MAINTENANCE TECHNICAL SUPPORT CENTER / MAINTENANCE POLICIES & PROGRAMS ENGINEERING / UNITED STATES POSTAL SERVICE

maintenance management order

UNITED STATES POSTAL SERVICE™

SUBJECT: Work Hour Estimator Program (WHEP)

DATE: October 10, 2000

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TO: 1. Area Maintenance Offices
2. Maintenance Capable Offices

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This Maintenance Management Order (MMO) supersedes MMO-028-97, dated June 2, 1997, and Chapter 13 of Handbook MS-1. This MMO transmits the Work Hour Estimator Program (WHEP) to be used to estimate maintenance work hours in each functional area. Guidelines contained in the program are derived from existing approved handbooks, MMOs, other source documents, and established historical databases. Refer to applicable documents for explanations of approved staffing hours.

Read the "Read Me 1st" and "Release Notes to VS. 2" text files from CD before proceeding. The WHEP can accept inventory downloads from VMARS or a migration from a previous version.

This MMO is supported by a software program which is distributed with the MMO. The recommended system requirements to install the software are :

Software :
Windows 95/Windows 98/Windows NT 4.0

Hardware :
Pentium-Class System
20 MB of Free Disk Space
32 MB of RAM
17" Monitor capable of 800 X 600 resolution
CD-ROM Drive
Keyboard and Mouse

The MTSC website http:// www.usps.mtsc.gov will provide up-to-date information on the WHEP. Select Plant Equipment•WHEP. Refer to this information source before calling for assistance.

Direct any questions or comments concerning this bulletin to the HelpDesk, Maintenance Technical Support Center, P.O. Box 1600, Norman OK 73070-1600; telephone FTS 2000 (405) 573-2123 or toll free (800) 366-4123.

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WORK HOUR ESTIMATOR PROGRAM

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Work Hour Estimator Program (WHEP)

1. General

a. The WHEP has been designed to calculate a package for a plant, and for any and all of that plant's subordinate facilities; stations, branches, AMCs, Annexes, etc. The system will then generate a report for the plant only, each subordinate facility only, or for the plant with its subordinate facilities "rolled up".

b. The WHEP is designed to be user friendly. With few exceptions, the screens are designed to look like manual forms used previously. Menus have been designed so that input screens and reports are easy to find and access.

c. The WHEP provides flexibility so that local management, with Area concurrence, can adjust the workhour allowances provided in the program in response to local conditions. For mail processing equipment, these adjustments can be based on factors such as: number, age, general condition of the machines; the distance between machines; the intensity of usage by mail processing; the length of maintenance window; the effectiveness of the preventive maintenance program; the experience level of mechanics and technicians; the historical experience of the site; and variety in size and complexity of equipment. For buildings and building equipment, other local conditions such as geographic area, climate, customer/employee activity, type of construction, and the age of the building or equipment may be considered.

d. The WHEP also provides the capability to estimate work hours by level. The program accomplishes this by utilizing the "minimum skill level" where provided by existing approved MMOs and by allowing the user to assign levels to workload where such MMOs do not exist. In either event, this distribution of workhours between levels can also be adjusted by local management in response to local conditions such as those described above.

2. Scope

a. The WHEP is intended for use in plants, stations, branches, annexes, airmail facilities, etc. It is not intended for use in the Bulk Mail Centers.

b. The WHEP provides the means to estimate workhhours for Mail Processing Equipment (Miscellaneous Postal Equipment and Major Equipment), Building and Building Equipment, Field Maintenance Operations, and Maintenance Operations Support.

c. The WHEP does not estimate workhours for Building Services, but accepts and displays data from other sources to provide a complete picture of a given facility.

3. Support

a. The Maintenance Technical Support Center (MTSC) provides continuing support for the WHEP. Problems with the WHEP should be reported to the MTSC Help Line, 1-800-366-4123.
b. In addition, MTSC will keep the WHEP current. Each quarter, if MMOs or other documentation have been issued which affect the WHEP, MTSC will issue an update to the estimator to reflect these changes.

4. Allowances and Adjustments

The WHEP calculates and includes various allowances and adjustments. These allowances are for staffing purposes only and do not require nor infer that this work cannot be assigned to lower level personnel if it is within their position description.

a. For Mail Processing Equipment, there is an 8% allowance for modifications, and a 6% allowance for alterations or training.

b. For automated equipment, 80% of Operational Maintenance is assigned to level 9; 20% is considered level 7. For other equipment where Operational Maintenance is authorized, 100% is assigned to level 7.

c. For automated equipment, Corrective Maintenance workhours are spread evenly between levels 5, 7, and 9. For other equipment, Corrective Maintenance is spread evenly between levels 4, 5, 7, and 9.

d. Training hours for automation are allotted 20%, 30%, and 50% to levels 5, 7, and 9 respectively. Other training hours are allotted 10%, 10%, 30%, and 50% to levels 4, 5, 7, and 9 respectively.

e. Modification hours are allotted 20% to level 7 and 80% to level 9.

f. Time for PM checklist items (other than items identified as accomplished by "All") are totaled by level. Non-productive time is then distributed among the levels in the same proportions. Time for items identified as accomplished by "All" is distributed among the levels in the same manner.

g. For Buildings and Building Equipment, there is a Corrective Maintenance allowance of 8 hours per 1000 gross square feet and a Space Adjustment allowance of 5 hours per 1000 gross square feet.

h. Also for Building and Building Equipment, there is a Miscellaneous adjustment of 10% of total workhours (not including the space adjustment allowance).

5. Inventories

a. Complete and accurate inventories of equipment to be maintained must be input into the WHEP in order to obtain valid work hour estimates for a facility. Utilize VMARS, previous staffing packages, and physical inventories of equipment to assure that this requirement is met.

b. Blank forms for gathering inventories may be generated by the WHEP under "Reports".

c. Partial inventories may be entered by transfer from VMARS or by migrating data from an older version of the Estimator. Only the acronym, description, and quantity are migrated; other data such as number of stackers, days operated, and run hours must be entered manually. See Inputs in Section 10. In this process, care must be exercised to ensure accuracy of the data being transferred. This data can be edited after the transfer if necessary.

6. Areas

The following types of areas are required for various calculations within the WHEP:

a. Gross area is the sum of the floor areas to the normal outside faces of the exterior walls, disregarding architectural setbacks or projections. This includes all stories or areas that have floor surfaces. Compute gross area by measuring from the normal outside face of the exterior walls, disregarding cornices, pilasters, and buttresses that extend beyond the wall face. In addition to areas obviously in this category, gross area includes basements (except portions that are not excavated), attics, garages, roofed porches, mezzanines, shipping platforms, penthouses, lobbies, corridors, and mechanical rooms provided they are within the normal face lines of the building. USPS mailing platforms are included in net assignable area and shall be included in gross area, regardless of whether they are within or outside the exterior wall lines of the building. The gross area does not include open courts, light wells, or upper portions of rooms or lobbies that rise above the story being measured or extend beyond the principal exterior walls of the building. Do not include unroofed features, such as cooling towers, in the gross area.

b. Net Interior Area - as defined in MS-47

c. Exterior paved Area *to be serviced* – as defined in MS47

d. Exterior unpaved Area *to be serviced* – as defined in MS47

e. Non-postal interior Area **-** space occupied by non-postal tenants.

7. Travel time

a. Separate travel time is developed only for building "traveling" routes.

b. Travel time is NOT the time required to travel to another facility.

c. Travel time is the actual time to the various work locations on the route and is determined by using the most expedient and feasible means of completing the route at a normal pace from beginning to end without stopping or unusual delay. To establish the travel time requirement, the door or entrance of each area on the route that contains equipment to be serviced will be passed. The entire route of travel must be covered taking into consideration waiting for elevators, use of stairs, etc. that are on the route. This time is then multiplied by the number of times per year the route is performed to determine the annual travel time.

8. Procedures

a. General **-**

When you open the Estimator, the first screen displays a flag that states: "Please be sure that your display is set to a minimum resolution of 600 X 800. Otherwise a number of the features of this program will not work properly". Observe this warning and take action if necessary before proceeding. Click on the "Close" button and this flag will be removed.

b. Main Menu -

It will now be apparent that there are six tabs at the top of this screen forming the main menu for the program; "Select Facility", "Inputs", "Reports", "Utilities", "Help", and "Exit". Details on the use of these tabs are provided below.

9. Select Facility -

Clicking on this option on the main menu will drop a secondary menu with two options: "Main Office" and "Station/Branch/Other". Clicking either of these options will give a "Site lookup" screen that allows you to select which facility you wish to work on. To access a facility you must have previously entered at least the basic "site information" for that facility (see below). Once you select a facility, all menu selections, inputs, etc. are related to that facility until you select a different facility.

10. Inputs -

Clicking on this second option on the main menu will drop a menu with eight options. Further information on each of these options is provided below.

a. Site Information -

Selecting this option will cause a screen to drop on which you may enter data to identify the site and provide basic data used by the program as shown below.

(1) Sub-site number (required input) - This should be the same sub-site number used in VMARS.

(2) Sub-site Location (required input) - This should be the same sub-location number used in VMARS.

(3) Finance Number (required input) - This should be the finance number for the facility and may be different for a plant and facilities serviced from that plant.

(4) District (required input)

(5) Building (optional input)

(6) Site Name (required input)

(7) Address (optional input)

(8) City (required input)

(9) State (required input)

(10) Zip Code (required input)

(11) Gross Bldg. Sq. Ft (required input) as defined above.

(12) Non-postal interior sq. ft (optional input)

(13) Station/Branch/Other (if any) - This tab allows you to enter site information as shown below for any facility which is subordinate to the main facility (such as an annex, an air mail facility, etc.).

(a) Station/Branch/Other (required input) - Name of subordinate facility.

(b) Sub-site number (required input) - This should be the same sub-location number used in VMARS.

(c) Sub-site Location (required input) - This should be the same sub-location number used in VMARS.

(d) Finance Number (required input)

(e) Gross Area-as defined above (required input)

(f) Net Interior Area-as defined in MS-47

(g) Exterior paved Area *to be serviced* – as defined in MS47

(h) Exterior unpaved Area *to be serviced* – as defined in MS47.

(i) Site type (required input)-this is a "drop down" selection. Select "Sta./Bra", "AMF/AMC", etc.

(j) Mail Proc.? Does facility have mail processing equipment (Yes/No)?

b. VMARS Transfer **-**

This option performs a data transfer from your local VMARS inventory files to the WHEP. Before you perform a VMARS data transfer, you must setup a VMARS path (See Utilities-12a). When you select this option, you are presented with a submenu: ‘Transfer Major (2B) Equip’ and ‘Transfer Misc. (2A) Equip’.

(1) Transfer Major (2B) Equip -

This utility will transfer your local major automation and mechanization equipment inventory into the WHEP. The screen is divided into 2 parts: The VMARS inventory and the WHEP inventory. Use the Add, Add All and Remove, Remove All buttons to move inventory items to and from the WHEP. When you are ready to proceed to the next acronym, click the ‘Next Acronym’ button. The ‘Previous Acronym’ button will take you back to the previous system in the list. When you are finished with the data transfer, click the ‘Close’ button.

(2) Transfer Misc (2A) Equip -

This option will transfer Miscellaneous Postal Equipment from your local VMARS inventory to the WHEP. Use the ‘Quantity’ field to indicate your current inventory for that particular acronym. When you are finished with an acronym and are ready to go to the next one, click the ‘Next Acronym’. Click the ‘Close’ button to exit.

c. Mail Processing **-**

This menu selection opens the section of the WHEP, which is used to estimate workhours for maintenance of miscellaneous postal equipment, mechanization, and automation. This section has five "tabs" which allow access to the five subsections; "Misc. Equip. (2A)", "Major Equip. (2B)", "Worksheets", "Other Requirements", and "Summary". More information on each of these subsections is provided below.

(1) Miscellaneous Postal Equipment -

(a) This subsection provides a listing of miscellaneous equipment maintained in many postal facilities. The quantities for many of these items may be entered by VMARS transfer or by migration from a prior WHEP staffing package. For other items of miscellaneous equipment, enter the quantity of each item that is maintained in your facility. Do not enter items that do not require maintenance or are maintained by contract. The program will calculate the total annual workhours for each item and, as a default, place this value in the "MM-4" column. If it is not appropriate for any or all of this work to be done by an MM-4 (Maintenance Mechanic-PS4) in your facility, you may move a portion or all of these hours into another column as applicable. As you enter hours into another column, the program will deduct that amount from the MM-4 column.

(b) Fill in all lines of this subsection that are applicable to your facility.

(c) If you have miscellaneous equipment that is not listed and requires maintenance by postal employees, make entries in the "Other Requirements" subsection as described below. Also, you may make adjustments to the equipment that is listed by appropriate entries in the "Other Requirements" subsection.

(2) Major Equipment –

(a) This subsection provides a listing of major equipment maintained in many postal facilities. The quantities for many of these items may be entered by VMARS transfer or by migration from a prior WHEP staffing package. For other equipment, enter the quantity that is maintained in your facility. After you enter the quantity, a flag will appear requesting the equipment numbers; make entries as required. When you have completed entering equipment numbers, a worksheet will open, requesting data specific to that equipment such as annual run time, days operated, number of bins, etc. More information on worksheets is provided below.

(b) If you have major equipment that is not listed, make entries in the "Other Requirements" subsection as described below. Also, you may make adjustments to the equipment that is listed by appropriate entries in the "Other Requirements" subsection.

(3) Worksheets **-**

(a) As noted above, a Worksheet will appear whenever an entry is made under "Quantity" on the Major Equipment listing. Make entries on the Worksheet as required for the specific equipment. As entries are made, the program will calculate the total annual workhours and spread these workhours between the various levels in accordance with the appropriate MMO for the equipment.

Again, you may adjust these workhours by appropriate entries in the "Other Requirements" subsection.

(4) Other Requirements -

(a) The "Other Requirements" subsection of the program is intended to provide the flexibility to accommodate variations in conditions and equipment from facility to facility.

(b) In this section, you may make inputs for equipment that is not listed specifically in the program. Locally developed or procured equipment is an example of entries that could be made in this section. Another example is nationally procured equipment for which PM checklist MMOs have not been issued.

(c) In this section, you may make adjusting or compensating entries for equipment that is listed in other sections. For instance, if Equipment A shows 100 hrs of MM-4 and 50 hrs of MM-5 for a total of 150 hrs, but due to local conditions you need 75 hrs MM-4 and 75 hrs MM-5, you would create an entry for Equipment A in "Other Requirements" with MM-4 of –25hrs and MM-5 of +25 hrs. You could also adjust total hours up or down in a similar manner.

(d) When an entry is made in this section with an acronym that is the same as an acronym listed in the "Miscellaneous Equipment" or "Major Equipment sections, the line item in the appropriate section will be highlighted. This is to assist a reviewer of this package to be aware that a change has been made to this acronym.

(5) Workhour Summary **-**

No inputs are required; this tab is provided as a convenience to view summary data as inputs are made in other sections.

d. Buildings and Building Equipment

(1) This menu selection opens the section of the WHEP that is used to estimate workhours for operation and maintenance of buildings and building equipment. This section has seven "tabs" which allow access to the seven building and building equipment subsections. The format of these subsections is similar to the format of existing MS-1 forms. More information on each of these subsections is provided below.

(2) Form 4896-A **-** Annual Standard Workhour Requirements for Building Preventive Maintenance.

