a halogen leak detector or suitable substitute.
5. Add refrigerant per manufacturer's instructions if needed.
6. Check compressor oil level.
7. Run machine; check action of controls, relays, switches, etc. to see that:
    a. Compressor(s) run at proper settings.
    b. Suction and discharge pressures are proper.
    c. Outlet water temperature is set properly.
8. Check and adjust vibration eliminators. Replace as necessary.
9. Sample test the refrigerant and oil to verify compliance with the Air Conditioning and Refrigeration Institute standards. Based on the results, refrigerant may need to be replaced or recycled, and oil replaced.
10. Check and calibrate safety controls.

Controls

1. Check operation of all relays, pilot valves, and pressure regulators.
2. Check resulting action of pressure sensing primary control elements such as diaphragms, bellows, inverted bells, and similar devices when activated by air, water, or similar pressure.

Motors

1. Refer to the appropriate Maintenance Standard for Motors.

Recommended Tools, Materials, and Equipment:

1. Tool Groups A and B
2. Pressure washer
3. Fin comb
4. Paint brushes
5. Cleaning materials and equipment. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
6. Respirator
7. Safety goggles.
8. Gloves.
9. Self sealing quick disconnect refrigerant hose fittings
10. Refrigerant recovery/recycle unit
11. EPA/DOT approved refrigerant storage tanks.
12. Approved refrigerant.
13. Electronic leak detector.

HVAC-CLR-01-01Y

Frequency: Annually

Central Chilled Water Package Unit:

Application:

This standard card applies to chilled water producing units that are self-contained, consisting of refrigeration compressors, condensers either air or water cooled, evaporator coils, refrigerant receivers, fan and motor, etc., contained in a common housing or assembly.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
5. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
6. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
7. Recover, recycle, or reclaim the refrigerant as appropriate.
8. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the item.
9. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
10. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
11. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.
12. Remove access covers prior to accomplishing check points.

Check Points:

Condenser

1. Remove debris from air screen and clean underneath unit.
2. Pressure wash coil with proper cleaning solution.

3. Straighten fin tubes with fin comb.
4. Check electrical wiring and tighten loose connections. Check fused disconnect switches for condition and operation.
5. Check mounting for tightness.
6. Check for corrosion. Clean and treat with inhibitor as needed.
7. Check fan or blower for bent or damaged blades and imbalance.
8. Lubricate shaft and motor bearings on fans and remove old or excess lubricant.
9. Inspect pulleys, belts, couplings, etc.; adjust tension and tighten mountings as necessary. Change badly worn belts. Multi-belt drives should be replaced with matched sets.
10. Condenser tubes should be inspected and cleaned. Condenser tubes from open tower systems may have contamination or hard scale. Excessive corrosion, scaling, erosion and algae typically indicate improper or lack of an adequate water treatment program. Consult water treatment standard for proper procedures.

Evaporator

1. Evaporator tubes should be inspected and cleaned of scale. Inspect and clean temperature sensors and flow switches.
2. Inspect plumbing, valves and flanges for leaks and correct.

Compressor(s)

1. Lubricate drive coupling.
2. Lubricate motor bearings (non-hermetic).
3. Check and correct alignment of drive couplings.
4. Inspect evaporator tubes for scale. Clean if required. Leak test tubes using a halogen leak detector or suitable substitute.
5. Add refrigerant per manufacturer's instructions if needed.
6. Check compressor oil level.
7. Run machine; check action of controls, relays, switches, etc. to see that:
    a. Compressor(s) run at proper settings.
    b. Suction and discharge pressures are proper.
    c. Outlet water temperature is set properly.
8. Check and adjust vibration eliminators. Replace as necessary.
9. Sample test the refrigerant and oil to verify compliance with the Air Conditioning and Refrigeration Institute standards. Based on the results, refrigerant may need to be replaced or recycled, and oil replaced.
10. Check and calibrate safety controls.

Controls

1. Check operation of all relays, pilot valves, and pressure regulators.
2. Check resulting action of pressure sensing primary control elements such as diaphragms, bellows, inverted bells, and similar devices when activated by air, water, or similar pressure.

Motors

1. Refer to the appropriate Maintenance Standard for Motors.

Recommended Tools, Materials, and Equipment:

1. Tool Groups A and B
2. Pressure washer
3. Fin comb
4. Paint brushes
5. Cleaning materials and equipment. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
6. Respirator
7. Safety goggles.
8. Gloves.
9. Self sealing quick disconnect refrigerant hose fittings
10. Refrigerant recovery/recycle unit
11. EPA/DOT approved refrigerant storage tanks.
12. Approved refrigerant.
13. Electronic leak detector.

HVAC-CLR-02-01Y

Frequency: Annually

Rotary Screw & Scroll Chiller

Application:

This standard card applies to chilled water producing units, consisting of refrigeration rotary screw or scroll compressor(s), water cooled condenser tube bundle, evaporator tube bundle, control panel, etc.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Coordinate PM of refrigeration machine control panel with this PM activity.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
6. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
7. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
8. Recover, recycle, or reclaim the refrigerant as appropriate.
9. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the item.
10. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
11. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
12. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check Points:

1. Pump down system. Remove a small sampling of refrigerant using appropriate refrigerant recovery/recycling equipment, in accordance with manufacturer's instructions. Test the sample of refrigerant and oil to verify compliance with the Air Conditioning and Refrigeration Institute standards.

2. Perform spectro-chemical analysis of compressor oil annually to determine bearing conditions and replace as necessary.
3. As oil testing indicates drain and replace oil in compressor oil reservoir including filters, strainers and traps.
4. Review the Material Data Safety Sheets (MSDS) for proper disposal of used oil. If appropriate, recycle oil at an authorized station.
5. Change oil filter or element and clean housing.
6. Inspect filter for metal particles which could indicate bearing wear.
7. Clean strainer and nozzles of eductor.
8. Clean all water strainers in the system.
9. Inspect relief valves and piping. Check for valve for corrosion or foreign material and replace valves. Valves are safety devices for equipment and personnel, DO NOT attempt to repair or recondition. Increase valve inspection frequency if equipment installed in corrosive environment.
10. Inspect evaporator and condenser tubes.
    a. Evaporator tubes should be inspected and cleaned of scale. Inspect and clean temperature sensors and flow switches.
    b. Condenser tubes should be inspected and cleaned. Condenser tubes from open tower systems may have contamination or hard scale.
    c. Excessive corrosion, scaling, erosion and algae typically indicate improper or lack of an adequate water treatment program. Consult water treatment standard for proper procedures.
11. Test for leaks per manufacturer's instructions. Refrigerant leak detection can be conducted with an electronic halide leak detectors, ultrasonic leak detectors or a soap bubble solution will be used along with dry nitrogen to pressurize chiller. If leaks are not able to be stopped or corrected, report leak status to supervisor.
12. Pull vacuum on refrigeration machine in accordance with manufacturer's instructions. Add refrigerant as required per specifications.
13. Megger compressor and oil pump motors and record readings.
14. Tighten all starter, control panel, motor terminals, overloads, and oil heater leads, etc. Loose connections can cause voltage spikes and overheating leading to malfunctions and failures.
15. Check all electrical contacts for wear, pitting, etc.
16. Check and calibrate overloads, record trip amps and trip times.
17. Check and calibrate safety controls.
18. Check external interlocks, flow switch, fans and pumps.
19. Check dash pot oil in main starter.
20. Check compressor(s) sequencing, if multiple stage system
21. Check pressure and temperature transducers against gage on both the oil, refrigerant and water side systems.

22. Clean up the work area. Properly recycle or dispose of materials in accordance with environmental regulations.

Recommended Tools, Materials, and Equipment:

1. Tool Groups A and C
2. Gloves
3. Safety goggles
4. Lubricants and gear box oil. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
5. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.
6. Self sealing quick disconnect refrigerant hose fittings
7. Refrigerant recovery/recycle unit
8. EPA/DOT approved refrigerant storage tanks.
9. Tube cleaning pressure washer.
10. Paint and brushes as required.
11. Dry nitrogen gas, cylinder, and regulator.
12. Approved refrigerant.
13. Electronic leak detector.
14. Megger.
15. Variac (variable voltage transformer)

HVAC-CLR-03-01Y

Frequency: Annually

Centrifugal Chiller

Application:

This standard card applies to chilled water producing units, consisting of refrigeration centrifugal compressor(s), water cooled condenser tube bundle, evaporator tube bundle, control panel, and associated equipment attached to the chiller.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Coordinate PM of refrigeration machine control panel in conjunction with this PM activity.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. The replacement filter-drier cores for the high efficiency purge unit absorb water vapor from the ambient air. They are shipped in sealed containers and are not to be opened until they can be installed and sealed in the purge tank.
5. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
6. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
7. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
8. Recover, recycle, or reclaim the refrigerant as appropriate.
9. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the item.
10. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
11. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
12. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check Points:

1. Lubricate drive couplings.

2. Check and correct alignment of drive couplings.
3. Lubricate motor bearings (non-hermetic)
4. Lightly lubricate vane control linkage bearings, ball joints and pivot points. DO NOT LUBRICATE the shaft of the vane operator.
5. Remove refrigerant in accordance with manufacturer's instructions. Sample test the refrigerant and oil to verify compliance with the Air Conditioning and Refrigeration Institute standards.
6. Perform spectro-chemical analysis of compressor oil annually to determine bearing conditions and replace as necessary.
7. As oil testing indicates drain and replace oil in compressor oil reservoir including filters, strainers and traps. Manufacturers typically recommended that oil should be changed after the first year of operation and every five years thereafter.
8. Review the Material Data Safety Sheets (MSDS) for proper disposal of used oil. If appropriate, recycle oil at an authorized station.
9. Change oil filter, clean strainer.
10. Drain and replace oil in purge compressor.
11. Drain and replace oil in purge gearbox.
12. Change refrigerant filter/drier on cooling line to motor (hermetic). Check moisture indicator sight glass and if moisture present find source of water leak.
13. Clean all water strainers in the system.
14. Inspect relief valves and piping. Check for valve for corrosion or foreign material and replace valves. Valves are safety devices for equipment and personnel, DO NOT attempt to repair or recondition. Increase valve inspection frequency if equipment installed in corrosive environment.
15. Check pressure and temperature transducers against gage on both the oil, refrigerant and water side systems.
16. Inspect evaporator and condenser tubes.
    a. Evaporator tubes should be inspected and cleaned of scale. Inspect and clean temperature sensors and flow switches.
    b. Condenser tubes should be inspected and cleaned. Condenser tubes from open tower systems may have contamination or hard scale.
    c. Excessive corrosion, scaling, erosion and algae typically indicate improper or lack of an adequate water treatment program. Consult water treatment standard for proper procedures.
17. Test for leaks per manufacturer's instructions. Refrigerant leak detection can be conducted with an electronic halide leak detectors, ultrasonic leak detectors or a soap bubble solution will be used along with dry nitrogen to pressurize chiller. If leaks are not able to be stopped or corrected, report leak status to supervisor.
18. Pull vacuum on refrigeration machine in accordance with manufacturer's instructions. Add refrigerant as required per specifications.

19. Megger compressor and oil pump motors and record readings.
20. Check dash pot oil in main starter.
21. Tighten all starter, control panel, motor terminals, overloads, and oil heater leads, etc. Loose connections can cause voltage spikes and overheating leading to malfunctions and failures.
22. Check all contacts for wear, pitting, etc.
23. Check and calibrate overloads, record trip amps and trip times.
24. Check and calibrate safety controls.
25. Clean up the work area. Properly recycle or dispose of materials in accordance with environmental regulations.

Recommended Tools, Materials, and Equipment:

1. Tool Groups A and C
2. Gloves
3. Safety goggles
4. Lubricants and gear box oil. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
5. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.
6. Self sealing quick disconnect refrigerant hose fittings
7. Refrigerant recovery/recycle unit
8. EPA/DOT approved refrigerant storage tanks.
9. Tube cleaning pressure washer.
10. Paint and brushes as required.
11. Dry nitrogen gas, cylinder, and regulator.
12. Approved refrigerant.
13. Electronic leak detector.
14. Megger.
15. Variac.

HVAC-CLR-04-01Y

Frequency: Annually

Refrigeration Machine, Absorption Unit

Application:

This standard card applies to chilled water producing units using absorption refrigeration cycle. Components consist of absorber tube bundle, water cooled condenser tube bundle, evaporator tube bundle, system pumps, control panel, and other chiller equipment.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Coordinate PM of refrigeration machine control panel and refrigeration machine controls in conjunction with this PM activity.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
6. Recover, recycle, or reclaim the refrigerant as appropriate.
7. If disposal of the equipment item is required, follow regulations concerning removal of refrigerants and disposal of the item.
8. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
9. Lithium bromide is a corrosive solution. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check Points:

1. Clean solution strainer(s). Clean unit pump motor cooling circuit in accordance with manufacturer's instructions.
2. Check and clean all strainers and traps in steam or hot water supply, condensate return, and condensing water circuit.
3. Inspect relief valves and piping. Check for valve for corrosion or foreign material and replace valves. Valves are safety devices for equipment and personnel, DO NOT attempt to repair or recondition. Increase valve inspection frequency if equipment installed in corrosive environment.
4. Check pressure and temperature transducers against gage on all systems.

5. Inspect and clean evaporator and condenser tubes. If steam and hot water fired also include absorber coil.
    a. Evaporator tubes should be inspected and cleaned of scale. Inspect and clean temperature sensors and flow switches.
    b. Condenser tubes should be inspected and cleaned. Condenser tubes from open tower systems may have contamination or hard scale.
    c. Excessive corrosion, scaling, erosion and algae typically indicate improper or lack of an adequate water treatment program. Consult water treatment standard for proper procedures.
6. For direct fired machines include inspection and cleaning of exhaust gas economizer.
7. For direct fired machines include gas burner PM per maintenance standard
8. Inspect and clean temperature sensors and flow switches.
9. Use oil-dry nitrogen under positive pressure to check for air leaks around valves, gaskets, seals, etc.
10. Units with external purge pump system:
    a. Check pulley alignment and V-belt extension.
    b. Clean purge drive belts with safety solvent.
    c. Change purge pump vacuum oil in accordance with manufacturer's instructions.
11. Review the Material Safety Data Sheets (MSDS) for proper disposal of used oil. If appropriate, recycle oil at an authorized station.
12. Lubricate purge pump motor with machine oil.
13. Check pumps, motors, controls, and lubricate as required (evaporator pumps, solution pump).
14. Add octyl alcohol to working fluids per manufacturer's charts and procedures.
15. Check and service system controls in accordance with manufacturer's instructions.
16. Clean up the work area. Properly recycle or dispose of materials in accordance with environmental regulations.

<u>Recommended Tools, Materials, and Equipment:</u>

1. Tool Groups A and C
2. Gloves
3. Safety goggles
4. Lubricants and gear box oil. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
5. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.

HVAC-CLR-05-01Y

Frequency: Annually

Chiller Control Panel

Application

This standard applies to control panels that are installed to protect and control the operation of central refrigeration machines (chillers). Typically the control panel is mounted on the chiller and controls chiller capacity, demand limit, temperatures, pressures as well as shut downs and safeties. The standard includes service to controllers, transmitters, sensors, relays, etc., associated with the central control panel.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Read and understand the manufacturer's instructions before making any adjustments or calibrations.
3. Obtain "As Built" diagrams of the control and safety systems.
4. Schedule work with operating personnel, as needed.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Ensure appropriate site personnel are notified that alarms that may result from testing and to disregard them until testing is completed.
7. Replace defective control safeties found while performing preventive maintenance.

Check Points:

1. Clean and calibrate all controlling instruments (temperature and pressure transducers, etc.) in accordance with manufacturer’s instructions and maintenance standard.
2. Check and clean all electrical contacts and pneumatic orifices.
3. Check pneumatic tubing for leaks or damage. Repair or replace as required.
4. Check electrical wiring insulation and connections. Tighten or replace if necessary.
5. Replace recorder charts for temperatures, kilowatt, etc., add ink (if applicable).
6. Check for bad indicator lights and gauges and replace as necessary.
7. Test all controllers and set at proper set points.
8. Check operating data and analyze for proper operation. Note unusual conditions such as compressor surge on maintenance log.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Pneumatic control gauge
3. Pressure gauge
4. Temperature gauge
5. Volt Ohm meter
6. Manufacturer's control kit
7. Cleaning materials and equipment. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

HVAC-CLR-06-01M

Frequency: Monthly

Refrigerant Monitor

Application

This standard applies to refrigerant monitors or detectors used to detect refrigerant leaks, primarily in chiller rooms. All commonly used refrigerants except ammonia are heavier than air at atmospheric pressure and, if released, will displace oxygen in the room posing suffocation hazards to personnel. Refrigerants coming into contact with flames or hot surfaces can break down to acidic or toxic compounds. For these and other reasons refrigeration machinery rooms may be required to have a refrigerant detector to activate an audible and visual alarm and enable ventilation systems.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Read and understand the manufacturer's instructions before making any adjustments or calibrations.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Children of this Piece of Equipment

The following equipment items are the children of this parent piece of equipment and the PMs for these items should be completed at the same time. See other sections of this standard for the detailed PM requirements for the children equipment.

1. Remote audible and visual alarms located inside and outside room entrances to warn people of leak.

Check Points:

1. Wipe down outside of unit.
2. Replace air filter on air sample intake to unit. When clogged air flow will be restricted and a filter or flow fault will occur. Samples can be taken from air surrounding the unit or through a sample tube from a remote location.
3. Calibrate unit with gas canisters that have specific levels of refrigerant. Two calibrations are required, Zero to calibrate when no refrigerant present and SPAN to calibrate level of refrigerant in parts per million (ppm) when unit

should alarm. A ZERO scrubber (carbon filter) may also be used which will remove all impurities form air giving a zero reading.

4. The ppm level to alarm at varies based on refrigerant type; see International Machine code refrigerant classification. Name plate on unit should have levels listed.
5. Check that all relays sent to remote equipment close or open upon alarm.
6. Internal electronic components and sensors are typically not field serviceable and should be replaced either with new parts or sent to factory as applicable.

Recommended Tools, Materials, and Equipment:

1. Standard Tools – Basic
2. Cleaning Materials
3. Filters, as required

HVAC-CLR-07-01Y

Frequency: Annually

Refrigerant Purge Units

Application

This standard applies to high efficiency purge units for centrifugal chillers. The units purge the refrigerant of non-condensable gasses such as air or sometimes nitrogen which is used to lay-up chiller and the high efficiency denotes that a minimum of refrigerant is lost when purging. There are different units depending on whether the chiller is low pressure (R-11, R-123) or high pressure (R-134a, R-12, R-22). Units may be mounted on the chiller or remotely on a wall and connected with tubes.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Always purge chiller after it has been opened for servicing.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. The replacement filter-drier cores absorb water vapor from ambient air, so they are shipped in sealed containers. Do not open them until the cores can be installed and sealed in the purge tank.
6. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
7. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
8. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
9. Recover, recycle, or reclaim the refrigerant as appropriate.
10. If appliance is disposed, follow regulations concerning removal of refrigerants and disposal of the appliance.
11. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
12. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
13. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and to all labels on refrigerant containers.

Parent of this Piece of Equipment

1. Chiller or Refrigeration Systems

Check Points:

The service points listed below cover the basic sequences and items to check out for all units. However due to the many models available some of the functions described below may be automatic such as liquid water drain out or purge unit isolation and do not require many steps to complete.

Check out and Water Removal

Perform the purge system control check as described in the manufacturer's instructions.
If applicable, check purge run time logs for excessive run times. This may indicate leaks in the system.

1. Purge tank service.
    a. Isolate the purge tank by closing the valves on the purge tank inlet and liquid return lines.
    b. With the purge condensing unit turned off, pressurize the purge tank through the purge tank drain valve to manufacturer's specifications and test the solenoid valves to insure they seal properly.
    c. Check the purge tank sight glass to determine if there is water in the purge tank.
2. If the refrigerant level is visible in the sight glass but there is no water in the tank, then perform the following:
    a. Connect a refrigerant hose from the purge tank Schrader valve to an access valve on the evaporator.
    b. Open the vapor line and disconnect the refrigerant hose.
    c. Proceed with the service procedure.
3. If, on the other hand, there is a layer of water on the refrigerant in the purge tank sight glass, then perform the following:
    a. Connect a refrigerant hose from the purge tank Schrader valve to an approved containment vessel.
    b. Disconnect the line at the pump-out compressor.
    c. Hold the service switch in the ON position. This will energize the solenoids and allow the purge tank to fill with air. The liquid refrigerant will drain into the container.
    d. Pour or siphon the water from the top of the refrigerant in the container. Seal the refrigerant in the container for later use or other disposition.

Filter-drier service:

1. Empty the purge tank and relieve the test pressure.
2. Remove the filter-drier cores (typically two cores) from inside the purge tank.
3. Visually inspect the core and all internal parts. Clean where necessary.
4. Inspect the tank drain valve and line to insure it is free of any debris.
5. Replace the tank gasket.
6. Install new filter-drier cores and gaskets as necessary. Filter-drier cores are able to absorb moisture for one year assuming normal humid air infiltration.
7. Put the tank back in place using a new gasket.
8. Reconnect the pump-out line and solenoid valve.
9. Pressurize the purge tank to manufacturer's specifications through the isolation solenoids, with the solenoids energized. Check for leaks. Release the pressure.
10. Switch the purge system to the manual ON position and wait for the pump-out compressor to start.
11. If refrigerant needs to be returned to the system, remove the cap from the purge tank drain valve and connect a hose from the drain valve to the container. As the pump-out compressor operates, a vacuum is created in the purge tank, drawing the liquid refrigerant from the container into the purge tank. Disconnect the hose when completed and replace the valve cap.
12. Open the valves on the purge tank inlet and liquid return lines.

Purge pump-out and fault check:

This procedure tests the ability of the purge to remove non-condensable from the unit. This is done by isolating the purge, adding air to the purge tank, and then using the purge compressor to remove the air again.

1. Note the timer setting and reset to the time recommended by the manufacturer.
2. Set purge control switch to turn on the purge condensing unit (see instruction manual).
3. Close the shutoff valves on the purge tank inlet and liquid return lines to isolate the purge tank.
4. Disconnect the line from the inlet of the pump-out compressor.
5. Energizing the pump-out solenoids and pump-out compressor. The purge will draw air into the purge tank back through the isolation solenoid valves.
6. Note: Repeat this procedure until sufficient air is drawn into the purge tank to initiate a pump-out sequence. Within approximately five minutes the pump-out compressor should start and run until the fault timer setting is exceeded. The pump-out compressor then shuts down.
7. De-energize the purge.

8. Reconnect the line at the inlet of the pump-out compressor.
9. Restore original fault timer setting, purge initiate pressure setting, purge cut-out pressure setting.
10. Restart the purge by turning the purge control switch to AUTO.
11. Open the shutoff valves on the purge tank inlet and liquid return lines.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Refrigerant recovery/recycle unit
3. Cleaning materials and equipment. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

HVAC-CLR-08-02Y

Frequency: 2-Year

Vibration Analysis, Chillers

Application

Electronic vibration analysis can detect impending problems which can lead to failure. Manufacturers of centrifugal chillers, in particular, recommend vibration analysis be performed during routine maintenance to ensure safe operation of the chiller.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Review manufacturer's instructions and guidelines for vibration analysis. Consult chiller manufacturer for pass/fail specifications as it pertains to vibration.
3. Always purge chiller after it has been opened for servicing.
4. Perform vibration analysis at various loads and compare against the previous vibration analysis.
5. Consult chiller manufacturer for baseline vibration data (for new chiller).

Check Points:

1. Take baseline readings on all permanently installed vibration transducers.
2. Monitor permanently installed vibration transducers with BAS.
3. An on-staff or contracted Vibration Analysis Technician using specialized software will need to determine criteria for unacceptable vibration signals.
4. Set up maintenance alarms or signal CMMS to issue a work order when transducer output exceeds acceptable levels based on baseline readings.
5. Take corrective action by:
    a. Having a full set of vibration readings taken by a qualified on-staff or contracted vibration analyst.
    b. Following the analyst's diagnostic recommendations.

Recommended Tools, Materials, and Equipment:

1. Typical sensor used vibration data collection on industrial machinery is an accelerometer: output is typically displayed in units of velocity. Follow manufacturer's recommendation for use of an accelerometer.

HVAC-CLR-09-03Y Frequency: 3-Year

Non-Destructive Tube Analysis (Eddy Current Analysis)

Application

This standard card applies to all centrifugal and absorption type chillers.

Special Instructions:

1. Coordinate performance of this PM activity with performance of annual PM on the central or packaged chilled water units. Schedule outage with operating personnel.
2. Complete an eddy current test of all heat exchanger tubes, both evaporator and condenser (plus concentrator and absorber in absorption units).
3. The test shall be performed in accordance with current requirements and procedures of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section V Nondestructive Examination, Article 8, Eddy Current Examination of Tubular Products and applicable recommended practice standards of the American Society for Testing and Materials for Eddy Current Testing.
4. A Certified Level II or higher technician or equivalent shall be used for this analysis in accordance with the American Society of Non-destructive Testing Recommended Practices, SNT-TC-1A, or current version.
5. The test is to be witnessed by the Contracting Officer's Representative or designated inspector.

Check Points:

1. Prepare equipment for non-destructive testing (NDT). Remove heat exchanger heads, piping, clean tubes, and erect scaffolding as necessary.
2. Test shall be recorded as required by the ASME code Section V (Article 8 - Appendix I, Article I-20).
3. System calibration shall be confirmed hourly.
4. The written procedure in paragraph I-23, Article 8 - Appendix I in the ASME code is required to be followed.
5. Strip chart recordings shall be provided for:

a. Each calibration standard and artificial discontinuity comparator used. Annotate to identify each defect machined in the standard and calibration of each division on the chart.
b. Typical good tube in each bundle
c. For each defective tube, annotate to identify tube. Indicate nature and extent of defect.

6. Test each tube to detect, as a minimum: leaks, saddle damage, pitting, interior erosion/corrosion, gasket condition, presence of “tramp” metal, presence of tube sheet condition.
7. Correct deficiencies as directed.
8. Restore equipment to service.

Reports and Records:

1. A copy of the magnetic tape record shall be maintained by the NDT contractor and furnished if requested by the Government.
2. A preliminary job site report shall be provided as soon as the test is completed.
3. Within ten (10) working days following completion of the test, the NDT contractor shall provide two complete test reports.
Include the following:

a. Written test procedure
b. Recommendations - List all tubes recommended for replacement or isolation.
c. Make complete description of defects (location, depth, inside or outside surface).
d. Map location - Show tube row, number, and support for each tube bundle.
e. Name of technician performing tests and evaluating data.
f. Contractor's certification of technician qualifications.

HVAC-CLS-01-01Y

Frequency: Annually

Coils Cooling, Heating, Preheat, Reheat, Etc.

Application:

This standard applies to all heating and cooling coils that are in the building, including units that are part of an air washer or air handling unit. The coils will be water or steam to air heat transfer coils.

Special Instructions.

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule shutdown with operating personnel, as needed.
3. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection."
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Parent of this Piece of Equipment

Air Handlers

Check Points:

1. Vacuum or blow out the fins, coils, etc.
2. Comb fins as required.
3. Remove obstructions to air flow.
4. Check coils for leaks. Correct or report any leaks.
5. Check drain pans for proper drainage, standing water, clogged drains and drain pipes. Clean drain pans as required. Check for rust on pans. Repair as necessary.
6. Test and inspect controls that protect coils against freezing.
7. Check for rust or corrosion around coil frame and coil mounting bracket. Clean, prepare for painting and coat with proper type paint as necessary.
8. Record differential air pressure across the coil.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Vacuum Cleaner wet/dry
3. Radiator brush

4. Coil comb
5. Coil cleaner. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
6. Respirator
7. Safety goggles
8. Materials to properly prepare and paint metal. Consult the MSDS to ensure that the paint lead level is 0.06% or less.
9. Manometer or magnahelic

HVAC-CND-01-01M

Frequency: Monthly

Condensing Unit, Refrigeration

Application:

This standard applies to critical or special purpose units that have the compressors located inside the air cooled condensing units. These units are considered one-half of a split system. Condensing units are usually installed where compressor noise and/or vibration is undesirable and are connected with an air handler, packaged air conditioning (A/C) unit, modular A/C units (evaporators) that are ceiling or wall mounted, or a split system associated with walk-in freezers and/or refrigerators.If condensing unit is subject or exposed to salt water conditions see salt water location section.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Obtain and review manufacturer's operation and maintenance instructions.
3. Should be serviced just prior to the cooling season
4. Schedule outage of unit with personnel in area the unit serves.
5. Review the standard operating procedure for "Selection, Care, and Use of Respiratory Protection".
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
8. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
9. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
10. Recover, recycle, or reclaim the refrigerant as appropriate.
11. If disposal of the equipment is required, follow regulations concerning removal of refrigerants and disposal of the unit.
12. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
13. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check Points:

1. Remove debris from air screen and clean underneath unit.
2. Pressure wash coil with coil cleaning solution. Rinse and neutralize (cleaning solution) in accordance with manufacturer's recommendations.
3. Straighten fins on tubes with a fin comb.
4. Check electrical connections for tightness.
5. Check unit mounts and tighten if necessary.
6. Check all refrigeration lines for support, and signs of wear
7. Thoroughly inspect and clean interior and exterior of machine.
8. Clean and treat all rusted areas. Touch up prime and paint as needed.
9. Check for refrigerant leaks using a halogen leak detector, soap bubbles, or similar testing device. If leaks are not able to be stopped or corrected, report leak status to supervisor.
10. Check refrigerant levels and recharge if needed.
11. Perform required lubrication and remove old or excess lubricant.
12. Clean motor with vacuum or low pressure air (less than 40 psi). Check for obstructions in motor cooling and air flow.
13. Visually inspect disconnect switches and contactors condition, proper operation, arcing or any evidence of overheating and fusing.
14. Check compressor crank case heater for current rating and controller manufacturer's recommended size before replacing heater. (Heater size shall not be changed without the Regional Design Engineer's approval.)
15. Check line and load connections and heater mounting screws for tightness.
16. Check condenser fan blades for dust buildup and clean if necessary.
17. Check condenser fan blades and moving parts for excessive wear.
18. Check fan motor RPM before replacing so the unit continues to operate at design specifications.
19. Check bearing collar set screws on fan shaft to make sure they are tight, if applicable.
20. Check dampers for dirt accumulation. Check felt; repair or replace as required.
21. Check damper motors and linkage for proper operation. Adjust linkage on vanes if out of alignment, if equipped.
22. Lubricate mechanical connections of dampers sparingly, if equipped.
23. Check compressor oil level (non-hermetically sealed units only) if compressor is equipped with a sight glass.
24. Run machine with service gauge manifold attached, checking action of controls, relays, switches, and other components to see that:
    a. compressor(s) run at proper settings.
    b. controls activate properly.
    c. controls activate unit.

d. refrigerant suction and discharge pressures are proper.

25. Check setting on controls and return and adjust back to normal operation if necessary.
26. Clean up the work area and properly dispose of debris and waste.

Note: Seal off all service ports with flare caps. Report any missing caps or dust covers.

Salt water Locations

Application:

This PM guide applies to equipment which has the condenser, fan(s), and fan motor(s) enclosed within the same housing. The compressor and other components are at a separate location. PM of these other devices should be scheduled simultaneously with the units serviced by the condenser. Special care must be taken to protect the unit's control board and other electrical components from getting any water on them while cleaning. The use of harsh or caustic cleaning agents or materials such as bleach or coil cleaners will cause damage or deterioration of the aluminum fin or coil material and is not recommended. Care must be taken not to bend the aluminum fin stock.

Special Instructions:

1. Review manufacturer's instructions.
2. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources."
3. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
4. Deenergize, lock out, and tag electrical circuit breaker.

Avoid use of extremely high-pressure water jet while cleaning coil surface. Fins will damage under extreme high pressure water. Do not use strongly alkaline detergent mixtures (pH greater than 10).

Check points:

1. Remove debris from air screen and clean underneath unit.
2. Pressure wash coil with biodegradable coil cleaning solution. Apply solution and let it stand for approx. five (5) minutes. Rinse with low pressure water.
3. The most effective method of coil cleaning is to open the unit and clean coils from the inside out using a low pressure-type sprayer.
4. Straighten fin tubes with fin comb.

5. Check electrical connections for tightness.
6. Check mounting for tightness.
7. Check for and remove all corrosion or rust from unit and supporting steel, prime and paint as necessary. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less. Consult the MSDS for proper personal protective equipment (PPE).
8. Check fan blades and belts. Clean fan blades as necessary.
9. Check wires at condenser electrical fused safety switches for tightness and burned insulation. Repair as necessary.
10. Clean up work area.

Recommended Tools, Materials, and Equipment:

1. Tool Group A.
2. Refrigeration manifold.
3. Pressure washer.
4. Fin comb.
5. Paint brush.
6. Cleaning materials and tools, vacuum, grease gun, and oil. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
7. Respirator
8. Safety goggles.
9. Gloves
10. Rust inhibitor and protective coatings. Consult the MSDS for hazardous ingredients and proper PPE. Consult the MSDS to ensure that the paint lead level is 0.06% or less.
11. Self sealing quick disconnect refrigerant hose fittings.
12. Refrigerant recovery/recycle unit.
13. EPA/DOT approved refrigerant storage tanks.
14. Approved refrigerant.
15. Electronic leak detector.

HVAC-CND-01-01Y

Frequency : Annually

Condensing Unit, Refrigeration

Application:

This standard applies to normal use units that have the compressors located inside the air cooled condensing units. These units are considered one-half of a split system. Condensing units are usually installed where compressor noise and/or vibration is undesirable and are connected with an air handler, packaged air conditioning (A/C) unit, modular A/C units (evaporators) that are ceiling or wall mounted, or a split system associated with walk-in freezers and/or refrigerators. If condensing unit is subject or exposed to salt water conditions see salt water location section.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Obtain and review manufacturer's operation and maintenance instructions.
3. Should be serviced just prior to the cooling season
4. Schedule outage of unit with personnel in area the unit serves.
5. Review the standard operating procedure for "Selection, Care, and Use of Respiratory Protection".
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
8. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
9. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
10. Recover, recycle, or reclaim the refrigerant as appropriate.
11. If disposal of the equipment is required, follow regulations concerning removal of refrigerants and disposal of the unit.
12. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
13. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
14. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and all labels on refrigerant containers.

Check Points:

1. Remove debris from air screen and clean underneath unit.
2. Pressure wash coil with coil cleaning solution. Rinse and neutralize (cleaning solution) in accordance with manufacturer's recommendations.
3. Straighten fins on tubes with a fin comb.
4. Check electrical connections for tightness.
5. Check unit mounts and tighten if necessary.
6. Check all refrigeration lines for support, and signs of wear
7. Thoroughly inspect and clean interior and exterior of machine.
8. Clean and treat all rusted areas. Touch up prime and paint as needed.
9. Check for refrigerant leaks using a halogen leak detector, soap bubbles, or similar testing device. If leaks are not able to be stopped or corrected, report leak status to supervisor.
10. Check refrigerant levels and recharge if needed.
11. Perform required lubrication and remove old or excess lubricant.
12. Clean motor with vacuum or low pressure air (less than 40 psi). Check for obstructions in motor cooling and air flow.
13. Visually inspect disconnect switches and contactors condition, proper operation, arcing or any evidence of overheating and fusing.
14. Check compressor crank case heater for current rating and controller manufacturer's recommended size before replacing heater. (Heater size shall not be changed without the Regional Design Engineer's approval.)
15. Check line and load connections and heater mounting screws for tightness.
16. Check condenser fan blades for dust buildup and clean if necessary.
17. Check condenser fan blades and moving parts for excessive wear.
18. Check fan motor RPM before replacing so the unit continues to operate at design specifications.
19. Check bearing collar set screws on fan shaft to make sure they are tight, if applicable.
20. Check dampers for dirt accumulation. Check felt; repair or replace as required.
21. Check damper motors and linkage for proper operation. Adjust linkage on vanes if out of alignment, if equipped.
22. Lubricate mechanical connections of dampers sparingly, if equipped.
23. Check compressor oil level (non-hermetically sealed units only) if compressor is equipped with a sight glass.
24. Run machine with service gauge manifold attached, checking action of controls, relays, switches, and other components to see that:
    a. compressor(s) run at proper settings.
    b. controls activate properly.
    c. controls activate unit.
    d. refrigerant suction and discharge pressures are proper.

25. Check setting on controls and return and adjust back to normal operation if necessary.
26. Clean up the work area and properly dispose of debris and waste.

Note: Seal off all service ports with flare caps. Report any missing caps or dust covers.

Salt water Locations

Application:

This PM guide applies to equipment which has the condenser, fan(s), and fan motor(s) enclosed within the same housing. The compressor and other components are at a separate location. PM of these other devices should be scheduled simultaneously with the units serviced by the condenser. Special care must be taken to protect the unit's control board and other electrical components from getting any water on them while cleaning. The use of harsh or caustic cleaning agents or materials such as bleach or coil cleaners will cause damage or deterioration of the aluminum fin or coil material and is not recommended. Care must be taken not to bend the aluminum fin stock.

Special Instructions:

1. Review manufacturer's instructions.
2. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources."
3. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
4. Deenergize, lock out, and tag electrical circuit breaker.

Avoid use of extremely high-pressure water jet while cleaning coil surface. Fins will damage under extreme high pressure water. Do not use strongly alkaline detergent mixtures (pH greater than 10).

Check points:

1. Remove debris from air screen and clean underneath unit.
2. Pressure wash coil with biodegradable coil cleaning solution. Apply solution and let it stand for approx. five (5) minutes. Rinse with low pressure water.
3. The most effective method of coil cleaning is to open the unit and clean coils from the inside out using a low pressure-type sprayer.
4. Straighten fin tubes with fin comb.

5. Check electrical connections for tightness.
6. Check mounting for tightness.
7. Check for and remove all corrosion or rust from unit and supporting steel, prime and paint as necessary. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less. Consult the MSDS for proper personal protective equipment (PPE).
8. Check fan blades and belts. Clean fan blades as necessary.
9. Check wires at condenser electrical fused safety switches for tightness and burned insulation. Repair as necessary.
10. Clean up work area.

Recommended Tools, Materials, and Equipment:

1. Tool Group A.
2. Refrigeration manifold.
3. Pressure washer.
4. Fin comb.
5. Paint brush.
6. Cleaning materials and tools, vacuum, grease gun, and oil. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
7. Respirator
8. Safety goggles.
9. Gloves
10. Rust inhibitor and protective coatings. Consult the MSDS for hazardous ingredients and proper PPE. Consult the MSDS to ensure that the paint lead level is 0.06% or less.
11. Self sealing quick disconnect refrigerant hose fittings.
12. Refrigerant recovery/recycle unit.
13. EPA/DOT approved refrigerant storage tanks.
14. Approved refrigerant.
15. Electronic leak detector.

HVAC-DMP-01-01Y

Frequency: Annually

Motorized Dampers, Pneumatic or Electric

Application

This standard applies to all dampers in the HVAC system including air handlers and remote dampers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule shutdown with operating personnel, as needed.
3. Review manufacturer's instructions.
4. During damper servicing, moveable surfaces should be cleaned and lubricated.
5. For pneumatic systems, verify proper main line pressure per manufacturer's specifications.
6. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work. Follow lock out/tag out procedures at all times.