(a) Frequencies and times for performing the preventive maintenance activities listed in Appendix B are preprinted on Form 4896-A. Because of local variations in size, complexity, and the use of some equipment, a range of frequencies and/or times has been established. In those instances, preventive maintenance requirements should be developed locally within the range indicated for each item. Complete this form only for the equipment preprinted thereon and only when local PM frequencies and workhours are within the ranges preprinted thereon. If frequencies or times in excess of (or less than) the guides are required due to local conditions, or other local equipment exists for which there are no USPS guides, list such equipment on Form 4896.

(b) Items are listed by general equipment type in PM guide number order. I.e., HVAC-"A" guides, Electrical - "E" guides, Elevators-"L" guides, miscellaneous equipment-"M" guides, and Plumbing - "P" guides. Enter the quantity of each item according to size as indicated. Questions concerning appropriate identification of specific equipment can usually be answered by referring to language in the preventive maintenance guides, Appendix B or operating guides, Appendix C.

(c) In most cases, the frequency and workhours per frequency are provided; no input is required. However, on those items highlighted in blue, input the frequency or workhours per frequency within the range indicated at the top of the column.

(d) The preventive maintenance times on Form 4896-A include allowances for normal travel within a facility. Travel time for preventive maintenance routes at outlying facilities should be minimized by performance of preventive maintenance on other trips when possible.

(e) The program will calculate the estimated work hours and provide subtotals for guide type as well as a grand total for the facility. The program will transfer this figure to Form 4893 to summarize all building and building equipment maintenance workhours.

(3) Form 4894-S **-** Annual Standard Requirement-Stationary Operating Routes.

(a) Form 4894S is to be prepared listing only those items within the stationary route area (no travel time authorized). The program will enter these total workhours on Form 4895 as part of the stationary route workload. This transfer of hours from the 4894S to the 4895 will be accomplished by the WHEP; no manual input is required on the 4895.

(b) Appendix C provides Equipment Operation Guidelines for use in conjunction with this subsection. Appendix C should be carefully reviewed for specific operational requirements and criteria for equipment or systems listed on forms 4894S, 4894T, and 4895. Local operating requirements varying from the guidelines given must be listed on form 4896. Locally developed requirements on items for which there are no operating guidelines in this or other official publications should also be listed on Form 4896.

(c) Using information from the building inventory and local operating logs, route sheets, etc., make the required entries in the "Quantity" column and the column that indicates "Days/Year", "Weeks/Year", or "Months/Year".

(d) This subsection of the WHEP has a feature called "Use Description" which allows the duplication of a description. This feature can be used, for instance, if there are 2 "A/C Package Units - Special" that run 365 days a year and one that runs 270 days /year. You would make an entry in row 1 for the two units, then, with the row 1 description still selected, click on the "Use Description" button at the bottom left of the screen. The "A/C Package Units - Special" description will appear in the first available, highlighted line on the form. You can then enter the one unit that runs 270 days per year on that line.

(4) Form 4894-T - Annual Standard Requirement-Traveling Operating Routes

(a) Form 4894T is to be prepared listing only items not in the stationary route area, i.e., where travel beyond the stationary route area is required to check the equipment.

(b) Appendix C provides Equipment Operation Guidelines for use in conjunction with this subsection. Local operating requirements varying from the guidelines given must be listed on form 4896. Locally developed requirements on items for which there are no operating guidelines in this or other official publications should also be listed on Form 4896.

(c) Using information from the building inventory and local operating logs, route sheets, etc., make the required entries in the "Quantity" column and the column that indicates "Days/Year", "Weeks/Year", or "Months/Year".

(d) Determine the local travel time for equipment in each route frequency as defined in section 7 of this document and make entries for "Annual Travel Time".

(e) This subsection of the WHEP has the feature called "Use Description" described above and is used in the same manner.

(5) Further clarification of requirements is provided below for individual line items on 4894S and 4894T:

LINE 1: A/C PACKAGE UNITS - SPECIAL

Special purpose package units are defined as equipment serving an area requiring critical temperature and humidity control, where malfunction of this equipment would seriously interfere with the activity being performed in the

areas because equipment or material would be damaged. Special purpose areas which are occupied at all times should be checked daily rather than twice daily since occupants will place a service call when additional attention is needed. Package units normally contain all components within an enclosure; however, this item may include a refrigeration system with separate components in the near vicinity. In such cases, the components should not be listed separately. The capacity of such units is usually less than 50 tons. Units above 50-ton capacity should usually be listed under line 5 rather than line 1.

LINE 2: AIR HANDLERS

The operation of air handlers shall conform to USPS equipment shutdown procedures. These units should not operate at night or on weekends when the area is unoccupied. Air handlers may consist of a centrifugal fan, heating, and cooling coils with dampers, controls, and circulating pump. This allowance is only for equipment with manual start-stop devices to be checked twice daily for startup and shutdown. Air handlers equipped with automatic or remote startup control devices will be listed under line 37, rather than line 2.

LINE 3: HEATING BOILERS (Hot Water or Low Pressure Steam)

USPS shutdown procedures will be followed. Generally, these types of boilers need not be checked more than twice per day when operational. Operating logs, PS Form 4846 or PS Form 4846A, provide specific operational activities to be performed.

LINE 4: COOLING TOWER (Over 500 Tons)

Cooling tower inspection frequency will correspond to the refrigeration units they serve. Enter here or on line 17 depending on capacity.

LINE 5: REFRIGERATION EQUIPMENT (Small Central Chillers)

This allowance is for small central chillers with capacities from 50 to 150 tons or larger, or those that are remote from the central plant area. The allowance includes time for checking other equipment such as pumps and condensers in the same room or area.

LINE 14: COMPRESSED AIR SYSTEMS (For Building Systems)

Compressed air systems (all capacities and types) may consist of one or two compressors (dual type) supplying central air and counted as one unit. Air compressors on a water supply or fire protection system should be included under line 19.

LINE 15: STEAM CONDENSATE RETURN SYSTEMS (Gravity or Vacuum)

In cases where a duplex unit is used, it is to be counted as one system.

LINE 16: CENTRAL DRINKING WATER SYSTEMS

A central drinking water system (all types and capacities) may be a single refrigeration machine or two units serving the same purpose. In either case, it is one system.

LINE 17: COOLING TOWERS (Up to 500 Tons)

See line 4.

LINE 18: HOT WATER SYSTEMS

Hot water systems are for domestic water supply. They usually contain a steam regulating valve, converter, pumps, traps, and accessories. Small domestic type hot water heaters are not to be included.

LINE 19: HYDRO-PNEUMATIC SYSTEMS (Including Fire Protection Systems)

Hydro-pneumatic systems (water supply or fire protection systems) may include pumps, pneumatic tanks, air compressors and valves. Air compressors included under this line are not to be entered on line 14. A separate allowance for fire pumps is given on line 38.

LINE 20: PUMPS (Other)

Pumps listed here should not be those which are located in the central chill water plant or central boiler plant area(s). Do not list here any pumps that are part of other systems listed on this form. Time allowances for inspection of pumps associated with centrally located plants and other listed systems are included in other lines. Do not include fractional horsepower circulating pumps at air handlers, air washers, hot water, or domestic water systems. This line may include oil transfer pumps, chilled water booster pumps, or others not covered in other lines.

LINE 21: PRESSURE REDUCING AND REGULATING STATIONS - STEAM AND WATER

This line covers pressure reducing valve (PRV) stations that have at least two stages reduction or serve a portion of a building.

LINE 22: SECONDARY WATER SYSTEM (Heating and Cooling)

A secondary water system for heating should include a steam or high temperature water system as a primary source of heat serving a control valve, converter, pumps, traps, and accessories. This line would not include secondary chilled water systems, air washers, or humidifier systems.

LINE 23: SEWAGE EJECTOR

Duplex sewage ejector units are to be listed as one system. The system generally consists of closed tank ejectors in which the sewage is lifted by directed air pressure or steam on the surface of the liquids. Sewage or lift pumps should be included under line 36.

LINE 32: PACKAGE UNITS - COMFORT COOLING

Equipment entered on this line refers to package units used for comfort cooling of building occupants. Small air handling units, especially of the ceiling-mounted type, should also be entered on this line. Window units or under-window, fan-coil units are not to be included.

LINE 33: CONDENSERS

This line should include air-cooled, water-cooled, or evaporative condensers of all capacities. When the condenser is in the immediate vicinity of the refrigeration unit, it is not to be listed as a separate item for route purposes. Also, air-cooled condensing units are not to be broken down into separate components (i.e., fan, condensing unit).

LINE 34: FANS

List only centrifugal fans over 15 horsepower.

LINE 35: FANS, PROPELLER

List only propeller-type fans having a diameter of 24" or larger.

LINE 36: SUMP PUMPS

Duplex sump pumps are to be listed as one unit.

LINE 37: AIR HANDLERS

Same as line 2 except that the air handlers are equipped with automatic or remote start-stop control devices eliminating the need for manual startup and shutdown at the equipment site. With automatic or remote start-stop control devices, equipment is turned on and off from a central board or general monitoring system and will be checked by route only once a week.

LINE 38: FIRE PUMPS

Enter the number of fire pumps driven be either electric motors, gasoline, natural gas, or diesel engines.

(6) Form 4895 **-** Annual Standard Workhour Requirement-Stationary Operating Routes.

(a) If applicable, fill in the unit numbers and fill in general information about the central chill water plant and high-pressure boiler plant in the "Description, Capacity, Manufacturer, etc." column.

(b) Enter information about the chiller(s) and high-pressure boiler(s) operating periods. Equipment operating periods should be based on procedures in Appendix C. For each unit, enter the average number of days per year and the average number of tours per day that the equipment operates.

Example: An office has two chillers (#1 and #2) and a cooling season of 180 days. Unit 1 runs an average of one tour per day for 60 days (the first and last months of the season), and two tours per day during the remaining 120 days of the season. Unit 2 runs an average of one tour per day for 90 days (during the hottest part of the season). Three entries would be made as follows:

Unit #	**Ann Op Days**	**Shifts/Day**
#1	60	1
#1	120	2
#2	90	1

(c) Refer to Appendix C for frequencies and times for central chill water plant and high-pressure boiler plant operation and make entries as applicable. Note that if this equipment is shown as operating three tours a day, the program will not allow "Start/Secure" time entries.

(d) The "Workhours for Other Duties" cell is automatically filled by the WHEP with the total hours from the 4894S. No manual entry is allowed.

(e) Compute the annual workhour requirement for operational checks of the central control panel based on criteria in Appendix C and enter in the cell labeled "Workhours for Central Control Panel".

(f) The program will calculate the "Chiller Total", the "Boiler Total" and the "Grand Total" and transfer this data to the Form PS4893.

(7) Form 4896 - Annual Local Workhour Requirement for Building Equipment PM and Operation

(a) This subsection of the program is intended to provide the flexibility to accommodate variations in conditions and equipment from facility to facility. Complete this form for equipment where frequencies or times in excess of (or less than) the guides are required due to local conditions. Also, use this form for other local equipment for which there are no USPS guides.

(b) Under "Guide #": Enter the applicable preventive maintenance guide number from Appendix B or the equipment operation guide reference from Appendix C when guides are provided. When guides do not exist, enter "MFGR" (manufacturer’s recommendations), "MMO-XX-XX " (applicable Maintenance

Bulletin Number), or other identifier to indicate the source of locally developed requirements.

(c) Under "Type", select "PM" (Preventive Maintenance) or "OP" (Operation).

(d) Under "Item/Justification": Enter the item from the Building Equipment Inventory and a brief justification of why this item doesn't fall within the allowances provided.

(e) Under "Qty", enter the number of items.

(f) Columns labeled "Freq." and "WH/Freq." under "Standard Allowance" should be completed only if local requirements exceed or are less than the provided frequencies and/or times. The entry of the given allowances serves only to provide data for workhour comparison to locally developed requirements entered under "Local Requirements". Obtain the frequency and workhours per frequency from Forms 4896-A, 4894, or Appendix C. Where a range is given, enter either the maximum if the locally developed requirement is more than the given allowances, or the minimum if the local requirement is less than the given allowance For local equipment without preventive maintenance or operational guides provided by this MMO, leave these columns blank and complete data under "Local Requirements" only.

(g) Complete the columns labeled "Freq." and "WH/Freq." under "Local Requirements". Enter the number of times per year that the locally developed checklist for this equipment is to be performed and the hours to perform the locally developed checklist one time. This time should also include job preparation (acquiring necessary equipment and materials), access to equipment, return of equipment and remaining materials, compliance with applicable safety standards, site cleanup, and necessary paperwork.

(h) Under " Travel Hours": Multiply the local route sheet travel time (one time) by the frequency and enter the results.

(i) The WHEP will calculate the total under "Standard Allowance", the total under "Local Requirement", and the "Variance". The total under "Local Requirement" will be transferred to the PS 4893.

(8) Form 4897 - Building Equipment Inventory - Completion of this form in the WHEP is optional. No data from this form is used in the program. However, it is recommended that this form be completed so that a record of the complete inventory used for the workhour estimate will be retained with the rest of the package.

(9) Form 4893 - Annual Building Equipment Operating and Maintenance Workhour Summary. The WHEP will fill out all portions of this form automatically except the allowances for Corrective Maintenance and Space Adjustment. A default value for each of these allowances is also calculated and displayed by the WHEP. These default values are based on 8 hours per 1000 gross square feet for Corrective Maintenance and 5 hours per 1000 gross square feet for Space Adjustments. These values can be modified manually if local conditions warrant.

e. Building Services

(1) The Building Services portion of the WHEP does not perform any significant calculations. It is intended only to take data calculated elsewhere and display it with the rest of the workhour estimates for a given facility to provide a better overall view of that facility.

(2) The only input required in this section is to "Enter Total from Line H on Form 4852" from the MS-47 package for the facility.

f. Field Maintenance Operations-

(1) Workhour estimation for Field Maintenance Operations is based upon historical data. This data should be available from VMARS or manual records. Make inputs for line items 1 through 5 and 7 through 9 as applicable. The WHEP will calculate the other lines and forward totals to summaries as appropriate.

g. Maintenance Operations Support-

(1) The WHEP will calculate the number of recommended MOS positions based on the chart below.

Number of positions supported	0-14	15-29	30-44	45-59	60-74	75-89	90-104	105-124	125-144	145 - 164	165-184	185-204
MOS Positions Authorized	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10	11
Number of positions supported	205-229	230-254	255-279	290-304	305-334	335-364	365-394	395-424	425-454	455 - 484	485-514	
MOS Positions Authorized	12	13	14	15	16	17	18	19	20	21	22	

(2) The WHEP will display this calculated value as a default value. This value can be modified as local conditions warrant.

h. Workhour Summary-

(1) Under "Workhour Summary, there are three tabs, "Workhour Summary", "Standard Craft Positions", and "Additional Craft Positions." On each of these input screens, highlighted cells are calculated by the program; others are for user input.

(a) In the "Workhour Summary" section, total calculated workhours are displayed for each major category. Where the WHEP has the appropriate information from prior inputs, these workhours are spread by position. Where the WHEP does not have this information, the WHEP will default all workhours for that category to the lowest level position listed in that category. The user shall spread these workhours according to existing policy and local requirements.

(b) In the "Standard Craft Positions" and "Additional Craft Positions" sections there are four columns of data; "current", "estimated", "proposed" and "difference". In the "current" columns, enter the quantity of all current authorized positions. The "estimated" figures will be calculated and entered automatically by the WHEP. The "proposed" data is to be entered by management, considering the "current" and "estimated" figures and

considering such factors as attrition, existing Preferred Assignment Registers (PARs) and Promotion Eligibility Registers (PERs) and recruiting capability. The "difference" column is calculated by the WHEP and is "current" minus "proposed".

11. Reports -

Detailed and summary reports are available from the WHEP under "Reports" on the Main Menu. Generally, these reports reflect the input screens found under "Inputs". The following is a listing of reports found under each sub-menu item under "Reports".

a. Site Information

b. Mail Processing

(1) Miscellaneous Postal Operating Equipment (rename "miscellaneous equipment" to be consistent with "input" label for this category)

(2) Major/Auto/Mech. (rename "major equipment" to be consistent with "input" label for this category)

(3) Major Equipment Worksheets. A detailed worksheet can be printed out for each equipment type listed under "Major Mech./Auto".

(4) Other Requirements-This will be a listing of all changes made to "Misc. POE" and "Major Mech./Auto" plus all local equipment which does not appear on either "Misc. POE" or "Major Mech./Auto".

c. Building and Building Equipment

(1) 4894S Annual Standard Requirement-Stationary Operating Routes

(2) 4894T Annual Standard Requirement-Traveling Operating Routes

(3) 4895 Annual Standard Workhour Requirement-Stationary Operating Routes

(4) 4893 Annual Building Equipment Operating and Maintenance Work Hour Summary

(5) 4896 Annual Local Workhour Requirement for Building Equipment Preventive Maintenance and Operation

(6) 4896A Annual Standard Workhour Requirement for Building Preventive Maintenance

(7) 4897 Building Equipment Inventory

(8) 4893A Annual Building Equipment Operating and Maintenance Work Hour Summary-Stations and Branches

d. Building Services

Custodial Work Load Summary-This report displays Building Services data for the main plant and all subordinate facilities such as stations, branches, annexes, etc. that are input under the main facility in "Site Information". Information includes facility name, pertinent area (Sq. FT) data, workhours, and positions.

e. Field Maintenance Operations

Field Maintenance Program Staffing Summary-this report simply displays the information input and calculated in the "Input" section.

f. Workhour Summary –

This report reflects the data input in the "Workhour Summary". It is a two-page report, "Summary-Workhour Estimator Program" and "Craft Positions-Workhour Estimator Program".

(1) Summary-Workhour Estimator Program. This report presents total workhours for each category as well as a breakdown of those workhours by position type.

(2) "Craft Positions-Workhour Estimator Program". This report presents a listing of all maintenance craft positions currently authorized in the facility. For each position, this report provides the current authorized quantity, the estimated quantity calculated by the WHEP, the proposed quantity determined by management, and the difference between the current quantity and the proposed quantity.

g. Complete Staffing Package -

This menu item provides a means to print a complete package including all of the reports listed above.

12. Utilities-

a. VMARS Path –

(1) In order to perform a VMARS Transfer, you must have a valid VMARS Path. This option allows you to setup a VMARS data transfer from your local VMARS system to the WHEP. When you select this option, a VMARS Path form is displayed. To perform a data transfer, you need the following files from your VMARS system :

Equip.dbc	eqmaster.cdx
Equip.dct	eqmaster.dbf
Equip.dcx	eqmaster.fpt

(2) These files must be copied from your VMARS system to the directory you enter on the VMARS Path form. Once you have entered the directory, click the ‘Save & Close’ button. This verifies that the correct files are present and copies them to a temporary directory for the WHEP. **Important**: You must complete this step whenever you copy a new set of files from your VMARS system.

b. Re-index Files -

This option performs file maintenance on the WHEP. Run this utility frequently (once or twice per week) to re-claim space from deleted records and to rebuild indexes for better performance.

c. Transfer Data to Disk -

This utility allows the download of data from the WHEP to a disk or other memory device.

d. Transfer Data from disk -

This utility allows the upload of data from a disk or other memory device to the WHEP.

e. Migrate from Previous Version -

This facility allows you to migrate your existing WHEP data to a newer version of the program. Once you select this option, choose the drive containing a backup of your old WHEP data. Then, click the 'Continue' button. You are then presented with a list of files on that drive. Select the file that contains the data you want to migrate. Click the 'Begin Migration' button to upgrade your data. **The data to migrate must have been generated using a previous version of the WHEP.** After the migration is complete, a 'Migration Report' is displayed on the screen. This report summarizes the migration procedure.

f. Error Report -

Generates an error report used by MTSC for debugging purposes. This utility allows you to print out error messages that you have encountered using the WHEP. Technical support personnel at MTSC might ask for this report in order to help resolve problems. Generally, this information is in a format usable only by Technical Support at MTSC. It should be printed and forwarded to MTSC only upon request.

APPENDIX A

EQUIPMENT INVENTORY REFERENCE GUIDE

ITEM	VMARS ACRO.	DESCRIPTION AND REMARKS (PS 4897)	PM GUIDE NO(S) Appendix B	OPERATING GUIDE App. C	OPERATING GUIDE PS 4894 LINE #	PS 4772 Reqmt
Air Compressors	AIR (6)	Give MFR, tank capacity motor hp, and pressure(psig)	M-1	C-7a	14	(3)
Air-Conditioning Machine Package Unit	HVACP	Give tonnage	A-1, A-20	C-7c	1, 32	(3)
Air-Conditioning, Window Units	HVACP	Give tonnage or BTU/hr	A-2, A-20			(3)
Air Handlers	HVACU	Give motor hp and CFM	A-4, A-16 thru A-19, E-29	C-7b4	2, 33	(3)
Alarms, Misc., Burglar, Civil Defense, Trespass, etc	EMSYS	Give make, no. of stations and receiving points	E-1			(3)
Backflow Preventers on HVACB or HVACC	PLUMB	Give mfr. and model no.	P-16			(3)
Batteries, Edison nickel-iron-alkaline	ELEC	Give number of cells and use	E-6	C-7d	53-55	(3)
Batteries, lead-acid	ELEC	Give number of cells and use	E-5	C-7d	53-55	(3)
Battery Chargers	BCR	Give mfr., rating and use	E-2			(3)
Boilers, Cast Iron and Steel	HVACB	Give mfr., type, lbs. steam/hr., BTUs/hr, Fuel(s) used	A-6, A-5, A-7, A-8		3	(3)
Burner, Gas	(1)	Give type of fuel and BTUs/hr	A-7		3, 18	(3)
Burner, Oil	(1)	Give type of fuel and BTUs/hr	A-8		3, 18	(3)
Clocks, Electric, Central System	ELEC	Give mfr. and type of master unit	E-3	-	-	
Coils, Preheat, Reheat, etc. (at remote locations)	HVACO	Give sq. ft. of exposed area	A-9	-	-	
Condensers, Air Cooled	HVACC	Give capacity in tons	A-3, E-29, P-18	C-7b2	33	(3)
Condensers, Evaporative	HVACC	Give capacity in tons	A-14, E-29, P-18	C-7b2	33	(3)
Controls, Central System	HVACI	Give net sq. ft. of space served by system, and number of stations (input devices)	A-10	C-5	-	(3)
Controls and Mechanisms for Roll-type Filers	HVACU	Give size and type (pressure or timer)	A-19	C-5	37	(3)

	VMARS		PM GUIDE NO(S)	OPERATING GUIDE		PS 4772
Cooling Towers	HVACC	Give tonnage and number of cells (cells includes fan, motor, etc	A-12, A-13, E-29	C-5	4 or 17	(3)
Dock Boards (also see Loading Ramp)	DOCKS	Give size and capacity	M-21	-		(4)*
Doors, Main Entrance (non-powered)	BLDG		M-9	-		
Doors, Main Entrance and Dock, Power Operated	BLDG		M-8	-		
Doors, Power Operated	BLDG	Give mfr. and type (overhead, sliding)	M-7	-	-	
Drains, Areaway, Driveway, Storm	ZOBM		P-21	-	-	
Drinking Water Coolers	PLUMB	Give mfr.	P-32	-	-	
Dumbwaiters	EL	Complete Form 4813 for each unit	L-19	-		
Elevators, Electric	EL	Complete Form 4813 for each unit	L-1 through L-12, E-29	C-7g	44-47	(2)
Elevators, Hydraulic	EL	Complete Form 4813 for each unit	L-13, L-14, E-29, P-18	C-7g	44-47	(2)
Elevators, Sidewalk	EL	Complete Form 4813 for each unit	L-17, E-29, P-18	C-7g	44-47	(2)
Escalators	EL	Complete Form 4813 for each unit	L-15, L-16, E-29	C-7h	-	
Expansion Joints in Piping (Slip-type)	(1)	Give pipe size and type of slip joint	P-22	-	3-5, 15-22, 38	
Fan/Coil Unit, Under Window Type	HVACO	Give type	A-24, A-20	-	-	
Fans, Centrifugal (Exhaust or Return Air)	ELEC	Give mfr. CFM and hp. of motor	A-15	C-7b4e	34	
Fans, Propeller, 24 in. dia. or larger	ELEC	Give make, size, and hp of motor	A-22	C-7b4e	35	
Fans, Propeller, Pedestal or Wall-Mounted	ELEC	Give diameter of blade and hp of motor	A-23	C-7b4e	-	
Filters, Electrostatic	(1)	Give mfr., air capacity and grid voltage	A-21	C-7b4b	-	(3)
Filters, Movable Curtain, Oil Coated	(1)	Give sq. ft. of exposed surface	A-16	C-7b4b	37	(3)
Filters, Roll Type, Disposable Media	HVAVU	Give size and type of media	A-17, A-19	C-7b4b	37	(3)
Filters, Throw Away	(1)	Give number of each size	A-20	C-7b4b	-	(3)
Filters, Viscous Type (Washable)	(1)	Give number of each size	A-18	C-7b4b	-	(3)
Fire Alarm Boxes (Manual)	EMSYS	Give mfr. and whether coded or non-coded	E-38	-	-	(3)

	VMARS		PM GUIDE NO(S)	OPERATING GUIDE		PS 4772
Fire Alarm Check Valves and Accessories (Wet Pipe Sprinkler System)	EMSYS	Give operating water pressure (unit includes retard chambers, jockey pumps, tamper alarms, etc.)	P-23	-	-	(3)
Fire Alarm or Fire Detection Devices, Automatic	EMSYS	Give type (ion chamber; temperature; photo-electric; water flow alarm)	E-35	-	-	(3)
Fire Alarm System Control Boards	EMSYS	Give mfr.	E-36	-	-	(3)
Fire Alarm System - Recorders	EMSYS	Give mfr.	E-37	-	-	(3)
Fire Control Valves, Dry Pipe, Deluge and Preaction	EMSYS		P-24	-	-	(3)
Fire Control Valves for Water Distribution Systems	EMSYS	Give size	P-2	-	-	(3)
Fire Dampers (In Duct)	HVACU	Give duct size	A-32	-	-	(3)
Fire Department Hose Connections (Standpipe Outlets)	EMSYS	Give size	P-26	-	-	(3)
Fire Department Pumper Connections (Standpipe or Sprinkler)	EMSYS	Give size and threads, i.e., National Standard or Pittsburgh Standard	P-27	C-7i	-	(3)
Fire Doors - Sliding Type	EMSYS	Give type of actuating device (Fusible link, etc.)	M-12	-	-	(3)
Fire Doors - Swinging Type, Stairwells and Exitways	EMSYS	Give type of hold open device, if any	M-11	-	-	(3)
Fire Extinguishers, Gas (CO2) - Cartridge Type	EMSYS	Give capacity in lbs. and ext. agent (MP Dry Chemical, Halon, etc.)	P-4, P-5	C-7q	64	(3)
Fire Extinguishers, Stored Pressure Type	EMSYS	Give capacity in lbs. and ext. agent (MP Dry Chemical, Halon, etc.)	P-3, P-5	C-7q	64	(3)
Fire Extinguishing Systems - Fixed	EMSYS	Give number of tanks, capacity, and ext. agent (CO2, Halon, etc.)	P-6	C-7q	-	(3)
Fire Hoses (1 1/2" racked in buildings)	EMSYS	Give date of purchase	P-25	-	-	(3)
Fire Hydrants (Dry or Wet Barrel)	EMSYS	Give type of barrel and gpm	P-28	-	-	(3)
Fire Pumps	EMSYS	Give type of drive	P-33 or P-34	C-7i	38	(3)
Fire Supervisory Signals - Testing	EMSYS	Give type of supervision	E-34	-	-	(3)
Floor Scrubber - Vacuum, Automatic, Battery-Powered	MOPE	Give mfr. and size	M-18	-	-	(5)*
General Monitoring System	GMS	System includes CPU, CRT (monitor) w/keyboard, disk drive, printer, and Programmable Interface Peripheral (PIP)	A-33, A-34 (See current MMO)	C-5	-	(3)

	VMARS		PM GUIDE NO(S)	OPERATING GUIDE		PS 4772
Generators, Emergency, Gasoline or Natural Gas Engines	EMSYS	Give KVA, KW, voltages and phases (single or 3-phase)	E-31, E-33	C-7l		(3)
Generators, Emergency, Diesel Engines	EMSYS`	Give KVA, KW, voltages and phases (single or 3-phase)	E-32, E-33	C-7l	-	(3)
Heaters, Baseboard, Electric	HVACO	Give length in feet at each location	A-29	C-7j	-	(3)
Heaters, In Duct, Electric	HVACO	Give sq.ft. of coil surface area	A-28	C-7j	-	(3)
Heaters, Unit, Gas-fired	HVACF	Give size or capacity and motor hp	A-31	C-7j	-	(3)
Heaters, Unit, Steam or Hot Water	HVACF	Give type, size or capacity and motor hp	A-30	C-7j	-	(3)
Heating/Cooling Units, Rooftop	HVACP	Give BTUs/hr	A-25	C-7j	-	(3)
Hot Water Heaters, Converters	PLUMB	Give size or capacity, size of coils	P-30, E-29, P-18	C-7k	22	
Hot Water Heaters, Domestic Type (Gas or Oil Fired)	PLUMB	Give capacity and type of fuel	P-31, E-29, P-18	C-7k	18	
Incinerators	PLUMB	Give mfr. and size or capacity	M-6	-	-	
Lawnmowers and Edgers (Gasoline powered)	MOPE	Give mfr., type, size, and engine hp.	M-2	-	-	(5)*
Lifts, Power	DOCKS	Give mfr. and height range	M-17	-	-	(5)*
Lighting Fixtures, Outside	ZOBM	Give type, no. of bulbs and wattage, and height	E-7	-	-	
Lighting Protection	ELEC	Give number of air terminals and down conductors	E-12	-	-	
Lights, Emergency	EMSYS	Give type (wet, dry, or gel cell)	E-4	C-7r	65	(3)
Load Levelers (below grade)	DOCKS	Give mfr. and capacity	M-20	-	-	(4)*
Loading Ramps, Adjustable	DOCKS	Give mfr. and capacity	M-10	-	-	(4)*
Manhole, Sewer	ZOBM		P-9	-	-	(3)
Motors, Over 5 hp	(1)	Give mfr., hp., and equipment served (complete PS 4772-A)	E-29	C-7l	2-5, 14-23, 32-38, 44-47	(3)
Paper Baler	BLDG	Give size of bale	M-5	-	-	
Pumps, Centrifugal (Not Integral with Motor)	(1)	Give motor hp., GPM and equipment/ system served	P-18, E-29	C-7m	2-5, 15-22, 33-37	(3)
Pumps, Condensate or Vacuum	(1)	Give motor hp. and equipment served	A-11	C-7m	15	(3)