Parent of this Piece of Equipment

Air Handlers

Check points:

1. Cleaning dampers annually with a power washer or with a bucket of soapy water and a brush. If dampers are on the intake of an air handler, ensure unit is shut down prior to cleaning.
2. Check damper for freedom of movement and proper operation. Drive actuator through full range.
3. Observe damper operation through full operating range, by activating controller.
4. Check damper surfaces for wear and clean vanes.
5. Check damper end bushings for excessive wear. Replace as needed.
6. Check actuator/damper linkage for proper operation. Adjust if needed. Tighten operator arm set screws.
7. Lubricate mechanical connections sparingly using an approved lubricant. Wipe off excess.
8. Check actuator for proper operation.
    a. If it does not stroke properly, check for binding drive stem.

   b. If actuator still does not operate properly, pressure test the diaphragm. If the diaphragm fails the pressure test, replace the diaphragm (pneumatic actuators).
   c. If the actuator still does not operate properly, disassemble the actuator (pneumatic actuators only) and check the accumulator for excessive wear or binding. Repair or replace the actuator.
   d. If the actuator has a pilot positioner (pneumatic only) calibrate the pilot positioner.
9. Check for proper operating voltage, signal voltage, and resistance as applicable on motorized actuators.
10. Check hydraulic fluid levels if applicable on electro-hydraulic motors. If low or discolored replace hydraulic medium or actuator per manufacturer's instructions.
11. If damper is used for outside air economizer, check economizer setpoints in the BAS.
12. For pneumatic actuators, check for air leaks around actuator and in air line between controller and actuator.
13. Lubricate actuator linkage sparingly. Wipe off excess lubricant. DO NOT LUBRICATE actuator/drive stem.
14. Clean off any corrosion or rust on damper frame and or damper blades and restore original finish.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Lubricants

HVAC-EVP-01- 03M

Frequency: Quarterly

Indirect Evaporative Cooling System

Application:

This standard card applies to those installations that utilize a indirect evaporative cooler as a precooler for an air handler system. Indirect evaporative cooling does not add moisture to the airstream to cool the air by means of contact with a cooling coil or other impermeable heat exchange surface. Typically, air or water is circulated through one side of the heat exchange surface while supply air is drawn through or past the other side, cooling the air. Heat exchange surfaces can be tubes or plates. These types of systems may have individual sumps or may also have a common sump. They may also be installed in conjunction with direct evaporative systems.

If this equipment is part of an Air Handler, the Air Handler will be serviced using that standard card and the evaporative cooler should be scheduled for accomplishment at the same time.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule outage with operating personnel.
4. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work. Follow lock out/tag out procedures at all times. Open, lock, and tag out electric circuits serving motors for the air handler, indirect evaporative cooling fan (if equipped) and circulating pump(s).
5. Preventive maintenance on associated equipment should be accomplished at this time.

Check Points:

1. Examine and wire brush all structural elements including doors, chamber, piping, plates, supports, pans, sumps, and framing.
2. Clean tank or sump and examine for leaks.
3. Examine all heat transfer surfaces for leaks, cracks or evidence of scaling. Check piping and plates for blockage or buildup. Clean as required.
4. Treat with rust inhibitor and paint as required. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less.
5. Clean pump suction screens.

6. Check operation of float valve, mixing or automatic control valves and thermometers.
7. Pumps and motors less than 1 HP will be serviced as part of this PM. Pumps and motors 1 HP and larger will be serviced using PM standard cards *HVAC-PMP-01* and *ELEC-MOT-01* respectively.
    a. Clean and lubricate pump. Check and replace packing if applicable.
    b. Blow out or vacuum motor windings and lubricate if required.
8. Check belts or drives on the indirect fan motors for wear, proper adjustment and proper alignment. Replace if necessary. Multiple belt installations require the belts to be replaced as sets.
9. Check outside (intake) air filters. Clean or replace as necessary.
10. If equipped, check exhaust filters. Clean or replace as necessary.
11. Remove tags and lockout from circuits for circulating pump only.
12. Check with operating personnel before restoring circuits to the air handlers, to be certain personnel are not working on the unit.

Note: Pans and sumps should remain dry during winter operation. Tags should be removed from supply valves at the completion of this work, but the valves should be opened by operating personnel only when the unit is to be filled and placed in service.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Standard tools - basic
2. Cleaning tools and materials, vacuum, grease gun and oil.
3. Rust inhibitor and paint. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
4. Gasket material
5. Goggles

HVAC-EVP-02-03M

Frequency: Quarterly

Direct Evaporative Cooling System

Application:

This standard card applies to those installations that utilize a direct evaporative cooler as either a precooler for an air handler system or as a stand alone system. Direct evaporative cooling adds moisture to the airstream to cool the air by means of a cooling pad or media. Typically, water is circulated via a small pump over the media while air is drawn through it cooling the air. These types of systems may have individual sumps or may also have a common sump.

If this equipment is part of an Air Handler, the Air Handler will be serviced using that standard card and the evaporative cooler should be scheduled for accomplishment at the same time.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule outage with operating personnel.
3. Review manufacturer's instructions.
4. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work. Follow lock out/tag out procedures at all times. Open, lock, and tag out electric circuits serving motors for the air handler, evaporative cooling fan (if equipped) and circulating pump.
5. Preventive maintenance on associated equipment should be accomplished at this time.

Check Points:

1. Examine and wire brush all structural elements including doors, chamber, piping, supports, pans, sumps, and framing.
2. Clean tank or sump and examine for leaks.
3. Treat with rust inhibitor and paint as required. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less.
4. Clean pump suction screens.
5. Check pad distribution piping and clean as necessary. Replace as required.
6. Check piping for blockage or buildup. Clean or replace as required.
7. Check operation of float valve, mixing or automatic control valves and thermometers.

8. Pumps and motors less than 1 HP will be serviced as part of this PM. Pumps and motors 1 HP and larger will be serviced using PM standard cards for the respective equipment.
    c. Clean and lubricate pump. Check and replace packing if applicable.
    d. Blow out or vacuum motor windings and lubricate if required.
9. Remove tags and lockout from circuits for circulating pump only.
10. Check with operating personnel before restoring circuits to the air handlers, to be certain personnel are not working on the unit.

Typical Maintenance Items	At start of season (Start-Up)	During the season	At end of season (Shut-Down)
Clean pads	X	As needed	X
Remove and clean or replace pads	As needed	As needed	As needed
Clean pump	X	As needed	X
Drain and clean water pan	X	As needed	X
Touch-Up cabinet	As needed	As needed	As needed

Note: Pans and sumps should remain dry during winter operation. Tags should be removed from supply valves at the completion of this work, but the valves should be opened by operating personnel only when the unit is to be filled and placed in service.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Standard tools - basic
2. Cleaning tools and materials, vacuum, grease gun and oil.
3. Rust inhibitor and paint. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
4. Gasket material
5. Goggles

HVAC-EVP-03-03M

Frequency: Quarterly

Humidification Systems

Application:

This standard card applies to self-contained humidification units containing a complete system or units which are part of a large air handler and controlled by a humidistat. These units are used to add or maintain the humidity at a prescribed level in a space in a given temperature range. These can be powered by a steam generator, supplied by site steam or electric.

Special Instructions.

1. Review manufacturer's instructions.
2. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection."
3. Turn off water supply.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Use of work gloves may be necessary due to caustic residual mineral deposits.

Check points.

1. Operate humidistat through its throttling range to verify activation, or deactivation of humidifier.
2. Clean and flush condensate pans, drains, water pans, etc. Remove corrosion, and repaint or recoat as needed. If a corrosion preventive chemical is used, ensure that it does not become a part of the indoor air by creating large amounts of volatile organic compounds or irritants. Check the Material Safety Data Sheet (MSDS) to see what hazardous products are present. If hazardous products are present rinse very well before the system is returned to use. Ensure that the paint lead level is 0.06% or less.
3. Check condition of heating element. Clean steam coils.
4. Clean steam/water spray nozzles. Adjust/replace as needed.
5. Chemically clean exterior of coil to remove scale and encrustations present on the coil.
6. Inspect steam trap for proper operation.
7. Inspect pneumatic controller for air leaks.
8. Inspect water lines for leaks and corrosion. Tighten all connections and repair leaks.

Recommended Tools, Materials, and Equipment.

1. Tool Group A
2. Psychrometer
3. Coil cleaning chemical. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
4. Work gloves
5. Safety goggles
6. Respirator

HVAC-FAN-01-01Y

Frequency: Annually

Fan, Centrifugal

Application

This standard is for centrifugal fans typically found in air handling systems. Although they may be found in other systems such as exhaust systems This standard will typically be performed with the parent standard as noted below. Motor PM shall be performed at the same time as the fan PM.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule shutdown with operating personnel, as needed.
3. Review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. All tests shall conform to the appropriate NETA test procedure and the values used as standards shall conform to the manufacturer's, NETA, and ANSI Standards specifications.
6. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Equipment."
7. Refer to appropriate standard cards and manufacturer's instructions for motor maintenance.

Parent of this Piece of Equipment

Air Handlers

Check points:

1. Check fan blades for dust buildup and clean if necessary.
2. Check fan blades and moving parts excessive wear. Clean as needed.
3. Check fan RPM to design specifications.
4. Check bearing collar set screws on fan shaft to make sure they are tight.
5. Remove old or excess lubricant while fan is off.
6. Vacuum interior of unit if accessible. Clean exterior.
7. Lubricate fan shaft bearings while unit is running. Add grease slowly until slight bleeding is noted from the seals. Do not over lubricate.
8. Check belts for wear, adjust tension or alignment, and replace belts when necessary. Multiple belts should be replaced with matched sets.

9. Check pulley wheels and clean and lubricate as required.
10. Check structural members, vibration eliminators, and flexible connections. Check fan housing to ensure there is no damage and the housing is tight.
11. Remove all trash and clean area around fan and fan room.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Tachometer
3. Cleaning equipment and materials - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Vacuum
5. Grease guns, lubricants - Consult the MSDS for hazardous ingredients and proper PPE.
6. Respirator

HVAC-FAN-02-01Y

Frequency: Annually

Fan, Propeller or Axial

Application

This standard is for propeller or axial fans typically found in air handling systems. Although they may be found in other systems such as exhaust systems. This standard will typically be performed with the parent standard as noted below. Motor PM shall be performed at the same time as the fan PM.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule maintenance with operating personnel.
3. Obtain and review manufacturer's information for servicing, testing and operating.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Parent of this Piece of Equipment

Air Handlers

Check Points:

1. Clean unit, especially fan blades.
2. Inspect pulleys, belts, couplings, etc.; adjust tension and tighten mountings as necessary. Change badly worn belts. Multiple belts should be replaced with matched sets.
3. Perform required lubrication and remove old or excess lubricant.
4. Clean motor with vacuum or low pressure dry air (less than 40 psig). Check for obstructions in motor cooling and air flow.
5. Remove all trash and debris.
6. Start unit and check for vibration and noise.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Vacuum
3. Cleaning materials - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

4. Lubricants - Consult the MSDS for hazardous ingredients and proper PPE.

General Services Administration Preventive Maintenance Guide
Effective Date: October, 2012

HVAC-FCU-01-03M Frequency: Quarterly

Fan Coil Unit

Application

This standard applies to all fan coil units; with or without fan speed control in two or four pipe systems. These units may be found in various locations including wall mounted, under window mounted, or ceiling mounted.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule shutdown with operating personnel, as needed.
3. Review manufacturer's instructions.
4. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work. Follow lock out/tag out procedures at all times.

Check Points:

1. Check fan blades for dust buildup and clean if necessary.
2. Check fan blades and moving parts for cracks and excessive wear.
3. Check running motor amperes. Compare with manufacturer's specifications.
4. Tighten all electrical connectors to proper torque
5. Check that the fan runs properly in all speeds as applicable.
6. Check dampers for dirt accumulations, clean as necessary. Check felt, repair or replace as necessary.
7. Check damper actuators and linkage for proper operation as applicable. Adjust linkage on dampers if out of alignment.
8. Lubricate mechanical connections of dampers sparingly as applicable.
9. Check the valve(s) for signs of leakage and proper operation. Repair or replace as necessary.
10. Clean coils by brushing, blowing, vacuuming, or pressure washing.
11. Check coils for leaking, tightness of fittings.
12. Use fin comb to straighten coil fins.
13. Check belts for wear and cracks, adjust tension or alignment as applicable. Replace belts when necessary.
14. Check rigid couplings for alignment on direct drives, and for tightness of assembly.
1. Before heating season on units with outside air (chilled water coils only):
    a. Drain cooling coils;
    b. Blow down to remove moisture.

2. Check freezestat for proper temperature setting and operation on units with outside air.
3. Vacuum interior of unit.
4. Check filter door for proper gasketing and air leaks. Correct as necessary.
5. Change the filter with the correct size and type filter.
6. Insure that drain(s) are clear and running.
7. Clean up work area.

Recommended Tools, Materials, and Equipment:

1. Tool Group A
2. Vacuum.
3. Fin comb
4. Cleaning tools and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
5. Safety goggles.
6. Gloves.

HVAC-FLT-01-03M

Frequency: Quarterly

Filters, Throw Away

Application

This standard is normally used for replicable prefilters, throw away type pleated filters or similar filters in air handling systems. This standard will typically be performed with the parent standard as noted below.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions and become familiar with manufacture recommended operating velocity. This information will assist in selecting proper filter efficiencies.
3. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Equipment."
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. The efficiency of all filters used in GSA controlled space will conform to the requirements of ASHRAE test method 52.1-92.
6. Review equipment design and or filter design specifications where applicable for the equipment. The design filter MERV rating shall be determined and installed.

Check points:

1. Replace filters when they lose their efficiency or when they are so clogged that they produce too much pressure drop across the filter. Check magnehelic gage to insure maximum pressure drop has not been reached.
2. Replace filters if the frame is bent or warped, or if the filtering medium is punctured.
3. Replace filters with the arrows on the frame pointing in the direction of airflow.
4. Check filter size and insure filters are installed to prevent leakage between the filter bed and its supporting frame.
5. Remove tags, restore to service, and check for proper operation.
6. Clean up work area and remove trash.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Filter replacement

3. Vacuum
4. Respirator

HVAC-FLT-02-03M

Frequency: Quarterly

Filters, Roll, Disposable

Application

This standard applies to changing disposable roll filter media. This standard will typically be performed with any required air handler maintenance.

Special Instructions:

1. Review manufacturer's instructions.
2. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
3. De energize fan, media motor; tag and lock out circuit.
4. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Equipment."

Parent of this Piece of Equipment

Air Handlers

Check points:

1. Remove old filter media as required and install new roll.
2. Vacuum heavy accumulation of dust and remove debris.
3. Inspect for proper alignment and operation of automatic controls, adjust as necessary.
4. Clean and lubricate filter rollers and transport mechanisms as necessary for proper operation.
5. Remove all trash from area and room, put equipment back in operation.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Respirator
3. Goggles

HVAC-FLT-02-01Y

Frequency: Annually

Filter, Roll Type Disposable

Application

This standard applies to changing disposable roll filter media as part of a larger air handler. This maintenance should be performed along with quarterly filter maintenance and any air handler maintenance as required.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Equipment."
5. Review manufacturer's instructions and become familiar with manufacture recommended operating velocity. This information will assist in selecting proper filter efficiencies.
6. The efficiency of all filters used in GSA controlled space will conform to the requirements of ASHRAE test method 52.1-92.

Parent of this Piece of Equipment

Air Handlers

Check points:

1. Remove old filter media roll, vacuum heavy dust and remove debris.
2. Inspect framework and structure. Look for loose or missing bolts, air leaks, condition of flashing or caulking.
3. Inspect all moving parts for proper alignment, freedom of motion, excessive clearance or play, Clean, adjust or tighten as necessary.
4. Install new media roll, inspect powered roll, and take-up roll for correct tracking of media. On manual operation, check wheel or hand crank.
5. On motor drives, check pressure sensing device(s) and pressure switches. Test settings for starting and stopping motor.
6. Inspect motor, starter, controls, selector switch for auto warning or indicator lights.

7. Check oil in gear case. Change or replenish as required. Perform required lubrication using graphite where it is suitable. Remove old or excess lubricant.
8. Remove all trash and debris to proper disposal area.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Respirator
3. Goggles
4. Appropriate lubricants - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

HVAC-FLT-03-03M

Frequency: Quarterly

Filters, Electrostatic

Application

This standard applies to all electrostatic filters used in air handling and kitchen applications. This standard will typically be performed with the parent standard as noted below.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Equipment."
5. Ground bus trips, top to bottom.

Parent of this Piece of Equipment

Air Handlers

Check points:

1. Before securing unit, check indicators for defective tubes or broken ionizing wires.
2. Secure filter unit and air handler.
3. Wash each manifold until totally clean. Units with water wash spray require approximately four (4) minutes with warm water or seven (7) minutes with cold water.
4. If dry filters are dirty, remove and clean or replace filter.
5. While cells are drying, look for defects, particularly broken wires or hum suppressor. Wipe insulators with soft dry cloth.
6. If unit requires disassembly, check it thoroughly, clean, and adjust as required.
7. Restore to service and check for evidence of shorts.
8. Clean work area and remove trash to proper disposal area.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic

2. Respirator
3. Cleaning equipment and materials - Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

HVAC-FLT-04-03M

Frequency: Quarterly

Filters, Viscous Type (Wire Mesh)

Application

This standard is for reusable filters and includes time for removing, cleaning, and replacing the filters. The throw-away filters are usually more economical than the viscous type. This standard will typically be performed with the parent standard as noted below.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Equipment."
3. The efficiency of all filters used in GSA controlled space will conform to the requirements of ASHRAE test method 52.1-92.
4. Filter efficiencies will be selected in accordance with the operating velocity recommended by the manufacture.
5. Liquid adhesive coatings used on air filters shall have a flash point no lower than 325 °F (163°C) as determined by ASTM D93 and the filter will meet all NFPA and UL standards.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Parent of this Piece of Equipment

Air Handlers

Check points.

1. Remove filters and replace with filters that have been cleaned and recoated. Examine frame and clean it with a high suction vacuum. Repair or replace damaged frame.
2. Move dirty filters to cleaning station.
3. Clean, recoat, and store filters removed until next scheduled change.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Respirator

3. Goggles

HVAC-FLT-05-03M

Frequency: Quarterly

Filters, Charcoal

Application

This standard card applies to charcoal filters used in air distribution systems to clean air of undesirable or hazardous materials. These filters may be cleaned by group forces or require shipping to manufacturer for recycling.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Notify operating personnel before shut down.
3. Maintenance personnel must wear NIOSH/MSHA respirators and appropriate protective clothing and equipment when servicing filters involving hazardous materials, i.e., shooting ranges, research laboratories, chemical laboratories, photographic development labs, etc.
4. Follow manufacturer's recommendations for handling, transporting, cleaning and shipping filters.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Parent of this Piece of Equipment

Air Handlers

Check points:

1. Remove old filters and place in plastic bags.
2. Clean filter holder, rack and surrounding area.
3. Install new filter.
4. Place cleaning materials in plastic bags for disposal if work involves hazardous materials. Consult the Material Safety Data Sheets (MSDS) for proper disposal.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Filter replacement
3. Vacuum
4. Respirator

HVAC-FLT-06-01M

Frequency: Monthly

Filters, Special situations or conditions.

Application
This standard is used for all filter types that will require changing monthly due to special or unusual air quality conditions. Use the applicable quarterly standard that applies to the specific filter type used.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions and become familiar with manufacture recommended operating velocity. This information will assist in selecting proper filter efficiencies.
3. Review the Standard Operating Procedure for "Selection, Care and Use of Respiratory Equipment."
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. The efficiency of all filters used in GSA controlled space will conform to the requirements of ASHRAE test method 52.1-92.
6. Review equipment design and or filter design specifications where applicable for the equipment. The design filter MERV rating shall be determined and installed.

Check points:

Reference applicable Quarterly standard.

a. HVAC-FLT-01-03M Filter, Throw Away
b. HVAC-FLT-02-03M Filter, Roll Type, Disposable Media
c. HVAC-FLT-03-03M Filter, Electrostatic
d. HVAC-FLT-04-03M Filters, Viscous Type (Wire Mesh)
e. HVAC-FLT-05-03M Filter, Charcoal

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Filter replacement
3. Vacuum
4. Respirator

HVAC-HXR-01-01Y

Frequency: Annually

Plate and Frame Heat Exchanger

Application

This standard applies to plate and frame heat exchangers. A plate and frame heat exchanger consist of plates separating the hot and cold fluids. Plate and frame heat exchangers have very high heat transfer surface area due to the large surface area of the plates in contact with the operating fluid. Plate and frame heat exchangers are compact compared to tube type heat exchanger of similar capacity. In commercial building application, plate and frame type heat exchangers are normally used in water side economizer systems.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions and drawings.
3. Open unit only when defective plates are suspected or leaks occur that cannot not be stopped by tightening.
4. If unit is opened follow manufacturer's instructions concerning disassembly, internal cleaning and reassemble.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Never open the unit when hot.
7. The pressure of both liquids should be simultaneously decreased gradually when shutting down a unit.
8. If leaks occur tighten to average dimension as shown on assembly drawing or unit data plate, follow manufacturer's suggested tightening sequence.
9. Back flush the unit when fibers or large particulate are present this can be accomplished by flushing the unit with clean water in reverse flow at 1 to 1½ times product flow or by arranging piping and valves so the unit may be operated in reverse flow mode on the product side for certain periods of time.
10. Clean in Place (CIP) when back flushing does not provide desired results, The unit must be flushed clear to obtain a thorough cleaning and it is necessary to flow CIP solution bottom to top to ensure wetting of all surfaces the rate of flow should be greater than normal product flow rate.
11. Strainers should be installed in supply lines ahead of the exchanger when the streams contain significant solids or fibers.

Check Points:

1. Check exposed bolt threads, upper guide bars, rollers in the moveable end frame and connecting frame. Clean and coat with a light grease.
2. Check unpainted carbon steel surfaces, clean and coat with light grease, SAE-30 oil or other rust inhibiting product.
3. Check pressure and temperature gauges, Back flush unit and clean in place annually or any time pressure/temperature profile exceeds set limits.
4. Check unit for leaks, follow manufactures trouble shooting guide to locate defective plates.
5. Check overall external appearance and condition of unit.

HVAC-PMP-01-01Y

Frequency: Annually

Centrifugal Pump

Description:

This procedure applies to all types of centrifugal pumps found in various mechanical systems throughout the building.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system PRIOR to making any changes.
3. Schedule service outages for the areas controlled by the field panel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. For replacement of mechanical seals, see the addendum at the end of this standard. It is generally not a good idea to tamper with pumps using mechanical seals if they are otherwise performing properly. Since mechanical seals can cost as much as the pump, it is usually not cost effective to risk damaging the seal by performing an annual internal inspection of the pump.

Check points:

1. Visually inspect the energized pump and motor. Look for fluid leaks originating from the area of the mechanical seal. Replace seal even if leaking only slightly. If seal is leaking, perform the following.
    a. Disconnect and remove pump/motor coupling from pump shaft.
    b. Clean external pump housing and shaft.
    c. Remove flange on pump housing to remove pump mechanical seal assembly while noting how the seal is assembled on the shaft and in the pump housing.
    d. After old seal has been removed, clean surfaces of shaft sleeve.
    e. If this sleeve is galled or damaged, a new seal will not hold for long. It is best to replace the shaft sleeve at this time.
    f. If the shaft sleeve is not damaged, follow seal manufacturer's instructions and install new mechanical seal.
    g. Install new pump housing "O" ring or gasket, reinstall pump housing.
    h. Slowly open discharge and suction valve, then rotate pump shaft to assist in setting mechanical seal.

2. Look for fluid leaks from other areas of the pump, flanges and gaskets, pressure gauges and fittings, bypass tubes or piping, and air release valves.
3. Look for bearing oil or grease leaks.
4. Observe coupling for excessive noise or obvious misalignment.
5. Observe fluid temperatures, pressures, and bearing temperatures if thermometers and pressure gauges are available.
6. De-energize pump and motor.
7. Observe pump and motor during shutdown. Often times, vibration and bearing problems become more noticeable during a coasting slowdown of the pump and motor.
8. Close suction and any bypass valves. Bleed off pressure but do not drain pump.
9. Observe pressure gauges for signs that the discharge check valve is not closing tightly.
10. Close discharge valve. Bleed off pressure but do not drain pump. Observe pressure gauges for signs that the discharge and suction valves are not closing tightly.
11. Lubricate pump and motor bearings. DO NOT OVER LUBRICATE
12. Use a torque wrench to check the tightness of all bolts, especially the bolts of cast iron pumps.
13. Closely inspect the pump-motor coupling.
14. Check motor and pump alignment.
15. Inspect and clean suction strainers and blowdown valves.
16. Clean pump and casing surfaces.

<u>Other pumps</u>:

1. Check that base bolts are securely fastened.
2. After shut-down, drain pump housing, check suction, discharge and check valve for holding.
3. Remove cover gland and packing.
4. Remove corrosion from impeller shaft and housing cover.
5. On pumps with oil ring lubricated bearings, drain oil, flush, and fill to proper oil level with new approved type oil.
6. Inspect water rings, seals, and impeller.
7. Clean pump suction strainers, and pump packing water seal filter/strainer.
8. Replace packing and reassemble.
9. Start and stop pump, noting vibration, pressure, and action of check valve.
10. Adjust packing.
11. Lubricate impeller shaft bearings. Do not over lubricate.
12. Check motor and pump alignment.
13. Check drive shaft coupling.
14. Clean up work area and remove all debris.

COUPLING SIZE	ALLOWABLE ALIGNMENT
1"-2"	0.101 Total ind. reading
Over 2"-4"	0.015 Total ind. reading
Over 4"-7"	0.020 Total ind. reading

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Alignment indicator
3. Grease gun
4. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
5. Hoist assembly for large pumps.

HVAC-PMP-02-01Y

Frequency: Annually

Vacuum Pump

Application

This standard card applies to vacuum pumps used in printing plants, photographic plants, and other operation that requires a vacuum to operate. These units vary in size and appearance. They may resemble a small tank-less air compressor or a larger tank mounted and belt driven air compressor

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system PRIOR to making any changes.
3. Schedule service outages for the areas controlled by the field panel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Drain oil from reservoir if applicable. Place oil in a proper receptacle for oil disposal.
2. Remove oil filter and replace, if applicable.
3. Remove oil sight glass and clean as needed.
4. Fill with the appropriate type and amount of oil if applicable. Refer to manufacturer's specifications for the equipment.
5. Remove the exhaust filter and replace.
6. Check the exhaust chamber and oil return line for clogging. Clean if needed.
7. Inspect the exhaust chamber for excess oil. Wipe out if needed.
8. Inspect the vacuum inlet filter.
9. Wipe out the interior of the filter housing
10. Wipe exterior surfaces of the pump free of debris and oil.
11. Remove and clean the vacuum diverter valve. Replace with new if needed.
12. If applicable, check the drive belt for cracks fraying and stretching. Replace if worn.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

2. Cleaning tools and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
3. Safety goggles.
4. Gloves.

HVAC-STM-01-01Y

Frequency: Annually

Condensate or Vacuum Pump

Application:

These pumps are generally present in steam systems, when condensate is returned to the steam plant to be reused or is expelled from the system. When steam is supplied by a local utility the condensate is not usually recirculated, since it is usually monitored for billing purposes. In some cases condensate pumps are present at coiling coils with dehumidification loads.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. This maintenance should only be performed when it will not prevent operation of the steam boiler.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check points:

1. Operate unit to check for steam binding.
2. Check condensate temperature. It should be approximately 30°F (17°C) below steam temperature if traps are not leaking.
3. Examine flanges for steam leaks, replace gaskets as necessary.
4. Pump receiver down.
5. Turn condensate to sewer.
6. Shut down unit.
7. Clean and examine receiver, vent pipe, inlet and discharge openings for corrosion; remove all external corrosion, and paint with appropriate type paint.
8. Clean and adjust motor float switch and float operation on high low water level. Inspect float rods and pressure switches.
9. Make any adjustments as necessary.
10. Check alignment of motor and pump coupling with straight edge. Align if necessary.
11. Lubricate pump and motor.
12. Adjust packing glands and change packing when necessary.
13. Examine vacuum breaker operation.
14. Inspect ball floats, rods, and other linkage, adjust as necessary.

15. Properly dispose of all debris.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Clean wiping cloths.
4. Gasket materials as required.
5. Metal cleaning materials and appropriate paint as necessary. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
6. Six inch level and straight edge.

HVAC-TAB-01-05Y

Frequency: 5-Year

Test-And-Balance

Application:

These standard applies to Test-And-Balance.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Review most recent certified TAB report.
3. Verify that any subsequent remodeling, tenant improvements, or installation of major electrical devices have been reviewed by a mechanical engineer for impacts on heating and cooling loads.

Check Points:

1. Using flow hoods, traverse pitot or anemometer to verify minimum and maximum air flows against the report.
2. Use pressure gauges to verify water flow rates against the report.
3. Verify readings agree with BAS readings, to within 5-10%.

Recommended Tools, Materials, and Equipment:

1. Flow hood
2. Traverse pitot tube or anemometer
3. Pressure gauges or flow meter

HVAC-TMU-01-01Y

Frequency: Annually

Terminal Units, Pneumatic or Electric

Application:

This maintenance standard applies to most terminal units (mixing boxes) which are found in most types of air handling systems. The terminal unit may be VAV, CAV, dual duct, with or without heating/re-heating or cooling, and be pressure dependant or pressure independent. These mixing boxes will be controlled by either pneumatics or Direct Digital Controls (DDC). The re-heat coil maintenance shall be combined with this standard.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's specifications.
3. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any control changes.
4. For pneumatic systems, verify proper main line pressure per manufacturer's specifications.
5. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work. Follow lock out/tag out procedures at all times.

Check Points:

DDC:

1. Check to see that the operating control sensor activates the damper per design specifications. If not, recalibrate or replace the operating control sensor with the same temperature range sensor.
2. Check damper linkage for tightness or damage. Lightly oil moving parts using an approved lubricant.
3. Inspect damper(s) for free movement in mixing box. Replace felt or other type seals as required.
4. Inspect mixing box and connecting ductwork for air leaks. Correct leaks with approved duct tape or tighten connections, as required.
5. Tighten electrical connections to all servo-motor actuators, and test as applicable.

6. Check the heating or cooling valve (if present) for leakage around the stem or between the seat and disk. Repair or replace as needed.
7. Check velocity sensor tubing for cracks, tightness, or holes if applicable.

Re-heat (if applicable)

8. Check electrical connections and insulators on re-heat coils.
9. Vacuum or blow out the fins, coils, etc.
10. Comb fins as required.
11. Remove obstructions to air flow.
12. Check coils for leaks. Correct or report any leaks.
13. Test and inspect controls that protect coils against freezing.
14. Check for rust or corrosion around coil frame and coil mounting bracket.
15. Clean, prepare for painting and coat with proper type paint as necessary.
16. Record differential air pressure across the coil.

Pneumatic:

1. Check damper linkage for tightness or damage. Lightly oil moving parts using an approved lubricant for pneumatic systems.
2. Inspect damper(s) for free movement in mixing box. Replace felt or other type seals as required.
3. Inspect mixing box and connecting ductwork for air leaks. Correct leaks with approved duct tape or tighten connections, as required.
4. Inspect damper actuator(s) for tightness to mounting brackets.
5. Inspect damper actuator diaphragm for leaks by performing a pressure test of the diaphragm.
6. Check the damper actuator spring range. Replace spring, adjust pilot positioner, or add pilot positioner as needed.
7. If pneumatic actuator does not stroke properly, correct sticking valve stem or binding linkage. Replace or repair the diaphragm or actuator if necessary.
8. Check the heating or cooling valve for leakage around the stem or between the seat and disk. Repair or replace as needed.
9. Inspect the valve actuator for leaks by performing a pressure test of the diaphragm. Repair or replace as needed.
10. Check the spring range of the valve actuator. Replace spring, adjust pilot positioner or add pilot positioner as needed.
11. Inspect for air leaks around actuator and in the air line between controller and pneumatic actuator.
12. Inspect operating control thermostat and/or pressure sensor for proper location and check main and branch air lines at thermostat for crimps, breaks, etc. Repair or replace if needed.
13. Check all inline filters for oil and/or moisture. Replace as needed.

14. Check all installed pressure gages for proper range and operability as applicable. Replace if needed.
15. Perform a spring range check for all remaining end devices.
16. Calibrate the operating control thermostat. Replace if it is defective with the same type action (direct or reverse action) and temperature range.
17. Check to see that the operating control thermostat activates the damper per design specifications. If not, recalibrate the operating control thermostat.

Re-heat (if applicable)

18. Check electrical connections and insulators on re-heat coils.
19. Vacuum or blow out the fins, coils, etc.
20. Comb fins as required.
21. Remove obstructions to air flow.
22. Check coils for leaks. Correct or report any leaks.
23. Check for rust or corrosion around coil frame and coil mounting bracket.
24. Clean, prepare for painting and coat with proper type paint as necessary.
25. Record differential air pressure across the coil.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Control drawings
3. Calibration tools
4. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
5. Duct tape
6. Cleaning materials and equipment. Consult the MSDS for hazardous ingredients and proper PPE.
7. Safety goggles

HVAC-TMU-02-03M

Frequency: Quarterly

Terminal Units, Pneumatic or Electric, Predictive Maintenance

Application:

This maintenance standard applies to most terminal units (mixing boxes) which are found in most types of air handling systems. The terminal unit may be VAV, CAV, dual duct, with or without heating or cooling, and be pressure dependant or pressure independent. These terminal units will be controlled by Direct Digital Controls (DDC) ONLY. This standard includes some predictive maintenance tasks and can be used as an alternative to the purely preventive maintenance standard for DDC controlled units only.

The use of a fault detection diagnostic tool, such as VAV Box Performance Assessment Control Charts (VPACC, form NIST) which uses a small number of control charts to assess the performance of VAV boxes is the primary means for this predictive maintenance task. This standard assumes that the diagnostic tools is installed and functioning properly and that staff has been trained on its use.

O&M contractors may propose changes to this standard. Such changes are subject to GSA approval. Proposed changes to standards must be submitted showing markups of changes for GSA approval.

This standard may be used in lieu of standard HVAC-TMU-01-01Y. However, this standard is performed quarterly.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's specifications.
3. Read and understand manufacturer's instructions of each device before making adjustments to the device or to the system. Understand what effects making adjustments will have on the overall Building Automation System and the operation of the building PRIOR to making any control changes.
4. For pneumatic systems, verify proper main line pressure per manufacturer’s specifications.
5. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work. Follow lock out/tag out procedures at all times.

Check Points:

DDC:

1. Check to see that the operating control sensor activates the damper per design specifications. If not, recalibrate or replace the operating control sensor with the same temperature range sensor.
2. Check damper linkage for tightness or damage. Lightly oil moving parts using an approved lubricant.
3. Inspect damper(s) for free movement in mixing box. Replace felt or other type seals as required.
4. Inspect mixing box and connecting ductwork for air leaks. Correct leaks with approved duct tape or tighten connections, as required.
5. Tighten electrical connections to all servo-motor actuators, and test as applicable.
6. Check the heating or cooling valve (if present) for leakage around the stem or between the seat and disk. Repair or replace as needed.
7. Check velocity sensor tubing for cracks, tightness, or holes if applicable.

Predictive Maintenance Checkpoints

1. Ensure that diagnostic tool has been installed properly.
2. Review all alarms associated with the diagnostic tool and any corrective actions that have been taken as a result. All alarming functions that were originally set up in the diagnostic tool should be responded to at the time of the alarm.
3. Review all trend data generated by the diagnostic tool where alarms are present.
4. Based on the results, repair or correct the terminal unit mechanical or control related deficiency as required by qualified staff.
5. Ensure that the diagnostic tool remains in operation and that operators are trained on its use.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Control drawings
3. Calibration tools
4. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
5. Duct tape
6. Cleaning materials and equipment. Consult the MSDS for hazardous ingredients and proper PPE.

7. Safety goggles

HVAC-TWR-01-03M

Frequency : Quarterly

Cooling Tower, Cleaning

Application:

This applies to all cooling towers and evaporative condensers. Those located on the mezzanine or lower levels and near fresh air intakes are particularly important. Since cooling tower and evaporative condensers can become contaminated with microorganisms which are harmful.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform work before seasonal start-up (unless system has remained clean and free of bio-deposits), before seasonal shutdown, and quarterly during the cooling season.
3. If unit is not used year round drain and clean at least twice per year.
4. Review manufacturer's instructions.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. times.
7. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
8. Ensure that there are safe and sturdy ladders and platforms to perform the lifting and cleaning required.
9. If biological growth is excessive, have a qualified water treatment specialist review your treatment program.
10. Refer to Table A for information on chlorine use.
11. If materials to be worked on, such as the wet deck panels (fill), are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.

Check Points:

1. Close building air intake vents within the vicinity of the cooling tower until the cleaning procedure is complete.

2. Shut down, drain, and flush the cooling tower with water (check with state to determine if there are any restrictions on discharging the water). Isolate the cooling tower from the rest of the condenser water system where applicable.
3. Clean the wet deck, remove all debris, and dispose of properly. If the wet deck panels contains asbestos, it is considered hazardous waste. Refer to Appendix G for the Universal Waste Guide.
4. Inspect the tower, the tower basin and holding tank for sediment and sludge, and any biological growth.
5. Using low pressure water hose or brushes, clean the tower, floor, sump, fill, spray pans and nozzles and removable components such as access hatches, ball float, and other fittings until all surfaces are clean and free of loose material. Porous surfaces such as wooden and ceramic tile towers will require additional cleaning and brushing. Clean cracks and crevices where buildup is not reached by water treatment.
6. Clean all system strainers and strainer housings.
7. Remove drift eliminators and clean thoroughly using a hose, steam, or chemical cleanser.
8. Check fan and air inlet screens and remove any dirt or debris.
9. Reassemble components, and fill tower and cooling system with water.
10. Monitor the water pH and maintain pH within a range of 7.5 to 9.5. The pH can be monitored with litmus paper or a pH meter.
11. Add chemicals need to maintain water chemistry properties recommended by a water treatment consultant.

Perform the following if a more thorough disinfectant cleaning is needed;

1. Add a silicate-based low or non-foaming detergent as a dispersant at a dosage of 10-25 pounds per thousand gallons of water in the system.
   a. If the total volume of water in the system is not known, it can be estimated to be ten (10) times the recirculating rate (gallons per minute) or 30 gallons per ton of refrigeration capacity.
   b. The dispersant is best added by first dissolving it in water and adding the solution to a turbulent zone in the water system, such as the cooling tower basin near the pump suction.
   c. Contact a professional water treatment specialist for a dispersant which may be safely used without interfering with the operation of the system.
2. Add chlorine disinfectant to achieve 25 parts per million (ppm) of free residual chlorine.
   a. Maintain 10 ppm of free residual chlorine in water returning to the cooling tower for 24 hours.
   b. A swimming pool test kit may be used to monitor the chlorine. Follow the manufacturer's instructions. Test papers such as those used to monitor restaurant sanitizing tanks may also be used.

c. Monitor every 15 minutes for two hours to maintain the 10 ppm level. Add chlorine as needed to maintain this level.
d. Two hours after the slug dose or after three measurements are stable at 10 ppm of free residual chlorine, monitor at two hour intervals to maintain the 10 ppm of free residual chlorine.
e. Some kits cannot measure 10 ppm. In this case dilute the test sample with distilled water to bring it within the test set range.

3. After 24 hours, drain the system (check with state to determine if there are any restrictions on discharging the water).
4. Adjust bleed, float, central valve for desired water level.
5. Open any building air vents that were closed prior to the cleaning of the cooling tower.
6. Implement an effective routine treatment program for microbial control.
7. Document all maintenance and cleaning procedures by date and time. Record the brand name and the volume or weight of chemicals used.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Tool Group C.
2. Pressure washer with hose and nozzle.
3. Cleaning tools and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
4. Appropriate chemicals and detergents (see standard card for details). Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
5. Respirator with acid/gas/mist/HEPA filters. For other chemicals, refer to the Material Safety Data Sheet (MSDS) for recommended respirator).
6. Safety goggles.
7. Waterproof clothing (while working inside a wet tower).
8. Gloves (refer to MSDS on chemicals used for the type of gloves required).
9. Rubber boots if wet.
10. Litmus paper or pH meter.
11. Swimming pool test kit.