	VMARS		PM GUIDE NO(S)	OPERATING GUIDE		PS 4772
Pumps, Sump (Sewage or Life)	PLUMB	Give motor hp.	P-11	C-7o	36	
Radiators, Heating	(1)	Indicate one- or two-pipe system	P-19	-	-	(3)
Refrigeration Machines (Absorption type)	HVACA	Give mfr., tonnage, and motor hp.	A-26, E-29, P-18	C-7c	5 or PS 4895	(3)
Refrigeration Machine (Centrifugal and Reciprocating)	HVACC	Give mfr., tonnage, and motor hp.	A-27, E-29, P-18	C-7c	5 or PS 4895	(3)
Roof, Built-up, including:	BLDG	Give sq. ft. of roof mat	P-20	-	-	
Drains and Down-spouts		Give quantity of each				
Penetrations (except drains and vent pipes)		Give quantity				
Expansion or Control Joints		Give lineal feet				
Gutters		Give lineal feet				
Perimeter		Give lineal feet				
Exterior Walls		Give lineal feet				
Inside Ceilings, Top Floor(s)		Give sq. ft. of office and workroom areas				
Sewage Ejectors (Pneumatic Tank Type)	PLUMB	Give mfr., type, size and motor hp.	P-10	-	23	
Snow Blower - Walking Type	MOPE	Give mfr., size and engine hp.	M-19	-	-	(5)*
Sprinkled Area	EMSYS	Give no. of heads and sq. ft. of each sprinkled area	P-29	-	-	(3)
Sprinkled Area (Outside area)	ZOBM		-	-	-	
Stationary Packers	BLDG	Give mfr. and capacity	M-13, M-14, M-15	-	-	(3)
Sweepers (Battery Powered)	MOPE	Give mfr., type and size	M-16	-	-	(5)*
Sweepers (Gasoline Powered)	MOPE	Give mfr., type, size, engine hp.	M-3	-	-	(5)*
Tanks, Fuel (Htg) Oil Storage	TANKS	Give approx. size or capacity	M-4	-	-	(2)
Tanks, Water (All Types)	TANKS (6)	Give approx. size or capacity and type (HW, CW, etc.)	P-12	C-7k	16, 18, 22	(2)*
Traps, Grease	PLUMB	Give size	P-7	-	-	

	VMARS		PM GUIDE NO(S)	OPERATING GUIDE		PS 4772
Traps, Steam All Types on Boilers	HVACB	Give type and pipe size	P-17	C-7e	3, 15, 18, 21, 22	(3)
Traps, Steam All Types on Other Equipment	PLUMB	Give type and pipe size	P-17	C-7e	3, 15, 18, 21, 22	
Valves, Manually Operated (Mainline or Critical - over 2 in)	(1)	Give size and function	P-14	-	-	(3)
Valves, Motor Operated	(1)	Give size and motor hp.	P-15	-	-	(3)
Valves, Regulating (Steam)	UTIL	Give size and pressure	P-13	-	21	(3)
Window Washing Scaffolds, Power Operated	BLDG	Give height of building and approx. length of track	L-18	-	-	(5)*

When setting up Form 4772, the reporting subsite can report the total number of units or may generate one form for each piece or each type of equipment installed and maintained.

(1) Use acronym for equipment or system on which this item is installed.

(2) Prepare Equipment Inventory History Record, PS Form 4772, for each unit and, if applicable, Motor Record, PS Form 4772A, for motor of one horsepower or larger.

(3) Prepare one PS Form 4772 for each system that includes this equipment.

(4) Prepare one PS Form 4772 for each subsite that has this equipment.

(5) Prepare a PS Form 4772 for each type of this equipment.

(6) Also Unfired Pressure Vessel (UPV), if applicable.

APPENDIX B Building and Building Equipment Preventive Maintenance Guides

GUIDE SET A

GUIDE NUMBER A-1: AIR-CONDITIONING MACHINE - PACKAGE UNITS

Frequency: Annual

Special Instructions: Prior to cooling Season, lockout power to the equipment.

Checkpoints:

1. Remove panels, clean entire unit.
2. Clean drip pan and drains. Paint as necessary.
3. Check bolts, nuts, electrical connections, anchors, etc.
4. Drain condenser, clean chemically, and neutralize. Clean and paint heads if needed.
5. Adjust or replace vibration eliminators.
6. Observe belt wear. Replace worn belts and/or adjust belt tension.
7. Check alignment of motor, fan, etc.
8. Replace filter, if required.
9. Check for refrigerant leaks.
10. Check oil level.
11. Check fan and motor. Clean fan blades, or motor, and lubricate bearings.
12. Run machine and check operation, water supply and control valves, suction and discharge pressures, need for refrigerant; recheck for leaks, functioning of controls, temperature of discharge, air, etc.
13. Restore panels and clean up area and machine.

GUIDE NUMBER A-2: AIR-CONDITIONING, WINDOW UNITS

Frequency: Annual

Special Instructions: Disconnect and lockout electric cord to unit. Review manufacturer's instructions.

Checkpoints:

1. Clean condenser, cooling coil fins, and fans.
2. Remove dirt or dust from all interior parts.

3. Replace filter.
4. Inspect and adjust damper.
5. Lubricate motor and fan bearings.
6. Inspect gaskets, look for leaks between unit and window, and caulk as necessary.
7. Check for refrigerant leaks.
8. Start unit and observe operation.
9. Check temperature differential and controls.
10. Check frame of Unit with ohmmeter for proper electric ground.
11. Replace covers (if any).
12. Clean area.

GUIDE NUMBER A-3: AIR-COOLED CONDENSERS

Frequency: Annual

Checkpoints:

Special Instructions: Lockout power to the equipment

1. Vacuum or blow out dirt on coils and fins.
2. Service fan, motor, motor controls, gear box, etc. Lubricate as needed.
3. Check structure, touch up, or repaint as required.
4. If applicable, check cold weather selector and control(s).

GUIDE NUMBER A-4: AIR HANDLERS

Frequency: Annual

Special Instructions: Lockout power to the equipment.

Checkpoints:

1. Fans
    a. Clean buildup, dust, and dirt from fan blades.
    b. Clean inside of fan housing and casing, noting structural irregularities, condition of insulation, loose bolts, foundation, and vibration isolation.
2. Bearings (With pillow blocks, sleeve or ball bearings)

a. Lubricate bearings, change oil, perform pressure lubrication according to manufacturer's instructions. Take care not to over lubricate.

b. Remove top housing and examine retainers and slings.

3. Drives (Belt and Direct)

a. Inspect for excessive belt wear indicating misalignment, overloading, or improper belt tension.

b. If belts are worn, they should be replaced to prevent untimely breakdown. (Multi-belt drives should be replaced in matched sets.) Adjust belt tension with a scale and straight edge.

c. Check rigid couplings for alignment on direct drives and for tightness of assembly.

d. Inspect flexible couplings for alignment and wear.

4. Coils

a. Examine coils for leakage at joints and bends.

b. Clean coil exterior by brushing, vacuuming, blowing, or chemical cleaning.

c. Humidifier or wet coils (city water, spray, steam pan grids, etc.) will require additional attention to avoid scaling and odors.

5. Freeze Protection

a. Check pitch of coil to drainage point and blow down with compressed air.

b. Inspect test controls and devices used for freeze protection.

c. Clean face bypass dampers and lubricate damper operators.

6. Controls

a. Inspect and clean dampers, control linkage and control motors.

b. Lubricate as necessary.

GUIDE NUMBER A-5: BOILERS, OIL FIRED

(Cleaning fireside only)

Frequency: 1 to 5 times annually

Application: This is to provide for fireside cleaning to remove soot and maintain high efficiency.

Special instructions: Allow boiler to cool, lockout power to oil pumps and blowers, and close and lockout valves.

1. Clean soot from chamber, tubes, and all heat transfer surfaces.

2. Look for signs of overheating, leakage, wear, abrasion, corrosion of pressure parts, or erosion of metal.

3. Clean burner nozzle and check for wear.

4. When unit is returned to service, check and adjust burner for optimum combustion efficiency.

GUIDE NUMBER A-6: BOILERS, CAST-IRON AND STEEL

Frequency: Annual

Special Instructions: Review manufacturer's instructions and ASME code for boilers. If boiler is part of an operating system, blanks should be installed to isolate the boiler from the system.

Checkpoints:

1. General

    a. Follow instructions in HBK MS-24 to remove boiler from service.

    b. Remove fly ash and soot from flue passages.

    c. If hydrostatic test is required by inspector, fill boiler and apply hydrostatic test, 1 1/2 times the operating pressure in the presence of qualified boiler inspector.

    d. Check fire sides, valves, and trim and mark position of leaks.

    e. Take proper safety precautions before working inside boiler, including tagging of valves and controls, and letting boiler cool down.

2. Water Sides

    a. Clean gauge glass and siphon loops to limit controls.

    b. See that petcocks and try-cocks open freely.

    c. Calibrate pressure and temperature gauges.

    If internal inspection is required:

    d. Remove hand-hole and manhole plates.

    e. Clean interior of boiler, wash down shell and drums to remove mud, loose scale, and deposits.

    f. Turbine tubes, check tube ends for leakage and corrosion. Re-roll, re-bead, and/or replace thin tubes.

    g. Examine complete water side for extent of corrosion, measure and record the location and depths of pits in drum internals, and feed connections, gauge glass, and steam pressure gauge outlets.

3. Exterior and Fire Sides

    a. Examine and clean water column and feed water regulators, high and low side alarms, drains, gauge glasses, siphon loops, petcocks and try-cocks.

    b. Look for signs of overheating, leakage, wear, abrasion; corrosion of pressure parts, or erosion of metal.

    c. Check tubes for evidence of blisters and pock marks.

    d. Check condition of all refractories for cracks, erosion, and caulk. Also expansion joints, baffles, dampers and actuating mechanisms, stay-bolts, etc.

    e. Check soot blower elements for misalignment, warping, and impingement on tubes.

    f. Test all non-return and stop valves. Clean and replace as necessary.

    g. Check fusible plugs, if used. Replace yearly.

    h. Check and clean bonnets, flues, and uptakes for defective metal. Replace if necessary.

    i. Check exterior structure for strains and tension.

    j. Clean and lubricate forced-draft fan.

    k. Check condition of door gaskets.

    l. Carefully account for all tools before closing up boiler.

GUIDE NUMBER A-7: BURNER, GAS

Frequency: Annual

Checkpoints:

1. Check boiler room for adequate ventilation in accordance with AGA burner requirements.

2. Check operation of all gas controls and valves including: Gas shutoff, petal gas regulator, safety shutoff valve (solenoid), automatic gas valve, petal solenoid valve, butterfly gas valve, motor, linkage to air louver, and safety petal solenoid (if used).

3. Check flue connections for tight joints and minimum resistance to airflow. (See that combustion chamber, flues, breeching, and chimney are clear before firing.)

4. Draft regulators should give 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 C02 flue gas temperature readings for determination of efficiency of the unit. C02 for atmospheric gas burners should be 8 to 9.5%; for forced draft burners 9 to 10%. Determine

combustion efficiency according to instructions with flue gas test apparatus. Combustion efficiency should be at least 80%. If efficiency is low, check baffling.

7. Check burner for flashback and tight shutoff of fuel.

8. Check operation of controls. Clean and adjust if necessary.

9. Satisfactory operation and adjustments should conform to manufacturer's instructions.

GUIDE NUMBER A-8: BURNER, OIL

Frequency: Annual

Checkpoints:

1. Test and inspect burner (with or without firing) at rated pressure for leaks.

2. Timed trial for ignition for pilots and burners should be in accordance with manufacturer's instructions.

3. Check operation of automatic safety controls and combustion flame safeguards for abnormal discharge of oil on ignition failure, and sensors for presence of flame.

4. Check pre-ignition purging capability of burner, combustion chamber, boiler passes, and breeching. 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, dislocation, distortion, and burning of parts.

6. Check that ignition transformer supplies 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 minimal for complete combustion. Test with 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 bearing, pulleys, and belts for wear and lubricate as necessary.

10. Check and clean filters, water separators, primary and secondary strainers.

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 constant level device to see that burner maintains proper oil level (within 1/3") at rated output.

14. Check to ensure that energy cannot feed back and energize ignition devices or feed valves after a control shuts off burner.

15. Replace nozzles and check for tight shutoff of fuel.

16. Check stacks for smoke or haze and adjust burner accordingly.

17. Take CO2, O2, and smoke readings. Compare CO2 and flue gas temperature for determination of boiler burner efficiency. CO2 should be 9 to 12%. Combustion efficiency should be at least 80%. Determine combustion efficiency according to instructions with flue gas test apparatus.

GUIDE NUMBER A-9: COILS, PREHEAT, REHEAT, ETC. (Remote from Air Handler)

Frequency: Annual

Application: This guide applies to coils that are not part of an air-washer or air-handling unit.

Checkpoints:

1. Vacuum or blow out the fins, coils, etc.

2. Remove obstructions to airflow.

3. Check coils. Correct or report any leaks.

4. Test and inspect controls that protect against freezing.

GUIDE NUMBER A-10: CONTROLS, CENTRAL SYSTEM, HEATING AND AIR

Frequency: Annual

Special Instructions: Read and understand manufacturer's instructions before making adjustments or calibration. Stations include devices such as sensors, controllers, actuators, positioners, etc.

Checkpoints:

1. Check set point of controls (temperature, humidity, or pressure).

2. Compare control point with an external measuring device, note deviation, and adjust.

3. Check the unit over its range of control. If possible, impose simulated conditions to activate controls and check operation.

4. Check for control-point cycling.

5. Check closeness of differential gap on two-position controllers (on-off-open-closed).

6. Check condition and action of primary elements in the controllers (bimetallic strips, sealed bellows with capillary tubes) for remote sensing, etc.

7. Note the action of the controlled device (thermostats, humidistats, and pressure-stats) which changes the controlled variable (motors, valves, dampers, etc.).

8. On electronic controls check the source of the signal and its amplification.

9. Check air systems for leaks. Check for correct maintenance of pressure in pneumatic electric and electric pneumatic units. Check units for proper closing and loose connections.

10. Check the condition and the ability of humidity-sensing primary control elements (hair, wood, leather, or similar substances) to read to moisture changes and their action on the control mechanism.

11. 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. Check operations of all relays, pilot valves, and pressure regulators.

12. Use test kits and manufacturer's instructions whenever possible. Replace rather than re-build a control installed in the system. Take control to shop for repair.

GUIDE NUMBER A-11: CONDENSATE OR VACUUM PUMPS (On steam return sys)

Frequency: Annual

Checkpoints:

1. Operate unit to check for steam binding.

2. Check condensate temperature (should be approximately 30 degrees F. below steam temperature if traps are not leaking).

3. Examine flanges for steam leaks.

4. Pump receiver down.

5. Turn condensate to sewer.

6. Shut down unit.

7. Clean receiver.

8. Clean and adjust motor float switch and float operation on high-low water level. Inspect pressure switches.

9. Clean and examine receiver, vent pipe, inlet, and discharge openings for excessive corrosion. Report condition.

10. Check alignment of coupling with straight edge.

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.

GUIDE NUMBER A-12: COOLING TOWERS

Frequency: Annual

Special Instructions: After the cooling season - Lockout power to the equipment.

Checkpoints:

1. Drain and flush down tower. Remove trash, dirt, and algae from pans, casings, fill, and screens.
2. Steel casing, basins, and framework should be painted with protective paint where applicable.
3. Check structural members of tower for deterioration. Check bolts and tighten when tower wood is dry.
4. Replace tower fill when necessary.
5. Examine water nozzles for obstructions and proper water distribution.
6. Drain and replace lubricant in gear box.
7. Check alignment of motor to gear to fan.
8. Inspect motor, motor starter, belts, etc., for proper operation.
9. Clean and check operation of the water-treatment equipment. Check bleed line and setting in accordance with requirements.
10. Fill tower. Adjust bleed float level. Charge with water-treatment chemicals.

GUIDE NUMBER A-13: COOLING TOWERS

Frequency: 1 to 6 times annually

Application: This guide may be used to provide periodic flushing of cooling towers, and should be used only if the towers accumulate excessive debris during the operating season.

Checkpoints:

1. Disconnect motors. Tag and lock circuits. Drain tower; flush out with hose.
2. Clean distribution nozzles and screens.
3. Remove debris from area.
4. Return unit to service.

GUIDE NUMBER A-14: EVAPORATIVE CONDENSERS

Frequency: Annual

Special Instructions: Drain water from all lines prior to freezing weather.

Checkpoints:

(After the cooling season)

1. Remove dirt, trash, algae from water pans; flush.
2. Check water pans; paint if necessary.
3. Check water outlets and coil connections.
4. Change oil in gear reducer.
5. Check fan and pump; lubricate as required.
6. Check gear box, bearings, alignment, etc.
7. Check drive shafts.
8. Check control and float valves.
9. Inspect eliminators; unclog if necessary.
10. Inspect condenser coil, fins, sprays, connections, etc. Clean if required.
11. Check screens.
12. Check water-treatment equipment.
13. Check motors and starters.
14. Check structural fittings.
15. Continuous bleed line should be open.
16. Drain and flush thoroughly.
17. Clean chemically, using USPS approved materials, and neutralize.

GUIDE NUMBER A-15: FANS, CENTRIFUGAL

Frequency: Annual

Special Instructions: Lockout power to fans and controls.

Checkpoints:

1. Check over unit thoroughly. Look for signs of rust, corrosion, or deterioration. Inspect interior of housing, if there are openings to do so.

2. Check insulation; repair if needed.

3. Check structural members, vibration eliminators, and flexible connections.

4. Check bearings, shaft, pulley, and alignment with motor (if vibration is excessive, check balance of rotor).

5. Perform required lubrication.

6. Check belts; adjust tension, or replace as required.

7. Blow out or vacuum windings, if necessary.

8. Clean complete unit, including fan rotor. Touch up or paint as required.

GUIDE NUMBER A-16: FILTERS, MOVABLE CURTAIN, OIL COATED

Frequency: 1 to 4 times annually

Special Instructions: Review manufacturer's instructions. Lockout power to fans, filter motor, and controls.

Checkpoints:

1. Inspect framework and structure. Look for loose or missing bolts, air leaks, condition, or flashing or caulking, etc.

2. Examine all moving parts for proper alignment, freedom of motion, excessive clearance or play, etc.

3. Inspect and adjust motor and drive unit, gear reducer, sprockets, drive chains, belts, etc. Perform required lubrication.

4. Inspect pressure-sensing device, pressure switches (if automatic), selector(s), starters, electric controls, warning and/or indicator lights, etc. Clean and adjust as necessary.

5. Remove sludge from pit. Change or replenish oil.

6. Remove lockouts. Restore to service and check operations.

GUIDE NUMBER A-17: FILTERS, ROLL-TYPE DISPOSABLE MEDIA

Frequency: 1 to 4 times annually

Application: To change roll filter media.

Special Instructions: Lockout filter and fans.

Checkpoints:

1. Remove old filter media roll and install new roll.

2. Vacuum heavy accumulation of dust and remove debris.

3. Inspect for proper alignment and operation of automatic controls, adjust if necessary.

GUIDE NUMBER A-18: FILTERS, VISCOUS-TYPE (WASHABLE)

Frequency: 4 to 52 times annually

Application: This guide is for reusable filters and includes time for removing, cleaning, and replacing the filters. The throwaway filters are usually more economical than the viscous type. Therefore, this filter shall be used only where economically justified.

Checkpoints:

1. Remove filters and replace with filters that have been cleaned and recoated. Examine frame and clean it with a high suction vacuum.

2. Move dirty filters to cleaning station.

3. Clean, recoat, and store filters removed until next scheduled change.

GUIDE NUMBER A-19: CONTROLS AND MECHANISMS ROLL-TYPE FILTERS

Frequency: Annual

Special Instructions: Review manufacturer's instructions. Lockout unit, controls, and fans.

Checkpoints:

1. Inspect framework and structure. Look for loose or missing bolts, air leaks, condition of flashing or caulking, etc.

2. Inspect all moving parts for proper alignment, freedom of motion, excessive clearance or play, etc. Clean, adjust, or tighten as necessary.

3. Inspect powered roll and take up roll for correct tracking of media. On manual operation check wheel or hand crank.

4. On motor drives, check pressure sensing device(s) and/or pressure switches. Test settings for starting and stopping motor.

5. Inspect motor, starter, controls, and selector switch for auto warning or indicator lights.

6. Check oil in gear case. Change or replenish as required. Perform required lubrication using graphite where it is suitable.

GUIDE NUMBER A-20: FILTERS, THROWAWAY

(Includes package and window units, etc.)

Frequency: 4 to 52 times annually

Special Instructions: Open and tag switches controlling fans. Change filters when the static pressure approaches the design maximum for the unit.

Checkpoints:

1. Remove and discard old filters.

2. Clean frame with vacuum.

3. Inspect frame, doors, etc.

4. Install new media.

GUIDE NUMBER A-21: FILTERS, ELECTROSTATIC

Frequency: 4 to 26 times annually

Special Instructions: Review manufacturer's instructions. Turn off supply to power unit. Turn off power unit safety switch. Lockout power to unit and fan. Ground bus trips, top to bottom.

Checkpoints:

1. Before securing unit, check indicators for defective tubes or broken ionizing wires.

2. Lockout filter unit and fan.

3. Wash down each manifold until clean. Units with water-wash spray require approximately 4 minutes with warm water or 7 minutes with cold water.

4. If dry filters are dirty, remove dirt or replace filter.

5. While cells are drying, look for defects, particularly broken wires or hum suppressers. Wipe insulator with sort, 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. Make certain high voltage is present.

GUIDE NUMBER A-22: FANS, PROPELLER, 24" DIAMETER OR LARGER

Frequency: Annual

Special Instructions: Lockout power to fan.

Checkpoints:

1. Clean unit, especially fan blades.

2. Inspect pulleys, belts, couplings, etc. Adjust tension and tighten mountings as necessary. Change badly worn belts.

3. Perform required lubrication.

4. Clean motor with vacuum or low pressure air (less than 30 PSI). Check for obstructions in motor cooling and airflow.

5. Perform visual examination for cracks at blade to blade - supporting assemblies.

6. Touch up paint for preservation.

7. Remove lockout; start unit and check for vibration and noise.

GUIDE NUMBER A-23: FANS PROPELLER, PEDESTAL OR WALL MOUNTED

Frequency: Annual

Special Instructions: This guide is for the large fans used in the workroom or other areas to provide air circulation. This maintenance should be performed during the winter prior to the cooling season. Lockout power to fan.

Checkpoints:

1. Disconnect from electric power and clean entire unit including the blade and motor.

2. Examine line cord for frayed insulation or evidence of deterioration.

3. Wrench test blade set-screw, motor mount bolts, and blade guard mounting bolts.

4. Lubricate unit and clean up excess lubricant.

5. Operate unit and check for excess vibration and unusual noise.

GUIDE NUMBER A-24: FAN/COIL UNITS, UNDER-WINDOW TYPE

Frequency: 1 to 4 times annually. (These units are normally in office areas maximum frequency is 4 times per year.)

Checkpoints:

1. Drain pan. Clean coils and other components with vacuum.

2. Inspect motor and fan. Lubricate as required.

3. Check trap, temperature regulator, and shutoff valves.

4. Change filter (if equipped and necessary).

5. Check for loose connections in unit. Tighten as necessary.

6. Clean and wipe down exterior vents and smooth surfaces.

7. Clean surrounding floor areas.

GUIDE NUMBER A-25: HEAT/COOLING UNIT, ROOFTOP (UP TO 15 TONS)

Frequency: Semiannual

Time: Spring 10 Hours, Fall 7 Hours

Special Instructions: Lockout unit. This applies to rooftop heating/cooling units. Gas-fired heating with air-cooled condenser.

1. Remove panels. Clean entire unit.

2. Clean drip pans and drains. Paint as necessary.

3. Replace worn belts and adjust proper tension.

4. Lubricate motor(s) and fan(s) bearings.

5. Check alignment of motor and tighten.

6. Charge filters.

SPRING

1. Clean evaporator and condenser coils.

2. Operate unit and check refrigeration. Charge.

3. Check thermostat.

FALL

1. Clean and check heat exchanger for leaks.

2. Check gas train and safety controls for adequacy and proper operation.

3. Set burner for maximum combustion efficiency.

GUIDE NUMBER A-26: REFRIGERATION MACHINES, ABSORPTION TYPE

Frequency: Annual

Special Instructions: Consult operating data to determine the temperature difference across the various system components as a guide to determining the condition of the evaporator and condenser tubes.

Checkpoints:

1. Evaporator Circuit

    a. Check and service evaporator pump, motor controls, starters, etc. Lubricate as prescribed.

    b. Clean and flush out seal, water tank seal chamber, and associated lines.

    c. Check purge valve diaphragm. Replace if necessary.

    d. Inspect ball in check valve.

    e. Inspect and clean evaporator spray header, nozzles, etc. Replace defective units.

    f. If operating data indicated the refrigerant temperature is slowly rising, test sample for the presence of solution. If excessive, follow the manufacturer's instructions for distilling refrigerant.

2. Solution Circuit

    a. Check and service solution pump, motor controls, starters, etc. Lubricate as prescribed.

    b. Check absorber and generator sight glasses. Replace if required.

    c. Check purge valve diaphragm. Replace if required.

    d. Inspect and clean solution spray nozzles. Replace defective units.

3. Condenser Circuit

    a. Clean condenser water tubing in the condenser and absorber. Use nylon brush or other soft material.

    b. Allow condenser water tubing to dry to determine if scale exists. Have scale chemically tested if necessary. Acid clean if necessary and flush.

4. Purge System

    a. If purge system indicates the system is not tight, follow manufacturer's recommendations for removing solution and for leak testing.

    b. Clean purge tank and purge with water following steps prescribed by the manufacturer.

c. Change oil in purge pump when it becomes contaminated or emulsified.

d. Inspect discharge valve and oil distributor rubbers; renew if necessary.

5. Controls

a. Check adjustment of pressure-control, restrict or, high level cutout, and low temperature cutout.

b. Check all control interlocks for proper operation.

c. Check capacity control valve, linkage, and stem. Lubricate according to manufacturer's instructions.

GUIDE NUMBER A-27: REFRIGERATION MACHINES (Centrifugal and Reciprocating)

Frequency: Annual

Special Instructions: Lockout power to the equipment.

Checkpoints:

1. Compressor

a. Take sample of oil and have analyzed for acid and metal content. Keep report of analysis with PS Form 4772. Drain, flush, and change oil in reservoirs including filters, strainers, and traps. Do not change oil in reciprocating machines unless contaminated.

b. Clean and inspect main and auxiliary oil pumps, including packing, seals, alignment, pulleys, belts, and couplings.

c. Check speed increaser. Drain oil from gear box. Flush and inspect gears for indication of wear, pitting, and misalignment.

d. Remove head from oil coolers. Inspect and clean tubes. Change oil filters.

e. Refill oil sump.

f. Remove access caps to compressor internals and clean where possible.

g. Clean and adjust pilot positioner for guide vanes.

h. Examine bearing for clearances and wear.

i. Clean and lubricate coupling.

j. Check hot and cold alignment between drive and driven compressor.

k. Check all relief valve rupture discs.

l. Test entire system for refrigerant leaks.

m. Calibrate and adjust all gauges and instruments. The thermometers that measure inlet and outlet temperature of chilled water should be calibrated together. Do this by placing the sensing element in a container of melting ice and water. This will provide a temperature of 32 degrees Fahrenheit for calibration purposes.

n. Check safety controls for setting operation; tighten electrical connections and clean where indicated.

o. Review manufacturer's literature for further details on service required on compressor.

p. Perform maintenance on purge unit in accordance with manufacturer's instructions.

q. Remove lockout from equipment power.

r. Leave equipment and area clean and free of debris.

2. Chiller

a. Note chiller performance on log sheets (inlet and outlet chilled water temperature and refrigerant temperatures).

b. If efficiency is reduced, inspect for control malfunction or sensing element failure.

c. Systems requiring minimum or no raw water make-up should be drained and inspected only in emergencies. The pH should be maintained between 7 and 8. To determine that the system is tight, disconnect automatic make-up water system and feed by hand. Frequency for cleaning on such systems should be once in every five years. (Note: New installations shall be cleaned after one year of operation.)

d. Clean tubes with nylon brush or similar material.

e. Blow tubes free of trapped water if unit is to be exposed to freezing temperatures.

f. Replace heads, installing new gaskets.

g. Treat water to control corrosion.

3. Water-Cooled Condensers

a. Review log and note condenser performance by inlet and outlet temperatures, head pressure, and temperature of refrigerant.

b. Remove condenser heads.

c. Remove mud, debris, scale, and other sediment collected during operation.

d. Clean water boxes and tube sheets. Scrape and paint with epoxy.

e. Clean tubes with nylon brush or other similar material and inspect for signs of corrosion.

f. Blow trapped water from tubes after cleaning if unit is exposed to freezing temperature.

g. Replace heads, installing new gaskets.

h. Chemically test scale, if necessary.

i. If condenser is chemically cleaned, neutralize after cleaning.

GUIDE NUMBER A-28: HEATER, ELECTRIC, IN-DUCT

Frequency: Annual

1. Vacuum or blow all dust and dirt from coils.
2. Remove airflow obstruction.
3. Visually inspect for cracked or broken insulators, distorted or burned coils, and loose connections. Replace as needed.
4. Inspect operating contacts and replace if needed.

GUIDE NUMBER A-29: HEATER, ELECTRIC, BASEBOARD

Frequency: Annual

1. Remove cover; clean coil, fins, and cover grille with vacuum.
2. Check electric connections and operating contacts; replace as needed.
3. Check mechanical fastenings to wall; repair if needed.
4. Replace cover.

GUIDE NUMBER A-30: UNIT HEATERS (STEAM AND HOT WATER)

Frequency: Annual

Checkpoints:

1. Clean strainer ahead of valve. Check valve head and seats for wear and cutting.
2. Replace valve if seats need regrinding. Send old valve to manufacturer for overhaul.
3. Steam quality should be examined for foreign matter if valves are being damaged.
4. Examine pilot lines for dirt.
5. Check steam gauges.
6. Check safety or pressure relief valve for relieving and seating.
7. Check diaphragms for failure.
8. Check binding of valve stem.

9. Clean and adjust heater deflector fins and element.

10. Clean fan and lubricate motor.

11. Adjust weighted lever or spring-control tension.

GUIDE NUMBER A-31: UNIT HEATERS (GAS FIRED)

Frequency: Annual

Special Instructions: Lockout electrical and gas supply to unit.