TABLE OF VALUES

Chlorine Compounds	**Percent Available Chlorine**	**Weight per 1000 gallons**
Hypochlorites		
Calcium, $Ca(OCl)_2$ (HTH)	70	0.3 lb.
Sodium, NaOCl		
Industrial grade	12-15	1.5 lb.
Domestic grade (bleach)	3-5	5.25 lb.
Potassium or sodium		
Chlorinated Isocyanurates	55-65	0.4 - 0.33 lb.
	66-90	0.33 - 0.25 lb.

* Only those compounds commonly available in most communities are listed. Other appropriate compounds may be suggested by a water treatment specialist.

** These weights are approximate and are calculated to attain a free chlorine level of 25 ppm in a theoretical cooling tower system with no bio-deposits. If bio-deposits are present, additional chlorine will be required. Calculate the volume of the entire cooling tower system, including the cooling tower water and the recirculating water; it should be several times more than the holding capacity of the tower.

*** Select only fast-release compounds, which are available in pellets, granular or extra granular forms in the 55-65% available chlorine category. Compounds with higher percentages of available chlorines (66-90%) release more slowly; use only the granular or extra granular forms.

HVAC-TWR-01-01Y

Frequency : Annually

Cooling Tower, Maintenance

Application:

Cooling towers are used in an open loop cooling water system. The most common use of a cooling tower is to cool the condenser water of a chiller. A cooling tower is composed of a fan, spray nozzles, heat transfer media and a water basin (sump). Within the cooling tower the water is sprayed over a heat transfer media called fill, as the first stage of cooling. The second stage of cooling occurs when the cooling tower fan is turned on. This fan is either a constant speed fan, a two speed fan or a variable speed fan.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule performance of this PM activity prior to seasonal start-up. Consider the time needed to effect any required repairs.
5. Perform cleaning of the tower in accordance with PM standard
6. Clean cooling tower(s) before performing this PM activity.
7. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
8. Properly dispose of any debris, excess oil, and grease.
9. If materials to be worked on, such as the wet deck panels (tower fill media), are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.

Children of this Piece of Equipment:

1. Fan Motors
2. Variable Frequency Drives

Check Points:

1. Exterior Structural:

a. Inspect louvers for correct position and alignment, missing or defective items, and supports.
b. Inspect casings and attaching hardware for leaks or defects. Check the integrity and secure attachment of the corner rolls.
c. Inspect for loose or rotten boards on wood casings. Examine from the interior. Extensive damage may require replacement with fiberglass sheathing.
d. Inspect condition of access doors and hinges. Repair as necessary.
e. Inspect the distribution system including flange connectors and gaskets, caulking of headers on counterflow towers, deterioration in distribution basins, splash guards, and associated piping on crossflow towers. If configured with water troughs check boards for warpage, splitting, and gaps.
f. Examine the drain boards for damage and proper drainage. Check the fasteners also.
g. Inspect stairways including handrails, knee rails, stringers, structure and fasteners for rot, corrosion, security and acid attack.
h. Shake ladders to verify security, and check all rungs.
i. Check the security, rot, and corrosion on walkway treads. Check treads, walkways, and platforms for loose, broken, or missing parts. Tighten or replace as necessary.
j. Ladders must be checked for corrosion, rot, etc. Verify compliance with Occupational Safety and Health regulations regarding height requirements. Check ladder security.
k. Check fan decks and supports for decay, missing and broken parts, and gaps. Check the security.
l. Fan cylinders must be securely anchored. Check fastening devices. Note any damaged, missing, or corroded items. Watch for wood rot and corrosion of steel. Verify proper tip clearance between the fan blade and interior of cylinder. Verify compliance with OSHA requirements regarding height. Check its condition.
m. Apply protective coatings as needed on exterior surfaces. Be sure rust and dirt have been removed first.

2. Interior Structural:
   a. Inspect the distribution system piping for decay, rust, or acid attack. Check the condition and tightness of connections and branch arms. Observe spray pattern of nozzles if possible and note missing and defective nozzles. Note condition of the redistribution system under the hot water system.
   b. Inspect mechanical equipment supports and fasteners for corrosion. Wood structural members in contact with steel should be checked for evidence of weakness. Check condition of springs or rubber vibration absorption pads, including adjusting bolts, ferrous members, and rubber pads.

c. Check valves and operating condition of fire detection system. Check for corrosion of pipes and connectors. Check wiring of any thermocouple installed.
d. Check drift eliminators and supports. Remove any clogging debris. Replace missing blades.
e. Inspect tower fill for damage, ice breakage, deterioration, and misplaced, missing, or defective splash bars.
f. Examine interior structural supports. Test columns, girts, and diagonal wood members for soundness by striking with a rubber mallet. A high pitched, sharp sound indicates good wood, whereas a dull sound indicates soft wood. Probe rotted areas with a screw driver to determine extent of rot. Look for iron rot of metal fasteners in contact with wood. Check condition of steel internals. Check condition and tightness of bolts.
g. Inspect the nuts and bolts in partitions for tightness and corrosion. Look for loose or deteriorated partition boards. Note if partitions are installed so as to prevent wind milling of idle fans. Make sure wind walls parallel to intake louvers are in position. Boards or transite members should be securely fastened. Check condition of wood or steel supports for rot and corrosion.
h. Check wooden cold water basins for deterioration, warps, splits, open joints, and sound of wood. Inspect steel basins for corrosion and general condition. Inspect concrete basins for cracks, breaking joints, and acid attack.
i. Check all sumps for debris, condition of screens, antiturbular plates, and freely operating drain valves.

3. Mechanical:
   a. Check alignment of gear, motor, and fan.
   b. Inspect fans and air inlet screens and remove any dirt or debris.
      1). Check hubs and hub covers for corrosion, and condition of attaching hardware.
      2). Inspect blade clamping arrangement for tightness and corrosion.
   c. Gear box
      1). Clean out any sludge.
      2). Change oil. Be sure gear box is full to avoid condensation.
      3). Rotate input shaft manually back and forth to check for backlash.
      4). Attempt to move the shaft radially to check for wear on the input pinion shaft bearing.
      5). Look for excessive play of the fan shaft bearings by applying a force up and down on the tip of a fan blade. Note: Some output shafts have a running clearance built into them.
   d. Power transmission.
      1). Check that the drive shaft and coupling guards are installed and that there are no signs of rubbing. Inspect the keys and set screws on the

drive shaft, and check the connecting hardware for tightness. Tighten or install as required.

2). Look for corrosion, wear, or missing elements on the drive shaft couplings.

3). Examine the exterior of the drive shaft for corrosion, and check the interior by tapping and listening for dead spots.

4). Observe flexible connectors of both ends of the shaft.

5). Inspect bearings, belts, and pulleys for excessive noise, wear or cracking, alignment, vibration, looseness, surface glazing, tension. Replace or repair as required.

e. Check water distribution. Adjust water level and flush out troughs if necessary. Check all piping, connections, and brackets for looseness. Tighten loose connections and mounting brackets. Replace bolts and braces as required.
f. Check nozzles for clogging and proper distribution.
g. Inspect keys and keyways in motor and drive shaft.

4. Electrical:
   a. Check electric motor for excessive heat and vibration. Lubricate all motor bearings as applicable. Remove excess lubricant.
   b. Inspect fused disconnect switches, wiring, conduit, and electrical controls for loose connections, charred or broken insulation, or other defects. Tighten, repair, or replace as required.
   c. Remove dust from air intakes, and check for corrosion. Check TEFC motors for conditions of air passages and fans.
   d. If there is a drain moisture plug installed, see if it is operational.
   e. Check amps and volts at operating loads, recommend pitching of fan blades to compensate.
   f. Look for corrosion and security of mounting bolts and attachments.
5. Winterizing: (if applicable) If Cooling Tower is seasonal.
   a. Check that all electrical energy switches condenser pumps, fans, sump heaters have been de-energized and tagged out.
   b. Check that tower is drained, water make-up has been secured at an interior building location tagged off and exterior line is drained and left open to prevent freezing.
   c. Check that tower drains are locked in the open position and tagged.
   d. If there are piping heaters, check to make sure they are energized and working.
   e. Check that tower supply and return lines have been drained down to a point inside the building where water in them will not freeze and that the water has been pre treated to prevent corrosion and bacteria growth.
   f. Check that any water treatment pumps that serve the cooling tower system have been secured.

g. Drain and secure cooling tower filtering systems that are exposed to freezing conditions.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Protective coating, brushes, solvent, etc. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Manufacturer approved lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
4. Cleaning tools and materials. Consult the MSDS for hazardous ingredients and proper PPE.
5. Respirator.
6. Safety goggles
7. Work gloves
8. Ladders of appropriate size constructed according to OSHA/ANSI standards or scaffolding. Check ladder for defects. Do not use defective ladders.
9. Amp probe and volt meter.
10. High pressure washer.

HVAC-UHT-01-01Y

Frequency: Annually

Unit Heater, Steam or Hot Water

Application

Unit heaters are usually used to heat otherwise unconditioned spaces These units can be horizontal or vertical and are usually heating only.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Check valve for full stroke operation in both directions.
2. Check valve for signs of abnormal wear and leaks. Replace packing if needed.
3. Clean the coil with vacuum cleaner.
4. Comb the fins as needed.
5. Clean all fans and motors.
6. Check operation of controls and safeties.
7. Lubricate as required.
8. Check all motors, belts, pulleys, shafts, etc. for alignment.
9. Treat all rusted areas with rust inhibitor and touch up paint.

Recommended Tools and Equipment:

1. Tool Group A and B
2. Vacuum cleaner and attachments
3. Rust inhibitor, paint, brushes. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper personal protective equipment (PPE). Consult the MSDS to ensure that the paint lead level is 0.06% or less.
4. Cleaning and patching materials. Consult the MSDS for hazardous ingredients and proper PPE.

HVAC-UHT-02-01Y

Frequency: Annually

Unit Heater, Gas or Oil

Application

Unit heaters are usually used to heat otherwise unconditioned spaces These units can be horizontal or vertical and are usually heating only.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection."
4. Schedule shutdown with operating personnel.
5. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
6. Coordinate other related preventive maintenance items, such as, burners, fuel tank, humidifier, or other equipment.

Check Points:

1. Remove access panels if applicable.
2. Check the fire box liner or refractory for cracks and leaks.
3. Check oil pump for leaks. Repair or replace as needed (oil units only)
4. Change the oil filter and oil spry nozzles (oil units only).
5. Check all gas lines for leaks. Repair as needed.
6. Check smoke stack for obstructions, leaks, etc.
7. Clean bottom of smoke stack (breaching).
8. Clean all fans and motors.
9. Check operation of controls and safeties.
10. Lubricate as required.
11. Replace access panels if removed.
12. Check all motors, belts, pulleys, shafts, etc. for alignment.
13. Treat all rusted areas with rust inhibitor and touch up paint.

Recommended Tools and Equipment:

1. Tool Group A and B
2. Vacuum cleaner and attachments

3. Rust inhibitor, paint, brushes. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper personal protective equipment (PPE). Consult the MSDS to ensure that the paint lead level is 0.06% or less.
4. Cleaning and patching materials. Consult the MSDS for hazardous ingredients and proper PPE.
5. Respirator, goggles and gloves.
6. Flue and stack cleaning brushes.

HVAC-VLV-01-01Y

Frequency: Annually

Valve, Pneumatic or DDC Operated

Application

This standard applies to all valves which are controlled through the BAS system and operated with an electric motor, pneumatic actuator or electric device such as a solenoid.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.

Parent of this Piece of Equipment

Air handlers, chillers, cooling towers

Check points:

1. Clean unit and make visual examination of all parts.
2. Operate from limit to limit. Observe operation, look for binding, sluggishness, action of limits, etc.
3. Determine if valve seats and holds properly.
4. Check condition of packing.
5. Apply graphite to moving parts of valve.

For electronic motors complete steps 6 to 10. For pneumatic actuators perform steps 11 to 18.

DDC:

1. Check to see that the operating control sensor activates the valve per design specifications. If not, recalibrate or replace the operating control sensor with the same temperature range sensor.
2. Inspect actuator for free movement.

3. Tighten electrical connections to all servo-motor actuators, and test as applicable.
4. Check all voltages or resistance at the actuator. Refer to manufacturer's specifications for values.
5. Skip to step 19.

Pneumatic:

1. Inspect actuator diaphragm for leaks by performing a pressure test of the diaphragm.
2. Check the actuator spring range. Replace spring, adjust pilot positioner, or add pilot positioner as needed.
3. If pneumatic actuator does not stroke properly, correct sticking valve stem or binding linkage. Replace or repair the diaphragm or actuator if necessary.
4. Inspect for air leaks around actuator and in the air line between controller and pneumatic actuator.
5. Inspect operating control thermostat and/or pressure sensor for proper location and check main and branch air lines at thermostat for crimps, breaks, etc. Repair or replace if needed.
6. Check all inline filters for oil and/or moisture. Replace as needed.
7. Check all installed pressure gages for proper range and operability as applicable. Replace if needed.
8. Check to see that the operating control thermostat activates the actuator per design specifications. If not, recalibrate the operating control thermostat.
9. Clean up work site.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Tool Group C
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.

HVAC-WTM-01-01M

Frequency: Monthly

Water Treatment Standard

Application:

This is applicable to both condenser water and chilled water systems. Included are open recirculating systems, closed systems, air washers, and sprayed coil unit and evaporative condensers. Once through systems are not applicable.

Note: This maintenance standard does not eliminate daily testing where it is an established policy.

Special Instructions:

1. Chemicals must comply with the Environmental Protection Agency (EPA) regulations and handled in accordance with occupational safety requirements. Employ personal protection against corrosive or hazardous treatment chemicals as appropriate.
2. Be familiar with the Material Safety Data Sheets of any chemicals used in the water treatment program.
3. Water treatment specialists must be properly trained.
4. Water treatment must be based on proven standard engineering practices. Treatment methods that claim mysterious magnetic or catalytic forces shall not be used.
5. Follow treatment as directed by manufacturer or water treatment company.
6. Maintenance includes chemicals, chemical feeding, maintaining proper water conditions, controlling bleed off, protecting idle equipment, and recordkeeping.
7. Select water treatment methods which protect the life of equipment, maximize heat transfer, and minimize scale, corrosion, solid matter buildup, algae, fungi, biological growth, and water usage. Alternate biocides. Changes to higher dosage levels may be required to control growth.
8. Ensure chemicals are properly stored, test equipment clean, and that chemicals have not passed expiration date.
9. Special attention must be paid to wooden towers and solar heating systems which can be more difficult to properly maintain.
10. Physical inspections of towers and piping systems are to be made to determine water treatment effectiveness.
11. Maintain records and test results.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Rubber gloves, face shield and apron.

HVAC-WTM-03-06M

Frequency: Semi-annually

Chemical Feeder

Application:

This is applicable to both condenser water and chilled water systems. Included are open recirculating systems, closed systems, air washers, and sprayed coil unit and evaporative condensers. Once through systems are not applicable.
Note: This maintenance standard does not eliminate daily testing where it is an established policy.

Special Instructions:

1. Chemicals must comply with the Environmental Protection Agency (EPA) regulations and handled in accordance with occupational safety requirements. Employ personal protection against corrosive or hazardous treatment chemicals as appropriate.
2. Be familiar with the Material Safety Data Sheets of any chemicals used in the water treatment program.
3. Water treatment specialists must be properly trained.
4. Water treatment must be based on proven standard engineering practices. Treatment methods that claim mysterious magnetic or catalytic forces shall not be used.
5. Follow treatment as directed by manufacturer or water treatment company.
6. Maintenance includes chemicals, chemical feeding, maintaining proper water conditions, controlling bleed off, protecting idle equipment, and recordkeeping.
7. Select water treatment methods which protect the life of equipment, maximize heat transfer, and minimize scale, corrosion, solid matter buildup, algae, fungi, biological growth, and water usage. Alternate biocides. Changes to higher dosage levels may be required to control growth.
8. Ensure chemicals are properly stored, test equipment clean, and that chemicals have not passed expiration date.
9. Special attention must be paid to wooden towers and solar heating systems which can be more difficult to properly maintain.
10. Physical inspections of towers and piping systems are to be made to determine water treatment effectiveness.
11. Maintain records and test results.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Rubber gloves, face shield and apron

HVAC-WTM-04-03M

Frequency: Quarterly

Water Treatment, Chemical Free

Application

This standard is intended for maintaining chemical free water treatment systems such as eH20 and Flozone. Each manufacturer has specific requirements; manufacturer recommendations shall be followed. This standard summarizes the typical tasks found in manuals for chemical free water treatment systems.

Special Instructions:

1. Manufacturer specific guidelines shall be followed. This standard only summarizes typical quarterly tasks and shall not be considered inclusive of all necessary activities.

Parent of this Piece of Equipment

Cooling Tower

Check points:

1. Per manufacturer recommendations, all sensors and probes shall be cleaned monthly. Follow manufacturer specific procedures for cleaning each probe. Typical probes include pH probes and conductivity probes; typical sensors include Oxygen percentage.
2. Per manufacturer recommendations, all filters shall be inspected, cleaned and replaced if necessary (if filter feels wet to the touch). Follow manufacturer specific procedures for inspecting, cleaning and replacing filters. Note: it may be necessary to perform a manual backwash, consult manufacturer specifications and recommendations.
3. Per manufacturer recommendations, desiccant indicators shall be inspected. Follow manufacturer specific procedures for verifying moisture content: the manufacturer shall be notified if high moisture content is present.
4. Per manufacturer recommendations, a visual inspection of the equipment shall be performed, with specific focus on loose fittings or other notable damage.
5. Per manufacturer recommendations, sensors and probes shall be calibrated. Follow manufacturer specific procedures for calibrating sensors.
6. Per manufacturer recommendations, coupons shall be changed out (this is manufacturer specific). Follow manufacturer specific procedures for replacing coupons.

Recommended Tools, Materials, and Equipment:
Consult manufacturer recommendations

HVAC-WTM-04-01Y

Frequency: Annually

Water Treatment, Chemical Free

Application

This standard is intended for maintaining chemical free water treatment systems such as eH20 and Flozone. Each manufacturer has specific requirements; manufacturer recommendations shall be followed. This standard summarizes the typical tasks found in manuals for chemical free water treatment systems.

Special Instructions:

1. Manufacturer specific guidelines shall be followed. This standard only summarizes typical annual tasks and shall not be considered inclusive of all necessary activities.

Parent of this Piece of Equipment

Cooling Tower

Check points:

1. Per manufacturer recommendations, check hours of operation of the devices (i.e. purifier, oxygen concentrator). If run hours exceed 8,000 hours, devices shall either be re-built or replaced. Consult manufacturer recommendations.

Recommended Tools, Materials, and Equipment:
Consult manufacturer recommendations

General Services Administration Preventive Maintenance Guide
Effective Date: October, 2012

KTCH-DSH-01-03M Frequency: Quarterly

Dishwashing Machine

Application

This maintenance standard applies to electric and steam operated cafeteria kitchen dishwashing equipment.

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. Notify cafeteria operator and get permission prior to performing all maintenance.
3. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.
4. Review manufacturer's instructions.
5. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
6. De-energize, lock out, and tag electrical circuits and fuel service.
7. Follow all instructions of Material Safety Data Sheets for lubricants and cleaners.

Check points:

1. Check with operator or manager for any deficiencies, verify cleaning program.
2. Check motor and bearings for excessive noise, vibration, and overheating. Clean motor ventilator openings
3. Check electric insulators, connection and wiring, including inside access panels and junction boxes, and final connections. Tighten loose connections.
4. Test electrical controls, signal lights, timer, and OFF/ON switches. Test timer and switches.
5. Examine all pump suction and discharge connections for leakage, adjust packing nuts as required.
6. Check temperature regulator and adjust or calibrate as required.
7. Check thermostatic control solenoid valve for a minimum of 100° prewash, 140° for wash, and 140° or 180°F for final rinse. (Low temp machines at 140°F.)
8. Check operation of wash and rinse spray mechanism for spray coverage and drainage.

9. Inspect soap and spray solution feeder lines; clean as necessary.
10. Inspect water/steam lines and fittings for leaks; tighten fittings as necessary.
11. Check packing glands on wash, rinse, and drain valves; add or replace packing as required. Tighten nuts, bolts, and screws.
12. Check lubricant in gear case; add manufacturer's recommended oil if required.
13. Inspect splash curtain for tears, clearance, and water tightness; adjust if required.
14. Check proper operation of solenoid valve and float in fill tank; adjust as required. Check and repair insulation as needed.
15. Check proper operation of micro-switch.
16. Check doors for operations of chains and counterweights, warping, alignment and water tightness. Replace door gaskets if needed
17. Clean lime off thermostatic probe and heating elements. Drain booster heater to remove scale from the bottom.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-FRY-01-03M

Frequency: Quarterly

Fryer

Application

This maintenance standard applies to electric or gas fired cafeteria kitchen fryer equipment, including deep fat, counter-top, drop-in, and free standing varieties.

Special Instructions:

1. Notify cafeteria operator and get permission prior to performing all maintenance.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
3. If any safety deficiencies are found which could cause injury or damage, including tank leaks, notify the cafeteria operator immediately and secure the equipment from further operations.
4. Review manufacturer's instructions.
5. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
6. De-energize, lock out, and tag electrical circuits and fuel service.

Check points:

1. Check pilot and flame on gas operated unit; adjust as necessary.
2. Check all gas connections for tightness and for leaks.
3. Check all electrical connections and wiring for tightness and signs of overheating.
4. Check thermostat; calibrate, if necessary.
5. Check basket raising mechanism.
6. Check basket/rack for bends, breaks, or defects; straighten bends or repair as necessary.
7. Check operation of unit.
8. Check flue for proper draft or obstructions.
9. If electric model, check heating elements by amperage draw and check against nameplate.
10. Check nuts, bolts, and screws for tightness; tighten or replace as necessary.
11. Verify that drop-in units must have flange to counter seal.
12. Clean interior walls and elements to obtain maximum heat transfer.
13. Inspect grease compartment.
14. Lubricate gas valves.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

General Services Administration Preventive Maintenance Guide
Effective Date: October, 2012

KTCH-GRL-01-03M Frequency: Quarterly

Grill

Application

This maintenance standard applies to electric operated or gas fired cafeteria kitchen grill equipment, including flat-top, open grill, drop-in, or free standing varieties.

Special Instructions:

1. Notify cafeteria operator and get permission prior to performing all maintenance.
2. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.
3. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
4. Review manufacturer's instructions.
5. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
6. De-energize, lock out, and tag electrical circuits and fuel service.

Check points:

1. Check with operator to verify cleaning program
2. Check with operating or area personnel for any deficiencies.
3. Check nuts, bolts, and screws for tightness; tighten or replace as required.
4. Inspect grease trough, drip tray, splash guard, and surface condition.
5. Examine gas utility supply line, valve packing, tighten fittings as required.
6. Examine/clean burners and elements.
7. On gas operated units, check pilot and gas burners for uniform flame; adjust as required.
8. On electrically operated units, check switches, connections, and wiring for loose or overheated conditions.
9. Check calibration of thermostats; calibrate if required
10. Check flue for proper draft or obstructions.
11. Lubricate gas valves.
12. Check elements to obtain maximum heat transfer take amperage measurement and check against nameplate.
13. Examine burner guards, grates, covers or cook top surfaces for cracks or damage.

14. Check all controls, mechanisms for proper operation; adjust as required.
15. Check electric power line condition, switch, disconnect, etc.; or check condition of gas supply, valves, regulators, and inspect pilot, check for Gas leaks.
16. Examine control knobs and indicating lights; adjust/replace as required.

Recommended Tools, Materials, and Equipment:

1.Tool Group A

KTCH-ICM-01-03M

Frequency: Quarterly

Ice Cream maker & Shake Maker

Application

This maintenance standard applies to cafeteria kitchen ice cream and shake maker equipment.

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
3. Review manufacturer's instructions.
4. Notify cafeteria operator and get permission prior to performing all maintenance.
5. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.
6. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
7. De-energize, lock out, and tag electrical circuits.
8. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
9. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
10. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
11. Recover, recycle, or reclaim the refrigerant as appropriate.
12. If appliance is disposed, follow regulations concerning removal of refrigerants and disposal of the appliance.
13. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
14. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
15. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and to all labels on refrigerant containers.

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Examine the differential pressure pump. Check the "O" ring seal and replace if defective.
3. Test for proper soft serve ice cream texture.
4. Inspect wash kit faucet (single lever swing spout).
5. Check beater motor, clean and grease assembly.
6. Check refrigerant charge.
7. Check machine amperage draw against nameplate.
8. Inspect gear reduce oil level and lubricate fan motor.
9. Examine pulley alignment, belt condition, and belt tension.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-ICE-02-03M

Frequency: Quarterly

Ice Maker

Application

This maintenance standard applies to cafeteria kitchen ice makers, including storage and dispenser types.

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
3. Review manufacturer's instructions.
4. Notify cafeteria operator and get permission prior to performing all maintenance.
5. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.
6. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
7. De-energize, lock out, and tag electrical circuits.
8. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
9. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
10. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
11. Recover, recycle, or reclaim the refrigerant as appropriate.
12. If appliance is disposed, follow regulations concerning removal of refrigerants and disposal of the appliance.
13. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
14. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
15. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and to all labels on refrigerant containers.
16. Only approved cleaning chemicals shall be used.

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Visually check for refrigerant, oil and water leaks.
3. Inspect ice condition/size.
4. Check and tighten any loose screw-type electrical connections.
5. Check all controls; adjust if necessary.
6. Examine water connection; open and close water valve; test ice dispensing valve and (door) metering adjustment.
7. Check and clear ice machine draining system (drain vent, strainer and trap).
8. Examine condition of bin doors-closure, hinges, gaskets, handles and ease of slide; lubricate as required. Check storage bin condition.
9. Clean motor, compressor, and condenser coil.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

General Services Administration Preventive Maintenance Guide
Effective Date: October, 2012

KTCH-KTL-01-06M Frequency: Semi-annually

Kettle

Application

This maintenance standard applies to cafeteria kitchen kettles, including steam, electric, gas, and tilting, (braising pan).

Special Instructions:

1. Preventive maintenance services, should be performed by a qualified manufacturer's service representative.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
3. Review manufacturer's instructions.
4. Notify cafeteria operator and get permission prior to performing all maintenance.
5. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.

Check points:

1. Check with operating or area personnel for any deficiencies; verify the cleaning program.
2. Examine utility supply line, valve packing, specialties, and insulation.
3. Inspect safety pressure valve.
4. Lubricate tilting gear mechanism and trunnion bearings, if applicable.
5. Calibrate thermostats as required.
6. Check and replace leaking packing washers.
7. Examine water supply control and fill valve.
8. Inspect temperature gauge, lid hinge and condition. Lubricate hinge.
9. Test timer, switches, pilot light.
10. Check for adequate steam pressure to unit.
11. Examine condensate trap, thermostatic trap, and regulator.
12. Lubricate valves
13. Tighten all screws in electrical wiring connections, i.e., panels, junction boxes, final connections, etc.
14. Check elements to obtain maximum heat transfer.
15. Examine handles, knobs and controls for tightness and safe condition.
16. NOTE: Remaining checks pertain to gas units.
17. Check for gas leaks

18. Check and clean burner orifices.
19. Clean and adjust pilot light assembly.
20. Check air shutters to make sure air/gas mixture is correct.
21. Check flue for obstructions and proper draft.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-OVN-01-03M

Frequency: Quarterly

Oven

Application

This maintenance standard applies to cafeteria kitchen ovens, including wet/dry steam, char broiler, convection or baking.

Special Instructions:

1. Preventive maintenance services, should be performed by a qualified manufacturer's service representative.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
3. Review manufacturer's instructions.
4. Notify cafeteria operator and get permission prior to performing all maintenance.
5. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Check all controls, mechanisms for proper operation; adjust as required.
3. Examine utility supply line, piping, valve packing, specialties, and insulation; look for leaks.
4. Check electric power line condition, switch, disconnect, etc.; or check condition of gas supply, valves, regulators, and inspect pilot, check for Gas leaks.
5. Check to ensure ovens and oven racks are level
6. Check gaskets and seals; check doors for tightness and warping; lubricate hinges and repair as necessary.
7. Examine handles, knobs and controls for tightness and safe condition.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-OVN-01-06M

Frequency: Semi-annually

Oven

Application

This maintenance standard applies to cafeteria kitchen ovens, including wet/dry steam, char broiler, convection or baking.

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
3. Review manufacturer's instructions.
4. Notify cafeteria operator and get permission prior to performing all maintenance.
5. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Check all controls, mechanisms for proper operation; adjust as required.
3. Examine utility supply line, piping, valve packing, specialties, and insulation; look for leaks.
4. Check electric power line condition, switch, disconnect, etc.; or check condition of gas supply, valves, regulators, and inspect pilot, check for Gas leaks.
5. Check and clean fan blades for convection ovens.
6. Check to ensure ovens and oven racks are level.
7. Check the operation of thermostats; calibrate if required
8. Clean and adjust gas burners.
9. Check safety pilot and solenoid.
10. Clean and adjust pilot light assembly.
11. Check flue for proper draft or obstructions.
12. Lubricate gas valves.
13. Tighten all electrical connections in panels, junction boxes, final connections, etc.
14. Clean interior walls and elements to obtain maximum heat transfer.

15. Check gaskets and seals; check doors for tightness and warping; lubricate hinges and repair as necessary.
16. Examine handles, knobs and controls for tightness and safe condition.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-RFG-01-03M

Frequency: Quarterly

Walk –In Refrigerators/ Freezers

Application

This maintenance standard applies to cafeteria kitchen refrigerators/freezers (walk-in units).

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. Review manufacturer's instructions.
3. Notify cafeteria operator and get permission prior to performing all maintenance.
4. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.
5. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
6. De-energize, lock out, and tag electrical circuits.
7. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
8. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
9. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
10. Recover, recycle, or reclaim the refrigerant as appropriate.
11. If appliance is disposed, follow regulations concerning removal of refrigerants and disposal of the appliance.
12. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
13. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
14. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and to all labels on refrigerant containers.

Parent of this Piece of Equipment

None

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Verify indicator light on; check compartment temperature.
3. Examine evaporator for proper clearances/slope and air flow.
4. Examine condensate drain and drain heating.
5. Examine handles, hinges and tightness of door closure.
6. Examine safety door release and fan shut down safety switch.
7. Inspect lighting for burnt out lamps.
8. Inspect door gaskets for damage and proper fit; adjust gaskets as required and lubricate hinges with food grade oil.
9. Check door gasket heater.
10. Check box floor for water or ice accumulation.
11. Check box for excessive ice build- up and open seams.
12. Verify defrost cycle and timer operation.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-RFG-01-06M

Frequency:Semiannual

Walk –In Refrigerators/ Freezers

Application

This maintenance standard applies to cafeteria kitchen refrigerators/freezers (walk-in units).

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. Review manufacturer's instructions.
3. Notify cafeteria operator and get permission prior to performing all maintenance.
4. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.
5. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
6. De-energize, lock out, and tag electrical circuits.
7. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
8. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
9. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
10. Recover, recycle, or reclaim the refrigerant as appropriate.
11. If appliance is disposed, follow regulations concerning removal of refrigerants and disposal of the appliance.
12. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
13. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
14. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and to all labels on refrigerant containers.

Parent of this Piece of Equipment

None

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Verify indicator light on; check compartment temperature.
3. Examine evaporator for proper clearances/slope and air flow.
4. Examine handles, hinges and tightness of door closure.
5. Examine safety door release and fan shut down safety switch.
6. Inspect lighting for burnt out lamps.
7. Check starter panels and controls for proper operation, burned or loose contacts, and loose connections.
8. Clean evaporator coil, evaporator drain pan, blowers, fans, motors, and drain piping as required; lubricate motor(s).
9. Inspect defrost systems for proper operation, including timer; adjust as required. Have automatic defrosters adjusted as required so freezer will defrost during "Off Peak" hours
10. Check operation of thermostats; calibrated as required.
11. Check coil superheat and adjust to manufacturers recommendations.
12. Inspect and service all electric motors.
13. Inspect door gaskets for damage and proper fit; adjust gaskets as required and lubricate hinges with food grade oil.
14. Check door gasket heater.
15. Check box floor for water or ice accumulation.
16. Check box for excessive ice build- up and open seams.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-RFG-02-03M

Frequency: Quarterly

Reach – in/ pass-thru Refrigerator/Freezers

Application

This maintenance standard applies to cafeteria kitchen refrigerators/freezer (Reach-In, Pass –Thru, Display case) Types

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. Review manufacturer's instructions.
3. Notify cafeteria operator and get permission prior to performing all maintenance.
4. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.
5. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
6. De-energize, lock out, and tag electrical circuits.
7. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
8. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
9. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
10. Recover, recycle, or reclaim the refrigerant as appropriate.
11. If appliance is disposed, follow regulations concerning removal of refrigerants and disposal of the appliance.
12. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
13. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
14. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and to all labels on refrigerant containers.

Parent of this Piece of Equipment

None

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Verify indicator light on; check compartment temperature.
3. Examine evaporator for proper clearances/slope and air flow.
4. Examine condensate drain and drain heating.
5. Examine handles, hinges and tightness of door closure.
6. Examine safety door release and fan shut down safety switch.
7. Inspect lighting for burnt out lamps.
8. Inspect door gaskets/doors for damage and proper fit; adjust gaskets as required and lubricate hinges with food grade oil.
9. Check door gasket heater.
10. Check box floor for water or ice accumulation.
11. Check box for excessive ice build- up and open seams.
12. Verify defrost cycle and timer operation, if applicable.
13. Clean condenser coil.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-RFG-02-06M

Frequency: Semiannual

Reach – in/ pass-thru Refrigerator/Freezers

Application

This maintenance standard applies to cafeteria kitchen refrigerators/freezer (Reach-In, Pass –Thru, Display case) Types

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. Review manufacturer's instructions.
3. Notify cafeteria operator and get permission prior to performing all maintenance.
4. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.
5. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
6. De-energize, lock out, and tag electrical circuits.
7. Comply with the latest provisions of the Clean Air Act and Environmental Protection Agency (EPA) regulations as they apply to protection of stratospheric ozone.
8. No intentional venting of refrigerants is permitted. During the servicing, maintenance, and repair of refrigeration equipment, the refrigerant must be recovered.
9. Whenever refrigerant is added or removed from equipment, record the quantities on the appropriate forms.
10. Recover, recycle, or reclaim the refrigerant as appropriate.
11. If appliance is disposed, follow regulations concerning removal of refrigerants and disposal of the appliance.
12. If materials containing refrigerants are discarded, comply with EPA regulations as applicable.
13. Refrigerant oils to be treated as hazardous waste. Refer to Appendix G for the Universal Waste Guide.
14. Closely follow all safety procedures described in the Material Safety Data Sheet (MSDS) for the refrigerant and to all labels on refrigerant containers.

Parent of this Piece of Equipment

None

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Verify indicator light on; check compartment temperature.
3. Examine evaporator for proper clearances/slope and air flow.
4. Examine handles, hinges and tightness of door closure.
5. Examine safety door release and fan shut down safety switch.
6. Inspect lighting for burnt out lamps.
7. Check starter panels and controls for proper operation, burned or loose contacts, and loose connections.
8. Clean evaporator coil, evaporator drain pan, blowers, fans, motors, and drain piping as required; lubricate motor(s).
9. Clean condenser coil and condensing unit section.
10. Clean and inspect defrost evaporation trays/pans.
11. Inspect defrost systems for proper operation, including timer; adjust as required. Have automatic defrosters adjusted as required so freezer will defrost during "Off Peak" hours
12. Check operation of thermostats; calibrated as required.
13. Check coil superheat and adjust to manufacturers recommendations.
14. Inspect and service all electric motors.
15. Inspect door gaskets for damage and proper fit; adjust gaskets as required and lubricate hinges with food grade oil.
16. Check door gasket heater.
17. Check box floor for water or ice accumulation.
18. Check box for excessive ice build- up and open seams.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-RNG-01-03M

Frequency: Quarterly

Range

Application

This maintenance standard applies to cafeteria kitchen ranges, including electric, or gas; open burner, hot plate, and griddle top. For oven base, see oven guide.

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
3. Review manufacturer's instructions.
4. Notify cafeteria operator and get permission prior to performing all maintenance.
5. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Check all controls, mechanisms for proper operation; adjust as required.
3. Examine utility supply line, piping, valve packing, specialties, and insulation; look for leaks.
4. Check electric power line condition, switch, disconnect, etc.; or check condition of gas supply, valves, regulators, and inspect pilot, check for Gas leaks.
5. Examine burner guards, covers or cook top surfaces for cracks or damage.
6. Examine handles, knobs and controls for tightness and safe condition.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

KTCH-RNG-01-06M

Frequency: Semi-annually

Range

Application

This maintenance standard applies to cafeteria kitchen ranges, including electric, or gas; open burner, hot plate, and griddle top. For oven base, see oven guide.

Special Instructions:

1. Preventive maintenance services should be performed by a qualified manufacturer's service representative.
2. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
3. Review manufacturer's instructions.
4. Notify cafeteria operator and get permission prior to performing all maintenance.
5. If any safety deficiencies are found which could cause injury or damage, notify the cafeteria operator immediately and secure the equipment from further operations.

Check points:

1. Check with operating or area personnel for any deficiencies; verify cleaning program.
2. Check all controls, mechanisms for proper operation; adjust as required.
3. Examine utility supply line, piping, valve packing, specialties, and insulation; look for leaks.
4. Check electric power line condition, switch, disconnect, etc.; or check condition of gas supply, valves, regulators, and inspect pilot, check for Gas leaks.
5. Examine burner guards, covers or cook top surfaces for cracks or damage.
6. Clean and adjust gas burners and pilot light assembly.
7. Clean electric heating elements and check amperage against nameplate.
8. Examine handles, knobs and controls for tightness and safe condition.
9. Check automatic burner lighters and safety controls.
10. Lubricate gas valves.
11. Check electric power line condition (switch, disconnect, etc.), or check condition of gas supply, valves, regulators.

Recommended Tools, Materials, and Equipment:

1. Tool Group A

MHDL-CRN-01-03M

Frequency: Quarterly

Crane, Electric

Application:

This standard card applies to electric driven cranes mounted on overhead tracks, mounted on walls or mounted on the floor. It is not to be applied to hydraulic lifts.

Special Instructions:

1. Coordinate related PM items at this time, i.e. ELEC-MOT-01, ELEC-MCC-03 Motor Control Center, etc.
2. Review manufacturer's instructions for operation and maintenance.
3. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources."
4. Shut off electrical power, tag and lockout of service.
5. The height of the crane may require the use of scaffolding or hydraulic lifts to accomplish this PM.

Check Points:

1. Inspect trolley wheels and track for condition.
2. Check braking system, including any hydraulic reservoirs.
3. Inspect all structural features including framing, supports, bracing, anchors, etc.
4. Scrape, wire brush, treat with rust inhibitor and paint all rusted or bare metal areas.
5. Inspect cables for worn, frayed or broken strands. Adjust tension if necessary.
6. Inspect pulleys, sheaves, chains, etc. for alignment and wear.
7. Check operation of controls, including limit switches.
8. Lubricate in accordance with manufacturer's recommendations.
9. Check oil in gear case, add or replace in accordance with manufacturer's instructions.
10. Remove tags and lockout, restore power.
11. Test operation.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.

MHDL-DMW-01-03M

Frequency: Quarterly

Dumbwaiter

Special Instructions:

1. Review manufacturer's Instructions.

Check points:

1. Inspect and clean hoistway. Remove trash from pit.
2. Examine sheaves, cable, counterweight, etc. Look for loose bolts, misalignment, weak or improper cable fasteners, etc. Make safety or reliability tests if anything questionable is found.
3. Examine car for structural features, appearance, need for attention, surface condition, condition of paint, etc.
4. On hand powered units, examine cable pulls for loose strands, sharp edges, rough surfaces, or other potential hazards.
5. Inspect power unit, motor controls, and all accessories.
6. Check all indicators, lights, bull's-eyes, controls, safety devices, etc.
7. Check door gate and interlocks.
8. Comply with lubrication schedule.
9. Check operating voltage and running amps of hoist motor.
10. Verify that safety devices are operating properly before putting dumbwaiter back in service.
11. Clean up and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Safety signs

Frequency: Annually

MHDL-HST-01-01Y

Chain Hoist and Trolley

Application:

This standard applies to manually operated lifts and hoists.

Special Instructions:

1. Review manufacturer's instructions.

Check Points:

1. Test operate and note condition, including all controls.
2. Check all hydraulic hoses, cylinders, and connections for leaks and condition. Tighten connections or replace hoses to correct leaks.
3. Check mechanical and hydraulic brake systems, including master cylinder fluid levels, and correct as required.
4. Lubricate all zerk fittings and any other points specified by the manufacturer.
5. Check all lift arms, stabilizers, locks, chains, cables, channels, and structure for condition and wear.
6. Where equipped with a battery, check charge, electrolyte level, and condition of cables and terminals.

Recommended Tools, Materials, and Equipment:

1. Standard tool group
2. Cleaning materials and equipment. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Hydraulic hose
4. Brake fluid
5. Grease gun, grease, oil
6. Hydrometer

MHDL-HST-02-01Y

Frequency: Annually

Hoist, Electric

Application:

This standard card applies to electric hoists that are installed in a fixed position or mounted on an overhead rail system. It does not apply to the larger motorized electric cranes.

Special Instructions:

1. Review manufacturer's instructions.
2. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources."
3. De-energize, tag, and lock out circuit.
4. Take appropriate safety precautions for working at heights.

Check Points:

1. Inspect cables and pulleys.
2. Lubricate as recommended by the manufacturer.
3. Check oil in gear box and add as required.
4. Restore power, test and operate.
5. Check and adjust brake if required.
6. Remove tags from power source.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Grease gun, grease, oil.
3. Lift platform, scaffolding, or ladder constructed according to OSHA/ANSI standards as required. Check ladder for defects. Do not use defective ladders.

MHDL-HST-03-01Y

Frequency: Annually

Hoist, Lighting

Application:

This standard card applies to electric hoists used to raise, lower, and support large decorative lighting fixtures in auditoriums and conference rooms.

Special Instructions:

1. Schedule all hoists to be maintained at one time.
2. Schedule hoists to coincide with PM on chandelier.

Check Points:

1. Check supply voltage.
2. Check connections at disconnect, starter, and reversing switch.
3. Check motor mounting frame and bolts, tighten if necessary.
4. Check hoist support, bracket lubricant, and pivot point.
5. Check sprockets and roller chain, lubricate as needed.
6. Check oil in gear motor, change if required.
7. Check and clean motor, lubricate as needed.
8. Check oil in hoist, change if required.
9. Remove safety bar and inspect for defects. Replace if required.
10. Inspect chain for wear, rust, and weak spots. Coat with oil or grease.
11. Test

Recommended Tools, Materials, and Equipment:

1. Tool group A
2. Cleaning tools and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
4. Multimeter

General Services Administration Preventive Maintenance Guide
Effective Date: October, 2012

MHDL-LFT-01-06M Frequency: Semi-annually

Lift, Electric, Stage Screen

Application:

This standard card applies to hoisting equipment such as is used for the understage movie screen located in the Departmental Auditorium in Washington, DC This compares to the hoisting equipment used for an electric elevator, but is smaller.

Special Instructions:

1. Review manufacturer's instructions.

Check Points:

1. Controller
    a. Clean with blower or vacuum.
    b. Check switches, relays, timers, resistors, contacts, connections, fuses, and overload settings.
    c. Replace worn parts and adjust for proper operation.
2. Brakes
    a. Observe operation.
    b. Inspect drum and shoe clearance, adjust if needed.
    c. Lubricate pivot points and clean as necessary.
3. Hoist Motor
    a. Inspect oil level, oil pickup, and belts.
    b. Check for excessive heat, noise, and leaks.
    c. Lubricate in accordance with specifications.
    d. Keep end bells clean.
4. Cables
    a. Inspect, lubricate, and adjust hoist cables and cable drums.
    b. Inspect traveling cables.
    c. Check all cable fastenings.
    d. Inspect guide rails and guide shoes.
5. Gear Machines.
    a. Inspect worm and gear for bottoming and back lash, and thrust end play.
    b. Check oil level and packing.
    c. Check for proper oil pickup.

6. Governor
    a. Observe operation.

b. Check electrical switches and seals.
c. Lubricate pivot points and clean as necessary.

7. Machine Room
   a. Dust machines, control cabinets, etc.
   b. Sweep floors and remove all trash. Relamp as necessary.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
4. Barricades

General Services Administration Preventive Maintenance Guide
Effective Date: October, 2012

MHDL-LFT-02-01M Frequency: Monthly

Material Handling Equipment, Electric Lift Trucks

Application:

This standard applies to electric lift trucks with 2,000 and 6,000 pound lifting capacities and operating 2,000 hours per year. Contact the lift truck manufacturer in cases when lift trucks are used more than 2,000 hours per year for guidance on adjusting the frequency of maintenance.

Special Instructions:

1. Review manufacturer's instructions for specific guidelines, as lift trucks vary.
2. Review the Standard Operating Procedure for "Powered Industrial Trucks (Forklifts)".
3. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources."
4. Proper battery maintenance is critical, as poor battery care can lead to expensive component failures.
    a. Maintain proper water levels.
    b. Keep battery and terminals clean.
    c. Keep battery properly charged.
5. Never smoke or carry an open flame in or near the battery.
6. Use caution in handling the electrolyte, it is harmful to the skin and clothing.
7. Never remove any connecting cables or straps while charger is on or there is a possibility of a load being on the batteries, (this can cause a spark that may ignite ever present hydrogen gas).
8. Wear acid resistant apron, gloves, and plastic face shield when handling electrolyte.
9. Review the Standard Operating Procedure for "Emergency Eyewash and Shower Equipment". Note the location of emergency eyewash and/or shower equipment.
10. Take appropriate action to correct deficiencies.
11. Document all findings on equipment history record.

Check Points:

1. Motor.
    a. Visually inspect the motor and connections.
    b. Measure the winding resistance.
2. Battery.
    a. Inspect the battery condition and cleanliness.
    b. Check and restore the electrolyte level

c. Check and restore the specific gravity.

3. Inspect the contactors.
4. Inspect the direction lever and direction switch.
5. Check the operation of the controller.
6. Tighten all fuses.
7. Inspect the wiring.
   a. Tighten terminal connections.
   b. Tighten battery connections.
8. Steering.
   a. Check the operation of the steering wheel.
   b. Inspect the steering links.
   c. Inspect the steering box.
9. Brake system.
   a. Inspect the brake lines.
   b. Adjust and check the operation of the brake assembly. Measure the pedal height. Replace cups at 1,000 hours.
   c. Adjust and check the operation of the parking brake.
   d. Check and restore the brake fluid level.
   e. Tighten the seat.
10. Lift and tilt cylinders.
    a. Measure the lift and tilt cylinders.
    b. Measure the lift speed.
    c. Inspect for oil leakage.
    d. Inspect mounting and control levers.
11. Hydraulic system.
    a. Check the oil pump for leaks.
    b. Check and restore the hydraulic oil level.
    c. Check the operation of the oil control valve and the tilt lock valve.
    d. Inspect the hydraulic pipes.
    e. Check and restore the transmission fluid.
    f. Check the differential for leaks.
12. Inspect the wheels and tires.
13. Tighten all lug nuts.
14. Inspect the wheel bearings, frame, and O.H. guard.
15. Inspect the mast/carriage and mast strips.
16. Tighten the back rest.
17. Inspect the forks and stopper pins.
18. Adjust the lift chains.
19. Inspect the anchor bolts and chain wheels.
20. Inspect the axle beam king pins and knuckles.
21. Inspect the lighting system, horn, and dash gauges.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Cleaning supplies and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous materials and proper Personal Protective Equipment (PPE).
3. Lubricants, hydraulic, brake and transmission fluids, and battery electrolyte. Consult the MSDS for hazardous ingredients and proper PPE.
4. Specific gravity tester.
5. Appropriate spare parts.

MHDL-LFT-02-01Y

Frequency: Annually

Material Handling Equipment, Electric Lift Trucks

Application:

This standard applies to electric lift trucks with 2,000 and 6,000 pound lifting capacities and operating 2,000 hours per year. Contact the lift truck manufacturer in cases when lift trucks are used more than 2,000 hours per year for guidance on adjusting the frequency of maintenance.

Special Instructions:

1. Review manufacturer's instructions for specific guidelines, as lift trucks vary.
2. Review the Standard Operating Procedure for "Powered Industrial Trucks (Forklifts)".
3. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources."
4. Never smoke or carry an open flame in or near the battery.
5. Review the Standard Operating Procedure for "Emergency Eyewash and Shower Equipment". Note the location of emergency eyewash and/or shower equipment.
6. Take appropriate action to correct deficiencies.
7. Document all findings on equipment history record.

Check Points:

1. Motor -
    a. Measure the brush wear.
    b. Measure the tension.
2. Battery - measure the volts per cell.
3. Measure the controller's overcurrent limit.
4. Inspect steering box, brake line, and hydraulic pipe hoses and replace at least once every two years or if defective.
5. Inspect brake master cylinder cups and replace at least once every two years or if defective.
6. Lubricate the brake assembly.
7. Perform a natural drop test of the lift and tilt cylinders.
8. Measure the hydraulic oil pressure.
9. Replace the differential fluid.
10. Grease the wheel bearings.
11. Inspect the lift chains and replace at least once every three years or if defective.
12. Inspect the axle beam and mast supports.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Lubricants. Consult the Material Safety Data Sheet (MSDS) for hazardous materials and proper Personal Protective Equipment (PPE).
3. Appropriate spare parts.

MHDL-LFT-03-03M

Frequency: Quarterly

Loading Ramp, Adjustable

Application:
This standard applies to adjustable loading ramps.

Special Instructions:

1. Review manufacturer's instructions.
2. Review the standard operating procedure for "Controlling Hazardous Energy Sources."
3. Disconnect, lock and tag switch.

Check Points:

1. Inspect structural features, framework, support members, anchor bolts, pit, platform, etc. Examine condition of bumper. Does it protect ramp properly?
2. Remove dirt and trash from pit and determine if pit drain is open.
3. Inspect motor, controls, starter, push buttons, solenoids, etc. Clean, adjust and lubricate as necessary. Be sure disconnect switch can be locked.
4. For hydraulic units.
   a. Inspect coupling, pump, control valves, piping, relief valve reservoir, fill pipe, cap, vents, etc. clean, adjust, and lubricate as needed.
   b. Inspect cylinder, ram, packing glands, etc. Add or renew packing as required.
   c. Change oil as required. Review the material data safety sheets (MSDS) for disposal of used oil. If appropriate, recycle oil at an authorized station. Contact the regional S&EM office if you have any questions.
5. For electro-mechanical units.
   a. Clean and inspect coupling, reduction gear, sprockets and chain, gear trains, screw and lever, and/or other mechanical features. Look for misalignment, loose bolts, evidence of binding or wear, excessive clearance, etc., Tighten as necessary.
   b. Examine lubrication devices. Service if required.
   c. Test operation of ramp in all directions using a load if possible. Note if ramp holds and does not creep when load is applied or removed. Adjust if necessary.
   d. Check manual operation, power disengagement, etc.
   e. Lubricate as required.
   f. Clean up work area.

5. For manual units.

a. Clean and inspect all mechanical features. Look for misalignment, loose bolts, evidence of binding or wear, excessive clearance, etc., Tighten as necessary.

b. Test operation of ramp in all configurations and directions using a load if possible. Note if ramp holds and does not creep when load is applied or removed. Adjust if necessary.

c. If ramp is foldable, test folding in all directions and check that it completes it's full range of motion. Adjust if necessary.

d. Lubricate as required.

e. Clean up work area

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Hydraulic fluid
3. Lubricants. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
4. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.

MHDL-LFT-04-01M

Frequency: Monthly

Lift, Automobile

Application:
This standard applies to automotive lifts primarily used for vehicle maintenance.

Special Instructions:

1. Review manufacturer's instructions.
2. Review the standard operating procedure for "Controlling Hazardous Energy Sources and and Confined space entry".
3. Disconnect, lock and tag switch.

Check Points:

1. Clean the drive assembly, lift platform, travel area, etc. Remove debris.
2. Visually inspect moving parts and cables for signs of excessive wear.
3. Check conditions of drive chain, belts, cables, etc. and adjust and replace as needed.
4. Check hydraulic seals, hoses and fittings for leaks and or damage.
5. Check hydraulic fluid levels. Replace if low or dirty.
6. Lubricate moving parts as required. Lubricate columns and ensure they are plumb.
7. Operate lift through its full range of motion in both directions, using a load if possible. Note operation of controls, safety devices, leveling, and other devices and features.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Hydraulic fluid
3. Lubricants. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
4. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.

MHDL-LFT-04-01Y

Frequency: Annual

Lift, Automobile

Application:
This standard applies to automotive lifts primarily used for vehicle maintenance.

Special Instructions:

1. Review manufacturer's instructions.
2. Review the standard operating procedure for "Controlling Hazardous Energy Sources and Confined space Entry."
3. Disconnect, lock and tag switch.

Check Points:

1. Complete the monthly maintenance for this equipment concurrent with this PM card.
2. Lubricate moving parts as required. Lubricate columns and ensure they are plumb.
3. Replace hydraulic fluid. It is crucial to keep it clean.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Hydraulic fluid
3. Lubricants. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
4. Cleaning materials. Consult the MSDS for hazardous ingredients and proper PPE.

MHDL-PPB-01-01Y

Frequency: Annually

Paper Baler

Special Instructions:

1. Review manufacturer's instructions.
2. Review the Standard Operating Procedure for "Controlling Hazardous Energy Sources".
3. Open and tag electric switches.

Check points:

1. Dust or wipe clean all parts of machine. Examine structural features.
2. Blow out electric motor. Inspect starter, controls, push button, upper and lower limit switch, etc. Clean and adjust as required.
3. Check drive unit, mechanical features, and all moving parts.
4. Comply with lubrication schedule.
5. Adjust operating mechanism.
6. Clean up work area.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

General Services Administration Preventive Maintenance Guide
Effective Date: October, 2012

MDHL-VHL-01-06M Frequency: Semi-annually

Material Handling Equipment, Engine Driven Vehicles

Application:

This standard applies to gasoline, LP gas, and diesel powered forklifts, tractors, front-end loaders, and light duty trucks. Review manufacturer's instructions before proceeding.

Special Instructions:

1. Review manufacturer's instructions.
2. Review the Standard Operating Procedure for "Powered Industrial Trucks (Forklifts)".
3. Handle flammable materials safely.
4. Have the proper fire extinguisher on hand. Ensure that the fire extinguisher is properly serviced and that it is in proper working order.
5. Use gasoline and LPG forklifts in well ventilated areas only.

Check Points:

1. Change engine oil. Review the Material Safety Data Sheets (MSDS) for proper disposal of used oil. If appropriate, recycle oil at an authorized station. Contact Regional S&EM office if you have any questions.
2. Remove crankcase breather cap and wash in solvent.
3. Inspect air cleaner element and clean or replace as required.
4. Tune up engine.
5. Change hydraulic oil filter.
6. Check all belts for proper tension or wear and hoses for deterioration. Adjust or replace as necessary.
7. Inspect all gauges and indicators.
8. Test horn, backup warning and safety lights.
9. Test operate all tilt, lift, and lowering controls.
10. Test steering and adjust if necessary.
11. Check all hydraulic hoses, cylinders, and connections for leaks and condition. Tighten connections and replace hoses to correct leaks.
12. Check mechanical and hydraulic brake systems, including master cylinder fluid levels, and correct as required.
13. Lubricate all zerk fittings and any other points specified by the manufacturer.
14. Check all lift arms, stabilizers, locks, chains, cables, channels, and structure for condition and wear.
15. Where equipped with a battery, check charge, electrolyte level, and condition of cables and terminals.

16. Check all other fluid levels and add or replace as required.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Cleaning materials and equipment. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
3. Hydraulic hose
4. Brake fluid
5. Grease gun, grease, oil
6. Hydrometer
7. Air cleaner element
8. Tune-up kit
9. Hydraulic oil filter
10. V-belts

MHDL-VHL-02-01Y

Frequency: Annually

Carts and Scooters, Engine or Battery Powered

Application:

This standard card applies to propane, gasoline, and battery powered carts and scooters used to transport personnel and materials in large buildings and on compounds or complex facilities.

Special Instructions:

1. Review manufacturer's maintenance instructions.
2. Review the Standard Operating Procedure for "Emergency Eyewash and Shower Equipment."
3. Work area must be properly ventilated to protect against battery gases and fumes from fuels.
4. Adequate personal protection against acid spills must be provided, i.e., face mask, rubber gloves, etc.
5. Have on hand an approved fire extinguisher. Ensure that the fire extinguisher is properly serviced and that it is in proper working order.

Check Points:

Battery powered:

1. Remove and clean battery terminals. Clean posts and reconnect terminals.
2. Check electrolyte specific gravity with a hydrometer.
3. Add water if required.
4. Inspect lights, buzzers, controls, and wiring for tight connections and proper operation.
5. Lubricate according to manufacturer's recommendations.
6. Check brakes, clutch, wheels, tires, steering, and frame.
7. Vacuum or blow out motor air passages and check mounting.
8. Check and adjust as needed belts and/or chain drive.
9. Test run (road test).
10. Wire brush, treat with rust inhibitor, and paint rusted areas.

Engine powered:

1. Inspect fuel tank, connections, and lines for leaks and deterioration. Tighten or replace as required.
2. Change oil. Change oil, air, and fuel filters.
3. Change points, condenser, plugs, and rotor button if applicable.

4. Lubricate according to manufacturer's recommendation.
5. Check brakes, clutch, wheels, tires, steering, and frame.
6. Inspect lights, buzzers, controls, flashers, and wiring for proper operation and tighteners.
7. Check and adjust, as needed, belts and/or chain drive.
8. Start engine and perform any manufacturer's recommended tune-up procedures.
9. Test run (road test).
10. Wire brush, treat with rust inhibitor, and paint all rusted areas.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Spark plug wrench and gap gauge
3. Feeler gauges
4. Leak detector (soap solution)
5. Filter, plugs, points, condenser, rotor button
6. Distilled water
7. Hydrometer
8. Face shield, rubber gloves, and apron.
9. Engine oil and container for old oil
10. Tire pressure gauge
11. Battery terminal cleaner brush
12. Rust inhibitor and paint. Consult the MSDS for hazardous ingredients and proper PPE. Consult the Material Safety Data Sheets to ensure that the paint lead level is 0.06% or less.
13. Emergency eye wash that provides at least 0.4 gallons/min for at least 15 minutes.

PLMB-DRN-01-01Y Frequency: Annually

Roof Drains, Downspout, and Gutter Inspection

Application

This standard applies to roof drains, downspouts, and gutters.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Use care when working in high places.
3. Use safety line with harness if necessary.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Check gutters, drains, and downspouts to insure that they are properly attached to the building, connections sealed, and free of debris.
2. Check drain strainers/screens for condition and proper installation.
3. If downspouts have heaters, test, operate and correct deficiencies.
4. Remove all trash, debris or unsecured material from roof area.
5. Where downspouts discharge onto lower roofs, check if there has been any scouring of the surfacing.
6. Check for missing or damaged splash blocks.

Recommended Tools, Materials, and Equipment:

1. Tool Group B
2. Ladders constructed according to OSHA/ANSI standards or scaffolding. Check ladder for defects. Do not use defective ladders.

PLMB-DRN-02-01Y

Frequency: Annually

Drains: Areaway, Driveway, Storm

Application

This standard applies to areaway, driveway, and storm drains.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Perform work in autumn after leaves have fallen.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Remove grate if it exists.
2. Clean drain and area leading to drain.
3. Remove sediment, debris and trash and dispose of properly.
4. Test drain for free water flow by flushing with a hose.
5. Replace grate if removed in step 1.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Hose
3. Work gloves

PLMB-DWS-01-01Y

Frequency: Annually

Domestic Hot Water Heater – Gas

Application

This standard applies to gas fired domestic hot water heaters.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. If the insulation is known or suspected to contain asbestos, check the building's asbestos management plan to see it has been tested for asbestos. If it is suspect but has not been tested, have it tested. Manage asbestos in accordance with the plan.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Use caution when working with natural gas fired equipment. Be aware of any smells (rotten egg) that could be a natural gas leak.
6. Do not allow any open flames around equipment.

Check Points:

1. Attach drain hose. Drain several gallons from tank to remove sediment.
2. Manually check operation of safety valve. Check for corrosion around valve. Verify the safety valve inspection tag is in place. Ensure that no personnel are in area of relief piping discharge.
3. Check all connections - electric, gas and water. Tighten as necessary.
4. Check operation and setting of aquastat. Check hot water temperature with dial thermometer, and set aquastat at minimum value required for all uses.
5. Drain storage and expansion tanks, and flush to remove sediment, scale, and solid at bottom of tank.
6. Clean sight glasses on tanks.
7. Clean strainer, check condition of traps. Report and repair leaks.
8. Clean pump, controls, switches, and starters. Check operation of pump and condition of pump seal or packing, and replace as required.
9. If applicable, Remove and inspect Anode, replace if necessary
10. Clean up work area and remove trash.
11. If the insulation contains asbestos, it is considered hazardous waste. Refer to Appendix G for the Universal Waste Guide.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Thermometer
4. Clamp-on ammeter
5. Gap gauge (auto ignition)
6. Drain Hose.

PLMB-DWS-02-01Y

Frequency: Annually

Domestic Hot Water Heater - Electric

Application

This standard applies to electric domestic hot water heaters.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. If the insulation is known or suspected to contain asbestos, check the building's asbestos management plan to see it has been tested for asbestos. If it is suspect but has not been tested, have it tested. Manage asbestos in accordance with the plan.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Attach drain hose. Drain several gallons from tank to remove sediment.
2. Manually check operation of safety valve. Ensure that no personnel are in area of relief piping discharge. Check for corrosion around valve.
3. Check all connections - electric and water. Tighten as necessary. Ensure power is disconnected to electric heaters prior to checking connections.
4. Check operation and setting of aquastat. Check hot water temperature with dial thermometer, and set aquastat at minimum value required for all uses.
5. Check amperage draw of upper and lower elements and compare to name plate data.
6. Clean element contacts, and check for proper closing under load.
7. Clean pump, controls, switches, and starters. Check condition of pump seal or packing, and replace as required.
8. If applicable, Remove and inspect Anode, replace if necessary
9. Clean up work area and remove trash.
10. If the insulation contains asbestos, it is considered hazardous waste. Refer to Appendix G for the Universal Waste Guide.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Thermometer
4. Clamp-on ammeter
5. Gap gauge (auto ignition)
6. Drain Hose

PLMB-DWS-03-01Y

Frequency: Annually

Hot Water Heater Steam Coil

Application

This standard applies to independent domestic hot water heaters, which consists of a hot water storage tank with coils for hot water or steam submerged into the water to be heated. The storage capacity is from 100 to 1000 gallons, with a temperature rise from 90 deg. F to 140 deg. F. The tank will require manholes or handhole inspection plates.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Obtain operating logs.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Review operating logs to check loss of efficiency of heat exchange surfaces, indicating scale and corrosion buildup.
6. Check inspection certificate.
7. If the insulation is known or suspected to contain asbestos, check the building's asbestos management plan to see it has been tested for asbestos. If it is suspect but has not been tested, have it tested. Manage asbestos in accordance with the plan.

Check Points:

1. Inspect element header and exterior of tank including fittings, manholes, and handholes for leaks and signs of corrosion.
2. Hand operate and test pressure relief valve.
3. Drain and flush tank.
4. Remove tank inspection plate and inspect tank interior. Record the size and depth of pits, presence of cracks, and condition of openings, fittings, welds, rivets, and joints.
5. Check condition of heat exchanger element. Remove and clean as necessary.
6. Inspect condition of epoxy tank lining.
7. Replace all gaskets and manhole inspection plates, and tighten all bolts as required.
8. Fill tank and check for leaks.
9. Clean strainer, check condition of traps. Report leaks.

10. Clean pump, controls, switches, and starters. Check condition of pump seal or packing, replace as required.
11. Clean, test, and inspect sight glasses, valves, fittings, drains.
12. Inspect structural supports, and repair or replace damaged insulation or covering.
13. Schedule hydrostatic testing according to established procedures.
14. Return tank to service and observe temperature control operation. Adjust as required.
15. If the insulation contains asbestos, it is considered hazardous waste. Refer to Appendix G for the Universal Waste Guide.

Recommended Tools and Equipment:

1. Tool Group C
2. Wrenches from stock for large bolts
3. Paint and brushes. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less.
4. Cleaning and patching materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
5. Hoses
6. Goggles

PLMB-DWS-04-06M

Frequency: Semi-Annually

Water Softener

Application

This standard applies to the three most common types of serviceable water softeners: Lime, zeolite, and anthracite.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Drain the tank.
    a. Examine the exterior of the tank including fittings, gauges, manholes, and handholes for signs of leaks or corrosion. Repair as necessary.
    b. Inspect structural supports and insulation or coverings for defects or deterioration.
    c. Open the tank and remove rust or chemical deposits from interior tank surfaces.
    d. Remove and clean all spray nozzles.
    e. Inspect the interior of the tank for pitting, cracks, and other defects.
2. Lime Water Softener
    f. Dismantle vacuum breakers. Inspect stem, valve seat and spring. Repair as required.
    g. Inspect, clean, and flush the nozzle ring.
    h. Remove vent condenser heads and clean the tubes.
    i. Inspect and clean the sight glass, level indicators, and level controllers.
3. Zeolite Water Softener
    j. Check the filter bed for proper level
    k. Take samples of the resin according to manufacturer's instructions and send to a lab for analyses.
4. Anthracite Water Softener.
    l. Check the filter bed for proper level

Recommended Tools, Materials, and Equipment:

1. Tool Group C.
2. Respirator
3. Gravel, sand, and charcoal

PLMB-DWS-05-06M

Frequency: Semi-annually

Water Filter

Application:

This standard card applies to water filters installed in secondary water systems for heating and cooling systems. These filters may be either a disposable cartridge type filter or a washable and reusable filter media.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Drain water from filter housing.
2. Remove cover from filter housing.
3. Remove spring, "O" rings, etc., and old filter.
4. Clean and flush filter housing.
5. Clean filter media, if applicable.
6. Install filter media or cartridge.
7. Replace springs and "O" rings.
8. Replace housing cover.
9. Open inlet and outlet valves.
10. Check housing cover for leaks.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic
2. Filter cartridge or media, if applicable.
3. Gaskets or "O" rings, as applicable.

PLMB-DWV-01-01Y

Frequency: Annually

Sewage Ejector (Pneumatic Tank Type Ejectors)

Application

This standard applies to pneumatic tank type sewage ejectors. Components consist of sewage tank and air lines from a tank or compressor with various valves and controls. When the tank fills the valves open to eject sewage with compressed air.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule outage with operating personnel.
3. Review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Observe personal safety requirements when working with the sewage ejector and related piping.

Check Points:

1. Inspect check valves in compressor or air storage tank inlet lines to tank, and suction and discharge lines of sewage pot.
2. Check freedom of motion, and wear on check valve clapper and clapper seat.
3. Remove sewage pot inspection plate. Inspect and clean float ball, bucket and rod or level sensor. There may be a few floats for different levels of ejection and a high level alarm.
4. Inspect float assembly linkage, shaft, keys, and keyways. Look for wear, binding, etc.
5. Change oil in immersed float switch. Check packing. Review the Material Safety Data Sheets (MSDS) for proper disposal of used oil. If appropriate, recycle oil at an authorized station. Contact the Regional S&EM office if you have any questions.
6. Remove any obstructions from water line. Clean strainer.
7. Check solenoid valve on air inlet for operation and freedom of movement.
8. Check that vent line is clear of any obstructions.
9. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Cleaning equipment and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
3. Lubricants and float oil (if required). Consult the MSDS for hazardous ingredients and proper PPE.
4. Other PPE such as clothing, respirators, and gloves required for personal protection.

PLMB-DWV-02-01Y

Frequency: Annually

Sewage Ejector, Sump Type

Application

This standard applies to sump pump type sewage ejectors that operate by means of an electric motor, pump with controls for pump start/stop and staging.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule outage with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
6. Wear rubber apron, gloves, boots, full face shield, and respirator when performing this work.
7. If a person must enter the pit, test for oxygen deficiency and supply proper ventilating equipment as needed.
8. No open flames or smoking.
9. If strainer and check valve cleaning requires removal of pump unit which should be considered a repair and not general maintenance.

Check Points:

1. Remove cover plates, flush pit, and pump out.
2. Check operation of level sensors, floats, rods, switches, or other types of level sensors and alarms.
3. Check and inspect wiring, electrical connections and conduit for corrosion and tightness.
4. Clean pump and lubricate as required. Some pumps have sealed factory lubricated bearings that require no further service until replacement is needed.
5. Inspect check valve.
6. Inspect interior of pit for cracks.
7. Clean motor with vacuum or low pressure air (less than 40 psi). Check for obstructions in motor cooling and air flow.
8. Check for corrosion. Clean and treat with rust inhibitor as needed.
9. Inspect cover plate gaskets and replace if necessary.
10. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Cleaning equipment and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
3. Lubricant (per manufacturer's instructions). Consult the MSDS for hazardous ingredients and proper PPE.
4. Other PPE such as clothing, full face shield, respirator, and gloves required for personal protection.
5. Ventilating equipment
6. Toxic gas test meter

PLMB-DWV-03-01Y

Frequency: Annually

Sump Pump

Application

This standard applies to sump pump that operates by means of an electric motor, pump with controls for pump start/stop and staging.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Schedule outage with operating personnel.
3. Review manufacturer's instructions.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. If the material removed from the pump is hazardous, contact the Regional S&EM office for disposal instructions.
6. If strainer cleaning requires removal of pump unit which should be considered a repair and not general maintenance.
7. Excessive sediment and debris, not removed by flushing the pit should be handled on a project basis, and not considered under this standard.

Check Points:

1. Remove cover plates, flush pit, and pump out.
2. Check operation of level sensors, floats, rods, switches, or other types of level sensors and alarms.
3. Clean pump and motor and lubricate as required. Some pumps have sealed factory lubricated bearings that require no further service until replacement is needed.
4. Inspect check valve.
5. Inspect interior of pit for cracks.
6. Inspect cover plate gaskets and replace if necessary.
7. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Cleaning equipment and materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).

3. Lubricant (per manufacturer's instructions). Consult the MSDS for hazardous ingredients and proper PPE.
4. Other PPE such as clothing, full face shield, respirator, and gloves required for personal protection.

PLMB-DWV-04-01W

Frequency: Weekly

Emergency Wash

Application:

This equipment includes emergency showers, eye-wash equipment, eye/face wash equipment, hand held drench hoses, and combination shower and eye-wash equipment, installed for the emergency treatment of the eyes and body of a person who has been exposed to injurious material. This includes water treatment chemicals, battery acid, cleaning solvents and compounds, etc.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. On non-plumbed units (units containing their own water supply), use manufacturer's instruction to perform maintenance.
6. Where units have been sealed, be certain seals are available to re-seal the unit after PM is accomplished.
7. Where flow alarms have been installed, check with responding unit before activating the unit.

Check Points:

1. Activate the unit to flush the line and verify proper operation.
2. Assure that area is free of obstructions, that activation mechanisms are accessible to personnel in a distressed condition.
3. Operate valve in full open and close position. Loss of ability to close tightly will require inspection of valve seals and discs for wear and contaminate build-up.
4. If applicable, check tempering feature, verify temperature and flow is correct.
5. Check systems for cleanliness and clean if necessary.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

PLMB-DWV-05-01Y

Frequency: Annually

Emergency Shower

Application:

This equipment includes emergency showers, eye-wash equipment, eye/face wash equipment, hand held drench hoses, and combination shower and eye-wash equipment, installed for the emergency treatment of the eyes and body of a person who has been exposed to injurious material. This includes water treatment chemicals, battery acid, cleaning solvents and compounds, etc.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Check operation of self-closing valve.
2. Check fittings.
3. Check pull lever for proper function.
4. Check shower head for signs of corrosion, encrustation, or foreign particles. Clean as necessary.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

PLMB-DWV-06-01Y

Frequency: Annually

Septic Tank and Drain Field

Application:

This procedure covers all septic tanks and drain fields.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Wear suitable protective clothing.
6. No open flames or smoking.
7. Use barricades around tank opening.
8. Follow "Confined Space" policies and procedures

Check Points:

1. Remove cover.
2. Pump out contents of tank into container truck that meets State health requirements.
3. After contacts are removed, inspect to make sure that baffle plates are in place and tank is in good condition.
4. Run water from inside of building to ensure that there are no blockages in the waste pipe from the building to the septic tank.
5. Install cover.
6. Contents of tank should be disposed of in accordance with State health requirements.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Long handled scrapper
4. Barricade

PLMB-HWS-01-01Y

Frequency: Annually

Hot Water Converter Steam

Application:

This standard card applies to hot water converters using a heat exchanger to transfer the heat from a steam system to the hot water system.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Review operating logs to check loss of efficiency of heat exchange surfaces, indicating scale and/or corrosion build-up.
6. If the insulation is known or suspected to contain asbestos, check the building's asbestos management plan to see it has been tested for asbestos. If it is suspect but has not been tested, have it tested. Manage asbestos in accordance with the plan.

Check Points:

1. Inspect element header for signs of leaking or corrosion. Remove corrosion and encrustations.
2. Remove heat exchanger element and clean only if a loss of efficiency is indicated, or signs of leaking around header are evident.
3. Tighten all bolts around header.
4. Renew paint/protective coating/insulation as required.
5. Drain storage and expansion tanks, and flush to remove sediment, scale, etc.
6. Clean sight glasses on tanks.
7. Clean strainer, check condition of traps. Report leaks.
8. Clean pump, controls, switches, and starters. Check condition of pump seal or packing, and replace as required.
9. Clean up work area and remove trash.
10. If the insulation contains asbestos, it is considered hazardous waste. Refer to Appendix G for the Universal Waste Guide.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Wrenches from stock for large bolts
3. Paint/brushes. Consult the Material Safety Data Sheet to ensure that the paint lead level is 0.06% or less.
4. Cleaning materials. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
5. Hose
6. Goggles

PLMB-HWS-02-06M

Frequency: Semi-annually

Solar Heating System

Application:

This standard applies to all solar collector panels for domestic hot water.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Check system pressure on closed loop for loss of fluid; pressure should be 40 psig.
2. Check glycol strength. Run pH test on glycol-water solution. If required, drain entire solution and replace with a 50-50 mixture of glycol and water.
3. Check for leaks and condition of insulation on lines.
4. Remove heat exchanger element and clean only if a loss of efficiency is indicated or signs of leaking are evident around header.
5. Inspect element header for signs of leaking or corrosion. Remove corrosion and encrustations.
6. Tighten all bolts around header.
7. Clean strainer and check condition of traps. Report leaks.
8. Check and secure all pipe hangers, expansion joints, and associated items.
9. Drain storage and expansion tanks; flush to remove sediment, scale, etc.
10. Clean sight glasses and flow indicators on tanks.
11. Check valves for proper positioning.
12. Clean pump, controls, switches, and starters. Check condition of pump seal or packing and replace as required. Lubricate motor if required.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Antifreeze tester
3. Cleaning materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

4. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
5. Hose
6. Goggles

PLMB-HWS-02-01Y

Frequency: Annually

Solar Heating System

Application:

This standard applies to all solar collector panels.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Check collector glazing for cracks or deterioration. Clean as required.
2. Check collector for damage and report same to supervisor.
3. If conditions warrant, clean collector glass with warm water or, if badly soiled, with a mild detergent and water. Never use a chemical glass cleaner, abrasives, steel wool, or any substance that could scratch the surface. Cold water should never be sprayed on hot collector surfaces.
4. Renew paint and/or protective coating.
5. Check collector framework and lines; ensure that unit is firmly bolted and anchored.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Wrenches for large bolts
3. Paint/brushes. Consult the Material Safety Data Sheet to ensure that the paint lead level is 0.06% or less.
4. Cleaning materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

PLMB-PLB-01-01Y

Frequency: Annually

Expansion Joints In Piping

Application:

This standard applies to slip type joints only. Bellows type joints are to be replaced when a leak occurs.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check points:

1. Slip-type Joint with packing-gland.
    a. Examine joint closely, look for evidence of displacement, loose or defective anchors or bolts, alignment of joint with piping, guide rods, etc. Correct what can be done with pressure on.
    b. Observe packing gland, adjust to stop weeping or leaks.
    c. Renew packing completely when system is down for other reasons such as repair, overhaul or maintenance of other components.
2. Gun-packed type.
    a. Perform work prescribed in (1a) and (1b) for slip-type joint with gland.
    b. Add packing if needed.
3. Clean up work area.

Recommended Tools, Materials, and Equipment:

1. Tool Group C.
2. Lubricants. Consult the Material Safety Data Sheet for hazardous ingredients and proper Personal Protective Equipment.
3. Cleaning supplies and materials. Consult the Material Safety Data Sheet for hazardous ingredients and proper Personal Protective Equipment.

PLMB-PLB-02-01Y

Frequency: Annually

Strainer, Y-Type

Application

This standard applies to Y-type strainers that are at remote locations or that are not included under the guide card of equipment they are paired with. Typically guide cards for various pumps include strainers as children rather than list maintenance for strainers on pump guide.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule outage with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. If the material removed is hazardous, contact the Regional S&EM office for disposal instructions.
6. The maintenance of Y-type strainers should be scheduled to coincide with the maintenance of the equipment that they are associated with unless strainer cleaning requires removal of the pump unit which should then be considered a repair and not general maintenance.

Check Points:

1. Secure strainer isolation valves.
2. Drain strainer housing.
3. Back flush if possible or remove and clean strainer cage, if applicable.
4. Replace cartridge type and clean out strainer housing, if applicable.
5. Reassemble unit or replace drain plug and open isolation valve.
6. Check unit for leaks.
7. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - basic
2. Hose and bucket
3. Gaskets or gasket material
4. Cartridge filter replacements

PLMB-PLB-03-01Y

Frequency: Annually

Strainer, Bolted Flange Type (Water and Steam)

Application

This standard applies to the maintenance of bolted flange type strainers that are not included under the guide card of equipment they are paired with. Typically guide cards for various pumps include strainers as children rather than list maintenance for strainers on pump guide.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule outage with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. If the material removed is hazardous, contact the Regional S&EM office for disposal instructions.
6. The maintenance of strainers should be scheduled to coincide with the maintenance of the equipment that they are associated with unless strainer cleaning requires removal of the pump unit which should then be considered a repair and not general maintenance.