Checkpoints:

1. Clean and adjust heater deflector fins and element.

2. Clean fan and lubricate motor.

3. Clean burner, chamber, thermocouple, and control. Use a high suction vacuum and/or brush.

4. Adjust pilot or electric ignition device.

5. Inspect vent and damper operation.

6. Remove lockout from unit.

7. Operate unit and adjust burner.

8. Check operation of safety pilot, gas shutoff valve, and other burner safety devices.

GUIDE NUMBER A-32: FIRE DAMPERS (IN DUCT)

Frequency: Annual

Special Instructions: Fusible link must never be replaced with a piece of wire. On first inspection, make sure that the damper is not installed backwards. In all cases, the air movement should tend to close damper.

Checkpoints:

1. Determine that the access door is reasonably airtight and latches properly.

2. If damper is closed, check for ruptured fusible links, broken attachment or hinge damage, corrosion, etc.

3. Remove fusible link and check for proper rating.

4. Determine that damper is self-closing and properly latches. Adjust if necessary.

5. Lubricate friction points and exercise damper to ensure complete freedom of movement.

6. Each year install new fusible links of proper rating and tensile strength in areas of vibration.

7. Reinstall fusible link (locations where vibration is not a problem).

8. Close access door and check for wind noise.

GUIDE NUMBER A-33 AND A-34: GENERAL MONITORING SYSTEM

GENERAL MONITORING SYSTEM

Special Instructions: See current Maintenance Bulletin for preventive maintenance checklist items, frequencies, time standards, etc., for GMS components. Calculate annual workhour requirements and enter on Form 4896-A.

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GUIDE SET E

GUIDE NUMBER E-1: ALARMS: MISC, BURGLAR, CIVIL DEFENSE, TRESPASS

Frequency: Quarterly

Special Instructions: Review applicable manufacturer's instructions.

Checkpoints:

1. Inspect all terminal contacts, connections, etc. at each station and receiving point. Tighten or adjust as needed.

2. Check source of supply for availability and reliability.

3. Test operation by real or assimilated action.

4. Clean; lubricate if needed. Wipe off excess.

5. Inspect remotely located alarms for obstruction, damage, etc.

6. Battery maintenance is described under another guide.

GUIDE NUMBER E-2: BATTERY CHARGERS

Frequency: Quarterly

Application: This guide is for chargers used for battery-powered custodial equipment and items related to building maintenance functions, including switch gear and alarm battery chargers.

Special Instructions: Do not allow open flame, cigarettes, etc. in battery-charging room or area. Review manufacturer's instructions. Lockout power to the equipment.

Checkpoints:

1. Check ventilation of charger, and exposure to moisture or water.

2. Clean accessible interior and exterior parts. Touch up paint as required.

3. Check tightness of electrical connections including alligator clips.

4. Inspect wiring and connections in charging circuit.

5. Record charger output voltage.

6. Report any deficiencies or need for repairs.

GUIDE NUMBER E-3: CLOCKS, ELECTRIC, CENTRAL SYSTEM

Frequency: Semiannual

Special Instructions: Review Manufacturer's instructions. This work should be done in Spring and Fall when time is changed from standard.

Checkpoints:

1. Clean dirt and dust of interior and exterior of cabinet.

2. Adjust relays. Check transmission of signal.

3. Tighten contacts and terminal screws.

4. Burnish contacts if necessary.

5. Perform work suggested by manufacturer's instruction book.

GUIDE NUMBER E-4: EMERGENCY LIGHTS

Frequency: Annual

Special Instructions: Use rubber gloves and apron. Do not spark battery terminals or smoke while performing maintenance. Review and follow manufacturer's instructions for cycling batteries. It may be necessary to remove the light from service and perform the cycling in a shop area. Any light that is removed must be replaced immediately. Only the batteries may need to be replaced. See manufacturer's instructions. The check-points apply to wet-cell, dry-cell, and gel-cell batteries unless otherwise indicated.

Checkpoints:

1. Inspect for structural defects and deposits.

2. Clean off corrosion deposits and apply silicone grease to terminals (wet-cell).

3. Inspect water level and take specific gravity reading. 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 (wet cell).

4. Add distilled water to raise electrolyte to proper level (wet cell).

5. Push test button and observe light operation. (See manufacturer's instructions.)

6. Check vent holes (wet cell).

7. Clean exterior with dry cloth.

8. Disconnect unit to operate for 1 1/2 hours. At the end of 1 1/2 hours, the unit must be fully operational. If the manufacturer's instructions recommend cycling the battery by allowing the unit to operate until the lights go out, leave the unit disconnected beyond the 1 1/2 hours to complete cycling. Reconnect the unit.

9. Record the results of the 1 1/2-hour duration test on the route sheet. If the unit did not pass the test, replace or repair it.

GUIDE NUMBER E-5: LEAD-ACID BATTERIES

Frequency: Quarterly

Application: This guide is for batteries used on 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. Use caution in handling the batteries and electrolyte. The electrolyte is injurious to the skin and clothing.

2. Never smoke or carry an open flame in or near the battery charging area.

3. Wear apron, face shield, and gloves.

4. Never remove any connecting cables or straps while charging or when there is a possibility of a load being on the battery (this can cause a spark that may ignite ever-present hydrogen gas).

Checkpoints:

1. Check as-found voltage and specific gravity for each cell and record on Form 4815, Storage Battery Monthly Report. Check and record the temperature of two to three cells in each row.

2. When the electrolyte is at the lowest mark, add distilled water to bring it to the proper level.

3. Raise voltage from charger for 8 to 24 hours to give the batteries an equalizing charge. Then, return to floating rate.

4. Check as-left voltage and specific gravity for each cell and record on Form 4815 as above. Compare reading with manufacturer's recommendations.

5. Wipe dirt accumulation from batteries with disposable cloth taking care not to drop foreign matter into batteries.

6. Clean terminals and tighten connections checking the condition of wiring.

7. Check condition of battery table for deterioration. Wooden members should receive special attention on this inspection.

8. Report any deficiencies for immediate correction.

GUIDE NUMBER E-6: EDISON, NICKEL-IRON-ALKALINE BATTERIES

Frequency: Quarterly

Application: This guide is for batteries used on 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. Use caution in handling the electrolyte; it is injurious to the skin and clothing.

2. Never smoke or carry an open flame in or near the battery room or area.

3. Wear face shield, apron, and gloves.

Checkpoints:

1. Check and record voltage of entire battery.

2. Add distilled water to bring electrolyte up to required level. Record water added.

3. Clean batteries removing salt accumulation. Wiping with a clean disposable cloth is usually sufficient.

4. Check floating charge voltage on battery and make required adjustments.

5. Check and record specific gravity on Form 4815, once per year.

6. Report deficiencies for immediate correction.

GUIDE NUMBER E-7: LIGHTING, OUTSIDE

Frequency: 1 to 2 times per year

Application: This guide applies to parking lots, streets, loading docks, and perimeter lighting, and provides for group lamp changes and maintenance of such fixtures outside the building.

Checkpoints:

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.

GUIDE NUMBER E-12: LIGHTNING PROTECTION

Frequency: Annual

Special Instructions: On first inspection, check that: (1), all air terminals (lightning rods) are interconnected; and (2), at least two down conductors are installed with their own ground connection.

Checkpoints:

1. Inspect air terminals for corrosion and rigid attachment to structure.

2. Examine conductors for corrosion, strong mechanical joints that 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.

GUIDE NUMBER E-29: MOTORS

Frequency: Annual

Application: This guide is for squirrel-cage, wound-rotor, and synchronous motors in excess of 5 horse power. The maintenance specified by this guide is not intended to require disassembly of the motor. This guide does not normally apply to motors rated less than 5 horsepower on building equipment. Maintenance for these motors is normally limited to cleaning and lubrication, which is accomplished during the maintenance of the driven machine.

Special Instructions: Obtain and review manufacturer's instructions. Lockout the motor. Give special attention to lubrication procedure as well as brush and commutator maintenance.

Checkpoints:

1. Clean motor with a clean rag or vacuum. Clean areas otherwise inaccessible, by blowing with clean, dry air using not more than 30 PSI. Clean surfaces and ventilation passages thoroughly.

2. Visually inspect winding for cleanliness. Look for coating of oil or grease (disassembly of a motor for cleaning is normally beyond the scope of preventive maintenance).

3. Check air-gap uniformity and report defective bearings for replacement.

4. Inspect squirrel-cage rotors for broken or loose bars and evidence of local heating.

5. On wound-rotor and synchronous motors, thoroughly clean the collector rings and/or commutators. Inspect them for roughness and eccentricity. Examine brushes for fit, free play, chipped toes or heels, heat cracks, wear, and contact pressure.

6. Perform lubrication according to manufacturer's instructions.

7. Inspect for moisture and protection from water.

8. If motor has not been operated for an extended period, check insulation resistance with a megger. If insulation resistance has dropped, the windings should be dried out before the motor is started.

9. Check motor mountings, supports, and couplings for tightness or defects.

10. Remove lockout and return unit to service.

11. Read load on motor at no load and/or full load and record on preventive maintenance record.

GUIDE NUMBER E-31: EMERGENCY GEN - GAS OR NATURAL GAS ENGINES

Frequency: Annual

Special Instructions: Have approved type fire extinguishers readily available. Do not allow open flames or smoking in area. Use safety-type fuel cans only. Review manufacturer's instructions.

Checkpoints:

1. Set distributor point dwell. Replace points, capacitor, rotor, and spark plugs after 100 hours of operation.

2. Set timing and distributor advance. Timing should be set at both idle and operating speed of generator.

3. Adjust carburetor and governor for proper operating speed.

4. Check fuel supply. If fuel is over 9 months old, discard and replace with fresh fuel. Gasoline deteriorates with age, so a large supply of fuel should not be maintained. Prior arrangements should be made to purchase fuel locally for emergencies.

5. Change engine oil and filter and perform other lubrication of engine and generator.

6. Inspect cooling system for leaks, air obstructions, "V" belt tension, and proper antifreeze solution. Make needed adjustments.

7. Inspect generator winding and clean if needed.

8. Clean commutator and collector rings; check brush wear and tension in accordance with manufacturer's instructions.

9. Inspect generator heaters.

10. Report needed repairs or observed defects.

GUIDE NUMBER E-32: EMERGENCY GENERATORS - DIESEL POWER

Frequency: Annual

Special Instructions: Have approved type fire extinguishers readily available. Do not allow open flames or smoking in area. Use safety-type fuel cans only.

Checkpoints:

1. Change fuel filters.

2. Inspect and adjust rack on unit injector or fuel distributor pump according to manufacturer's instructions.

3. Check governor; adjust for correct speed.

4. Determine fuel level, drain water from tank, and inspect for contamination. Prior arrangements should be made for local procurement of fuel in emergencies.

5. Change engine oil and filter and perform other lubrication on engine and generator.

6. Inspect cooling system for leaks, air obstructions, "V" belt tension, and proper antifreeze solution. Make needed adjustments.

7. Inspect generator winding and clean if needed.

8. Clean commutator and collector rings. Check brush wear and tension in accordance with manufacturer's instructions.

9. Inspect generator heaters.

10. Report any needed repairs.

GUIDE NUMBER E-33: EMERGENCY GENERATORS, ALL TYPES OF ENGINES

Frequency: Monthly

Application: This guide provides for the operational test of emergency generators.

Special Instructions: Check fire extinguishers for location and type. Do not allow open flames or smoking in the area. Use only approved safety-type fuel cans. Obtain and review manufacturer's instructions and specifications.

Checkpoints:

1. Drain condensate from bottom of fuel tank and check fuel for quantity and contamination.

2. Check engine oil level.

3. Check coolant level and inspect for leaks. Inspect engine air cleaner. Replace if dirty.

4. Test and determine specific gravity of starting batteries. Clean terminals. Set proper charge rate after generator has been operated.

5. Examine generator for moisture and/or dirt.

6. Start and operate unit under full load for 1 hour. It is important that the unit be operated under load. If a portion of the building load cannot be connected, a resistance load should be used.

7. While unit is operating, thoroughly observe operation for indication of defects or possible malfunctions.

8. After unit has operated for 50 minutes, log the operation to show at least the following information: engine and generator speed in RPM, operating voltage, operating amperes, engine temperature, engine oil pressure, and hour meter readings.

9. After unit has been operated, check lubricant and coolant according to manufacturer's instructions to assure that it will be ready to operate in an emergency.

10. Report any needed repairs or observed defects.

GUIDE NUMBER E-34: FIRE SUPERVISORY SIGNALS– TESTING

Frequency: Quarterly

Special Instructions: The work required by this procedure can cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center or fire department that will receive the alarm and/or signal must be notified prior to start of work. When feasible, the position of valves, air pressure, temperature, or water level being monitored should be altered to actuate the signals. Check all supervisory devices for damage, corrosion, and pitted electrical contactors. Inspect conduit for loose joints, hangers, and clamps.

Checkpoints:

1. Valve supervision - turn valve stem about three revolutions and check for signal. Adjust tamper device if necessary.

2. Air pressure supervision:

    a. Inspect pressure gauges for any damage.

    b. Tap gauge to see if needle is jammed or immovable.

    c. Check for proper air pressure.

    d. Gradually release air pressure and note pressure at which pressure switch deactivates signal. When necessary, adjust pressure switch. Re-pressurize system.

3. Temperature supervision - mechanically activate temperature switches and check for signal. Adjust if necessary.

4. Water-level supervision - check float mechanism for corrosion and freedom of movement. Move float until signal is received. Adjust if necessary.

GUIDE NUMBER E-35: AUTOMATIC FIRE DETECTION OR ALARM DEVICES

Frequency: Semiannual

Special Instructions: The work required by this procedure can cause the activation of an alarm and/or a supervisory signal. The field maintenance manager and the control center or fire department that will receive the alarm and/or signal must be notified prior to start of work. When it is both feasible and safe, the environmental conditions being monitored should be altered to actuate the device. Check all detection devices for drainage and proper anchorage.

Checkpoints:

1. Inspect conduit for loose hangers or clamps.

2. Ion chamber detectors - activate alarm with Freon aerosol spray or by blowing smoke near detector. Test for proper signals. Clean according to manufacturer's instructions.

3. Self-restoring temperature detectors - increase temperature, or mechanically complete circuit and test for proper signals. Make adjustments if necessary (Snap action or bimetallic strips).

4. Non restorable temperature detectors - check tension on thermostatic cable. Check continuity of circuits by use of test buttons or by mechanically completing circuit. Test for proper signals.

5. Pneumatic tube detectors - in locations susceptible to damage, check tubing for crimps or damage. Neat tubing by means of resistance heater, hot water, etc., and test for proper signals. Adjust release device and replace diaphragm if necessary.

6. Photoelectric detectors - inspect for proper alignment. Diffuse or obstruct the light rays and test for proper signals. Clean according to manufacturer's instructions.

7. Water flow alarms (zoned) - open valve to test pipe or drain pipe (usually located at sprinkler risers) or open Inspector's test valve (located at end of most remote branch line) and check for proper transmission of signals from water flow paddle alarms or pressure switches. This should be done in conjunction with alarm check valve maintenance (see Guide Number P-23).

GUIDE NUMBER E-36: FIRE ALARM SYSTEM - CONTROL BOARDS

Frequency: Daily

Checkpoints:

1. Check for proper voltage from power supply.

2. Check for ground, shorts, and open faults.

3. Identify and correct any problems indicated by trouble signals or test buttons.

4. Test line voltage of each circuit, voltage-to-ground on ungrounded systems, and supervisory current, when applicable. Log the readings and weather conditions.