Check Points:

1. Remove flange cover bolts.
2. If required, use hoist or crane to remove cover plate.
3. Remove device or devices; clean and inspect for damage.
4. Clean strainer housing cover plate and any interior apparatus. Check for cracks and deterioration.
5. Install new cover gasket and reassemble.
6. Remove tags and open valves; check for leaks.
7. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - basic
2. Hose and bucket
3. Gaskets or gasket material
4. Crane or hoist if needed

PLMB-PLB-04-01Y

Frequency: Annually

Dual Strainer

Application

This standard applies to those strainers used to remove the larger particles of debris in water that may be drawn from rivers, reflecting pools, or non-potable sources. Many are motorized self cleaning type. This water is sometimes used as condenser water in refrigeration systems. These strainers are installed just ahead of backwash strainers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule outage with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. If system is used as condenser water for a refrigeration unit, ensure the affected refrigeration unit is shutdown.
6. If the material removed from is hazardous, contact the Regional S&EM office for disposal instructions.

Check Points:

1. Close off main water inlet.
2. Close off condenser valves.
3. Open all drains and start drain pump if necessary.
4. Clean both strainer lid covers and remove baskets.
5. Clean inner housing, baskets, and screens.
6. Replace lid hatch seals.
7. Check sliding door seals and replace if necessary.
8. Check for pitting and corrosion and paint with rust inhibitor wherever necessary.
9. Check strainer baskets; repair or replace as necessary.
10. Remove and replace gland packing.
11. Remove and replace lubricant in gear box with manufacturer's recommended type.
12. Lubricate motor.
13. Check starter, relays, contactor, points, and wire connections.
14. Run drive mechanism and check for proper operation.

15. Install baskets, close lids, open valves, and check for leaks.
16. Replace hoist ropes if necessary and inspect pulleys.
17. Clean outside casing and touch up pitted or corroded areas with rust inhibitor.
18. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - basic
2. Hose and bucket
3. Gaskets or gasket material
4. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
5. Cleaning equipment and material. Consult the MSDS for hazardous ingredients and proper PPE.
6. Multimeter
7. Rust inhibitor. Consult the MSDS for hazardous ingredients and proper PPE.
8. Crane or hoist if needed

PLMB-PLB-05-01Y

Frequency: Annually

Backwash Strainer

Application

This standard applies to those strainers used to remove the small solids found in water drawn from rivers, reflecting pools, etc. Many are motorized self cleaning type. This water is sometimes used as condenser water in refrigeration systems. These strainers are installed just after the dual strainers.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule outage with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. If the material removed from is hazardous, contact the Regional S&EM office for disposal instructions.

Check Points:

1. Close inlet and outlet valves.
2. Drain backwash.
3. Install hoist and remove lid bolts.
4. Remove wiring harness and shaft hex nuts.
5. Lift cover flange.
6. Remove tube support rod nuts and tie bar.
7. Individually remove tubes and acid/detergent clean each tube.
8. Clean inner casing and tube sheet. Inspect for pits and cracks.
9. Remove side inspection plate and clean bottom sump.
10. Inspect arm assembly and bolt flange.
11. Inspect cutless bearing (rubber lined cylindrical bearing), bearing housing, set screw, shaft coupler bolt and nut, shaft, and distributor barrel seat.
12. Install tubes, rod nuts, and tie bars.
13. Replace shaft gasket.
14. Inspect main shaft, bearing housing, set screw, cutless bearing, drive shaft bearing, and the stud and nut (upper unit).
15. Replace gasket for main cover.
16. Install cover lid and bolts.
17. Replace packing and inspect gland bolt.

18. Replace two "O" rings on upper shaft.
19. Inspect thrust bearings and replace if necessary.
20. Replace shear key and install hex nuts.
21. Drain oil from gear case and replace.
22. Install wiring harness and lubricate motor if necessary.
23. Check all starting relay contacts and wire connections.
24. Start backwash; observe rotation and arm movement through inspection plate.
25. Clean tubing and flange for pressure gauge.
26. Secure unit and install inspection plate.
27. Close drain valve and open inlet and outlet valves.
28. Start backwash and adjust packing.
29. Inspect unit for leaks.
30. Touch up rusted and corroded areas with rust inhibitor and paint.
31. Clean up work site.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - basic
2. Hose and bucket
3. Gaskets or gasket material
4. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
5. Cleaning equipment and material. Consult the MSDS for hazardous ingredients and proper PPE.
6. Multimeter
7. Rust inhibitor. Consult the MSDS for hazardous ingredients and proper PPE.
8. Crane or hoist if needed

PLMB-PLB-06-01Y Frequency: Annually

Steam Traps (High Pressure)

Application:

This standard applies to all types of high pressure steam traps.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Check trap operation under steam pressure.
6. Remove and replace faulty traps or trap elements

Check Points:

1. Thermostatic traps. (Bellows or diaphragm type)
    a. Remove cap or bonnet.
    b. Clean interior of trap, valve, and seat.
    c. Inspect bellows and diaphragm and note by sound whether it contains liquid charge.
    d. Replace bellows or diaphragm as necessary.
    e. If valve seat is cut, replace seat.
2. Float and/or thermostatic traps.
    a. Remove bonnet. Inspect linkage and float operation for leakage, defective operation or deterioration.
    b. Examine, clean, and check operation of bellows as in 1 above.
3. Inverted bucket trap.
    a. Remove bonnet.
    b. Clean interior or trap.
    c. Inspect valve linkage mechanism and seating of valve.
    d. Examine condition of bucket.
    e. Examine vent or face, inlet and outlet for evidence of corrosion.
4. Impulse trap.
    a. Remove bonnet.
    b. Inspect valve disc, inlet valve, outlet outface.
    c. See that fulcrum point is free of dirt.
    d. Clean body of trap.

Recommended Tools, Materials, and Equipment:

1. Tool Group C

General Services Administration Preventive Maintenance Guide
Effective Date: October, 2012

PLMB-PLB-06-05Y Frequency: Every 5 Years

Steam Traps (Low Pressure)

Application:

This standard applies to all types of low pressure steam traps.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Check trap operation under steam pressure.
6. Remove and replace faulty traps or trap elements

Check Points:

1. Thermostatic traps. (Bellows or diaphragm type)
    a. Remove cap or bonnet.
    b. Clean interior of trap, valve, and seat.
    c. Inspect bellows and diaphragm and note by sound whether it contains liquid charge.
    d. Replace bellows or diaphragm as necessary.
    e. If valve seat is cut, replace seat.
2. Float and/or thermostatic traps.
    a. Remove bonnet. Inspect linkage and float operation for leakage, defective operation or deterioration.
    b. Examine, clean, and check operation of bellows as in 1 above.
3. Inverted bucket trap.
    a. Remove bonnet.
    b. Clean interior or trap.
    c. Inspect valve linkage mechanism and seating of valve.
    d. Examine condition of bucket.
    e. Examine vent or face, inlet and outlet for evidence of corrosion.
4. Impulse trap.
    a. Remove bonnet.
    b. Inspect valve disc, inlet valve, outlet outface.
    c. See that fulcrum point is free of dirt.
    d. Clean body of trap.

Recommended Tools, Materials, and Equipment:

1. Tool Group C

PLMB-PLB-07-01Y

Frequency: Annually

Distiller, Water, Laboratory use only

Application

This standard applies to water distillers used in laboratories only.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's operation and maintenance instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Secure and tag water supply.

Check Points:

1. Drain the unit.
2. Remove cover and clean interior of unit, including heating element electrode.
3. Inspect control cabinet. Clean by using vacuum or dry compressed air to remove dust and tighten all connections.
4. Check for leaks at fittings, gaskets and gauge glass.
5. Restore to service and check operation.
6. Collect sample and perform water hardness test.

Recommended Tools, Materials, and Equipment:

1. Tool Group B.
2. Water Testing Kit
3. Measuring containers

PLMB-VLV-01-01M

Frequency: Monthly

Valve, Safety Relief

Application:

This standard card applies to safety relief valves installed on boilers, steam lines, and other equipment. The safety valves are designed to safely relieve excessive pressure, thus preventing rupture or explosion of the pressure parts. Safety valves differ from relief valves in that the safety relief valve opens fully when the applied pressure exceeds its lifting set-point and remains open until the applied pressure drops below its reset point. Relief valve start to open when pressure overcomes the spring pressure and remains open to the degree that the applied pressure pushes it open. When pressure drops, the spring closes the valve.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. The safety relief valves are designed to be operated by steam and should only be tested when sufficient pressure exists to clear the seating area of any debris.
6. Check with foreman and operating personnel before performing this test.
7. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan

Check Points:

1. Inspect condition of spring, flanges, and threaded connections.
2. Inspect the manual lifting lever for obstruction and damage, Note follow manufacturers procedures for manually lifting valve via valve lever. Check for binding of the stem or seat. Make sure that the valve returns to proper position when the lever is released.
3. Inspect support brackets and tighten as required

4. Check that the discharge piping support is tight and not causing stress on the valve.
5. Clean the valve body.
6. Lubricate the stem and lever pivot.

Recommended Tools, Materials, and Equipment:

1. Tool Group C

PLMB-VLV-02-01Y

Frequency: Annually

Valve, Regulating

Application:

This applies to single or double seated, diaphragm or spring loaded pilot operated valves.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.

Check Points:

1. Inspect for dirt collected at bleed port and restriction elbow. Clean if necessary.
2. Inspect joints for leakage. Tighten all bolts
3. Check for dust or other material on the upper face of the pilot pressure plate. Clean if needed.
4. Remove and clean line strainer (back-flush where possible).
5. Inspect valve head and seats for nicks or abrasions. Notify supervisor if valve requires regrinding.
6. Inspect pressure reading against set point.
7. Check for free operation of valve stem.
8. Inspect condition of diaphragm.
9. Inspect pilot line for leaks.
10. Clean up work area and remove all debris.

Recommended Tools, Materials, and Equipment:

1. Tool Group C

PLMB-VLV-03-01Y

Frequency: Annually

Valve, Manually Operated

Application:

This applies to valves other than those used on Fire Protection systems. Maintenance for valves used on fire protection systems are described under the appropriate guide for the specific item of fire protection equipment.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.

Check Points:

1. Operate valve in full open/closed position. Loss of ability to close tightly will require inspection of valve seals and discs for wear and contaminant build-ups.
2. Check for sticking valve stems and lubricate stems and fittings sparingly.
3. Replace packing; dress, re-bush, or replace packing gland assembly, if required.
4. Check for freedom of motion on valves equipped with wheel and chain for remote operation.
5. Clean up work site.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

PLMB-VLV-04-01Y

Frequency: Annually

Valve, Critical Check

Application:

This standard card applies to check valves in primary fluid systems that improve operating efficiency or prevent damage to system components. It applies only to check valves not serviced in conjunction with their associated equipment.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Schedule shutdown with operating personnel.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.

Check Points:

1. Remove the cover and clean the valve seat and disc.
2. Examine the hanger, disc, and seat for cracks or wear.
3. Check seals, packing, and gaskets for deterioration; replace if necessary.
4. Reassemble valve using a new cover gasket or seal.
5. Test under operating conditions if possible.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Packing and gaskets
3. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE)

PLMB-VLV-05-01Y

Frequency: Annually

Valve, Backflow Preventer

Application:

This standard card applies to approved backflow prevention devices installed in water lines to prevent the backflow of contaminated water into the potable water system. Standard check valves or double check valves are not approved backflow preventers and are not included for servicing under this standard.

Backflow preventers are installed in main supply lines and water lines that supply boilers, central chilled water units, cooling towers, deep sinks used for cleaning, lawn sprinklers, lavatories, kitchen equipment, fire sprinkler systems, hose bibs, laboratories, or wherever contaminated water could backflow into the potable water system.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Schedule outage of equipment with operating personnel. For cafeteria kitchens, coordinate the maintenance activity with the cafeteria operator.
5. Schedule maintenance on manually operated valves in conjunction with this activity.
6. Typically, backflow prevention devices **MUST** be tested by a licensed journeyman tradesperson certified by the authority having jurisdiction. Comply with this authority as required.
7. Review manufacturer's instructions for maintenance and testing procedures and required equipment. These procedures may vary depending on the model and size of the backflow preventer.
8. Study the test procedures to be used.

Check Points:

1. On reduced pressure zone backflow preventers, perform the following tests in accordance with the manufacturer's specifications, using the appropriate test kit:
    a. Test check valve number 2 for tightness against reverse flow.
    b. Test gate valve number 2 for tightness.

   c. Test check valve number 1 for tightness.
   d. Test operation of pressure differential relief valve.
2. Service the first and second checks. **CAUTION:** If the check valve is spring loaded, **do not remove** the spring retainers. Consult the manufacturer's instructions for proper servicing.
   a. Carefully remove screws, cover, and check.
   b. Disengage the disc and spring assembly into individual components in accordance with manufacturer's instructions. Remove any embedded foreign objects, and inspect for corrosion, worn seals, etc. Clean or replace the assembly as required.
   c. Clean or replace seals as necessary. Apply a light coating of manufacturer's specified and FDA approved lubrication prior to installation of seals.
   d. Reassemble the check valve module in reverse order.
   e. Repeat for second check.
3. Service the relief valve. **CAUTION:** Springs may be loaded. Strictly comply with manufacturer's instructions.
   a. Remove bolts, cover, diaphragm, and relief valve piston assembly per manufacturer's instructions.
   b. Clean or replace wiper seal, piston "O" ring, and relief valve disc as required. Apply appropriate lubricant to "O" ring per manufacturer's specifications prior to reinstallation.
   c. Inspect bottom spring assembly. If defective, replace entire unit. **Do not attempt to remove the spring.**
4. Following the manufacturer's procedures, test and calibrate the device.
5. Following the manufacturer's procedures, vent both chambers and return the system to normal operation. Verify that there is no dripping or periodic spitting, and that the water flows properly and pressure drop is normal.
6. For cafeterias and kitchens only, inspect food cookers, post-mix carbonated beverage machines, dishwashers, hose bibs, and service sinks and determine whether a backflow preventer is installed. If missing, ensure a preventer isn't located upstream, then initiate a work order to install one if required.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Tool Group C
2. Manufacturer's testing, service, and calibration kits.
3. Lubricants. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

TANK-AGS-01-01Y

Frequency: Annually

Tanks, Air, Refrigerant, LP Gas

Application:

This standard card applies to three types of fixed storage tanks; air, refrigerant, and LP gas. These are large permanently mounted supply or reserve tanks. Not included are main supply tanks serviced by the supplier, or small returnable tanks used on mobile equipment or for maintenance..

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Maintenance shall be coordinated with required inspections. This applies to hot water, cold water, expansion tanks, etc., but not to hot water converter (steam) tanks.
5. Review the Standard Operating Procedure for "Confined Space Entry." Follow OSHA guidelines for permitting of entry and atmospheric testing of confined spaces. NEVER enter a confined space without a safety watch.
6. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
7. If asbestos containing materials are present, check the building's asbestos management plan as described in the Environmental Management portion of the Safety and Environmental Management Program. Manage asbestos in accordance with the asbestos management plan.

Check Points:

1. Examine exterior of tank, including fittings, gauges, manholes, and handholes for leaks, rust, and corrosion. Wire brush and touch up paint.
2. Open tank and remove rust, scale and sludge by scraping, wire brushing, or shot cleaning. If the material removed from the tank is hazardous waste, refer to Appendix G for the Universal Waste Guide.
3. Prior to entering the tank, ensure that it is a safe environment for entry by testing the air. Follow appropriate safety precautions.
4. Inspect interior of tank carefully, recording the size and depth of pits, presence of cracks and condition of openings, fittings, weld, rivets, and joints.
5. Touch up interior coat with an approved protective coating.

6. Inspect structural supports and condition of insulation, if any. If insulation contains asbestos and is damaged or eroded, it is considered hazardous waste. Refer to Appendix G for the Universal Waste Guide.
7. Perform hydrostatic test, if required. Note: Hydrostatic test of unfired pressure vessels is required of any vessel that has a capacity of greater than 30 gallons and operates at a pressure in excess of 60 psig.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Paint. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less.
3. Protective coating material. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
4. Expansion meter or gas meter
5. Approved fire extinguisher. Ensure that the fire extinguisher is properly serviced and that it is in proper working condition.
6. Respirator.

TANK-CHM-01-01Y

Frequency: Annually

Chemical Storage Tanks

Application:

This maintenance standard applies to chemical tanks other than water softener tanks or plastic expendable vats or tanks.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Review the Standard Operating Procedure for "Confined Space Entry." Follow OSHA guidelines for permitting of entry and atmospheric testing of confined spaces. NEVER enter a confined space without a safety watch.
5. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
6. Schedule annual valve maintenance in conjunction with this activity.

Check Points:

1. Examine exterior of tank, including fittings, gauges, structural supports, manholes, and handholes for leaks, signs of corrosion, or other defects. Correct as indicated.
2. Drain and flush the tank. If the material removed from the tank is hazardous waste, refer to Appendix G for the Universal Waste Guide.
3. Prior to entering the tank, ensure that it is a safe environment for entry by testing the air. Follow appropriate safety precautions.
4. Open tank and remove rust or chemical deposits from interior surfaces.
5. Inspect thoroughly the interior of the tank; record the size and depth of pits, presence of cracks, and the condition of openings, fittings, welds, rivets, and joints.
6. Check condition of agitators and/or float assemblies.
7. Clean strainer(s).
8. Touch up cost with approved protective coating.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic

2. Paint. Consult the Material Safety Data Sheet (MSDS) to ensure that the paint lead level is 0.06% or less.
3. Protective coating material. Consult the MSDS for hazardous ingredients and proper personal protective equipment (PPE).
4. Respirator and ventilation equipment
5. Face shield, rubber apron, other appropriate protective equipment as required.

TANK-FOL-01-04Y

Frequency: 4-Year

Tanks, Fuel Oil Storage

Application:

This standard card applies to fuel oil storage tanks generally used for heating oil supply.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard (Appendix I), the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Review the Standard Operating Procedure for "Confined Space Entry." Follow OSHA guidelines for permitting of entry and atmospheric testing of confined spaces. NEVER enter a confined space without a safety watch.
5. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
6. If asbestos containing materials are present, check the building's asbestos management plan as described in the Environmental Management portion of the Safety and Environmental Management Program. Manage asbestos in accordance with the asbestos management plan.

Check Points:

1. Refer to Appendix I for requirements and procedures.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Goggles
3. Respirator
4. Safety harness

TANK-UST-01-01M

Frequency: Monthly

Underground Storage Tanks

Application:

This standard card applies to UST systems used to store regulated substances (i.e., petroleum products and hazardous substances)

Special Instructions:

Reference Appendix I

TANK-WTR-01-03Y

Frequency: 3-Year

Tanks, Water Storage

Application:

This standard applies to all storage tanks including hot water, cold water, and expansion tanks which water is stored.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Maintenance shall be coordinated with required inspections. This applies to hot water, cold water, expansion tanks, etc., but not to hot water converter (steam) tanks.
5. Review the Standard Operating Procedure for "Confined Space Entry." Follow OSHA guidelines for permitting of entry and atmospheric testing of confined spaces. NEVER enter a confined space without a safety watch.
6. Review the Standard Operating Procedure for "Selection, Care, and Use of Respiratory Protection".
7. If asbestos containing materials are present, check the building's asbestos management plan as described in the Environmental Management portion of the Safety and Environmental Management Program. Manage asbestos in accordance with the asbestos management plan.

Check Points:

1. Examine exterior of tank including fittings, manholes, and handholes for leaks, signs of corrosion, and correct as indicated.
2. Drain and flush tank.
3. Prior to entering the tank, ensure that it is a safe environment for entry by testing the air. Follow appropriate safety precautions.
4. Open tank and remove rust, scale and buildup by scraping, wire brushing or shot cleaning.
5. Inspect thoroughly the interior of tank; record the size and depth of pits, presence of cracks and condition of openings, fittings, welds, rivets, and joints.
6. Coat with epoxy or other approved protective coatings.
7. Inspect structural supports and repair or replace damaged insulation or covering. If insulation contains asbestos and is damaged or eroded, it is

considered a hazardous waste. Refer to Appendix G for the Universal Waste Guide.

8. Clean, test and inspect sight glasses, valves, fittings, drains, and controls.
9. Perform hydrostatic test if required.
10. Fill and return to service.
11. Add an EPA approved biocide.
12. Clean up work site.

Recommended Tools, Materials, and Equipment:

1. Tool Group C
2. Safety signs
3. Respirator.
4. Goggles
5. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
6. EPA approved biocide. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).

VTRN-ELV-01-06M

Frequency: Semi-annually

Elevators, Hydraulic

Application:

This standard applies to hydraulically operated passenger and freight elevators.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. This elevator inspection guide is adapted from the ANSI/ASME Codes A17.1 and A17.2, hereinafter referred to as the "code." Refer to these documents for comprehensive instructions on elevator inspections. Adhere to local codes when applicable.
3. Inspectors shall meet the requirements of the ANSI/ASME QEI-1 Standard for the Qualifications of Elevator Inspectors and shall be recognized by GSA. Inspectors and inspection supervisors shall be certified by an ASME accredited organization in accordance with the requirements of ASME QEI-1. Inspections and tests shall be performed by an inspector employed by GSA or by an outside inspector authorized by GSA to perform them. They shall be witnessed by an inspector employed by GSA, or by a qualified person authorized by GSA to witness the tests and inspections on its behalf. Immediately following these inspections and tests, the inspector shall submit to GSA a statement certifying that the inspections and tests have been performed and a report on the results thereof.
4. Avoid the wearing of loose clothing and neckties during the performance of this inspection.
5. Be at all times vigilant of the location and movement of cars, counterweights, projections, rotating machinery, etc. Note the clearance available when working on top of the car or in the pit. Do not enter any pit containing standing water.
6. Be sure that safety devices are operational before performing any inspection work.
7. Inspection checklists adapted from the code are included for convenience.
8. The semiannual inspection of hydraulic elevators includes those designated as routine in the code.
9. Items requiring attention should be reported to the elevator shop supervisor or elevator contractor.
10. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
11. Use energy efficient lighting to the fullest practical extent.

12. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.
13. Comply with state and local codes as applicable.

Check Points, Perform the following in accordance with the elevator code:

1. Inside of Car: Emergency stop switch; car emergency signal; rated load, platform area capacity and data plate; signs in freight elevator; car enclosure; ventilation of passenger elevators; side emergency exits; car door or gate; car door or gate electric contacts; closed position of car door or gate; power opening of doors or gates; power closing of doors or gates; door reopening device; car floor and landing sill; operating control device; emergency signal device; and car lighting (including emergency).
2. Outside Hoist way: Car platform guard; power closing of hoist way doors; sequence operation; hoist way enclosure; hoist way doors; vision panels; hoist way door locking device; elevator parking device; access to hoist way; and emergency doors.
3. Top of Car: Top car clearance and refuge space; stop switch top of car; top car operating device; top car light and outlet; traveling cables and junction; door gate contacts, cams, etc., hangars and connections; hoist way clearances; normal terminal stopping device; top emergency exit; crosshead data plate; construction of hoist way; floor over hoist way; hoist way smoke control; guide rails, fastenings, and alignment; pipe, wiring, and ducts; floor numbers; landing sill guards, projections, and recesses; car frame and stiles; and anticreep leveling device.
4. Machine Room and Machinery Space: Access to machine space; pressure tanks; lighting machine space; ventilation of machine and control space; guards for exposed equipment; control valve; terminal stopping device; pumps; relief and check valve; drives; flexible hose and fittings; tank and oil level; controller wiring fuses, etc.; piping supply line and shutoff.
5. Pit: Pit light and stop switch; pit access; car clearance and runby; construction of oil buffer; oil buffer oil level gage; oil buffer data plate; spring buffer and data plate; solid bumper; cylinder oil collection; pipes, valves, fittings, and supports; plunger; plunger connection to car; normal stopping device; guard between pits; pit access; illumination; traveling; car frame and platform; and pit construction.
6. Test: Oil buffer; terminal stopping devices; and emergency power operation.
7. Motors: Inspect connections, armature and rotor clearances of the hoist motor and motor generator set: Clean and adjust as necessary to obtain proper operation.
8. Cables: Inspect, lubricate and properly adjust hoist cables, compensating cables, governor cables, and traveling cables to their manufacturer's

specifications. Check all cable fastenings. Inspect guide rails and counter weights. Check and adjust the slow down and limit switches. Adjust all other items as necessary to obtain proper operation

9. Sheaves: Inspect, clean, and lubricate in accordance with manufacturer's specifications all deflector, compensating, and top of car sheaves.
10. Clean up and remove all debris from work areas.

Recommended Tools and Materials:

1. Standard Tools - Basic.
2. Cleaning supplies and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Out of service signs.
4. Barricades.
5. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
6. Flashlight with a non conductive case for inspecting wire ropes or other equipment where there is insufficient light.
7. 6 ft (2 m) rule of non conductive material.
8. Set of thickness gages.
9. Small hammer, preferably a ½ lb. (0.2 kg) ball peen.
10. Chalk or crayon.
11. Small metal mirror for examining wire ropes or other items normally inaccessible.
12. Non conductive safety hat.
13. Rope caliper.
14. Sheave groove gage.
15. Copy of the latest edition of the ANSI/ASME A17.1 Safety Code for Elevators and Escalators.
16. Copy of the latest edition of the ANSI/ASME A17.2 Inspector's Manual for Elevators and Escalators.
17. Copy of the latest edition of the Elevator Industry Field Employees' Safety Handbook.
18. Stop Watch.
19. 50 ft (15 m) non conductive tape.
20. Tachometer, preferably one provided with a 1 ft (305 mm) circumference wheel for measuring speeds, or one that reads directly in feet per minute (meters per second).
21. Meter, to check grounding continuity, correct phasing, and verification of voltages.
22. Spirit level.
23. Door test scale (gage) to check closing door force.
24. Suitable test weights.
25. Suitable light meter for measuring light level in foot-candles (lux).

26. Pressure gage, preferably one with a maximum scale of twice the working pressure to be tested.

CHECKLIST FOR INSPECTION OF HYDRAULIC ELEVATORS

GENERAL NOTES:
(a) See ASME A17.2–2004 for detailed inspection information on each item number.
(b) OK = meets requirements; NG = insert number to identify comment on back of this Checklist; NA = not applicable.

Address: _____
_____
_____

ID No: _____

☐ Passenger Rated load: _____

☐ Freight class _____ Speed: _____

☐ Routine inspection and test
☐ Periodic inspection and test
☐ Acceptance inspection and test

Code Edition: _____

Inspected by: _____ (Print)

Signature: _____ Date: _____

QEI No: _____ Certifying organization: _____

		OK	NG	NA
1	**ELEVATOR — INSIDE OF CAR**			
1.1	Door reopening device	☐	☐	☐
1.2	Stop switches	☐	☐	☐
1.3	Operating control devices	☐	☐	☐
1.4	Sills and car floor	☐	☐	☐
1.5	Car lighting and receptacles	☐	☐	☐
1.6	Car emergency signal	☐	☐	☐
1.7	Car door or gate	☐	☐	☐
1.8	Door closing force	☐	☐	☐
1.9	Power closing of doors or gates	☐	☐	☐
1.10	Power opening of doors or gates	☐	☐	☐
1.11	Car vision panels and glass car doors	☐	☐	☐
1.12	Car enclosure	☐	☐	☐
1.13	Emergency exit	☐	☐	☐
1.14	Ventilation	☐	☐	☐
1.15	Signs and operating device symbols	☐	☐	☐
1.16	Rated load, platform area, and data plate	☐	☐	☐
1.17	Standby power operation	☐	☐	☐
1.18	Restricted opening of car or hoistway doors	☐	☐	☐
1.19	Car ride	☐	☐	☐
2	**ELEVATOR — MACHINE ROOM**			
2.1	Access to machine space	☐	☐	☐
2.2	Headroom	☐	☐	☐
2.3	Lighting and receptacles	☐	☐	☐
2.4	Machine space	☐	☐	☐
2.5	Housekeeping	☐	☐	☐
2.6	Ventilation	☐	☐	☐
2.7	Fire extinguisher	☐	☐	☐
2.8	Pipes, wiring, and ducts	☐	☐	☐
2.9	Guarding of exposed auxiliary equipment	☐	☐	☐
2.10	Numbering of elevators, machines, and disconnect switches	☐	☐	☐
2.11	Disconnecting means and control	☐	☐	☐
2.12	Controller wiring, fuses, grounding, etc.	☐	☐	☐
2.13	Governor, overspeed switch, and seal	☐	☐	☐
2.14	Code data plate	☐	☐	☐
2.30	Hydraulic power unit	☐	☐	☐
2.31	Relief valves	☐	☐	☐
2.32	Control valve	☐	☐	☐
2.33	Tanks	☐	☐	☐
2.34	Flexible hydraulic hose and fitting assemblies	☐	☐	☐
2.35	Supply line and shutoff valve	☐	☐	☐
2.36	Hydraulic cylinders	☐	☐	☐
2.37	Pressure switch	☐	☐	☐
2.38	Roped water hydraulic elevators	☐	☐	☐
2.39	Low oil protection	☐	☐	☐
2.40	Inspection control	☐	☐	☐
2.41	Maintenance records	☐	☐	☐
2.42	Static control	☐	☐	☐
3	**ELEVATOR — TOP OF CAR**			
3.1	Top-of-car stop switch	☐	☐	☐
3.2	Car top light and outlet	☐	☐	☐
3.3	Top-of-car operating device	☐	☐	☐
3.4	Top-of-car clearance, refuge space, and standard railing	☐	☐	☐
3.5	Normal terminal stopping devices	☐	☐	☐
3.6	Final and emergency terminal stopping devices	☐	☐	☐
3.7	Car leveling and anticreep devices	☐	☐	☐
3.8	Top emergency exit	☐	☐	☐
3.9	Floor and emergency identification numbering	☐	☐	☐
3.10	Hoistway construction	☐	☐	☐
3.11	Hoistway smoke control	☐	☐	☐
3.12	Pipes, wiring, and ducts	☐	☐	☐
3.13	Windows, projections, recesses, and setbacks	☐	☐	☐
3.14	Hoistway clearances	☐	☐	☐
3.15	Multiple hoistways	☐	☐	☐
3.16	Traveling cables and junction boxes	☐	☐	☐
3.17	Door and gate equipment	☐	☐	☐
3.18	Car frame and stiles	☐	☐	☐
3.19	Guide rails fastenings and equipment	☐	☐	☐
3.20	Governor rope	☐	☐	☐
3.21	Governor releasing carrier	☐	☐	☐
3.22	Wire rope fastening and hitch plate	☐	☐	☐
3.23	Suspension rope	☐	☐	☐
3.27	Crosshead data plate and rope data tags	☐	☐	☐
3.28	Counterweight and counterweight buffer	☐	☐	☐
3.29	Counterweight safeties	☐	☐	☐
3.30	Speed test	☐	☐	☐
3.31	Slack rope device — roped-hydraulic elevators installed under A17.1b–1989 and later editions	☐	☐	☐
3.32	Traveling sheave — roped-hydraulic elevators installed under A17.1b–1989 and later editions	☐	☐	☐

CHECKLIST FOR INSPECTION OF HYDRAULIC ELEVATORS (Back)

		OK	NG	NA
4	**ELEVATOR — OUTSIDE HOISTWAY**			
4.1	Car platform guard	☐	☐	☐
4.2	Hoistway doors	☐	☐	☐
4.3	Vision panels	☐	☐	☐
4.4	Hoistway door locking devices	☐	☐	☐
4.5	Access to hoistway	☐	☐	☐
4.6	Power closing of hoistway doors	☐	☐	☐
4.7	Sequence operation	☐	☐	☐
4.8	Hoistway enclosure	☐	☐	☐
4.9	Elevator parking device	☐	☐	☐
4.10	Emergency doors in blind hoistways	☐	☐	☐
4.12	Standby power selection switch	☐	☐	☐
4.13	Inspection control	☐	☐	☐
5	**ELEVATOR — PIT**			
5.1	Pit access, lighting, stop switch, and condition	☐	☐	☐
5.2	Bottom clearance, runby, and minimum refuge space	☐	☐	☐
5.4	Normal terminal stopping devices	☐	☐	☐
5.5	Traveling cables	☐	☐	☐
5.6	Governor-rope tension device	☐	☐	☐
5.7	Car frame and platform	☐	☐	☐
5.8	Car safeties and guiding members — including roped-hydraulic elevators installed under A17.1b–1989 and later editions	☐	☐	☐
5.11	Plunger and cylinder	☐	☐	☐
5.12	Car buffer	☐	☐	☐
5.13	Guiding members	☐	☐	☐
5.14	Supply piping	☐	☐	☐
6	**ELEVATOR — FIREFIGHTERS' SERVICE**			
6.1	☐ A17.1b–1973 through A17.1b–1980	☐	☐	☐
6.2	☐ A17.1–1981 through A17.1b–1983	☐	☐	☐
6.3	☐ A17.1–1984 through A17.1a–1988 and A17.3	☐	☐	☐
6.4	☐ A17.1b–1989 through A17.1d–2000	☐	☐	☐

Comments: _____

VTRN-ELV-01-01Y: Frequency: Annually

Elevators, Hydraulic

Application:

This standard applies to hydraulically operated passenger and freight elevators. Normally, these elevators are limited to 4 floors or less.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. This elevator inspection guide is adapted from the ANSI/ASME Codes A17.1 and A17.2, hereinafter referred to as the "code." Refer to these documents for comprehensive instructions on elevator inspections. Adhere to local codes when applicable.
3. Inspectors shall meet the requirements of the ANSI/ASME QEI-1 Standard for the Qualifications of Elevator Inspectors and shall be recognized by GSA. Inspectors and inspection supervisors shall be certified by an ASME accredited organization in accordance with the requirements of ASME QEI-1. Inspections and tests shall be performed by an inspector employed by GSA or by an outside inspector authorized by GSA to perform them. They shall be witnessed by an inspector employed by GSA, or by a qualified person authorized by GSA to witness the tests and inspections on its behalf. Immediately following these inspections and tests, the inspector shall submit to GSA a statement certifying that the inspections and tests have been performed and a report on the results thereof.
4. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
5. Avoid the wearing of loose clothing and neckties during the performance of this inspection.
6. Be at all times vigilant of the location and movement of cars, counterweights, projections, rotating machinery, etc. Note the clearance available when working on top of the car or in the pit. Do not enter any pit containing standing water.
7. Be sure that safety devices are operational before performing any inspection work.
8. The annual inspection of hydraulic elevators includes those designated as periodic in the code.
9. Use energy efficient lighting to the fullest practical extent.
10. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for

asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.

11. Comply with state and local codes as applicable.

Check Points, Perform the following in accordance with the elevator code:

1. Brakes: Completely dismantle brake assembly, clean, and inspect for wear. Replace defective parts required for proper operation. Where brake shoes are asbestos-containing, check for dust, and practice appropriate cleanup and maintenance precautions. Lubricate bearing, pins, and pivot points.
2. Selector: Inspect, clean, lubricate, replace parts, and make repairs or adjustments required for proper operation of selector unit components, including cables, chains, clutches, cams gears, fuses, motor brushes, wiring, connections, contacts, relays, tape, tape tension sheave, broken tape switch and tape wipers.
3. Controller: Thoroughly clean controller with blower or vacuum. Inspect and check the operation of switches, relays, timers, capacitors, resistors, contacts, overloads, wiring, connections, fuses, oil level of overloads and overload settings. Check for MG shutdown, high call reversal, zone control, and load by-pass door failure time. Check programming up peak, down peak, off peak, off hours. Replace worn or defective parts and adjust controller for proper operation.
4. Hoist way Doors: Clean, inspect, and lubricate all door operating mechanisms; including but not limited to rollers, upthrusts, interlocks, clutches, self closing, gibs and sills. Replace worn or defective parts, repair and adjust door mechanisms as required for proper operation.
5. Hoist ways: Clean rails, beams, and all related iron work in hoist way. Dust hoist way walls. Clean top, bottom, and sides of car. Clean counterweight and pit area.
6. Hoist Machine and Motor-Generator: Clean with blower or vacuum. Clean end bells, and brush riggings and commutator. Inspect connections, armature and rotor clearances.
7. Buffers: Check oil level and operation of switches. Add oil or adjust switches as necessary for proper operation. Manually compress buffer; test the proper return in accordance with ASME/ANSI A17.1 Safety Code for Elevators and Escalators, Rule 201.4e(1).
8. Scheduling, Dispatch, and Signal Boards: Clean with blower or vacuum. Inspect and check the operation of all switches, relays, timers, fuses, capacitors, resistors, contacts, overloads, wiring and connections. Replace worn or defective parts and adjust for proper operation.
9. Motors: Change oil in hoist motor, motor generator set, geared machines, and gear boxes with lubricants as specified by the equipment manufacturer(s).

10. Inside of Car: Emergency stop switch; car emergency signal; rated load, platform area capacity and data plate; signs in freight elevator; car enclosure; ventilation of passenger elevators; side emergency exits; car door or gate; car door or gate electric contacts; closed position of car door or gate; power opening of doors or gates; power closing of doors or gates; door reopening device; car floor and landing sill; operating control device; emergency signal device; and car lighting (including emergency).
11. Outside Hoist way: Car platform guard; power closing of hoist way doors; door closing force; sequence operation; hoist way enclosure; hoist way doors; vision panels; hoist way door locking device; elevator parking device; access to hoist way; and emergency doors.
12. Top of Car: Top car clearance and refuge space; stop switch top of car; top car operating device; top car light and outlet; traveling cables and junction; door gate contacts, cams, etc., hangars and connections; hoist way clearances; normal terminal stopping device; top emergency exit; crosshead data plate; construction of hoist way; floor over hoist way; hoist way smoke control; guide rails, fastenings, and alignment; pipe, wiring, and ducts; floor numbers; landing sill guards, projections, and recesses; car frame and stiles; and ant creep leveling device.
13. Machine Room and Machinery Space: Access to machine space; pressure tanks; lighting machine space; ventilation of machine and control space; guards for exposed equipment; control valve; terminal stopping device; pumps; relief and check valve; drives; flexible hose and fittings; tank and oil level; controller wiring fuses, etc.; piping supply line and shutoff.
14. Pit: Pit light and stop switch; pit access; car clearance and runby; construction of oil buffer; oil buffer plunger return; oil buffer oil level gage; oil buffer data plate; spring buffer and data plate; solid bumper; cylinder oil collection; pipes, valves, fittings, and supports; plunger; plunger connection to car; normal stopping device; guard between pits; pit access; illumination; traveling; car frame and platform; and pit construction.
15. Test: Flexible hose and fittings; oil buffer (perform the five year test as necessary); terminal stopping devices; firefighters service; emergency power operation; power door closing force; pressure tank (three year); pressure switch; relief valve setting; static load test; emergency terminal speed limiting device.
16. Safeties: Inspect, clean, lubricate and manually operate safety mechanisms. Replace parts or adjust as necessary.
17. Clean up and remove all debris from work area.

<u>Recommended Tools and Materials</u>:

1. Standard Tools - Basic.

2. Cleaning supplies and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Out of service signs.
4. Barricades.
5. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
6. Flashlight with a non conductive case for inspecting wire ropes or other equipment where there is insufficient light.
7. 6 ft (2 m) rule of non conductive material.
8. Set of thickness gages.
9. Small hammer, preferably a ½ lb. (0.2 kg) ball peen.
10. Chalk or crayon.
11. Small metal mirror for examining wire ropes or other items normally inaccessible.
12. Non conductive safety hat.
13. Rope caliper.
14. Sheave groove gage.
15. Copy of the latest edition of the ANSI/ASME A17.1 Safety Code for Elevators and Escalators.
16. Copy of the latest edition of the ANSI/ASME A17.2 Inspector's Manual for Elevators and Escalators.
17. Copy of the latest edition of the Elevator Industry Field Employees' Safety Handbook.
18. Stop Watch.
19. 50 ft (15 m) non conductive tape.
20. Tachometer, preferably one provided with a 1 ft (305 mm) circumference wheel for measuring speeds, or one that reads directly in feet per minute (meters per second).
21. Meter, to check grounding continuity, correct phasing, and verification of voltages.
22. Spirit level.
23. Door test scale (gage) to check closing door force.
24. Suitable test weights.
25. Suitable light meter for measuring light level in foot-candles (lux).
26. Pressure gage, preferably one with a maximum scale of twice the working pressure to be tested.

CHECKLIST FOR INSPECTION OF HYDRAULIC ELEVATORS

GENERAL NOTES:
(a) See ASME A17.2–2004 for detailed inspection information on each item number.
(b) OK = meets requirements; NG = insert number to identify comment on back of this Checklist; NA = not applicable.

Address: _____
_____
_____

ID No: _____

☐ Passenger Rated load: _____

☐ Freight class _____ Speed: _____

☐ Routine inspection and test
☐ Periodic inspection and test
☐ Acceptance inspection and test

Code Edition: _____

Inspected by: _____ (Print)

Signature: _____ Date: _____

QEI No: _____ Certifying organization: _____

		OK	NG	NA
1	**ELEVATOR — INSIDE OF CAR**			
1.1	Door reopening device	☐	☐	☐
1.2	Stop switches	☐	☐	☐
1.3	Operating control devices	☐	☐	☐
1.4	Sills and car floor	☐	☐	☐
1.5	Car lighting and receptacles	☐	☐	☐
1.6	Car emergency signal	☐	☐	☐
1.7	Car door or gate	☐	☐	☐
1.8	Door closing force	☐	☐	☐
1.9	Power closing of doors or gates	☐	☐	☐
1.10	Power opening of doors or gates	☐	☐	☐
1.11	Car vision panels and glass car doors	☐	☐	☐
1.12	Car enclosure	☐	☐	☐
1.13	Emergency exit	☐	☐	☐
1.14	Ventilation	☐	☐	☐
1.15	Signs and operating device symbols	☐	☐	☐
1.16	Rated load, platform area, and data plate	☐	☐	☐
1.17	Standby power operation	☐	☐	☐
1.18	Restricted opening of car or hoistway doors	☐	☐	☐
1.19	Car ride	☐	☐	☐
2	**ELEVATOR — MACHINE ROOM**			
2.1	Access to machine space	☐	☐	☐
2.2	Headroom	☐	☐	☐
2.3	Lighting and receptacles	☐	☐	☐
2.4	Machine space	☐	☐	☐
2.5	Housekeeping	☐	☐	☐
2.6	Ventilation	☐	☐	☐
2.7	Fire extinguisher	☐	☐	☐
2.8	Pipes, wiring, and ducts	☐	☐	☐
2.9	Guarding of exposed auxiliary equipment	☐	☐	☐
2.10	Numbering of elevators, machines, and disconnect switches	☐	☐	☐
2.11	Disconnecting means and control	☐	☐	☐
2.12	Controller wiring, fuses, grounding, etc.	☐	☐	☐
2.13	Governor, overspeed switch, and seal	☐	☐	☐
2.14	Code data plate	☐	☐	☐
2.30	Hydraulic power unit	☐	☐	☐
2.31	Relief valves	☐	☐	☐
2.32	Control valve	☐	☐	☐
2.33	Tanks	☐	☐	☐
2.34	Flexible hydraulic hose and fitting assemblies	☐	☐	☐
2.35	Supply line and shutoff valve	☐	☐	☐
2.36	Hydraulic cylinders	☐	☐	☐
2.37	Pressure switch	☐	☐	☐
2.38	Roped water hydraulic elevators	☐	☐	☐
2.39	Low oil protection	☐	☐	☐
2.40	Inspection control	☐	☐	☐
2.41	Maintenance records	☐	☐	☐
2.42	Static control	☐	☐	☐
3	**ELEVATOR — TOP OF CAR**			
3.1	Top-of-car stop switch	☐	☐	☐
3.2	Car top light and outlet	☐	☐	☐
3.3	Top-of-car operating device	☐	☐	☐
3.4	Top-of-car clearance, refuge space, and standard railing	☐	☐	☐
3.5	Normal terminal stopping devices	☐	☐	☐
3.6	Final and emergency terminal stopping devices	☐	☐	☐
3.7	Car leveling and anticreep devices	☐	☐	☐
3.8	Top emergency exit	☐	☐	☐
3.9	Floor and emergency identification numbering	☐	☐	☐
3.10	Hoistway construction	☐	☐	☐
3.11	Hoistway smoke control	☐	☐	☐
3.12	Pipes, wiring, and ducts	☐	☐	☐
3.13	Windows, projections, recesses, and setbacks	☐	☐	☐
3.14	Hoistway clearances	☐	☐	☐
3.15	Multiple hoistways	☐	☐	☐
3.16	Traveling cables and junction boxes	☐	☐	☐
3.17	Door and gate equipment	☐	☐	☐
3.18	Car frame and stiles	☐	☐	☐
3.19	Guide rails fastenings and equipment	☐	☐	☐
3.20	Governor rope	☐	☐	☐
3.21	Governor releasing carrier	☐	☐	☐
3.22	Wire rope fastening and hitch plate	☐	☐	☐
3.23	Suspension rope	☐	☐	☐
3.27	Crosshead data plate and rope data tags	☐	☐	☐
3.28	Counterweight and counterweight buffer	☐	☐	☐
3.29	Counterweight safeties	☐	☐	☐
3.30	Speed test	☐	☐	☐
3.31	Slack rope device — roped-hydraulic elevators installed under A17.1b–1989 and later editions	☐	☐	☐
3.32	Traveling sheave — roped-hydraulic elevators installed under A17.1b–1989 and later editions	☐	☐	☐

CHECKLIST FOR INSPECTION OF HYDRAULIC ELEVATORS (Back)

		OK	NG	NA
4	**ELEVATOR — OUTSIDE HOISTWAY**			
4.1	Car platform guard	☐	☐	☐
4.2	Hoistway doors	☐	☐	☐
4.3	Vision panels	☐	☐	☐
4.4	Hoistway door locking devices	☐	☐	☐
4.5	Access to hoistway	☐	☐	☐
4.6	Power closing of hoistway doors	☐	☐	☐
4.7	Sequence operation	☐	☐	☐
4.8	Hoistway enclosure	☐	☐	☐
4.9	Elevator parking device	☐	☐	☐
4.10	Emergency doors in blind hoistways	☐	☐	☐
4.12	Standby power selection switch	☐	☐	☐
4.13	Inspection control	☐	☐	☐
5	**ELEVATOR — PIT**			
5.1	Pit access, lighting, stop switch, and condition	☐	☐	☐
5.2	Bottom clearance, runby, and minimum refuge space	☐	☐	☐
5.4	Normal terminal stopping devices	☐	☐	☐
5.5	Traveling cables	☐	☐	☐
5.6	Governor-rope tension device	☐	☐	☐
5.7	Car frame and platform	☐	☐	☐
5.8	Car safeties and guiding members — including roped-hydraulic elevators installed under A17.1b–1989 and later editions	☐	☐	☐
5.11	Plunger and cylinder	☐	☐	☐
5.12	Car buffer	☐	☐	☐
5.13	Guiding members	☐	☐	☐
5.14	Supply piping	☐	☐	☐
6	**ELEVATOR — FIREFIGHTERS' SERVICE**			
6.1	☐ A17.1b–1973 through A17.1b–1980	☐	☐	☐
6.2	☐ A17.1–1981 through A17.1b–1983	☐	☐	☐
6.3	☐ A17.1–1984 through A17.1a–1988 and A17.3	☐	☐	☐
6.4	☐ A17.1b–1989 through A17.1d–2000	☐	☐	☐

Comments: _____

VTRN-ELV-02-06M

Frequency: Semi-annually

Elevators, Electric

Application:

This standard applies to electrically operated passenger and freight elevators.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. This elevator inspection guide is adapted from the ANSI/ASME Codes A17.1, Safety Code for Elevators and Escalators, and A17.2, Inspectors' Manual for Electric Elevators, hereinafter referred to as the "code". Refer to these documents for comprehensive instructions on elevator inspections. Adhere to local codes when applicable.
3. Inspectors shall meet the requirements of the ANSI/ASME QEI-1 Standard for the Qualifications of Elevator Inspectors and shall be recognized by GSA. Inspectors and inspection supervisors shall be certified by an ASME accredited organization in accordance with the requirements of ASME QEI-1. Inspections and tests shall be performed by an inspector employed by GSA or by an outside inspector authorized by GSA to perform them. They shall be witnessed by an inspector employed by GSA, or by a qualified person authorized by GSA to witness the tests and inspections on its behalf. Immediately following these inspections and tests, the inspector shall submit to GSA a statement certifying that the inspections and tests have been performed and a report on the results thereof.
4. Avoid the wearing of loose clothing and neckties during the performance of this inspection.
5. Be at all times vigilant of the location and movement of cars, counterweights, projections, rotating machinery, etc. Note the clearance available when working on top of the car or in the pit. Do not enter any pit containing standing water.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Be sure that safety devices are operational before performing any inspection work.
8. The semiannual inspection of electric elevators includes those designated as routine in the code.
9. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.

10. Comply with state and local codes as applicable.

Check Points, Perform the following in accordance with the elevator code:

1. Inside of Car: Door reopening device; stop switches; operating control devices; car floor and landing sill; car lighting; car emergency signal; car door or gate; door closing force; power closing of doors or gates; power opening of doors or gates; car vision panels and glass car doors; car enclosure; emergency exit; ventilation; signs and operating device symbols; rated load, platform area, and data plate; standby power operation; restricted opening of car or hoist way doors; and car ride.
2. Machine Room: Lighting and receptacles; housekeeping; ventilation; fire extinguisher; pipes, wiring, and ducts; guarding of exposed auxiliary equipment; numbering of machines and disconnect switches; disconnecting means and control; controller wiring, fuses, grounding, etc.; static control; drive machine brake; traction drive machines; gears and bearings; winding drum machine; belt- or chain-drive machine; motor generator; absorption of regenerated power; AC drives from a DC source; traction sheaves; secondary and deflector sheaves; rope fastenings; terminal stopping devices; slack rope devices; governor, over speed switch, and seal; and car and counterweight safeties.
3. Top of Car: Top-of-car stop switch; car top light and outlet; top-of-car operating device and working platforms; top-of-car clearance and refuge space; top counterweight clearance; car, overhead, and deflector sheaves; normal terminal stopping devices; final terminal stopping devices; broken rope, chain, or tape switch; car leveling devices; top emergency exit; counterweight and counterweight buffer; counterweight safeties; hoist way smoke control; pipes, wiring, and ducts; hoist way clearances; multiple hoist ways; traveling cables and junction boxes; door and gate equipment; car frame and stiles; guide rails fastening and equipment; governor rope; governor releasing carrier; wire rope fastening and hitch plate; suspension rope; and compensating ropes and chains.
4. Outside Hoist way: Car platform guard; hoist way doors; vision panels; hoist way door locking devices; access to hoist way; power closing of hoist way doors; sequence operations; elevator parking devices; emergency doors blind hoist ways; and standby power selection switch.
5. Inspections Made in the Pit: Pit access, lighting, and stop switch, and condition; car and counterweight buffer; final terminal stopping devices; normal terminal stopping devices; traveling cables; governor-rope tension devices; compensating chains, ropes, and sheaves; car frame and platform; and car safeties and guiding members.
6. Motors: Inspect connections, armature and rotor clearances of the hoist motor and motor generator set: Clean and adjust as necessary to obtain proper operation.

7. Cables: Inspect, lubricate and properly adjust hoist cables, compensating cables, governor cables, and traveling cables to their manufacturer's specifications. Check all cable fastenings. Inspect guide rails and counter weights. Check and adjust the slow down and limit switches. Adjust all other items as necessary to obtain proper operation
8. Sheaves: Inspect, clean, and lubricate in accordance with manufacturer's specifications all deflector, compensating, and top of car sheaves.
9. Clean up and remove all debris from work areas.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Cleaning supplies and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Out of service signs.
4. Barricades.
5. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
6. Flashlight with a non conductive case for inspecting wire ropes or other equipment where there is insufficient light.
7. 6 ft (2 m) rule of non conductive material.
8. Set of thickness gages.
9. Small hammer, preferably a ½ lb. (0.2 kg) ball peen.
10. Chalk or crayon.
11. Small metal mirror for examining wire ropes or other items normally inaccessible.
12. Non conductive safety hat.
13. Rope caliper.
14. Sheave groove gage.
15. Copy of the latest edition of the ANSI/ASME A17.1 Safety Code for Elevators and Escalators.
16. Copy of the latest edition of the ANSI/ASME A17.2 Inspector's Manual for Elevators and Escalators.
17. Copy of the latest edition of the Elevator Industry Field Employees' Safety Handbook.
18. Stop Watch.
19. 50 ft (15 m) non conductive tape.
20. Tachometer, preferably one provided with a 1 ft (305 mm) circumference wheel for measuring speeds, or one that reads directly in feet per minute (meters per second).
21. Meter, to check grounding continuity, phasing, and voltages.
22. Spirit level.
23. Door test scale (gage) to check closing door force.

24. Suitable test weights.
25. Suitable light meter for measuring light intensity.
26. Pressure gage, preferably one with a maximum scale of twice the working pressure to be tested.
27. Latest edition of ASME A17.4, Evacuation of Passengers from Stalled Elevators.

CHECKLIST FOR INSPECTION OF ELECTRIC ELEVATORS

GENERAL NOTES:
(a) See ASME A17.2–2004 for detailed inspection information on each item number.
(b) OK = meets requirements; NG = insert number to identify comment on back of this Checklist; NA = not applicable.

Address: _____

_____

_____

ID No: _____

☐ Passenger Rated load: _____

☐ Freight class _____ Speed: _____

☐ Routine inspection and test
☐ Periodic inspection and test
☐ Acceptance inspection and test

Code Edition: _____

Inspected by: _____ (Print)

Signature: _____ Date: _____

QEI No: _____ Certifying organization: _____

		OK	NG	NA
1	**ELEVATOR — INSIDE OF CAR**			
1.1	Door reopening device	☐	☐	☐
1.2	Stop switches	☐	☐	☐
1.3	Operating control devices	☐	☐	☐
1.4	Sills and car floor	☐	☐	☐
1.5	Car lighting and receptacles	☐	☐	☐
1.6	Car emergency signal	☐	☐	☐
1.7	Car door or gate	☐	☐	☐
1.8	Door closing force	☐	☐	☐
1.9	Power closing of doors or gates	☐	☐	☐
1.10	Power opening of doors or gates	☐	☐	☐
1.11	Car vision panels and glass car doors	☐	☐	☐
1.12	Car enclosure	☐	☐	☐
1.13	Emergency exit	☐	☐	☐
1.14	Ventilation	☐	☐	☐
1.15	Signs and operating device symbols	☐	☐	☐
1.16	Rated load, platform area, and data plate	☐	☐	☐
1.17	Standby power operation	☐	☐	☐
1.18	Restricted opening of car or hoistway doors	☐	☐	☐
1.19	Car ride	☐	☐	☐
2	**ELEVATOR — MACHINE ROOM**			
2.1	Access to machine space	☐	☐	☐
2.2	Headroom	☐	☐	☐
2.3	Lighting and receptacles	☐	☐	☐
2.4	Machine space	☐	☐	☐
2.5	Housekeeping	☐	☐	☐
2.6	Ventilation	☐	☐	☐
2.7	Fire extinguisher	☐	☐	☐
2.8	Pipes, wiring, and ducts	☐	☐	☐
2.9	Guarding of exposed auxiliary equipment	☐	☐	☐
2.10	Numbering of elevators, machines, and disconnect switches	☐	☐	☐
2.11	Disconnecting means and control	☐	☐	☐
2.12	Controller wiring, fuses, grounding, etc.	☐	☐	☐
2.13	Governor, overspeed switch, and seal	☐	☐	☐
2.14	Code data plate	☐	☐	☐
2.15	Static control	☐	☐	☐
2.16	Overhead beam and fastenings	☐	☐	☐
2.17	Drive machine brake	☐	☐	☐
2.18	Traction drive machines	☐	☐	☐
2.19	Gears, bearings, and flexible couplings	☐	☐	☐
2.20	Winding drum machine and slack cable device	☐	☐	☐
2.21	Belt- or chain-drive machine	☐	☐	☐
2.22	Motor generator	☐	☐	☐
2.23	Absorption of regenerated power	☐	☐	☐
2.24	AC drives from a DC source	☐	☐	☐
2.25	Traction sheaves	☐	☐	☐
2.26	Secondary and deflector sheaves	☐	☐	☐
2.27	Rope fastenings	☐	☐	☐
2.28	Terminal stopping devices	☐	☐	☐
2.29	Car and counterweight safeties	☐	☐	☐
2.39	Low oil protection	☐	☐	☐
2.40	Inspection control	☐	☐	☐
2.41	Maintenance records	☐	☐	☐
2.42	Static control	☐	☐	☐
3	**ELEVATOR — TOP OF CAR**			
3.1	Top-of-car stop switch	☐	☐	☐
3.2	Car top light and outlet	☐	☐	☐
3.3	Top-of-car operating device	☐	☐	☐
3.4	Top-of-car clearance, refuge space, and standard railing	☐	☐	☐
3.5	Normal terminal stopping devices	☐	☐	☐
3.6	Final and emergency terminal stopping devices	☐	☐	☐
3.7	Car leveling and anticreep devices	☐	☐	☐
3.8	Top emergency exit	☐	☐	☐
3.9	Floor and emergency identification numbering	☐	☐	☐
3.10	Hoistway construction	☐	☐	☐
3.11	Hoistway smoke control	☐	☐	☐
3.12	Pipes, wiring, and ducts	☐	☐	☐
3.13	Windows, projections, recesses, and setbacks	☐	☐	☐
3.14	Hoistway clearances	☐	☐	☐
3.15	Multiple hoistways	☐	☐	☐
3.16	Traveling cables and junction boxes	☐	☐	☐
3.17	Door and gate equipment	☐	☐	☐
3.18	Car frame and stiles	☐	☐	☐
3.19	Guide rails fastening and equipment	☐	☐	☐
3.20	Governor rope	☐	☐	☐
3.21	Governor releasing carrier	☐	☐	☐
3.22	Wire rope fastening and hitch plate	☐	☐	☐
3.23	Suspension rope	☐	☐	☐
3.24	Top counterweight clearance	☐	☐	☐
3.25	Car, overhead, and deflector sheaves	☐	☐	☐

CHECKLIST FOR INSPECTION OF ELECTRIC ELEVATORS (Back)

		OK	NG	NA
3.26	Broken rope, chain, or tape switch	☐	☐	☐
3.27	Crosshead data plate and rope data tags	☐	☐	☐
3.28	Counterweight and counterweight buffer	☐	☐	☐
3.29	Counterweight safeties	☐	☐	☐
3.33	Compensating ropes and chains	☐	☐	☐
4	**ELEVATOR — OUTSIDE HOISTWAY**			
4.1	Car platform guard	☐	☐	☐
4.2	Hoistway doors	☐	☐	☐
4.3	Vision panels	☐	☐	☐
4.4	Hoistway door locking devices	☐	☐	☐
4.5	Access to hoistway	☐	☐	☐
4.6	Power closing of hoistway doors	☐	☐	☐
4.7	Sequence operation	☐	☐	☐
4.8	Hoistway enclosure	☐	☐	☐
4.9	Elevator Parking devices	☐	☐	☐
4.10	Emergency doors in blind hoistways	☐	☐	☐
4.11	Separate counterweight hoistway	☐	☐	☐
4.12	Standby power selection switch	☐	☐	☐
4.13	Inspection control	☐	☐	☐
5	**ELEVATOR — PIT**			
5.1	Pit access, lighting, stop switch, and condition	☐	☐	☐

		OK	NG	NA
5.2	Bottom clearance, runby, and minimum refuge space	☐	☐	☐
5.3	Final and emergency terminal stopping devices	☐	☐	☐
5.4	Normal terminal stopping devices	☐	☐	☐
5.5	Traveling cables	☐	☐	☐
5.6	Governor-rope tension devices	☐	☐	☐
5.7	Car Frame and platform	☐	☐	☐
5.8	Car safeties and guiding members — including roped-hydraulic elevators installed under A17.1b–1989 and later editions	☐	☐	☐
5.9	Buffers and emergency terminal speed limiting devices	☐	☐	☐
5.10	Compensating chains, ropes, and sheaves	☐	☐	☐
6	**ELEVATOR — FIREFIGHTERS' SERVICE**			
6.1	☐ A17.1b–1973 through A17.1b–1980	☐	☐	☐
6.2	☐ A17.1–1981 through A17.1b–1983	☐	☐	☐
6.3	☐ A17.1–1984 through A17.1a–1988 and A17.3	☐	☐	☐
6.4	☐ A17.1b–1989 through A17.1d–2000	☐	☐	☐

Comments: _____

VTRN-ELV-02-01Y

Frequency: Annually

Elevators, Electric

Application:

This standard applies to electrically operated passenger and freight elevators.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. This elevator inspection guide is adapted from the ANSI/ASME Codes A17.1, Safety Code for Elevators and Escalators, and A17.2, Inspectors' Manual for Electric Elevators, hereinafter referred to as the "code". Refer to these documents for comprehensive instructions on elevator inspections. Adhere to local codes when applicable.
3. Inspectors shall meet the requirements of the ANSI/ASME QEI-1 Standard for the Qualifications of Elevator Inspectors and shall be recognized by GSA. Inspectors and inspection supervisors shall be certified by an ASME accredited organization in accordance with the requirements of ASME QEI-1. Inspections and tests shall be performed by an inspector employed by GSA or by an outside inspector authorized by GSA to perform them. They shall be witnessed by an inspector employed by GSA, or by a qualified person authorized by GSA to witness the tests and inspections on its behalf. Immediately following these inspections and tests, the inspector shall submit to GSA a statement certifying that the inspections and tests have been performed and a report on the results thereof.
4. Avoid the wearing of loose clothing and neckties during the performance of this inspection.
5. Be at all times vigilant of the location and movement of cars, counterweights, projections, rotating machinery, etc. Note the clearance available when working on top of the car or in the pit. Do not enter any pit containing standing water.
6. Be sure that safety devices are operational before performing any inspection work.
7. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
8. The annual inspection of electric elevators are described in the periodic section of the code.
9. Perform the semiannual inspection simultaneously.
10. Comply with state and local codes as applicable.
11. Use energy efficient lighting to the fullest practical extent.

12. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.
13. Comply with state and local codes as applicable.

Check Points, Perform the following in accordance with the elevator code:

1. Inside of Car: Car lighting; standby power operation.
2. Machine Room: Static control (check and torque all connections to correct specifications, and check and lubricate cooling fan); check primary and secondary voltages phase to phase and phase to ground; winding drum machine; AC drives from a DC source; traction sheaves; terminal stopping devices; slack rope devices; governor, over speed switch, and seal; and car and counterweight safeties.
3. Top of Car: Final terminal stopping devices; and counterweight safeties.
4. Outside Hoist way: Standby power selection switch.
5. Inspections Made in the Pit: Car and counterweight buffer; final terminal stopping devices; normal terminal stopping devices; and car safeties and guiding members.
6. Firefighter's Service: Operation of elevators under fire and other emergency conditions, A17.1b-1973 through A17.1b-1980; operation of elevators under fire and other emergency conditions, A17.1-1981 through A17.1b-1983; firefighter's service A17.1-1984 through A17.1a-1988 and A17.3; firefighter's service A17.1b-1989 and later editions.
7. Brakes: Completely dismantle brake assembly, clean, and inspect for wear. Replace defective parts required for proper operation. Where brake shoes are asbestos-containing, check for dust, and practice appropriate cleanup and maintenance precautions. Lubricate bearing, pins, and pivot points.
8. Selector: Inspect, clean, lubricate, replace parts, and make repairs or adjustments required for proper operation of selector unit components, including cables, chains, clutches, cams gears, fuses, motor brushes, wiring, connections, contacts, relays, tape, tape tension sheave, broken tape switch and tape wipers.
9. Controller: Thoroughly clean controller with blower or vacuum. Inspect and check the operation of switches, relays, timers, capacitors, resistors, contacts, overloads, wiring, connections, fuses, oil level of overloads and overload settings. Check for MG shutdown, high call reversal, zone control, and load by-pass door failure time. Check programming up peak, down peak, off peak, off hours. Replace worn or defective parts and adjust controller for proper operation.
10. Hoist way Doors: Clean, inspect, and lubricate all door operating mechanisms; including but not limited to rollers, upthrusts, interlocks, clutches, self closing,

gibs and sills. Replace worn or defective parts, repair and adjust door mechanisms as required for proper operation.

11. Hoist ways: Clean rails, beams, and all related iron work in hoist way. Dust hoist way walls. Clean top, bottom, and sides of car. Clean counterweight and pit area.
12. Hoist Machine and Motor-Generator: Clean with blower or vacuum. Clean end bells, and brush riggings and commutator. Inspect connections, armature and rotor clearances.
13. Buffers: Check oil level and operation of switches. Add oil or adjust switches as necessary for proper operation. Manually compress buffer; test the proper return in accordance with ASME/ANSI A17.1 Safety Code for Elevators and Escalators, Rule 201.4e(1).
14. Scheduling, Dispatch, and Signal Boards: Clean with blower or vacuum. Inspect and check the operation of all switches, relays, timers, fuses, capacitors, resistors, contacts, overloads, wiring and connections. Replace worn or defective parts and adjust for proper operation.
15. Motors: Change oil in hoist motor, motor generator set, geared machines, and gear boxes with lubricants as specified by the equipment manufacturer(s).
16. Safeties: Inspect, clean, lubricate and manually operate safety mechanisms. Replace parts or adjust as necessary.
17. Clean up and remove all debris from work area.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Standard Tools - Basic.
2. Cleaning supplies and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Out of service signs.
4. Barricades.
5. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.
6. Flashlight with a non conductive case for inspecting wire ropes or other equipment where there is insufficient light.
7. 6 ft (2 m) rule of non conductive material.
8. Set of thickness gages.
9. Small hammer, preferably a ½ lb. (0.2 kg) ball peen.
10. Chalk or crayon.
11. Small metal mirror for examining wire ropes or other items normally inaccessible.
12. Non conductive safety hat.
13. Rope caliper.
14. Sheave groove gage.

15. Copy of the latest edition of the ANSI/ASME A17.1 Safety Code for Elevators and Escalators.
16. Copy of the latest edition of the ANSI/ASME A17.2 Inspector's Manual for Elevators and Escalators.
17. Copy of the latest edition of the Elevator Industry Field Employees' Safety Handbook.
18. Stop Watch.
19. 50 ft (15 m) non conductive tape.
20. Tachometer, preferably one provided with a 1 ft (305 mm) circumference wheel for measuring speeds, or one that reads directly in feet per minute (meters per second).
21. Meter, to check grounding continuity, correct phasing, and verification of voltages.
22. Spirit level.
23. Door test scale (gage) to check closing door force.
24. Suitable test weights.
25. Suitable light meter for measuring light level in foot-candles (lux).

CHECKLIST FOR INSPECTION OF ELECTRIC ELEVATORS

GENERAL NOTES:
(a) See ASME A17.2–2004 for detailed inspection information on each item number.
(b) OK = meets requirements; NG = insert number to identify comment on back of this Checklist; NA = not applicable.

Address: _____

_____

_____

ID No: _____

☐ Passenger Rated load: _____

☐ Freight class _____ Speed: _____

☐ Routine inspection and test
☐ Periodic inspection and test
☐ Acceptance inspection and test

Code Edition: _____

Inspected by: _____ (Print)

Signature: _____ Date: _____

QEI No: _____ Certifying organization: _____

		OK	NG	NA
1	**ELEVATOR — INSIDE OF CAR**			
1.1	Door reopening device	☐	☐	☐
1.2	Stop switches	☐	☐	☐
1.3	Operating control devices	☐	☐	☐
1.4	Sills and car floor	☐	☐	☐
1.5	Car lighting and receptacles	☐	☐	☐
1.6	Car emergency signal	☐	☐	☐
1.7	Car door or gate	☐	☐	☐
1.8	Door closing force	☐	☐	☐
1.9	Power closing of doors or gates	☐	☐	☐
1.10	Power opening of doors or gates	☐	☐	☐
1.11	Car vision panels and glass car doors	☐	☐	☐
1.12	Car enclosure	☐	☐	☐
1.13	Emergency exit	☐	☐	☐
1.14	Ventilation	☐	☐	☐
1.15	Signs and operating device symbols	☐	☐	☐
1.16	Rated load, platform area, and data plate	☐	☐	☐
1.17	Standby power operation	☐	☐	☐
1.18	Restricted opening of car or hoistway doors	☐	☐	☐
1.19	Car ride	☐	☐	☐
2	**ELEVATOR — MACHINE ROOM**			
2.1	Access to machine space	☐	☐	☐
2.2	Headroom	☐	☐	☐
2.3	Lighting and receptacles	☐	☐	☐
2.4	Machine space	☐	☐	☐
2.5	Housekeeping	☐	☐	☐
2.6	Ventilation	☐	☐	☐
2.7	Fire extinguisher	☐	☐	☐
2.8	Pipes, wiring, and ducts	☐	☐	☐
2.9	Guarding of exposed auxiliary equipment	☐	☐	☐
2.10	Numbering of elevators, machines, and disconnect switches	☐	☐	☐
2.11	Disconnecting means and control	☐	☐	☐
2.12	Controller wiring, fuses, grounding, etc.	☐	☐	☐
2.13	Governor, overspeed switch, and seal	☐	☐	☐
2.14	Code data plate	☐	☐	☐
2.15	Static control	☐	☐	☐
2.16	Overhead beam and fastenings	☐	☐	☐
2.17	Drive machine brake	☐	☐	☐
2.18	Traction drive machines	☐	☐	☐
2.19	Gears, bearings, and flexible couplings	☐	☐	☐
2.20	Winding drum machine and slack cable device	☐	☐	☐
2.21	Belt- or chain-drive machine	☐	☐	☐
2.22	Motor generator	☐	☐	☐
2.23	Absorption of regenerated power	☐	☐	☐
2.24	AC drives from a DC source	☐	☐	☐
2.25	Traction sheaves	☐	☐	☐
2.26	Secondary and deflector sheaves	☐	☐	☐
2.27	Rope fastenings	☐	☐	☐
2.28	Terminal stopping devices	☐	☐	☐
2.29	Car and counterweight safeties	☐	☐	☐
2.39	Low oil protection	☐	☐	☐
2.40	Inspection control	☐	☐	☐
2.41	Maintenance records	☐	☐	☐
2.42	Static control	☐	☐	☐
3	**ELEVATOR — TOP OF CAR**			
3.1	Top-of-car stop switch	☐	☐	☐
3.2	Car top light and outlet	☐	☐	☐
3.3	Top-of-car operating device	☐	☐	☐
3.4	Top-of-car clearance, refuge space, and standard railing	☐	☐	☐
3.5	Normal terminal stopping devices	☐	☐	☐
3.6	Final and emergency terminal stopping devices	☐	☐	☐
3.7	Car leveling and anticreep devices	☐	☐	☐
3.8	Top emergency exit	☐	☐	☐
3.9	Floor and emergency identification numbering	☐	☐	☐
3.10	Hoistway construction	☐	☐	☐
3.11	Hoistway smoke control	☐	☐	☐
3.12	Pipes, wiring, and ducts	☐	☐	☐
3.13	Windows, projections, recesses, and setbacks	☐	☐	☐
3.14	Hoistway clearances	☐	☐	☐
3.15	Multiple hoistways	☐	☐	☐
3.16	Traveling cables and junction boxes	☐	☐	☐
3.17	Door and gate equipment	☐	☐	☐
3.18	Car frame and stiles	☐	☐	☐
3.19	Guide rails fastening and equipment	☐	☐	☐
3.20	Governor rope	☐	☐	☐
3.21	Governor releasing carrier	☐	☐	☐
3.22	Wire rope fastening and hitch plate	☐	☐	☐
3.23	Suspension rope	☐	☐	☐
3.24	Top counterweight clearance	☐	☐	☐
3.25	Car, overhead, and deflector sheaves	☐	☐	☐

CHECKLIST FOR INSPECTION OF ELECTRIC ELEVATORS (Back)

		OK	NG	NA
3.26	Broken rope, chain, or tape switch	☐	☐	☐
3.27	Crosshead data plate and rope data tags	☐	☐	☐
3.28	Counterweight and counterweight buffer	☐	☐	☐
3.29	Counterweight safeties	☐	☐	☐
3.33	Compensating ropes and chains	☐	☐	☐
4	**ELEVATOR — OUTSIDE HOISTWAY**			
4.1	Car platform guard	☐	☐	☐
4.2	Hoistway doors	☐	☐	☐
4.3	Vision panels	☐	☐	☐
4.4	Hoistway door locking devices	☐	☐	☐
4.5	Access to hoistway	☐	☐	☐
4.6	Power closing of hoistway doors	☐	☐	☐
4.7	Sequence operation	☐	☐	☐
4.8	Hoistway enclosure	☐	☐	☐
4.9	Elevator Parking devices	☐	☐	☐
4.10	Emergency doors in blind hoistways	☐	☐	☐
4.11	Separate counterweight hoistway	☐	☐	☐
4.12	Standby power selection switch	☐	☐	☐
4.13	Inspection control	☐	☐	☐
5	**ELEVATOR — PIT**			
5.1	Pit access, lighting, stop switch, and condition	☐	☐	☐

		OK	NG	NA
5.2	Bottom clearance, runby, and minimum refuge space	☐	☐	☐
5.3	Final and emergency terminal stopping devices	☐	☐	☐
5.4	Normal terminal stopping devices	☐	☐	☐
5.5	Traveling cables	☐	☐	☐
5.6	Governor-rope tension devices	☐	☐	☐
5.7	Car Frame and platform	☐	☐	☐
5.8	Car safeties and guiding members — including roped-hydraulic elevators installed under A17.1b–1989 and later editions	☐	☐	☐
5.9	Buffers and emergency terminal speed limiting devices	☐	☐	☐
5.10	Compensating chains, ropes, and sheaves	☐	☐	☐
6	**ELEVATOR — FIREFIGHTERS' SERVICE**			
6.1	☐ A17.1b–1973 through A17.1b–1980	☐	☐	☐
6.2	☐ A17.1–1981 through A17.1b–1983	☐	☐	☐
6.3	☐ A17.1–1984 through A17.1a–1988 and A17.3	☐	☐	☐
6.4	☐ A17.1b–1989 through A17.1d–2000	☐	☐	☐

Comments: _____

VTRN-ELV-02-05Y

Frequency: 5-Year

Elevators, Electric

Application:

This standard applies to electrically operated passenger and freight elevators.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. This elevator inspection guide is adapted from the ANSI/ASME Codes A17.1, Safety Code for Elevators and Escalators, and A17.2, Inspectors' Manual for Electric Elevators, hereinafter referred to as the "code". Refer to these documents for comprehensive instructions on elevator inspections. Adhere to local codes when applicable.
3. Inspectors shall meet the requirements of the ANSI/ASME QEI-1 Standard for the Qualifications of Elevator Inspectors and shall be recognized by GSA. Inspectors and inspection supervisors shall be certified by an ASME accredited organization in accordance with the requirements of ASME QEI-1. Inspections and tests shall be performed by an inspector employed by GSA or by an outside inspector authorized by GSA to perform them. They shall be witnessed by an inspector employed by GSA, or by a qualified person authorized by GSA to witness the tests and inspections on its behalf. Immediately following these inspections and tests, the inspector shall submit to GSA a statement certifying that the inspections and tests have been performed and a report on the results thereof.
4. Avoid the wearing of loose clothing and neckties during the performance of this inspection.
5. Be at all times vigilant of the location and movement of cars, counterweights, projections, rotating machinery, etc. Note the clearance available when working on top of the car or in the pit. Do not enter any pit containing standing water.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Be sure that safety devices are operational before performing any inspection work.
8. The 5 year inspection of electric elevators are described in the periodic section of the code.
9. Perform the semiannual and annual inspection simultaneously.
10. Comply with state and local codes as applicable.

Check Points, Perform the following in accordance with the elevator code:

1. Inside of Car: Power opening of doors or gates; standby power operation.
2. Machine Room: Traction sheaves; terminal stopping devices;

3. Top of Car: Counterweight safeties.
4. Inspections Made in the Pit: Car and counterweight buffer.

Recommended Tools, Materials, and Equipment:

1. Flashlight with a non conductive case for inspecting wire ropes or other equipment where there is insufficient light.
2. 6 ft (2 m) rule of non conductive material.
3. Set of thickness gages.
4. Small hammer, preferably a ½ lb. (0.2 kg) ball peen.
5. Chalk or crayon.
6. Small metal mirror for examining wire ropes or other items normally inaccessible.
7. Non conductive safety hat.
8. Rope caliper.
9. Sheave groove gage.
10. Copy of the latest edition of the ANSI/ASME A17.1 Safety Code for Elevators and Escalators.
11. Copy of the latest edition of the ANSI/ASME A17.2 Inspector's Manual for Elevators and Escalators.
12. Copy of the latest edition of the Elevator Industry Field Employees' Safety Handbook.
13. Stop Watch.
14. 50 ft (15 m) non conductive tape.
15. Tachometer, preferably one provided with a 1 ft (305 mm) circumference wheel for measuring speeds, or one that reads directly in feet per minute (meters per second).
16. Meter, to check grounding continuity, correct phasing, and verification of voltages.
17. Spirit level.
18. Door test scale (gage) to check closing door force.
19. Suitable test weights.
20. Suitable light meter for measuring light level in foot-candles (lux).

VTRN-ELV-03-01W

Frequency: Weekly

Elevators, Electric or Hydraulic

Application:

This standard applies to all elevators, electric or hydraulic types (4 floors or less).

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Review manufacturer's instructions.
3. Comply with state and local codes as applicable.

Check Points:

1. Inspected the following equipment looking for proper operation.
    a. motor-generator unit
    b. hoist machine
    c. controls and governor
    d. Doors, door hangers, closers, interlocks and door operators

Items requiring attention should be reported to the elevator shop supervisor or elevator contractor.

2. Emergency Items: Check that emergency procedure sign is in place and inspection certificate is current and visible (or filed in buildings manager's office).
3. Clean up and remove all debris from work areas.

Recommended Tools and Materials:

1. Standard Tools - Basic.
2. Cleaning supplies and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).

VTRN-ELV-03-01M

Frequency: Monthly

Elevators, Electric or Hydraulic

Application:

This standard applies to all elevators, electric or hydraulic types.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Items requiring attention should be reported to the elevator shop supervisor or elevator contractor.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.
5. Comply with state and local codes as applicable.

Check Points:

1. Machine Room: Dust drive machines, motor generator sets, and control cabinets. Sweep floor, re-lamp inoperative machine room lights and remove trash. Inspect controllers, signal, scheduling and dispatch panels, selectors and selector tapes. Make maintenance adjustments necessary for proper operation.
2. Pits: Dust ironwork, sweep floor, empty drip pans, re-lamp inoperative lights, remove trash and check for leaks. Check run-by, buffer switch, compensating switch and emergency stop switch. Make maintenance adjustments necessary for proper operation.
3. Motors; hoist motor, motor generator and regulators: Inspect oil level, oil pick up and belts. Make maintenance adjustments necessary for proper operation. Check for excessive heat, noise and leaks. Lubricate in accordance with manufacturer's specification. Renew brushes as necessary for proper operation. Keep end bells, commutators and brush riggings clean.
4. Geared Machines: Inspect worm and gear for bottoming and backlash, thrust end play, bearing wear, oil pick up, oil level and packing. Check for leaks and empty drip pan. Renew brushes as necessary. Keep end bells, commutators and brush riggings clean.
5. Brakes: Observe operation of brake. Inspect drum and shoe clearance and adjust as necessary for proper operation. Clean and lubricate pivot points. Where brake shoes are asbestos-containing, check for dust, and practice appropriate cleanup and maintenance precautions.