5. Inspect for burned out indicator lamps, inoperative targets, and all other types of supervisory signals on the control board.

GUIDE NUMBER E-37: FIRE ALARM SYSTEM– RECORDERS

Frequency: Weekly

Checkpoints:

1. Clean recording devices.

2. Check pre-wound mechanisms. Rewind if necessary.

3. Examine alignment and tension of paper tape and supply of tape on reels. Install new tape when needed.

4. Manually move ribbon to prevent ink from drying (paper-marking type).

5. Inspect for legible punctures or markings on tape.

6. Check for correct time on time stamp. Reset if necessary.

GUIDE NUMBER E-38: FIRE ALARM BOXES (MANUAL)

Frequency: Quarterly (Bimonthly if non-supervised)

Special Instructions: The work required by this procedure can cause the activation of an alarm and/or a supervisory signal. The field maintenance manager and the control center or fire department that will receive the alarm and/or signal must be notified prior to start of work. When alarm systems are connected to municipal systems, test signals to be transmitted to them will be limited to those acceptable to that authority. Results should be recorded on the route sheet. A different box should be activated on each test.

Checkpoints:

1. Examine box for damage and legible box number.

2. Check external tamper devices.

3. When practical, remove "Break Glass" and follow instructions for actuating alarm.

4. Confirm that proper signal (coded or uncoded) is transmitted to receiving station (Central Control Station, Fire Department, Police Department, ADT, etc.).

5. Determine that audible alarms or signals (local or general) actuated by the alarm box are operating.

6. Inspect recording register for legibility, time, code number, and number of rounds.

7. On systems with shunt non-interfering circuits, operate one box and then operate another box on each box loop prior to the completion of the first cycle. Check for interference at receiving station or recording register.

8. Restore alarm box and accessories to normal position promptly after each test. This includes rewinding, resetting, replacement of tamper devices, etc.

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GUIDE SET L

GUIDE NUMBER L-1: ELEVATORS, ELECTRIC (First Month)

Frequency: Annual (First Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, sill trips, and checking devices.

3. Selector - Clean, adjust, and lubricate brushes, dash pots, traveling cables, chain, brush, pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

4. Car - Clean, adjust, and lubricate car door and gate tracks, pivots, hangers, car grille, stile channels, and side and top exits.

5. Leveling - Clean, adjust, and lubricate leveling switches, leveling operation, hoist way vanes, magnets, and inductors.

6. Hoist way Doors - Clean, lubricate, and adjust tracks, hangers, and up-thrust.

7. Machines - Inspect brake and brake drum, drive sheave and motor, worm and gear backlash, thrust end play, and any bearing wear. Remove, clean, and lubricate brake cores on DC brakes; clean linings if necessary; and inspect for wear.

8. Miscellaneous - Observe operation of signal and dispatching systems. Inspect compensating chain hitches, drum buffers, rope clamps, slack cable switch, couplings, keyways, indicator dials, and pulleys. Check load-weighing device and dispatching time settings. Clean, adjust, and lubricate as necessary.

9. Emergency Light - Check operation.

10. Oil Level - Check level in oil buffer.

11. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-2: ELEVATORS, ELECTRIC (Second Month)

Frequency: Annual (Second Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, sill trips, and checking devices.

3. Selector - Clean, adjust, and lubricate brushes, dash pots, traveling cables, chain, brush, pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

4. Ropes - Inspect all fastenings and ropes for wear and lubrication.

5. Car - Clean, adjust, and lubricate car door or gate tracks, pivots, hangers, car grille, and stile channels.

6. Car Operating Box - Check, clean, and adjust contacts, switches, and lubricate car operating box.

7. Motors and Generators - Clean all commutators; renew or reseat brushes as necessary. Clean armatures and motors with blower or vacuum. Inspect armature and rotor clearances. Check motor and motor generator set connections, change oil in bearings, and lubricate in accordance with manufacturer's instructions.

8. Miscellaneous - Observe operation of signal and dispatching systems. Inspect drum buffers, rope clamps, slack cable switch, coupling, shaft, keyways, indicator dials, and pulleys. Clean, adjust, and lubricate as necessary.

9. Emergency Light - Check operation.

10. Oil Level - Check level in oil buffer.

11. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-3: ELEVATORS, ELECTRIC (Third Month)

Frequency: Annual (Third Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, sill trips, and checking devices.

3. Guide Shoes - Lubricate guide shoe stems; adjust if necessary.

4. Car - Test alarm bell system. Clean light fixtures. Inspect, clean, and adjust retiring cam device, chain, dashpots, commutators, brushes, cam pivots, fastenings. Test emergency switch (ground case if necessary). Inspect safety parts, pivots, set-screws, switches, etc. Check adjustment of car shoes or roller guides; adjust if necessary. Clean and lubricate car gate tracks, pivots, hangers, car grille, and stile channels.

5. Selector - Clean, adjust, and lubricate brushes, dash pots, traveling cables, chain, brush, pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

6. Controllers - Clean with blower; check alignment of switches, relays, timers, hinge pins, etc. Adjust and lubricate. Check all condensers, resistance tubes, grids, fuses, holders, and all controller connections.

7. Miscellaneous - Observe operation of signal and dispatching systems. Inspect drum buffers, rope clamps, slack cable switch, couplings, shafts, keyways, etc. Clean, adjust, and lubricate as necessary.

8. Emergency Light - Check operation.

9. Oil Level - Check level in oil buffer.

10. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-4: ELEVATORS, ELECTRIC (Fourth Month)

Frequency: Annual (Fourth Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, sill trips, and checking devices.

3. Selector - Clean, adjust, and lubricate brushes, dash pots, traveling cables, chain, brush, pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

4. Leveling - Clean, adjust, and lubricate leveling switches, leveling operation, hoist way vanes, and magnets or inductors.

5. Car - Clean, adjust, and lubricate car door or gate tracks, pivots, hangers, etc.

6. Machine - Inspect worm and gear backlash, thrust end play, and any bearing wear in machine.

7. Hoist way Doors - Clean, lubricate, and adjust tracks, hangers, and up-thrust.

8. Pit - Lubricate compensating sheave; inspect hitches; check oil level in buffers; inspect governor and tape tension sheave fastenings; empty and clean oil drip pans.

9. Sheaves - Inspect sheaves to ensure they are tight on shafts. Sound spokes and rim with hammer for cracks.

10. Miscellaneous - Observe operation of signal and dispatching systems. Inspect compensating chain hitches, drum buffers, rope clamps, slack cable switch, couplings, shafts, keyways, etc. Clean, adjust, and lubricate as necessary.

11. Emergency Light - Check operation.

12. Oil Level - Check level in oil buffer.

13. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-5: ELEVATORS, ELECTRIC (Fifth Month)

Frequency: Annual (Fifth Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, fastenings, checking devices, and sill trips. Observe operation of checks, interlocks, etc. Adjust as necessary.

3. Selector - Clean, adjust, and lubricate brushes, dash pots, traveling cables, chain, brush and pawl magnets, wiring, contacts, relays, tape drive, broken tape switch, and traveling nut and gears.

4. Car - Clean, adjust, and lubricate car door or gate tracks, pivots, hangers, etc.

5. Ropes - Inspect all fastenings and ropes for wear and lubrication. Inspect all rope hitches and shackles and equalize rope tension.

6. Hall - Inspect hall button contacts, springs, and wiring. Clean and lubricate.

7. Motors and Generators - Clean all commutators; renew or reseat brushes if necessary.

8. Miscellaneous - Observe operation of signal and dispatching systems. Inspect drum buffers, rope clamps, slack cable switch, couplings, shafts, keyways, etc. Clean, adjust, and lubricate as necessary.

9. Emergency Light - Check operation.

10. Oil Level - Check level in oil buffer.

11. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-6: ELEVATORS, ELECTRIC (Sixth Month)

Frequency: Annual (Sixth Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, sill trips, and checking devices.

3. Selector - Clean, adjust, and lubricate brushes, dashpots, traveling cables, chain, brush and pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

4. Car - Test alarm bell and communication system. Clean, adjust and lubricate car gate tracks, pivots, hangers, etc. clean light fixture. Test emergency switch. Inspect, clean, and adjust retiring cam devices, chain, dashpots, commutator, brushes, cams, pivots, fastenings, etc. Inspect safety parts, pivots, set-screws, and switches. Check clearance of car and safety shoes; adjust as necessary. Test all safety devices. Check car enclosure steadying plates. Inspect stile channels for bends or cracks, also car frame, cams and supports. Inspect gate up - thrust, sill grooves, bottom guides, etc. Clean and adjust as required. Lubricate moving parts or door or gate, pivot points, sheaves, guides, and track.

5. Miscellaneous - Observe operation of signal and dispatching systems. Inspect drum buffers, rope clamps, slack cable switch, couplings, shafts, keyways, etc. Clean, adjust, and lubricate as necessary.

6. Emergency Light - Install new dry cell battery, and check operation.

7. Oil Level - Check level in oil buffer.

8. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-7: ELEVATORS, ELECTRIC (Seventh Month)

Frequency: Annual (Seventh Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, sill trips, and checking devices.

3. Selector - Clean, adjust, and lubricate brushes, dashpots, traveling cables, chain, brush and pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

4. Leveling - Clean, adjust, and lubricate leveling switches, leveling operation, hoistway vanes, and magnets or inductors.

5. Hoistways - Examine guide rails, cams, fastening, and counterweights. Inspect and test limit and terminal switches.

6. Hoistway Doors - Clean, lubricate, and adjust tracks, hangers, and upthrust.

7. Car - Clean, adjust, and lubricate car door or gate tracks, pivots, hangers, etc.

8. Machine - Inspect worm and gear backlash, thrust end play, and any bearing wear in machine.

9. Miscellaneous - Inspect drum buffers, rope clamps, slack cable switch, coupling, shaft, keyways, etc. Clean, adjust, and lubricate. Observe operation of signal and dispatching system. Check compensating chain hitches. Lubricate indicator dials and pulleys. Clean car grille and stile channels. Check load-weighing device and dispatching time settings.

10. Emergency Light - Check operation.

11. Oil Level - Check level in oil buffer.

12. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operations. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-8: ELEVATORS, ELECTRIC (Eighth Month)

Frequency: Annual (Eighth Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate, pivot points, sill trips, and checking devices.

3. Selector - Clean, adjust, and lubricate brushes, dashpots, traveling cables, chain, brush and pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

4. Car - Clean, adjust, and lubricate car door or gate tracks, pivots, hangers, etc.

5. Motors and Generators - Clean all motor commutators; renew or reseat brushes if necessary.

6. Ropes - Inspect all fastenings and ropes for wear and lubrication.

7. Car Operation Box - Check, clean, and adjust contacts and switches; lubricate car operating box.

8. Travel Cable - Inspect insulation, hanging, and junction box connections.

9. Miscellaneous - Observe operation of signal and dispatching system. Inspect drum buffers, rope clamps, slack cable switch, couplings, shafts, keyways, etc. Clean, adjust, and lubricate.

10. Emergency Light - Check operation.

11. Oil Level - Check level in oil buffer.

12. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-9: ELEVATORS, ELECTRIC (Ninth Month)

Frequency: Annual (Ninth Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, sill trips, and checking devices.

3. Selector - Clean, adjust, and lubricate brushes, dashpots, traveling cables, chain, brush and pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

4. Controllers - Clean with blower. Check alignment of switches, relays, timers, hinge pins, etc. adjust and lubricate; check all resistance tubes and grids; check oil in overload relays, settings, and operation of overloads. Clean and inspect fuses, holders, and all controller connections.

5. Car - Test alarm bell and communication systems. Clean, adjust, and lubricate car gate tracks, pivots, hangers, etc. clean light fixture. Test emergency switch. Inspect, clean, and adjust retiring cam device, chain dashpots, commutator, brushes, cams, pivots, fastenings, etc. Inspect safety parts, pivots, set-screws, switch, etc. Check adjustment of car shoes or roller guides; adjust if necessary.

6. Emergency Light - Check operations.

7. Oil Level - Check level in oil buffer.

8. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-10: ELEVATORS, ELECTRIC (Tenth Month)

Frequency: Annual (Tenth Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, sill trips, and checking devices.

3. Selector - Clean, adjust, and lubricate brushes, dashpots, brush and pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

4. Car - Clean, adjust, and lubricate car door or gate tracks, pivots, hangers, etc.

5. Leveling - Clean, adjust, and lubricate leveling switches, leveling operation, hoistway vanes, and magnets or inductors.

6. Machine - Inspect worm and gear backlash, thrust end play, and any bearing wear in machine.

7. Hoistway Doors - Clean and lubricate tracks, chains, sheaves, hangers, check up-thrust and adjust if necessary. Fill and adjust checks. Check bottom gibs, struts, sills, headers, and fastenings. Adjust door contacts as required.

8. Pit - Inspect governor and tape tension sheave fastenings. Empty and clean drip pans. Lubricate compensating sheave and inspect hitches. Check oil level in buffers.

9. Miscellaneous - Observe operation signal and dispatching systems. Inspect drum buffers, rope clamp, slack cable switch, couplings, shafts, keyways, etc. Clean, adjust, and lubricate.

10. Emergency Light - Check operation.

11. Oil Level - Check level in oil buffer.

12. For elevators provided with Fire Fighters Service, Initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-11: ELEVATORS, ELECTRIC (Eleventh Month)

Frequency: Annual (Eleventh Month)

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Door operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, fastenings, checking devices, and sill trips. Observe operation of checks, interlocks, etc. and adjust as necessary.

3. Selector - Clean, adjust, and lubricate brushes, dashpots, traveling cables, chain, brush, wiring, contacts, relays, tape drive, broken tape switch, and pawl magnets. Inspect traveling nuts and gears for wear.

4. Ropes - Inspect all fastenings and ropes for wear and lubrication. Check all ropes, hitches, and shackles; equalize rope tension.

5. Car - Clean, adjust, and lubricate car gate tracks, pivots, hangers, etc.

6. Motors and Generators - Clean all commutators. Renew or reseat brushes if necessary.

7. Miscellaneous - Observe operation of signal and dispatching systems. Inspect drum buffers, rope clamps, slack cable switch, coupling, shafts, keyways, etc. Clean, adjust, and lubricate.

8. Emergency Light - Check operation.

9. Oil Level - Check level in oil buffer.

10. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-12: ELEVATORS, ELECTRIC (Twelfth Month)

Frequency: Annual (Twelfth Month)

Special Instructions: Review manufacturer's instructions.

1. Door Operation - Check keys, set-screws, contacts, chains, and cams. Clean, lubricate, and adjust brake, checks, linkages, gears, wiring, and motor.

2. Door Closer - Clean, adjust, and lubricate pivot points, sill trips, and checking devices.

3. Selector - Clean, adjust, and lubricate brushes, dashpots, traveling cables, chain, brush and pawl magnets, wiring, contacts, relays, tape drive, and broken tape switch.

4. Guides - Lubricate wheel bearings (roller guides) as necessary.

5. Car - Clean, adjust, and lubricate car gate tracks, pivots, hangers, etc. Test alarm bell and communication system. Clean light fixture. Test emergency switch. Inspect safety parts, pivots, set-screws, and switch. Check adjustment of car shoes or roller guides. Inspect stile channels for bends or cracks, also car frame, cams, and supports. Inspect gate or door up-thrust, sill grooves, and bottom guides. Check pivot points, sheaves, guides, and tracks for wear.