6. Car Gate: Clean, lubricate and inspect hangers and all related gate operating mechanisms. Check rollers, up-thrust, interlock, gear box, motor brushes, door control box, cables, safety edge, light rays, gibs, sills, proper operating speed and force close speed. Make maintenance adjustments necessary for proper operation.
7. Speed Governor: Observe operation, including tension sheave. Check electrical switches for proper operation; check that inspection seals are in place and not broken. Clean and lubricate pivot points.
8. Lighting: Re-lamp all inoperative lamps located in lamp hatchway, hall landings, position indicators, car stations, dome, and wherever else required. Clean light diffusers and car stations.
9. Hydraulic Machines: Observe operation of motor and pump, oil lines, tank, controls, plunger and packing. Adjust as necessary for proper operation. Correct excessive creeping. Test manual and emergency control. Clean and lubricate as necessary. Check for and repair leaks on oil lines, tank, and packing. Test manual and emergency control. Clean and lubricate all equipment as necessary for proper operation.
10. Emergency Items: Check that emergency procedure sign is in place and inspection certificate is current and visible (or filed in buildings manager's office). Check top and side exits and related switches for proper operation. Test alarm bell, emergency stop switch, communications system, fire recall service (key capture, minimum one floor run on Phase II), and any other emergency recall features. Repair, replace, and adjust parts and equipment as necessary to insure operation in accordance with the manufacturer's specifications. Document each test performed, including the date and results of each test.
11. Clean up and remove all debris from work areas.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Standard Tools - Basic.
2. Cleaning supplies and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Out of service signs.
4. Barricades.
5. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.

VTRN-ELV-03-03M

Frequency: Quarterly

Elevators, Electric or Hydraulic

Application:

This standard applies to all elevators, electric or hydraulic types (4 floors or less).

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Items requiring attention should be reported to the elevator shop supervisor or elevator contractor.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Use energy efficient lighting to the fullest practical extent.
5. If materials to be worked on are known or suspected to contain asbestos, check the building's asbestos management plan to see if they have been tested for asbestos. If they are suspect but have not been tested, have them tested. Manage asbestos in accordance with the plan.
6. Comply with state and local codes as applicable.

Check Points:

1. Guides: Inspect, clean, lubricate, and properly adjust all roller guides, guide shoes, and rail oilers.
2. Car Tops: Remove all dirt, dust, and oil. Clean and lubricate fans.
3. Emergency Lighting: Check the operation of the emergency lights; replace as necessary.
4. Solid State Components and Circuit Boards: Inspect printed circuit board and other solid state devices for cleanliness, condensation spots, evidence of heating and deterioration. Check and replace defective solid state devices.
5. Leveling: Inspect leveling operation. Clean and lubricate switches, vanes, and all other related parts. Adjust to obtain the proper leveling at all landings in both the UP and DOWN directions within ¼ inch above or below the landing sill.
6. Clean up and remove all debris from work area.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Cleaning supplies and materials. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Out of service signs.

4. Barricades.
5. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.

VTRN-ESC-01-01W

Frequency: Weekly

Escalator

Application:

This weekly maintenance standard applies to passenger escalators.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. Set up a barricade at the escalator entry point. Use signs to direct passengers to stairs. Once escalator is vacant, set up another barricade at the exit point, and stop the escalator.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Comply with state and local codes as applicable. This escalator and moving walk inspection guide is adapted from the ANSI/ASME Codes A17.1 and A17.2, hereinafter referred to as the "code." Refer to these documents for comprehensive instructions on elevator inspections. Comply also with all state, county, city, and town codes.

Check Points, Perform the following in accordance with the elevator code:

1. Ride escalator. Check operation for smoothness, unusual vibration or noise, condition of handrails, etc.
2. De-energize, tag and lockout the electrical circuit.
3. Inspect comb plates at both ends of escalator for broken teeth and check for proper clearance between combs and step teeth and check for broken step treads.
4. Check clearance between steps and skirt panel. Look for anything (loose trim, screws or bolts) that could snag or damage clothing or cause injury. Check operation of handrail brushes.
5. Clean escalator machine space.
6. Clean and lubricate step rollers, step chain, drive gears or chains, handrail drive chains, etc., according to manufacturer's instructions. Observe gears and chains for signs of wear, misalignment, etc. Adjust as required.
7. Check motor for signs of overheating; clean excess grease.
8. Inspect controller for loose leads, burned contacts, etc. Repair as required. Clean excess grease and interior of controller. Check for loose connections.
9. Clean handrails as required.
10. Check escalator lighting. Replace bulbs as required.
11. Operate each emergency stop button and note that the escalator stops. If the escalator has the capabilities of running in both directions, stop buttons should function properly for each direction of travel. Observe the stopping distance.

12. Clean up and remove all debris from work area.
13. Remove barricades and place escalator back into service.

Recommended Tools, Materials, and Equipment:

1. Standard Tools - Basic.
2. Lubricants. Consult the Material Safety Data Sheet (MSDS) for hazardous ingredients and proper Personal Protective Equipment (PPE).
3. Cleaning supplies and materials. Consult the MSDS for hazardous ingredients and proper PPE.
4. Barricades, ropes.

VTRN-ESC-01-01Y

Frequency: Annually

Escalator (and Moving Walkway)

Application:

This standard applies to escalators and moving walkways.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer's recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered to.
2. This escalator and moving walk inspection guide is adapted from the ANSI/ASME Codes A17.1 and A17.2, hereinafter referred to as the "code." Refer to these documents for comprehensive instructions on elevator inspections..
3. Inspectors shall meet the requirements of the ANSI/ASME QEI-1 Standard for the Qualifications of Elevator Inspectors and shall be recognized by GSA. Inspectors and inspection supervisors shall be certified by an ASME accredited organization in accordance with the requirements of ASME QEI-1. Inspections and tests shall be performed by an inspector employed by GSA or by an outside inspector authorized by GSA to perform them. They shall be witnessed by an inspector employed by GSA, or by a qualified person authorized by GSA to witness the tests and inspections on its behalf. Immediately following these inspections and tests, the inspector shall submit to GSA a statement certifying that the inspections and tests have been performed and a report on the results thereof.
4. Avoid the wearing of loose clothing and neckties during the performance of this inspection.
5. Be at all times vigilant of the location and movement of cars, counterweights, projections, rotating machinery, etc. Note the clearance available when working on around this equipment.
6. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
7. Be sure that safety devices are operational before performing any inspection work.
8. Set up a barricade at the escalator entry point. Use signs to direct passengers to stairs. Once escalator is vacant, set up another barricade at the exit point, and stop the escalator.
9. Comply with state and local codes as applicable.

Check Points, Perform the following in accordance with the elevator code:

1. Speed Governors. Where a speed governor is required, test by manually operating the trip mechanism.

2. Escalator Broken Step-Chain Device. Test the broken step-chain device by operating it manually.
3. Broken Drive-Chain Devices. Test the broken drive-chain device by operating the actuating mechanism manually.
4. Moving Walk Broken Treadway Devices. Test by manually operating the actuating device.
5. Stop Switches. Test all stop switches, including those located in machine spaces, and all mainline disconnect switches for proper operation.
6. Fire Shutters. Test the fire shutters to verify that their operation will stop the escalator or moving walk. If power operated. the force and reversing requirements must be met.
7. Escalator Skirt-Obstruction Devices. These devices are to be manually operated by simulating an actual obstruction.
8. Brakes. Test the operation of the electrically released brake by manually operating the other safety devices and observing.
9. Starting Switches. Test for proper operation and type.
10. Escalator Reversal Stop Devices. Inspect and test operation.
11. Escalator Step Upthrust Devices. Test by manually displacing the step, which should cause the device to operate.
12. Remove steps as required to provide clear access to escalator pan and place steps on tarp.
13. Thoroughly clean escalator, working from top to bottom.
14. Clean all tracks and check for wear or rippling. File tracks as required. Check all step and chain rollers. Adjust step and chain roller upthrust as required. Adjust transfer bars or guides or replace as necessary.
15. Remove upper panel on each side of escalator, taking care not to scratch or gouge panel. Check handrail tension device and handrail drive assembly. Clean, adjust and lubricate as required.
16. Check operation of all safety devices, including skirt switches, handrail switches, broken chain switches, lower unit tension devices, etc.
17. Follow manufacturer's recommendations for lubrication.
18. Perform annual work as prescribed by the manufacturer.
19. Re-assemble entire unit, thoroughly cleaning steps and check for broken treads as they are replaced. Check entire unit for proper running clearances. Re-shim steps as required.
20. After work has been completed, perform periodic inspection and complete the Certificate of Inspection.
21. Remove barricades and place escalator back into service.

<u>Recommended Tools, Materials, and Equipment</u>:

1. Flashlight with a non conductive case for inspecting wire ropes or other equipment where there is insufficient light.
2. 6 ft (2 m) rule of non conductive material.
3. Set of thickness gages.
4. Small hammer, preferably a ½ lb. (0.2 kg) ball peen.
5. Chalk or crayon.

6. Small metal mirror for examining wire ropes or other items normally inaccessible.
7. Non conductive safety hat.
8. Rope caliper.
9. Sheave groove gage.
10. Copy of the latest edition of the ANSI/ASME A17.1 Safety Code for Elevators and Escalators.
11. Copy of the latest edition of the ANSI/ASME A17.2 Inspector's Manual for Elevators and Escalators.
12. Copy of the latest edition of the Elevator Industry Field Employees' Safety Handbook.
13. Stop Watch.
14. 50 ft (15 m) non conductive tape.
15. Tachometer, preferably one provided with a 1 ft (305 mm) circumference wheel for measuring speeds, or one that reads directly in feet per minute (meters per second).
16. Meter, to check grounding continuity, correct phasing, and verification of voltages.
17. Spirit level.
18. Door test scale (gage) to check closing door force.
19. Suitable test weights.
20. Suitable light meter for measuring light level in foot-candles (lux).
21. Pressure gage, preferably one with a maximum scale of twice the working pressure to be tested.
22. Barricades, ropes.

CHECKLIST FOR INSPECTION OF ESCALATORS

GENERAL NOTES:
(a) See ASME A17.2–2004 for detailed inspection information on each item number.
(b) OK = meets requirements; NG = insert number to identify comment on back of this Checklist; NA = not applicable.

Address: _____

_____

_____

ID No: _____

☐ Passenger Rated load: _____

☐ Freight class _____ Speed: _____

☐ Routine inspection and test
☐ Periodic inspection and test
☐ Acceptance inspection and test

Code Edition: _____

Inspected by: _____
Print

Signature: _____ Date: _____

QEI No: _____ Certifying organization: _____

		OK	NG	NA
7	**ESCALATOR — EXTERNAL**			
7.1	General fire protection	☐	☐	☐
7.2	Geometry	☐	☐	☐
7.3	Handrails	☐	☐	☐
7.4	Entrance and egress ends	☐	☐	☐
7.5	Lighting	☐	☐	☐
7.6	Caution signs	☐	☐	☐
7.7	Combplate and comb step impact device	☐	☐	☐
7.8	Deck barricades and antislide devices	☐	☐	☐
7.9	Steps and upthrust device	☐	☐	☐
7.10	Operating and safety devices	☐	☐	☐
7.11	Skirt obstruction device	☐	☐	☐
7.13	Egress restriction (rolling shutter) device	☐	☐	☐
7.14	Speed	☐	☐	☐
7.15	Balustrades	☐	☐	☐
7.16	Ceiling intersection guards	☐	☐	☐
7.17	Step/skirt clearances, panels, and performance index	☐	☐	☐
7.18	Outdoor protection	☐	☐	☐

		OK	NG	NA
8	**ESCALATOR — INTERNAL**			
8.1	Machinery space access, lighting, receptacle, and condition	☐	☐	☐
8.2	Stop switch	☐	☐	☐
8.3	Controller and wiring	☐	☐	☐
8.4	Drive machine and brake	☐	☐	☐
8.5	Speed governor	☐	☐	☐
8.6	Broken drive chain and disconnected motor safety device	☐	☐	☐
8.7	Reversal stop switch	☐	☐	☐
8.8	Broken step chain device	☐	☐	☐
8.9	Step upthrust device	☐	☐	☐
8.10	Missing step device	☐	☐	☐
8.11	Step level device	☐	☐	☐
8.12	Steps, step chains, and trusses	☐	☐	☐
8.13	Handrail systems and safety devices	☐	☐	☐
8.14	Code data plate	☐	☐	☐
8.15	Response to smoke detectors	☐	☐	☐
8.16	Step lateral displacement device	☐	☐	☐

Comments: _____

CHECKLIST FOR INSPECTION OF MOVING WALKS

GENERAL NOTES:
(a) See ASME A17.2–2004 for detailed inspection information on each item number.
(b) OK = meets requirements; NG = insert number to identify comment on back of this Checklist; NA = not applicable.

Address: _____

_____

_____

ID No: _____

☐ Passenger Rated load: _____

☐ Freight class _____ Speed: _____

☐ Routine inspection and test
☐ Periodic inspection and test
☐ Acceptance inspection and test

Code Edition: _____

Inspected by: _____
Print

Signature: _____ Date: _____

QEI No: _____ Certifying organization: _____

		OK	NG	NA
9	**MOVING WALK — EXTERNAL**			
9.1	General fire protection	☐	☐	☐
9.2	Geometry	☐	☐	☐
9.3	Handrails	☐	☐	☐
9.4	Entrance and egress ends	☐	☐	☐
9.5	Lighting	☐	☐	☐
9.6	Caution signs	☐	☐	☐
9.7	Combplate and comb step impact device	☐	☐	☐
9.8	Deck barricades	☐	☐	☐
9.9	Treadways	☐	☐	☐
9.10	Operating and safety devices	☐	☐	☐
9.13	Egress restriction (rolling shutter) device	☐	☐	☐
9.14	Speed	☐	☐	☐
9.15	Balustrades	☐	☐	☐
9.16	Ceiling intersection guards	☐	☐	☐
9.17	Skirt panels	☐	☐	☐
9.18	Outdoor protection	☐	☐	☐
9.19	Maintenance records	☐	☐	☐

		OK	NG	NA
10	**MOVING WALK — INTERNAL**			
10.1	Machinery space access, lighting, receptacle, and condition	☐	☐	☐
10.2	Stop switch	☐	☐	☐
10.3	Controller and wiring	☐	☐	☐
10.4	Drive machine and brake	☐	☐	☐
10.5	Speed governor	☐	☐	☐
10.6	Broken drive chain and disconnected motor safety device	☐	☐	☐
10.7	Reversal stop switch	☐	☐	☐
10.8	Broken treadway device	☐	☐	☐
10.9	(Reserved)	☐	☐	☐
10.10	Missing pallet device	☐	☐	☐
10.11	Pallet level device	☐	☐	☐
10.12	Pallets, pallet chains, and trusses	☐	☐	☐
10.13	Handrail systems and safety devices	☐	☐	☐
10.14	Code data plate	☐	☐	☐
10.15	Response to smoke detectors	☐	☐	☐

Comments: _____

VTRN-WLF-01-01M

Frequency: Monthly

Wheel Chair Lift

Application:

This standard card applies to wheelchair lifts, normally found at entrances and in entrance lobbies of various public buildings.

Special Instructions:

1. In addition to the procedure(s) outlined in this standard, the equipment manufacturer’s recommended maintenance procedure(s) and/or instruction(s) shall be strictly adhered.
2. Review manufacturer's instructions for all system components.
3. Follow lock out/tag out procedures at all times. De-energize or discharge all hydraulic, electrical, mechanical, or thermal energy prior to beginning work.
4. Disconnect, tag, and lock out electric circuits serving the unit.
5. Set up a barricade at the lift entry point.

Check Points:

1. Thoroughly clean the drive assembly, lift platform, travel area, etc. Remove trash and debris.
2. Inspect structural features, framework, support members, anchor bolts, lift platform, etc., for condition and structural integrity. Tighten any loose bolts or screws.
3. Lubricate screw mechanisms, gears, sprockets and chains, pillow blocks, bearings, etc., as required.
4. Check condition of drive chains or belts and adjust or replace as required.
5. Operate lift through its full range of travel, in both directions, using a load if possible. Note operation of controls, safety devices, leveling, and other devices or features.

Recommended Tools, Materials, and Equipment:

1. Standard tools - basic
2. Cleaning equipment and materials. Consult the Material Safety Data Sheets (MSDS) for hazardous ingredients and proper personal protective equipment (PPE).
3. Lubricants. Consult the MSDS for hazardous ingredients and proper PPE.

APPENDICES

Appendix A: NETA Qualifications, Responsibilities and Safety

The 2011 International Electrical Testing Association (NETA) *Maintenance Testing Specifications* will be used as the guide for all Electrical Testing procedures. By reference, the NETA requirements for Qualifications, Responsibilities and Safety for test procedures have been included in this Appendix and are to be followed in the performance of maintenance on all electrical systems.

From the 2011 International Electrical Testing Association (NETA) *Maintenance Testing Specifications*, the following sections will be included for testing requirements (Note: section numbers may change as part of the 2011 guide):

3. QUALIFICATIONS OF TESTING ORGANIZATION AND PERSONNEL

4. DIVISION OF RESPONSIBILITY

5. GENERAL

3. QUALIFICATIONS OF TESTING ORGANIZATION AND PERSONNEL

3.1 Testing Organization

1. The testing organization shall be an independent, third-party entity which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems being evaluated.
2. The testing organization shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.
3. The testing organization shall use technicians who are regularly employed for testing services.
4. An organization having a “Full Membership” classification issued by the International Electrical Testing Association meets the above criteria.
5. The testing organization shall submit appropriate documentation to demonstrate that it satisfactorily complies with these requirements.

3.2. Testing Personnel

1. Technicians performing these electrical tests and inspections shall be trained and experienced concerning the apparatus and systems being evaluated. These individuals shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved. They must evaluate the test data and make a judgment on the continued serviceability or nonserviceability of the specific equipment.
2. Technicians shall be certified in accordance with ANSI/NETA ETT, Standard for Certification of Electrical Testing Personnel. Each on-site crew leader shall hold a current certification, Level III or higher, in electrical testing.
3. The Contractor shall provide documentation to the CO or designee on qualifications identified in this standard. Certification can be obtained through; ANSI/NETA Certification program (http://www.netaworld.org/press-release/251) or Electrical Testing Technician Certification Institute (http://www.ettci.org/).

4. DIVISION OF RESPONSIBILITY

4.1 The User

The user shall be responsible for all power switching of equipment and for providing equipment in a ready-to-test condition. The user shall provide the testing organization with the following:

1. A short-circuit analysis, a coordination study, an arc-flash hazard analysis, and a protective device setting sheet as described in Section 6, if applicable.
2. The most current set of electrical drawings and instruction manuals applicable to the scope of work relative to the equipment under test.
3. An itemized description of equipment to be inspected and tested.
4. A determination of who shall provide a suitable and stable source of electrical power to each test site.
5. Notification of when equipment becomes available for maintenance tests. Work shall be coordinated to expedite project scheduling.
6. Site-specific hazard notification and safety training.

4.2 The Testing Organization

The testing organization shall provide the following:

1. All field technical services, tooling, equipment, instrumentation, and technical supervision to perform such tests and inspections.
2. Specific power requirements for test equipment.
3. Notification to the user prior to commencement of any testing.
4. A timely notification of any system, material, or workmanship which is found deficient on the basis of maintenance tests.
5. A record of all tests and a final report.

5. GENERAL

5.1 Safety and Precautions

All parties involved must be cognizant of industry-standard safety procedures. This document does not include any procedures, including specific safety procedures. It is recognized that an overwhelming majority of the tests and inspections recommended in these specifications are potentially hazardous. Individuals performing these tests shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved.

1. Safety practices shall include, but are not limited to, the following requirements:
    a. All applicable provisions of the Occupational Safety and Health Act, particularly OSHA 29CFR 1910.
    b. ANSI/NFPA 70E, Standard for Electrical Safety in the Workplace
    c. The Electrical Safety Program Book, Kenneth G. Mastrullo, Ray A. Jones, Jayne G. Jones, NFPA.
    d. Applicable state and local safety operating procedures.
    e. Owner's safety practices.
2. A safety lead person shall be identified prior to commencement of work.
3. A safety briefing shall be conducted prior to the commencement of work.
4. All tests shall be performed with the apparatus de-energized and grounded except where otherwise specifically required to be ungrounded or energized for certain tests.
5. The testing organization shall have a designated safety representative on the project to supervise operations with respect to safety. This individual may be the same person described in 5.1.2.

5.2 Suitability of Test Equipment

1. All test equipment shall meet the requirements in Section 5.3 and be in good mechanical and electrical condition.
2. Field test metering used to check power system meter calibration must be more accurate than the instrument being tested.
3. Accuracy of metering in test equipment shall be appropriate for the test being performed.
4. Waveshape and frequency of test equipment output waveforms shall be appropriate for the test and the tested equipment.

5.3 Test Instrument Calibration

1. The testing organization shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy for each test instrument calibrated.
2. The firm providing calibration service shall maintain up-to-date instrument calibration instructions and procedures for each test instrument calibrated.
3. The accuracy shall be directly traceable to the National Institute of Standards and Technology (NIST).

4. Instruments shall be calibrated in accordance with the following frequency schedule:
    a. Field instruments: Analog, 6 months maximum. Digital, 12 months maximum.
    b. Laboratory instruments: 12 months maximum.
    c. Leased specialty equipment: 12 months maximum.
5. Dated calibration labels shall be visible on all test equipment.
6. Records, which show date and results of instruments calibrated or tested, must be kept up-to-date.
7. Calibrating standard shall be of higher accuracy than that of the instrument tested.

5.4 Test Report

1. The test report shall include the following:
    a. Summary of project.
    b. Description of equipment tested.
    c. Description of tests.
    d. Test data.
    e. Analysis and recommendations.
2. Test data records shall include the following minimum requirements:
    a. Identification of the testing organization.
    b. Equipment identification.
    c. Humidity, temperature, and other conditions that may affect the results of the tests/calibrations.
    d. Date of inspections, tests, maintenance, and/or calibrations.
    e. Identification of the testing technician.
    f. Indication of inspections, tests, maintenance, and/or calibrations to be performed and recorded.
    g. Indication of expected results when calibrations are to be performed.
    h. Indication of “as-found” and “as-left” results, as applicable.
    i. Sufficient spaces to allow all results and comments to be indicated.
3. The testing organization shall furnish a copy or copies of the complete report to the owner as specified in the maintenance testing contract.

Appendix B: NETA Electrical Test Frequencies

The 2011 American National Standards Institute / International Electrical Testing Association (NETA) *Maintenance Testing Specifications* ANSI/NETA MTS-2011 has been used as the guide for all Electrical Testing procedures. By reference, the ANSI/NETA MTS-2011 requirements for Frequency of Maintenance Tests have been included in this Appendix and are to be followed in the performance of maintenance on all electrical systems.

Frequency of Maintenance Tests

NETA recognizes that the ideal maintenance program is reliability-based, unique to each plant and to each piece of equipment. In the absence of this information and in response to requests for a maintenance timetable, NETA's Standards Review Council presents the following time-based maintenance schedule and matrix.

One should contact a NETA Full-Member company for a reliability-based evaluation.

The following matrix is to be used in conjunction with NETA's Frequency of Maintenance Tests table. Application of the matrix is recognized as a guide only.
Specific condition, criticality, and reliability must be determined to correctly apply the matrix. Application of the matrix, along with the culmination of historical testing data and trending, should provide a quality electrical preventive maintenance program.

MAINTENANCE FREQUENCY MATRIX				
		EQUIPMENT CONDITION		
		POOR	AVERAGE	GOOD
EQUIPMENT RELIABILITY REQUIREMENT	LOW	1	2	2.5
	MEDIUM	0.5	1	1.5
	HIGH	0.25	0.5	0.75

APPENDIX B (cont.)
Inspections and Tests
(Frequency in Months)
Multiplier for Inspections and Tests
(Multiply Value by Matrix)

Section	Description	Visual	Visual & Mechanical	Visual & Mechanical & Electrical
7.1	Switchgear & Switchboard Assemblies	12	12	24
7.2	Transformers			
7.2.1.1	Small Dry-Type Transformers	2	12	36
7.2.1.2	Large Dry-Type Transformers	1	12	24
7.2.2	Liquid-Filled Transformers	1	12	24
	Sampling	–	–	12
7.3	Cables			
7.3.2	Low-Voltage Cables	2	12	36
7.3.3	Medium- and High-Voltage Cables	2	12	36
7.4	Metal-Enclosed Busways	2	12	24
	Infrared Only	–	–	12
7.5	Switches			
7.5.1.1	Low-Voltage Air Switches	2	12	36
7.5.1.2	Medium-Voltage Metal-Enclosed Switches	–	12	24
7.5.1.3	Medium- and High-Voltage Open Switches	1	12	24
7.5.2	Medium-Voltage Oil Switches	1	12	24
7.5.3	Medium-Voltage Vacuum Switches	1	12	24
7.5.4	Medium-Voltage SF_6 Switches	1	12	24
7.5.5	Cutouts	12	24	24
7.6	Circuit Breakers			
7.6.1.1	Low-Voltage Insulated-Case/Molded-Case CB	1	12	36
7.6.1.2	Low-Voltage Power CB	1	12	36
7.6.1.3	Medium-Voltage Air CB	1	12	36
7.6.2	Medium-Voltage Oil CB	1	12	36
	Sampling	–	–	12
7.6.2	High-Voltage Oil CB	1	12	12
	Sampling	–	–	12
7.6.3	Medium-Voltage Vacuum CB	1	12	24
7.6.4	Extra-High-Voltage SF_6	1	12	12
7.7	Circuit Switchers	1	12	12
7.8	Network Protectors	12	12	24

APPENDIX B (cont.)
Inspections and Tests
(Frequency in Months)
Multiplier for Inspections and Tests
(Multiply Value by Matrix)

Section	Description	Visual	Visual & Mechanical	Visual & Mechanical & Electrical
7.9	Protective Relays			
7.9.1	Electrical/Mechanical and Solid State	1	12	12
7.9.2	Microprocessor-Based	1	12	12
7.10	Instrument Transformers	12	12	36
7.11	Metering Devices	12	12	36
7.12	Regulating Apparatus			
7.12.1.1	Step-Voltage Regulators	1	12	24
	Sample Liquid	–	–	12
7.12.1.2	Induction Regulators	12	12	24
7.12.2	Current Regulators	1	12	24
7.12.3	Load-Tap-changers	1	12	24
	Sample Liquid	–	–	12
7.13	Grounding Systems	2	12	24
7.14	Ground-Fault Protection Systems	2	12	12
7.15	Rotating Machinery			
7.15.3	AC Motors	1	12	24
7.15.1	DC Motors	1	12	24
7.15.3	AC Generators	1	12	24
7.15.4	DC Generators	1	12	24
7.16	Motor Control			
7.16.1.1	Low-Voltage Motor Starters	2	12	24
7.16.1.2	Medium-Voltage Motor Starters	2	12	24
7.16.2.1	Low-Voltage Motor Control Centers	2	12	24
7.16.2.2	Medium-Voltage Motor Control Centers	2	12	24
7.17	Adjustable Speed Drive Systems	1	12	24
7.18	Direct-Current Systems			
7.18.1	Batteries	1	12	12
7.18.2	Battery Chargers	1	12	12
7.18.3	Rectifiers	1	12	24
7.19	Surge Arresters			
7.19.1	Low-Voltage Devices	2	12	24
7.19.2	Medium- and High-Voltage Devices	2	12	24
7.20	Capacitors and Reactors			

APPENDIX B (cont.)
Inspections and Tests
(Frequency in Months)
Multiplier for Inspections and Tests
(Multiply Value by Matrix)

Section	Description	Visual	Visual & Mechanical	Visual & Mechanical & Electrical
7.20.1	Capacitors	1	12	12
7.20.2	Capacitor Control Devices		1	12
7.20.3.1	Reactors – Dry-Type	2	12	24
7.20.3.2	Reactors – Liquid-Filled	1	12	24
	Sampling	–	–	12
7.21	Outdoor Bus Structures	1	12	36
7.22	Emergency Systems			
7.22.1	Engine Generator	1	2	12
	Functional Testing	–	–	2
7.22.2	Uninterruptible Power Systems		1	12
	Functional Testing	–	–	2
7.22.3	Automatic Transformer Switches	1	12	12
	Functional Testing	–	–	2
7.23	Telemetry/Pilot Wire SCADA	1	12	12
7.24	Automatic Circuit Reclosers and Line Sectionalizers			
7.24.1	Automatic Circuit Reclosers, Oil/Vacuum	1	12	24
	Sample	–	–	12
7.24.2	Automatic Line Sectionalizers, Oil	1	12	24
	Sample	–	–	12
7.27	EMF Testing	12	12	12

Appendix C: Equipment Attributes Lists

Equipment Attributes Listings

The following lists are the equipment attributes that the Operations and Maintenance Contractor is required to collect data from and submit to GSA. This is part of the maintenance requirements for each building in order for GSA to have an accurate and up to date database of each building's equipment. Equipment is listed with the values and the type of data that shall be collected.

Note, this list will be updated slightly based on ongoing discussions with GSA.

Equipment Attributes - Chiller

Attribute type	
Equipment ID	
Chiller Compressor Type	Scroll, Screw, Centrifugal, Recip, Absorption
Refrigerant Type	R-22, R134a, Ammonia
Condenser Type	Water Cooled, Air Cooled
Nominal Capacity	Tons
Nominal Efficiency	kW/ton
IPLV	kW/ton
Design Chilled Water Flow	GPM
Design Chilled Water Supply Temperature	°F
Design Chilled Water Delta T	°F delta-T
Design Condenser Water Flow	GPM
Design Condenser Water Inlet Temperature	°F
Design Condenser Water Delta T	°F delta-T
Nominal Power Consumption	kW
Nominal Voltage	Volts
Full Loaded Amps (FLA) (Pkg Chillers)	Amps
Motor Efficiency	%
Chiller Heat Source (Absorption Only)	Hot Water, Steam, Exhaust
Design Input Pressure (Absorption Only)	psig
Design Output Pressure (Absorption Only)	psig
Design Input Temperature (Absorption Only)	°F
Design Output Temperature (Absorption Only)	°F
Condenser Fan Drive Type (Pkg Chillers)	Belt Driven, Direct Drive, Gear
Nominal Power Consumption - Condenser Fan(s) (Pkg Chillers)	kW

Equipment Attributes - Cooling Towers

Attribute type	
Equipment ID	
Capacity Control	VFD, 2-speed, constant flow
Nominal Capacity	Tons
Cooling Tower Type	Induced Draft Counter Flow, Induced Draft Crossflow, Forced Draft Counter Flow, Forced Draft Crossflow
Material of Construction	Wood, Metal (typically steel with galvanized zinc), Plastic
Fan Drive Type	Belt Driven, Direct Drive, Gear
Fan Motor Size	Hp
Nominal Voltage	Volts
Full Load Amps (FLA)	Amps
Design Condenser Water Flow Rate	GPM
Sump/Basin Capacity	Gallons
Operating Weight	lbs
Ambient Design Dry Bulb Temperature	°F
Ambient Design Wet Bulb Temperature	°F
Design Approach Temperature	°F
Design Condenser Water inlet Temp.	°F
Design Condenser Water outlet Temp.	°F

Equipment Attributes - Fluid Coolers

Attribute type	
Equipment ID	
Nominal Capacity	Tons
Cooling Unit Type	Induced Draft Counter Flow, Induced Draft Crossflow, Forced Draft Counter Flow, Forced Draft Crossflow
Construction Material	Wood, Metal (typically steel with galvanized zinc), Plastic
Cooled Fluid	
Design Fluid Flow Rate	GPM
Design Approach Temperature	°F
Ambient Design Dry Bulb Temperature	°F
Ambient Design Wet Bulb Temperature	°F
Design Inlet Temp.	°F
Design Outlet Temp.	°F
Design Pressure Drop	psig
Water Storage	Gallons
Capacity Control	VFD, 2-speed, Staged Fans
Fan Drive Type	Belt Driven, Direct Drive, Gear
Blower Fan Power	Hp
Nominal Voltage	Volts
Full Load Amps (FLA)	Amps
Phase	1φ or 3φ

Equipment Attributes - Heat Exchangers

Attribute type	
Equipment ID	
Heat Exchanger Type	Plate & Frame, Shell & Tube, Fin Tube
Heat Transfer Process	Steam to HW, HP Steam to LP Steam
Unit Capacity	Tons, MBH
System Served Cold Side	Heating HW, Dom. HW, Condenser Water, Chilled Water, Steam Boiler, Utilities Steam,…etc
Design Flow Rate Cold Side	gpm
Design Delta-T Cold Side	°F delta-T
System Served Hot Side	Heating HW, Dom. HW, Condenser Water, Chilled Water, Steam Boiler, Utilities Steam,…etc
Design Flow Rate Hot Side	gpm
Design Delta-T Hot Side	°F delta-T

Equipment Attributes - Built Up Air Handler

Attribute type	
Equipment ID	
Air Handler Type	Duct Multiple Zones, Multi-Zone,
Air Flow Control	Axial
Cooling Capacity	Tons
CHW Supply Temp	°F
Design CHW DeltaT	°F delta-T
Design CHW Flow	gpm
Design CHW Coil Airside Delta-T	°F delta-T
Design Cooling Supply Air Temperature Setpoint	°F
Heating Type	Resistance
Heating Capacity	MBH
Design HW Supply Temp	°F
Design HW Delta-T	°F delta-T
Design Heating Type Flow	gpm
Design Htg Coil Airside Delta-T	°F delta-T
Design Heating Supply Air Temperature Setpoint	°F
Supply Fan #1 Drive Type	Belt Driven, Direct Drive, Gear
Supply Fan #1 Belt Specification	spec
Supply Fan #1 Fan Type	Curved, Radial, Forward Curved),
Supply Fan #1 Motor Power	Hp
Supply Fan #1 Flow Rate	CFM
Supply Fan #1 Static Pressure	"WC
Supply Fan #2 Drive Type	Belt Driven, Direct Drive, Gear
Supply Fan #2 Belt Specification	spec
Supply Fan #2 Fan Type	Curved, Radial, Forward Curved),
Supply Fan #2 Motor Power	Hp
Supply Fan #2 Flow Rate	CFM
Supply Fan #2 Static Pressure	"WC
Return Fan #1 Drive Type	Belt Driven, Direct Drive, Gear
Return Fan #1 Belt Specification	spec
Return Fan #1 Fan Type	Centrifugal (Airfoil, Backward Curved, Radial, Forward Curved), Axial (Vaneaxial, Tubeaxial,
Return Fan #1 Motor Power	Hp
Return Fan #1 Flow Rate	CFM
Return Fan #2 Drive Type	Belt Driven, Direct Drive, Gear
Return Fan #2 Belt Specification	spec
Return Fan #2 Fan Type	Centrifugal (Airfoil, Backward Curved, Radial, Forward Curved), Axial (Vaneaxial, Tubeaxial,
Return Fan #2 Motor Power	Hp
Return Fan #2 Fan Flow Rate	CFM
Economizer Type	Water Side, Air Side, n/a

Equipment Attributes - Packaged Air Handler

Attribute type	
Equipment ID	
Air Handler Type	Single Duct Multiple Zone, Dual Duct Multiple Zone, Multi-Zone, Single Zone
Air Flow Control	Constant, Inlet Vane, VFD, Vane-Axial
Condenser Type	Water Cooled, Air Cooled, None
Nominal Voltage	Volts
Air Handler Full Load Amps (FLA)	Amps
Refrigerant/Cooling type	Chilled Water, Glycol, R22, R134a,..etc
Cooling Capacity	Tons
Design Cooling Temp Range	°F delta-T
Design Cooling Type Flow	gpm
Heating Type	Steam, Hot water, Electric Resistance
Heating Capacity	MBH
Design Heating Temp Range	°F delta-T
Design Heating Type Flow	gpm
Supply Fan Drive Type	Belt Driven, Direct Drive, Gear
Supply Fan Motor Power	Hp
Supply Fan Flow Rate	CFM
Static Pressure	"WC
Return Fan Drive Type	Belt Driven, Direct Drive, Gear
Return Fan Motor Power	Hp
Return Fan Flow Rate	CFM
Cond Fan Drive Type	Belt Driven, Direct Drive, Gear
Cond Fan Quantity	#
Cond Fan Motor Power	Hp
Cond Fan Flow Rate	CFM
Economizer Type	Water Side, Air Side, n/a

Equipment Attributes - Drives

Attribute type	
Equipment ID	
Child	
Service Type	Air handler fan, Boiler Blower Fan, Air handler Return fan, Chilled water Pump…etc
Nominal Voltage	Volts
Max Current Output	Amps
Rated Power Output	Hp
Phase	1φ or 3φ

Equipment Attributes - AC Unit

Attribute type	
Equipment ID	
Unit Type	Split DX, Terminal
Refrigerant Type	R-22, R134A
Nominal Voltage	Volts
Full Load Amps (FLA)	Amps
Phase	1φ or 3φ
Cooling Capacity	Tons
Efficiency (EER or SEER)	
Fan Drive Type	Belt Driven, Direct Drive, Gear
Supply Fan Power	Hp
Supply Fan Flow	cfm
Heating Type	Natural gas, Electric Resistance, Heat Pump
Heating Capacity	MBH
Condenser Type	Water Cooled, Air Cooled
Fan Drive Type	Belt Driven, Direct Drive, Gear
Condenser Fan Power	Hp
Condenser Design Flow	gpm
Economizer Type	Water Side, Air Side, n/a

Equipment Attributes - FC Unit

Attribute type	
Equipment ID	
Fan Coil Type	2 pipe,4 pipe
Fan Drive Type	Belt Driven, Direct Drive, Gear
Fan Power	Hp
Fan Design Air Flow	CFM
Nominal Voltage	Volts
Full Load Amps (FLA)	Amps
Phase	1φ or 3φ
Cooling Capacity	Tons
Supply Air Setpoint-Cooling	°F
Design Cooling Delta-T	°F delta-T
Design Cooling Type Flow	gpm
Heating Type	Hot water, Electric Resistance, n/a
Supply Air Setpoint-Heating	°F
Heating Capacity	MBH
Design Heating Delta-T	°F delta-T
Design Heating Type Flow	gpm

Equipment Attributes - Condensing Unit

Attribute type	
Equipment ID	
Refrigerant Type	R-22, R134a,...etc.
Condenser Type	Air Cooled, Water Cooled
Design Capacity	Tons
Fan Drive Type	Belt Driven, Direct Drive, Gear
Fan Motor Power	Hp
Nominal Voltage	Volts
Full Load Amps (FLA)	Amps
Phase	1φ or 3φ

Equipment Attributes - Terminal Units

Attribute type	
Equipment ID	
Box Type	Dual Duct CV, Dual Duct VAV, VAV, Constant Volume
Damper Control	Pneumatic, DDC, None
Configuration	Parallel Fan Powered, Series Fan Powered, Single Duct, Convection, Radiant
Unit's Rated Maximum Flow	CFM
Design Cold Deck Min Flow	CFM
Design Cold Deck Max Flow	CFM
Design Hot Deck Min Flow	CFM
Design Hot Deck/ Heating Max Flow	CFM
Re-heat Type	Electric Resistance, Hot Water, None
Heating Capacity	MBH
Fan Drive Type	Belt Driven, Direct Drive, Gear, None
Fan Power	Hp
Nominal Voltage	Volts
Full Load Amps (FLA)	Amps
Phase	1φ or 3φ

Equipment Attributes - Water Heater

Attribute type	
Equipment ID	
Type	Condensing, Electric Resistance, Instantaneous
Flame Control	High/ Low, Variable Postion Gas Valve, On with demand
Fuel Type	Oil, Natural Gas, Propane, Electricity
Fluid Heating Rate	GPH
Design Temp. Output	°F
Design Heating Input	MBH
Design Heating Output	MBH
Full Load Efficiency	%
Water Storage	Internal, External, Tankless
Water Storage Size	Gallons
Nominal Voltage	Volts
Full Load Amps	Amps
Phase	1φ or 3φ

Equipment Attributes - Boilers

Attribute type	
Equipment ID	
Type	Fire Tube, Water Tube
Flame Draft Type	Induced, Natural, Forced
Flame Control	O2 Trim Control, Variable Postion Gas Valve
Air Flow Control	Damper, VFD
Fuel Type	Oil, Natural Gas, Propane,...etc
Output	Hot Oil, Hot Water, High Pres. Steam, Low Pres. Steam
Design Temp.	°F
Design Pres.	psig
Burner NOX	PPM
Rated Power	Hp
Design Heating Input	MBH
Design Heating Output	MBH
Full Load Efficiency	%
Fan Drive Type	Belt Driven, Direct Drive, Gear
Blower Fan Power	Hp
Nominal Voltage	Volts
Full Load Amps	Amps

Equipment Attributes - Pumps

Attribute type	
Equipment ID	
Pump Type	Double Suction, End Suction, Inline, Centrifugal, Axial, Rotary, Turbine, Submersible
Design Flow Rate	gpm
Design Head	Feet
Brake Horspower	BHP
Impeller Size	Inches
Pump Motor Power	Hp
Design Speed	RPM
Motor Efficiency	%
Nominal Voltage	Volts
Rated Load Amps (RLA)	Amps
Phase	1φ or 3φ

Equipment Attributes - Domestic Cold Water Pumping Controller

Attribute type	
Equipment ID	
Type of Service	Domestic, Hot Water, Sump, Sewage
Pump Type	Double Suction, End Suction, Inline, Centrifugal, Axial, Rotary, Turbine, Submersible
Pump ID # in System	Pump 1, 2, 3...etc
Design System Pressure	psig
Pump Head	ft
Pump Size	HP
Control Type	VFD, Staged, Pressure
Nominal Voltage	Volts
Rated Load Amps (RLA)	Amps
Phase	1φ or 3φ

Equipment Attributes - Automated Valves

Attribute type	
Equipment ID	
Parent	
Service Type	Heating Hot Water, Chilled Water, Condenser Water
Valve Type	Buterfly, Ball, Gate, Globe
Valve Position Type	2-way, 3-way
Valve Constant	Cv
Valve Size	Inches
Actuator Type	Pneumatic, DDC
Nominal Voltage	Volts
Current	Amps
Power Usage	kW

Equipment Attributes - Elevators

Attribute type	
Equipment ID	ELEV-#
Elevator Type	Hydraulic, Cable
Service Type	Public, Private, Security, Service
Number of floors served	
Motor Power	Hp
Motor Efficiency	%
Nominal Voltage	Volts
Rated Load Amps (RLA)	Amps
Phase	1φ or 3φ

Equipment Attributes - Engines/Generators

Attribute type	
Equipment ID	
Engine Fuel Type	Natural gas, Diesel, High Pressure Steam
Engine Type	Reciprocating, Turbine
Fuel Storage Location	
Fuel Storage Capacity	Gallons
Generator Power Rating	kW
Efficiency	%
Generator Type	Induction, Synchronous
Generator Power	BHp
Nominal Voltage	Volts
Rated Load Amps (RLA)	Amps
Phase	1φ or 3φ
Generator Electrical Efficiency	%

Equipment Attributes - Substations

Attribute type	
Equipment ID	
Switch Gear Served	
Area of Building Served	
Number & Type of Relays	
Number of Breakers	
Distribution Board ID's	
Utility Meter Number	
System Output Voltage	Volts
System Rated Current	Amps

Equipment Attributes - Transformer

Attribute type	
Load Side Serves	
Line Side Served By	
Transformer Size	kVA
Transformer Type	Dry Cell / Wet Cell
Cooling Type	Fan, Liquid, Natural
Primary Voltage	Volts
Secondary Voltage	Volts

Equipment Attributes - Feeder Breaker

Attribute type	
Equipment ID	
Distribution Boards/ Panels Served	
Frame Size	
Trip Setting	
Type	Power Air, Vaccum, Molded Case
Nominal Voltage	Volts
Design Current	Amps

Equipment Attributes - Distribution Board

Attribute type	
Equipment ID	
Nominal Voltage	Volts
Capacity	Amps
Number of Breakers	

Equipment Attributes - Motor Control Center

Attribute type	
Equipment ID	
Served Equipment IDs	
Nominal Voltage	Volts
Design Current	Amps
Number of Buckets	

Equipment Attributes - Panel Board

Attribute type	
Equipment ID	
Distribution Board ID	
Nominal Voltage	Volts
Capacity	Amps
Number of Breakers	

Equipment Attributes - Lighting Control Panels

Attribute type	
Equipment ID	
Served Controller IDs	
Control Type	Dimming, Daylighting, Multi-Switching Modes
Nominal Voltage	Volts
Design Current	Amps
Number of Breakers	

Equipment Attributes - Building Automation System

Attribute type	
Manufacturer	Alerton, Trane, Siemens, Richards-Zeta, etc..
Software Version	IBEX, Summit, Apogee, etc..
Front End Specification	Computer Make and Model
Memory	MB
Hard Disk Size	MB
Back-up Hard Disk	MB
Standard Protocol	BACnet, LON, MOD Bus, BACnet/MSTP, BACnet/Ethernet, BACnet/IP, BACnet/ArcNet
No of Clients	#
Number of Building Controllers	#
No of Points	#
Web Based	Yes/No

Equipment Attributes - Controller

Attribute type	
Electronic Sensors	All analog input points incl. temperature, humidity, pressure, CO2, CO, flow, etc.
Field Panel Name	Equipment No of Field Panel that Controller is connected to

Equipment Attributes - Field Panel

Attribute type	
Controllers	Number of controllers that are on field panel

Appendix D: Maintenance Standard List Key

1. Maintenance Standard Numbers. The GSA Maintenance standard is arranged by sections according to building equipment groups or building components. A four (4) tier system is used to easily identify the type of building group, equipment type and frequency for performing maintenance on these systems. The format is as follows:

   a) Tier 1 identifies the building component system or type of building equipment group, i.e. Electrical (ELEC), Heating Ventilation, Air Conditioning (HVAC)

   b) Tier 2 identifies the type of equipment, i.e. Transformer (TRN), Chiller (CLR)

   c) Tier 3 further defines the equipment by number when there is more than one type, i.e. Centrifugal Chiller (04), Absorption Chiller (05)

   d) Tier 4 defines the frequency for the specific maintenance task to be performed, i.e. Monthly (01M), Quarterly (03M) Semi-annually (06M), Annually (01Y)

Tier 1 Designation	Code	Description
Architectural and Structural	ARCS	Bollards, Doors, gates, fences, windows, lightning protection, etc.
Child Care	CHLD	Equipment, Areas, secured perimeter systems
Cleaning Equipment	CLNG	mechanical sweepers, snow blowers floor cleaners, vacuum systems
Controls	CTRL	Building Controls, Control Systems
Electrical	ELEC	includes lighting
Fire and Life Safety	FLSF	Fire Alarm Systems, Emergency Generators, Emergency Power
HVAC	HVAC	Heating, Ventilating and Air Conditioning, Central Plants
Kitchen	KTCH	Kitchen production equipment
Material Handling	MHDL	Hoists, cranes, lifts, electric/gas carts, vehicles
Plumbing	PLMB	Plumbing Equipment
Storage Tanks	TANK	Storage Tanks, Underground Storage Tanks
Vertical Transportation	VTRN	Elevators, Escalators, Lifts,

Tier 2 Designation	Code
Architectural & Structural	**ARCS**
Security Bollards and Barricades	BAR
Davits	DAV
Doors	DOR
Fireplaces/Incinerator	FPL
Landscape	LND
Manholes	MHL
Roofs	RFS
Security & Access Systems	SCT
Lightning Protection Systems	STR
Storm Water Management	SWM
Windows	WIN
Child Care	**CHLD**
Equipment	EQP
Space & Areas	SPC
Secured perimeter systems	SEC
Cleaning Equipment	**CLNG**
Scrubbing Machine (Battery or Propane Powered)	SCB
Snow Blower	SNO
Sweeper	SWP
Trash Compactor	TCP
Vacuum	VAC
Controls	**CTRL**
Direct Digital BAS	DDC
End Devices	END
Pneumatic BAS	PNU
Electrical	**ELEC**
Automatic Transfer Switch	ATS
Busways, Bus Ducts	BDT
Capacitors and Reactors	CAP
Cables	CBL
Circuit Breaker	CKB
Clocks	CLK
Direct Current Systems	DCS
Emergency Systems, UPS, ATS	EMG
Grounding Systems	GRD
Instrument Transformer	ITR
Lighting	LTG
Motor Control Center	MCC
Rotating machinery, Motors & Generators	MOT
Metering Devices	MTR
Network Protectors	NWP
Photovoltaic Systems	PVS
Tier 2 Designation	**Code**
Regulators	REG
Relay	RLY
Surge Arresters	SRG
Switchboards	SWB
Switches	SWT

Transformers	TRN
Uninterruptable Power Systems	UPS
Adjustable Speed Drive Systems	VFD
Fire Life Safety	**FLSF**
Alarms, Indicators, Panels	ALM
Fire Doors	DOR
Emergency Power	EPR
Fire Extinguishers	FEX
Fire and Smoke Dampers	FSD
Sprinkler Heads	FSP
Fire Hose/ Hose Connections	HSE
Fire Hydrant	HYD
Pumps	PMP
Valves	VLV
HVAC	**HVAC**
Air Conditioning Unit	ACR
Air Handler	AHU
Air/Control, Air Systems	AIR
Boilers	BLR
Baseboards	BSB
Chiller	CLR
Coils	CLS
Condensing Units	CND
Cooling Towers	CTR
Dampers	DMP
Evaporative Cooling	EVP
Fans	FAN
Fan Coil Unit	FCU
Filters	FLT
Heat Exchanger	HXR
Pumps	PMP
Condensate or Vacuum Pump	STM
Test and Balance	TAB
Terminal Units	TMU
Cooling Tower	TWR
Unit Heaters	UHT
Automated Valves	VLV
Water Treatment	WTM
Kitchen Equipment	**KTCH**
Dishwashing machine	DSH
Fryer	FRY
Tier 2 Designation	**Code**
Ice Maker	ICE
Ice Cream maker & shake machine	ICM
Kettle	KTL
Oven	OVN
Refrigerators and Freezers	RFG
Range	RNG
Material Handling	**MHDL**
Cranes	CRN
Dumbwaiters	DMW

Hoists	HST
Lifts	LFT
Paper Bailer	PPB
Vehicles	VHL
Plumbing	**PLMB**
Drains, Roof, Storm	DRN
Domestic Water Systems	DWS
Drain, Waste and Vent System	DWV
Hot Water Systems	HWS
General Plumbing	PLB
Valves	VLV
Storage Tanks	**TANK**
Tank, Air/Refrigerant/LP Gas	AGS
Tank, Chemical	CHM
Tank, Fuel Oil Storage	FOL
Underground Storage Tank	UST
Tank, Water (All Types)	WTR
Vertical Transportation	**VTRN**
Elevators	ELV
Escalators	ESC
Wheelchair Lift	WLF

Tier 3 Designation for Architectural & Structural	Code
Security Bollards and Barricades	**BAR**
Security Bollards and Barricades	01
Davits	**DAV**
Electrically operated	01
Doors	**DOR**
Door Power Operated	01
Door Hydraulic, Electric, Pneumatic	02
Door, Manual, Overhead	03
Door, Manually Operated Entrace	04
Fireplaces/Incinerators	**FPL**
Fireplaces	01
Incinerators	02
Landscape	**LND**
Fountain, Memorial or Decorative	01
Gates and Fences, Security and Access	02
Lawn Sprinklers (per nozzle)	03
Flag Pole, Electric and Manual	04
Lawn Mower and Edger	05
Manholes	**MHL**
Manholes, Electric	01
Manholes, Sewer	02
Manhole, Water/Steam/Fuel Oil (also includes hot water, chilled water, and condenser water)	03
Roofs	**RFS**
Roof Inspection – Built-up type (per square, or 100 sq. ft.)	01
Roof Inspection – Shingle Type (per 100 sq. ft.)	02
Extensive and Intensive Vegetative Roof	03
Security & Access Systems	**SCT**
Key Card Systems	01
Parking Arm Gates	02
Lightning Protection Systems	**STR**
Lightning Protection (per down conductor)	01
Storm Water Management	**SWM**
Storm Water Management: Ponds (Dry and Wet)	01
Tier 3 Designation for Architectural & Structural	**Code**
Storm Water Management: Trenches	03
Storm Water Management: Dry Wells	04
Storm Water Management: Permeable Pavers	05

Storm Water Management: Hydrodynamic Structures (i.e. swales)	06
Storm Water Management: Biofiltration	07
Windows	**WIN**
Window Washing Scaffold, Power Operated	01
Tier 3 Designation for Child Care	**Code**
Equipment	**EQP**
Child Care Equipment	01
Secured perimeter systems	**SEC**
Child Care Secured perimeter systems	01
Child Care areas/spaces	**SPC**
Child Care Areas	01
Tier 3 Designation for Cleaning Equipment	**Code**
Scrubbing Machine	**SCB**
Scrubbing Machine (Battery or Propane Powered)	01
Snow Blower	**SNO**
Snow Blower	01
Sweeper	**SWP**
Sweeper	01
Trash Compactor	**TCP**
Trash Compactor	01
Vacuum	**VAC**
Vacuum Cleaner HD	01
Vacuum System, Centralized	02
Tier 3 Designation for Controls	**Code**
DDC	**DDC**
BAS Server	01
BAS Server Client Workstation	02
Network, Management Level	03
Network, Building Level	04
Field Panel	05
Tier 3 Designation for Controls	**Code**
DDC	**DDC**
Controller	06
Electronic Sensors	07
Alarm Maintenance	08
BAS Wireless Electronic/Pneumatic End Devices (Thermostats)	09
End Devices	**END**
End Devices	01

Pneumatic BAS	**PNU**
Control Air System	01
Receiver Controller	02
Filter, Control Air	03
Tier 3 Designation Electrical	**Code**
Automatic Transfer Swiitch	**ATS**
Busways	**BDT**
Metal-Enclosed Busways	01
Capacitors and Reactors	**CAP**
Capacitors	01
Reactors – Dry-Type	02
Reactors – Liquid-Filled	03
Cables	**CBL**
Cables, Low-Voltage	01
Medium- and High-Voltage Cables	02
Circuit Breakers	**CKB**
Circuit Breakers, Air, Insulated-Case/Molded-Case	01
Circuit Breakers, Air, Low-Voltage Power	02
Circuit Breakers, Air, Medium-Voltage	03
Circuit Breakers, Oil, Medium- and High-Voltage	04
Circuit Breakers, Vacuum, Medium-Voltage	05
Circuit Breakers, SF	06
Clocks	**CLK**
Clocks/Central Systems	01
DC Systems	**DCS**
DC, Batteries, Lead-Acid	01
Dry Cell Battery	02
Nickel Cadmium Batteries	03
Tier 3 Designation Electrical	**Code**
DC Systems	**DCS**
Direct-Current Systems, Chargers	04
Emergency Systems	**EMG**
Emergency Systems, Engine Generator	01
Grounding Systems	**GRD**
Grounding Systems	01
Instrument Transformers	**ITR**
Instrument Transformers	01
Lighting	**LTG**

Dimmer and Control, Stage and General Lighting	01
Fluorescent Lighting Fixture, Washing and Relamping	02
Lighting, Special Feature	03
Lighting, Outside Incandescent Fluorescent,	04
Lighting, Outside Mercury Vapor or High Pressure Sodium, Metal halide	05
Emergency Lights, Closed System	06
Emergency Lighting, Wet Cell	07
Motor Control	**MCC**
Low-Voltage Motor Starters	01
Medium-Voltage Motor Starters	02
Low-Voltage Motor Control Centers	03
Medium-Voltage Motor Control Centers	04
Rotating Machinery	**MOT**
Rotating Machinery, AC Induction Motors and Generators	01
Metering Devices	**MTR**
Metering Devices	01
Advanced Metering	02
Network Protectors	**NWP**
Network Protectors, 600 Volt Class	01
Photovoltaic Systems	**PVS**
Photovoltaic Systems	01
Regulators	**REG**
Step-Voltage Regulators	01
Tier 3 Designation Electrical	**Code**
Regulators	**REG**
Induction Regulators	02
Load-Tap-changers	03
Relays	**RLY**
Protective Relays, Microprocessor-Based	01
Surge Arresters	**SRG**
Surge Arresters, Low-Voltage Surge Protection Devices	01
Medium Voltage Surge Arresters	02
Switchboard	**SWB**
Switchgear and Switchboard Assemblies	01
Switches	**SWT**
Switches, Air, Low-Voltage	01
Switches, Air, Medium-Voltage, Metal-Enclosed	02
Switches, Air, Medium- and High-Voltage, Open	03

Medium-Voltage Oil Switches	04
Switches, Vacuum, Medium-Voltage	05
Switches, SF6, Medium-Voltage	06
Switches, Cutouts	07
Transformers	**TRN**
Transformers, Dry-Type, Air-Cooled, Low-Voltage, Small	01
Transformers, Dry-Type, Air-Cooled, Large	02
Transformers, Liquid-Filled	03
Uninterruptible Power Systems	**UPS**
Uninterruptible Power Systems	**01**
Variable Speed Drive/Adjustable Seed Drive	**VFD**
Adjustable-Speed Drive Systems	01
Tier 3 Designation for Fire and Life Safety	**Code**
Alarms, Indicators, Panels	**ALM**
Alarm Check Valves and Accessories	01
Fire Supervisory Signals, Testing	02
Automatic Fire Detection, Smoke Detectors	03
Automatic Fire Detection, Waterflow Alarms	04
Automatic Fire Detection, Heat Detectors	05
Automatic Fire Detection, Operational Testing (per zone)	06
Fire Alarm Control Panel and Remote Annunciators	07
Fire Alarm Control Panel, Special Systems (Halon, etc)	08
Tier 3 Designation for Fire and Life Safety	**Code**
Alarms, Indicators, Panels	**ALM**
Central Station, Transmitters	09
Central Station, Receiver and Re-transmission Equipment	10
Fire Alarm System, Recorder	11
Fire Alarm System. Event Printer	12
Fire Alarm System, Audio Control Panel	13
Fire Alarm System, Remote Controller	14
Fire Alarm System, Remote Amplifier	15
Manual Fire Alarm Stations	16
Fire Life Safety Alarm	17
Fire Doors	**DOR**
Fire doors Stairwells and Exitways, swinging	01
Emergency Power	**EPR**
Emergency Generator; Gasoline, or Natural Gas Engine	01
Emergency Generator, Diesel Engines	02
Emergency Generator	03
Emergency Pumps and Ventilators	04

Fuel Oil Filter/Strainer	05
Fuel Oil Heater	06
Emergency Generator, Steam Driven	07
Load Bank Testing	08
Fire Extinguishers	**FEX**
Fire Extinguisher, Inspection	01
Fire Extinguishers, Pressure w/ Gage	02
Fire Extinguishers, Non Rechargeable	03
Fire Extinguisher, Gas Cartridge or Cylinder (No Gauge)	04
Water Spray Extinguishing Systems	05
Fire Extinguisher System, Carbon Dioxide (High Pressure), Halon, Dry Chemical – Inspection	06
Fire and Smoke Dampers	**FSD**
Fire and Smoke Dampers	01
Fire Sprinkler	**FSP**
Sprinkler Head, Sprinklered Areas	01
Tier 3 Designation for Fire and Life Safety	**Code**
Fire Sprinkler	**FSP**
Antifreeze Solution in Sprinkler Systems	02
Fire Hose/ Hose Connections	**HSE**
Fire Hose – 1.5 in., Racked in Buildings	01
Fire Department Hose Connections (Standpipe Outlets)	02
Fire Department Pumper Connections, Standpipe or Sprinkler	03
Fire Hydrant	**HYD**
Fire Hydrant – Dry Barrel and Wet Barrel	01
Pump	**PMP**
Fire Pump, Diesel Engine Driven	01
Fire Pump – Electric Motor Driven	02
Valves	**VLV**
Dry Pipe, Deluge and Preaction Valves	01
Post Indicator Valves	02
Fire Control Valves	03
Valves, Fire System – Pressure Regulating Type	04
Tier 3 Designation for HVAC	**Code**
Air Conditioning Systems	**ACR**
Air Conditioning Unit, Special Purpose	01
Heat Pumps, Water Cooled	02
Air Conditioning Unit or Heat Pump, Split System	03
Air Conditioning Unit, Ceiling/Wall Mounted	04
Air Cooled Condenser	05
Evaporative Condenser	06

Air Handlers	**AHU**
Built-Up AHU	01
Not used	02
Built-Up AHU >5000 CFM Predictive	03
Package AHU (includes DX, Heat Pumps, Gas Heat)	04
Package AHU Predictive	05
Air Washer	06
Hot Air Furnace	07
AHU UV Treatment System	08

Tier 3 Designation for HVAC	Code
Compressed Air Systems	**AIR**
Air Dryer, Refrigerated or Regenerative Desiccant Type	01
Air Compressor	02
Glycol Dry Cooler, Special Purpose	03
After-Cooler/Separator	04
Boiler	**BLR**
Boiler (Natural Gas and Oil Fired)	01
Boiler, Electric	02
Burner, Gas	03
Burner, Oil	04
Boiler, Instruments/Controls	05
Baseboards	**BSB**
Radiant Baseboards/Convectors (steam, hot water, or electric – per linear foot)	01
Chillers	**CLR**
Central Chilled Water Package Unit	01
Refrigeration Machine, Screw and Scroll	02
Refrigeration Machine, Centrifugal	03
Refrigeration Machine, Absorption Unit	04
Control Panel – Central Refrigeration Unit	05
Refrigerant Monitor	06
High Efficiency Purge Units	07
Vibration Analysis, Chillers	08
Non-Destructive Tube Analysis (Eddy Current Analysis)	09
Coils	**CLS**
Coils, Preheat, Reheat, Etc. (Remote Locations)	01
Condensing Units	**CND**
Condensing Unit refrigeration	**01**
Motorized Dampers, Pneumatic or Electric	**DMP**
Motorized Dampers, Pneumatic or Electric	01
Evaporative Cooling and Humidification	**EVP**
Indirect Evaporative Cooling	01
Direct Evaporative Cooling	02
Humidification System	03
Fans	**FAN**
Fan, Centrifugal	01
Tier 3 Designation for HVAC	Code
Fans	**FAN**
Fan, Propeller, 24 in. Diameter or Larger	02
Fan Coil Units	**FCU**

Fan Coil Unit, Under Window Type	01
Filters	**FLT**
Filter, Throw Away	01
Filter, Roll Type, Disposable Media	02
Filter, Roll Type, Disposable Media, Manual or Motor Driven	03
Filters, Viscous Type (Wire Mesh)	04
Filter, Charcoal	05
Special situations or conditions	06
Heat Exchangers	**HXR**
Plate and Frame	01
Pumps	**PMP**
Pump, Centrifugal	01
Pump, Vacuum	02
Steam Systems	**STM**
Condensate or Vacuum Pump	01
Test and Balance	**TAB**
Terminal Units	**TMU**
Terminal Units, Pneumatic or Electric	01
Terminal Units, DDC Only, Predictive	02
Cooling Towers	**TWR**
Cooling Towers	01
Unit Heaters	**UHT**
Unit Heater (Steam and Hot Water)	01
Unit Heater (Gas and Oil Fired)	02
Valves	**VLV**
DDC Control, Motor Operated	01
Water Treatment	**WTM**
Water Treatment Guide	01
Heating/Cooling Systems	02
Chemical Feeder	03
Water Treatment, Chemical Free	04
Tier 3 Designation for Kitchen Equipment	**Code**
Dishwashing machine	**DSH**
Fryer	**FRY**
Grill	**GRL**
Ice maker	**ICE**

Ice Cream maker & Shake Maker	**ICM**
Kettle	**KTL**
Oven	**OVN**
Refrigerator and Freezers	**RFG**
Walk-In Refrigerators and Freezers	01
Reach-In Refrigerators and Freezers	02
Range	**RNG**
Tier 3 Designation for Material Handling	**Code**
Cranes	**CRN**
Crane, Electric	01
Dumbwaiters	**DMW**
Hoists	**HST**
Hoist, Lighting	01
Hoist, Electric	02
Chain Hoist and Trolley	03
Lifts	**LFT**
Lift, Electric, Stage Screen	01
Material Handling Equipment Electric Lift Trucks	02
Loading Ramp, Adjustable	03
Lift, Automotive	04
Paper Bailer	**PPB**
Vehicles	**VHL**
Material Handling Equipment, Engine Driven Vehicles	01
Mobile Equipment, engine driven	02
Carts and Scooters, Engine or Battery Powered	03
Material Handling Equipment	04
Tier 3 Designation for Plumbing	**Code**
Roof Drains/ Building Drains	**DRN**
Roof Drains, Downspout, and Gutter Inspection	01
Drains, Areaway, Driveway, Storm	02
Tier 3 Designation for Plumbing	**Code**
Domestic Water Systems	**DWS**
Hot Water Heater, Gas	01
Hot Water Heater, Electric	02
Hot Water Heater, Steam Coil	03
Plate Heat Exchanger	04
Drinking Water Filter Systems	05

Water Softener	06
Water Filter Systems	07
Drain, Waste and Vent System	**DWV**
Sewage Ejector (Pneumatic Tank Type Ejectors)	01
Sewage Ejector, Sump type	02
Sump Pump	03
Wash, Emergency	04
Emergency Shower	05
Septic Tank and Drain Field	06
Hot Water Systems	**HWS**
Hot Water Converter, Steam	01
Solar Heating System	02
General Plumbing	**PLB**
Expansion Joints in piping	01
Strainer, Y-Type	02
Strainer, Bolted Flange (water and steam)	03
Dual Strainer	04
Backwash Strainer	05
Traps, All Types	06
Distiller, Water, Laboratory use only	07
Valves	**VLV**
Valve, Safety Relief	01
Valve Regulating	02
Valve, Manually Operated	03
Valve, Critical Check	04
Backflow Preventer	05
Tier 3 Designation for Tanks	**Code**
Tank, Air/Refrigerant/LP Gas	**AGS**
Tank, Chemical	**CHM**
Tank, Fuel Oil Storage	**FOL**
Underground Storage Tank (UST)	**UST**
Tier 3 Designation for Tanks	**Code**
Tank, Water (All Types)	**WTR**
Tier 3 Designation for Vertical Transportation	**Code**
Elevators	**ELV**
Elevator, Hydraulic, Inspection 4 floors or less.	01
Elevator, Electric, Inspection 4 floors or less.	02
Elevator, Electric or Hydraulic 4 floors or More	03
Escalators	**ESC**
Escalators and Moving Walks	01

Escalator	02
Wheelchair Lift	**WLF**

Appendix E RFID Tag Procedures

Radio Frequency Identification (RFID) Tags are installed at select facilities. These RFID tags are designed to facilitate consistent asset tracking, locate equipment that is not readily visible, track compliance with O&M contract requirements, and, for select pieces of equipment, record temperature.

Prior to the installation of RFID tags, it is critical that the facility's equipment list be accurate and account for each piece of equipment. It may be necessary to update the equipment list and upload the revised list to the Computerized Maintenance Management System (CMMS). The CMMS automatically assigns a unique identification number to each piece of equipment. Further, with enhanced bar-coding software designed to support Code 39 encoding, a Code 39 bar-code (denoting the unique identification number assigned by the CMMS) will be assigned to each piece of equipment within the CMMS. The bar-code image will not appear until the equipment list is printed. The equipment list, with bar-codes, must be printed before proceeding with the actual RFID tagging installation.

Prior to installing an RFID on a piece of equipment, the RFID tag must first be associated to the piece of equipment. To associate an RFID tag to a piece of equipment, personnel will use a Motorola 9090US hand-held reader. Using the hand-held reader, it is necessary to first scan the bar-code from the printed equipment list (for a designated piece of equipment). The handheld will display basic information such as equipment description and location. Personnel should confirm that the information on the handheld matches the actual piece of equipment (to be tagged). Once this information has been confirmed, personnel should then scan the RFID tag (RFID tags have pre-assigned numbers and codes on the actual tags). A pre-programmed application on the hand-held will prompt the user to associate the RFID tag to the piece of equipment. Upon acceptance of the association, the RFID tag is then associated to the piece of equipment in the field. At this point, the RFID tag can be affixed to the piece of equipment.

The method to affix an RFID tag to a piece of equipment will vary depending on both the location of the equipment and the type of equipment. Below is a table describing the methodology for installing tags, along with the type of tag for select pieces of equipment:

Location and or Equipment Type	Tag Type	Method to Affix Tag to Piece of Equipment
Above the Ceiling (i.e. VAV boxes)	Intelleflex STT	Hang Tag to Piece of Equipment Using a Zip-Tie
Valves	Intelleflex STT	Hang Tag to Valve Using a Zip-Tie
All Other Equipment Excluding Motors and Select Walk-In Freezers	Intelleflex SMT	Mount Tag to Equipment Using GE Clear Silicone
Select Motors and Walk-In Freezers	Intelleflex TMT	Mount Tag to Equipment Using GE Clear Silicone

Once tags are associated and affixed to equipment, information can then pass from the tag to the CMMS. Information is only passed when the hand-held is docked (a docking station will be connected to a GSA networked computer). Personnel should dock the hand-held reader at the end of each day to refresh the database—a database will link information off the hand-held to the CMMS.

Personnel shall scan the RFID tag (located at the piece of equipment) each time a piece of equipment is “visited.” Equipment may be visited to perform preventative maintenance and/or reactive maintenance. Prior to performing maintenance, personnel shall first scan the printed work-order number: each printed work-order will have a 39 encoded bar-code located above the work-order number. After scanning the bar-code on the work-order, personnel shall then scan the RFID tag. Maintenance tasks, as stipulated by the work-order, shall then be completed. Once completing the designated maintenance tasks, personnel shall scan the RFID tag to document that tasks are complete. Personnel will be prompted (via the hand held) to enter notes describing the work done at each piece of equipment (the intent is to provide drown-down boxes for typical work done, rather than asking users to type). Personnel will also have the option to add notes once the hand-held is docked via a web user interface. Upon docking, the user will be asked to do some basic quality control checks to ensure information passing from the hand-held to the CMMS is accurate.

Temperature tags will be affixed to select motors and walk-in freezers. These tags will record the temperature (an average of the equipment and the ambient air temperature) every 15 minutes. Alarm ranges will be set for each tag such that the tag itself will only store temperatures which are in the alarm state. Temperatures shall be scanned when routine maintenance is done on either a motor or a walk-in freezer. To scan temperature, personnel must first scan the temperature RFID tag. The user will them be prompted, via software on the handheld, to “read temperature.” Once selecting the “read temperature” button, the handheld will read temperatures: it is necessary to be within a few feet of the tag for it to read the

temperature. Personnel shall dock the handheld at the end of their shift in order to allow temperature data to pass from the handheld to the CMMS.

The RFID tags are passive, battery-assist tags. Battery life for the temperature tags is expected to be two years; battery life for the non-temperature tags is up to five years. RFID temperature tags shall be replaced every year; non temperature RFID tags should be replaced every four years (the tags are relatively inexpensive—the cost differential to replace the tag relative to the battery is minimal).

Appendix F: Point Naming Convention

Point naming, for graphics and trend data, shall be standardized. The standard naming convention, for all points, shall follow:

LOCATION_PARAMETER_MODIFIER

LOCATION

Location describes the device, physical location of the device, source of the signal, or the apparatus/function being controlled. In some cases, multiple Locations are used together; for example, PRI_CHW_PMP (or just PCHWP) is the Primary Chilled Water Pump. Standard Locations are as follows:

BYP	Bypass (Face/Bypass)
CC	Cooling Coil
CD	Cold Deck (when there are parallel paths)
HC	Heating Coil (Assumed to be in the MA, before the CC. Use PH for an OA-only coil, or RHC for reheat after the CC)
HD	Hot Deck (when there are parallel paths)
PC	Pre-cooling (specifically for OA. Note this is generally insufficient: The Pre-cooling *what?*)
PCC	Pre-cooling coil (specifically for OA)
PH	Pre-heat (specifically for OA)
PHC	Pre-heat coil (specifically for OA)
RHC	Reheat coil
RHP	Reheat Pump
MA	Mixed Air
MinOA	Minimum OA section
OA	Outdoor Air
RA	Return Air
EA	Relief Air (E from “exhaust” and to avoid confusion with RA. But it is Relief, not Exhaust)
REL	Relief Air (Use is discouraged in favor of EA)
EX	Exhaust Air
EF	Exhaust Fan (specifically for points related to the fan, not the airflow)
SA	Supply Air (the “main” airflow at the outlet of the unit)
DA	Discharge Air (Use of SA is preferred at the AHU. DA is used for a terminal unit or an intermediate device.)
SF	Supply Fan (specifically for points related to the fan, not the airflow)
RF	Return Fan (specifically for points related to the fan, not the airflow)
CTF	Cooling Tower Fan
ECO	Economizer

FLT	Filter
HUM	Humidifier
HRW	Heat Recovery Wheel
PLN	Plenum
BLDG	Building (e.g. BLDG-P for pressurization)
ZN	Zone
DELTA	Differential (for flow or temperature)
CHW	Chilled Water
PCHW	Primary Chilled Water
SCHW	Secondary Chilled Water
TCHW	Tertiary Chilled Water
CHWS	Chilled Water Supply
CHWR	Chilled Water Return
CW	Condenser Water
GLY	Glycol (water)
MUW	Make up water
HW	Hot Water
PHW	Primary Hot Water
SHW	Secondary Hot Water
HWS	Hot Water Supply
HWR	Hot Water Return
DHW	Domestic Hot Water
TW	Tempered Water (use for dual-temp loops where it could be hot or cold)
STM	Steam
HPS	High Pressure Steam
LPS	Low Pressure Steam
BLR	Boiler
DX	DX (cooling) Unit
CT	Cooling Tower
EVAP	Evaporator (chiller)
COND	Condenser (chiller)
HX	Heat Exchanger
PMP	Pump (use when “P” would not be clear from context)
P	Pump
SUP	Supply (use only when “S” is not clear from context)
S	Supply
RET	Return (use only when “R” is not clear from context)
R	Return
PRI	Primary (use when “P” would not be clear from context)
P	Primary
SEC	Secondary (use when “S” would not be clear from context)
S	Secondary

TER	Tertiary (use when “T” would not be clear from context)
T	Tertiary
EW	Entering Water (for chillers, heat exchangers, equipment)
LW	Leaving Water (for chillers, heat exchangers, equipment)
EA	Entering Air (for air-cooled chillers, heat exchangers, equipment)
LA	Leaving Air (for air-cooled chillers, heat exchangers, equipment)
IA	Inlet Air (for inlet temperature on VAV box only when there is an inlet temperature sensor at the VAV box; if it is a reference then use that reference point name)
VAV	VAV Box

Locations may be further modified by pre-pending “P,” “S,” and “T” to indicate Primary, Secondary and Tertiary, respectively. Locations may be further modified by appending “S” and “R” to indicate Supply and Return, respectively.

PARAMETER

Parameter is descriptive of the type of point, measured variable or controlled device. The following are standard PARAMETERS:

A	Amps
BTU	BTU
BTUh	BTU/hr
kBTU	thousand BTU
kW	Kilowatts (power)
kWh	Kilowatt-hours (energy)
CO2	Carbon Dioxide (ppm)
T	Temperature (degree F)
P	Pressure (IWC for air side and psi for water side, if different units are needed attach appropriate modifier)
DP	Differential Pressure (IWC for air side and psi for water side, if different units are needed attach appropriate modifier)
RH	Relative Humidity
E	Enthalpy (BTU/lb)
F	Flow (CFM for air side and GPM for water side, if different units are needed, attach appropriate modifier)
V	Valve output (0 – 100%; 0 = full closed, 100% = full open)
D	Damper output (0 – 100%; 0 = full closed, 100% = full open)
S	Status (Binary feedback)
RTIM	Run Time
C	Command (Binary output, e.g. to fan or 2-position device)
C	Command (Analog output, 0 – 100%) (use of this is discouraged in favor of V, D, PCT.)
Hz	Hertz (Frequency)
WB	Wet Bulb (degree F)
DEW	Dew Point (degree F)
PCT	Percent
SPD	Speed (use of this is discouraged, use PCT instead)
LL	Low Limit
HL	High Limit
ENA	Enable
DIS	Disable

LD	Load (assume percent; if other provide appropriate units in name, e.g., Btuh, kW, etc.)
OCC	Occupied
UNOC	Unoccupied
STBY	Standby

MODIFIER

The modifier is optional. In some cases, a modifier is required to further describe the type of control signal. There is no delimiter between the PARAMETER and its MODIFIER. The following are standard MODIFIERS:

sp	Set Point Where the Set Point is a temperature, the T is often omitted: CD_sp, is the Cold Deck (Temperature) Set Point. A heating Set Point would be HTG_sp and a cooling Set Point would be CLG_sp.
avg	Average
units	Engineering units, when not clear from the context, are also treated as modifiers. As an example, SA_lps would be Supply Air Flow in litres per second. English units are standard unless explicitly noted otherwise. The use of PCT is preferred over mA or Vdc.
fb	Feedback points
alm	Alarm
ovr	Override
man	Manual
mode	Mode
dly	Delay
time	Time
dir	Direction
max	Maximum
min	Minimum
htg	Heating
clg	Cooling
lck	Lockout
sfe	Safety

Where multiple pieces of equipment exist in parallel, add a number after the location. For example, if there are three supply fans, then the fans are SF1, SF2, SF3, and the points associated with them are SF1_PCT, SF2_PCT, and so on.

Where multiple points map to a single piece of equipment or location, add a number at the end of the point name. For example, if there are 3 temperature sensors in a single SA duct, then they are SA_T1, SA_T2, SA_T3. (If, instead there were parallel SA ducts, then the points would be SA1_T, SA2_T, SA3_T).

Examples:

PCHWP_P2	Second pressure sensor on the Primary Chilled Water Pump
SHWP2_C	Binary run command to the second pump on the secondary hot water
MinOA_D	Damper command for the MinOA duct
SEC_PMP	Secondary Pump. “SP” alone would be unclear in this context.
STM_HX_ENA	Enable signal to the steam heat exchanger
MA_T	Mixed air temperature
MA_T_LL	Mixed air temperature low limit (typically to start closing the OA duct)
SCHWS_T	Secondary Chilled Water Supply Temperature
TER_TWR_T	Tertiary Tempered Water Return Temperature (TTWR_T would be OK)

For object naming, other than point naming, refer to NISTIR 6392, GSA Guide to Specifying Interoperable Building Automation and Controls Systems.

Appendix G: Universal Waste Guide (GSA)

Refer to attached Appendix G.

Appendix H: Refrigerant Management Guide (GSA)

Refer to attached Appendix H.

Appendix I: Underground Storage Tank Regulatory Requirements (GSA)

Refer to attached Appendix I.

Appendix J: Predictive Maintenance and Toolsets

Certain PMs could be replaced by the installation of a fault diagnostic and detection (FDD) toolset. As an example, if a contractor installed VPACC, PMs for VAV boxes would not be required. Further, sensor calibration may not be necessary for an air handler if PACRAT (or something similar) is installed. Many Predictive Maintenance Procedures have been written into this standard.