6. Miscellaneous - Inspect drum buffers, rope clamps, slack cable, switch, coupling, shafts, keyway, etc. Clean, adjust, and lubricate. Observe operation of signal and dispatching system.

7. Emergency Light - Install new dry cell battery and check operation.

8. Oil Level - Check level in oil buffer.

9. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-13: ELEVATORS, HYDRAULIC (Monthly)

Frequency: Monthly

Special instructions: Review manufacturer's instructions.

Checkpoints:

1. Observe operation of elevator throughout its full range and at all floors it serves to test controls, safety devices, leveling, re-leveling, and other devices. If creeping is excessive, determine cause and correct it.

2. Check opening and closing of doors, gates, the indicators in cab, and at each floor.

3. Inspect interior of car. Test telephone, normal and emergency lights, fan, emergency call system certificate and holder, control panel, emergency light, etc.

4. Inspect hoistway and pit. Clean and lubricate equipment as required.

5. Test mechanism. Observe operation of motor and pump, oil lines, tank, controls, plunger, packing; check oil level, etc.

6. Test manual and emergency control.

7. Report any needed work you cannot do.

8. For elevators provided with Fire Fighters Service, initiate Phase I Recall and operate to at least two floors under Phase II Operation. Log results of this test on reverse of route sheet.

GUIDE NUMBER L-14: ELEVATORS, HYDRAULIC (Annual)

Frequency: Annual

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Thoroughly clean the mechanism, hoistway, pit, top and bottom of cab, etc.

2. Make annual inspection and test.

3. If possible, the above shall coincide with required USPS annual inspection of the elevators and issuance of Form 279, Certificate of Inspection.

GUIDE NUMBER L-15: ESCALATORS (Weekly)

Frequency: Weekly

Checkpoints:

1. Ride escalator. Check operation for smoothness, unusual vibration or noise, condition of handrails, etc.

2. Inspect camp plates at both ends of escalator for broken teeth and check for proper clearance between combs and step treads. Check for broken step treads.

3. 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.

4. Clean escalator machine space.

5. 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.

6. Check motor for signs of overheating.

7. Inspect controller for loose leads, burned contacts, etc. Repair as required.

8. Clean handrails as required.

9. Check escalator lighting. Replace bulbs as required.

GUIDE NUMBER L-16: ESCALATORS (Annual)

Frequency: Annual

Checkpoints:

1. Set up barricades and signs directing people to stairs or elevators. Spread tarps on floor at lower end of escalator.

2. Remove steps as required to provide clear access to escalator pan, and place steps on tarp.

3. Starting in the machine space, thoroughly clean escalator, working from top to bottom.

4. Clean all tracks and check for wear or rippling. File tracks if required. Check all step and chain rollers. Adjust step and chain roller up-thrust as required. Adjust transfer bars or guides, or replace as necessary.

5. Remove upper panel on each side of escalator, taking care not to scratch or gouge panel. Check handrail tension device and handrail drive assembly. Adjust and lubricate as required.

6. Check operation of all safety devices including skirt switches, handrail switches, broken chain switches, lower unit tension devices, etc.

7. Up-thrust Safety Switches:

    a. Open and lockout the main disconnect.

    b. Clean all four up-thrust safety switches.

    c. Connect a circuit continuity tester, such as an ohmmeter, across the safety control circuit. Operate each switch and note if continuity is lost.

    d. Lift up on the riser of the step located on the lower curve so that the step contacts the up-thrust track. Determine that the safety circuit continuity is broken and is re-established when the step riser is released. This will confirm the mechanical integrity of the up-thrust device as well as its electrical function within the electrical control circuit.

8. Follow manufacturer's recommendations for lubrication.

9. Perform annual work as prescribed by the manufacturer.

10. Reassemble entire unit, thoroughly cleaning steps. Check for broken treads as steps are replaced. Check entire unit for proper running clearances. Re-shim steps as required.

11. Submit condition report to supervisor listing any major repairs required so that needed parts can be ordered and work scheduled.

GUIDE NUMBER L-17: ELEVATORS, SIDEWALK (Monthly)

Frequency: Monthly

Special Instructions: Review manufacturer's instructions. Use suitable barricade for sidewalk opening.

Checkpoints:

1. Operate elevator through full range and at the levels served to test controls, safety devices, leveling, re-leveling, and other devices. If creeping is excessive, determine cause and correct.

2. Inspect opening and closing of sidewalk doors. Clean cam(s), moving parts, hoistway, pits, etc. Lubricate as required.

3. Test emergency stop switch and signal bell or alarm.

4. Examine operating mechanism, motor, motor controls, pump, oil lines, valves, tanks, etc.

5. Report any deficiencies found during scheduled maintenance.

GUIDE NUMBER L-18: WINDOW WASHING SCAFFOLD, POWER OPER (Quarterly)

Frequency: Quarterly

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Inspect structural features on roof. Remove any 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/or emergency controls, handcrank, motor disengagement, brakes, and other devices. Adjust as necessary.

7. Inspect fresh water and wash water tanks, pipe lines, drains, inspection or access opening and covers, etc. Tanks should be emptied and washed out after use.

8. Test operation of scaffold from low to high position and along track to assure safe operation and test operation of all control devices, limits, interlocks, etc.

9. Inspect hoist ropes for worn, frayed, or broken strands.

10. Perform any work prescribed by manufacturer that is not indicated here.

11. Perform lubrication.

12. Clean, wire brush, and touch up paint as required.

GUIDE NUMBER L-19: DUMBWAITERS (Quarterly)

Frequency: Quarterly

Special Instructions: Refer to manufacturer's literature. Open and tag electric circuits.

Checkpoints:

1. Inspect and clean hoist way. Remove trash from pit.

2. Examine sheaves, cable, counter-weight, 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, paint condition, etc.

4. On band-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. Comply with lubrication scheduled.

8. Report all deficiencies and needed repairs.

GUIDE SET M

GUIDE NUMBER M-1: AIR COMPRESSORS

Frequency: Annual

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Test the pressure gauge(s) and cutout and cut-in pressure. Use test gauge to test accuracy of gauge on machine. Gauge should be within 10%.
2. Check safety valve.
3. Tank to be inspected and tested by qualified inspector.
4. On two-stage compressor(s), check intermediate pressure.
5. Listen for knocks and inspect for mechanical failures. Report any leaks to supervisor.
6. Test compression; correct or repair as necessary.
7. On water-cooled compressor(s) check for encrustation or excessive corrosion.
8. Clean moisture traps in system. Check operation of timed-moisture-release system, if so equipped.
9. Change oil in crankcase.
10. Check controls, belts, pulleys, alignment, etc.
11. Check air-cooled heat exchanger.
12. Check motor, bearings, starting switches, controller, pressure switches, etc.
13. Clean equipment. Touch up or repaint as required.
14. Comply with lubrication schedule.

GUIDE NUMBER M-2: LAWNMOWERS AND EDGERS

Frequency: Every 50 Operating Hours

Application: Gasoline-powered, hand-operated, rotary mowers, and edgers.

Maintenance should be scheduled after every 50 hours of operation or twice a season. Routine daily lubrication should be accomplished by operator.

Checkpoints:

1. Change engine oil (Oil should be changed and gasoline drained at end of season prior to laying up unit 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.

GUIDE NUMBER M-3: SWEEPERS (GASOLINE)

Frequency: Every 50 Operating Hours

Special Instructions: Review manufacturer's maintenance recommendations.

Application: Gasoline or gas powered riding type sweepers used in driveways, parking lots, sidewalks, etc. Daily lubrication should be accomplished by the operator.

Checkpoints:

1. Change oil and change or clean filter, as appropriate, 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. Inspect entire unit. Make or report needed repairs.

GUIDE NUMBER M-4: TANKS, FUEL OIL STORAGE

Frequency: Every 4 Years

Checkpoints:

1. Prior to end of heating season, adjust oil deliveries so oil will be nearly consumed.

2. Remove manhole.

3. Pump oil tank down to within 6" of bottom of tank.

4. Pump sludge from bottom of tank. Flush and dispose of by approved method. A vacuum truck may be required to remove and dispose of sludge.

5. Disconnect heating coil. Remove from tank and clean.

6. Examine tank for leaks.

7. Clean and adjust oil transfer pumps (oil - or steam-driven).

8. Examine, clean, and adjust operation of strainers, traps, control valves, oil-flow meter, oil temperature, and pressure gauges.

9. If a worker must enter tank; test for oxygen deficiency and supply proper respirator as needed. Safety harness must be worn and an observer shall be present outside tank at all times while worker is inside tank.

GUIDE NUMBER M-5: PAPER BALERS

Frequency: Annual

Special Instructions: Open and tag electric switches.

Checkpoints:

1. Dust or wipe clean all parts of machine. Examine structural features.

2. Blow out electric motor. Inspect 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 recommended by manufacturer.

5. Adjust operating mechanism.

GUIDE NUMBER M-6: INCINERATOR

Frequency: Annual

Checkpoints:

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 firebrick.

5. Examine all doors, inspect and/or clean out ports. Ensure doors and clean out ports 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 damages or missing insulation.

12. Inspect stack or chimney for holes, cracks, or deterioration.

13. Inspect spark arrestor or screen on top of stack. Repair holes or replace.

14. Touch up or paint as required.

GUIDE NUMBER M-7: DOORS, POWER OPERATED

Frequency: Semiannual

Application: Warehouse or large overhead doors.

Special Instructions: Review manufacturer's instructions.

Checkpoints:

1. Inspect general arrangement of door and mechanism, mountings, guides, wind locks, anchor bolts, counterbalances, weather stripping, etc. Clean, tighten, and adjust as required.

2. Operate with power from stop to stop and at intermediate positions. Observe performance of various components, such as brake, limit switches, motor, gear box, etc. Clean and adjust as needed.

3. Check operations of electric eye, treadle, or other operating devices.

4. Check manual operation. Note brake release, motor disengagement, functioning or hand pulls, chains, sprockets, clutch, etc.

5. Examine motor, starter, push button, etc. Blow out or vacuum if required.

6. Inspect gear box. Change or add oil as required.

7. Perform required lubrication.

8. Clean unit and mechanism thoroughly. Touch up paint where needed.

GUIDE NUMBER M-8: DOOR, POWER-OPERATED MAIN ENTRANCE AND DOCK

Frequency: Quarterly

Checkpoints:

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 operating of actuating and safety mats, door speed, and checking functions.

3. Check manual operation.

4. Inspect power unit, add oil, and tighten hydraulic lines as required.

5. Check operation of control board relays. Clean, replace, and adjust contacts as required.

6. Inspect door operating unit, tighten lines, and adjust as required.

7. Clean and lubricate door pivot points.

8. Report any needed repairs.

GUIDE NUMBER M-9: DOORS, MAIN ENTRANCE

Frequency: Semiannual

Application: Entrance doors used in main entries to buildings where a poorly operating door may be dangerous and cause congestion.

Checkpoints (for hinged doors):

1. Inspect the frame and supporting structure.

2. Inspect hardware: hinges, latch keeper, lock, etc. Apply graphite where needed; wipe off excess.

3. Inspect glass, putty, or retaining pieces. Correct any deficiencies.

4. Operate door to observe functioning of check. Adjust and service as needed.

5. Touch up paint as needed.

Checkpoints (for revolving doors):

1. Remove obstructions and clean out track.

2. Fold door. Note action and freedom of motion.

3. Inspect locking device; adjust as needed.

4. Clean pivot points and apply graphite.

5. Inspect felt or rubber seals. Report needed repairs.

6. Touch up paint as required.

GUIDE NUMBER M-10: LOADING RAMPS, ADJUSTABLE

Frequency: Quarterly

Special Instructions: Disconnect, lock, and tag switch out. Review manufacturer's instructions.

Checkpoints:

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, pushbuttons, 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.

5. For electromechanical units:

    a. Clean and inspect coupling, reduction gear, sprockets, 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. Ensure that 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.

GUIDE NUMBER M-11: FIRE DOORS - STAIRWELLS AND EXITWAYS (SWINGING)

Frequency: Quarterly

Checkpoints:

1. Remove all hold-open devices except approved smoke or magnetic operated releases.
2. Check hang and swing for close fit. Doors must latch on normal closing cycle and have a neat fit.
3. Remove any obstructions that retard full swing or movement of door.
4. Test operation of panic hardware.
5. Inspect door coordinates on pairs.
6. Check operation of any special devices such as smoke detectors or magnetic door releases.
7. Inspect door for damage.

GUIDE NUMBER M-12: FIRE DOORS - SLIDING TYPE

Frequency: Quarterly

Checkpoints:

1. Clean track.
2. Lubricate all pulleys.
3. Inspect for damage, worn and binding cable or chain, and proper threading through pulleys.
4. Replace fusible links and other heat-actuated devices that have been painted. Check operation of heat-actuated devices other than fusible links.
5. Replace damaged or stretched cables or chains. Adjust to proper length.
6. Check counterweight for proper suspension.
7. Operate door by disconnecting or lifting counterweight, or by other appropriate means.
8. Check for proper fit in binders and tight fit of wedge against stay roll. Inspect stay roll for wear.
9. Check for breaks in face covering of doors.
10. Examine tin-clad and Kalamein doors for dry rot.
11. Inspect all hardware for damage or wear.

GUIDE NUMBER M-13: STATIONARY PACKERS

Frequency: Weekly

Checkpoints:

1. Observe all safety precautions. Shut off all electrical power before performing activities listed below.
2. Oil shaft bearing under packer with #10 oil.
3. Lubricate container roller fittings in axle.
4. Oil all moving joints on container door latch with #10 oil.
5. Oil all container door hinges with #10 oil.
6. Oil tie rod (Lock Hook) with #10 oil. Inspect condition of cotter pins.
7. Wipe clean and apply heavy grease along top slide.
8. Wipe clean and apply heavy grease throughout length of slide channel.
9. Inspect cotter pins, closed end of packer cylinder. Look for signs of worn or broken cotter pins.
10. Insure all dirt and debris have been cleared from under and around carriage of compaction unit.
11. Check open-end packer cylinder mounting pin.

GUIDE NUMBER M-14: STATIONARY PACKERS

Frequency: Monthly

Checkpoints:

1. Observe all safety precautions. Shut off current before performing activities listed below.
2. Remove breather cap on oil tank. Clean breather holes and replace cap. Do not press on so tightly as to block air passage.
3. Inspect mounting hardware on side and bottom slides. Check for lost or broken cotter pins and loose belts.
4. Check and tighten mounting hardware on scraper bar.

GUIDE NUMBER M-15: STATIONARY PACKERS

Frequency: Quarterly

Checkpoints:

1. Observe all safety precautions. Shut off all electrical power before performing activities listed below.
2. Check hydraulic oil for proper level and presence of contamination. Add or change oil as required.
3. Remove, clean, or replace oil filter.
4. Grease the grease hole coupling.

GUIDE NUMBER M-16: SWEEPERS, ELECTRIC (BATTERY)

Frequency: Monthly

Checkpoints:

1. Check battery for correct water level. Add water if required.
2. Check battery terminals and cable clamps for corrosion and looseness.
3. Check hydraulic pump, hoses, lines, fittings, etc. for noise, leakage, and damage.
4. Check condition of tank and dust filter. Clean filter in solvent as necessary.
5. Check belts and chains for proper tension, wear, alignment, and general condition.
6. Check operational controls for proper operation.
7. Check dust skirts for proper adjustment.
8. Check hydraulic fluid and add lubricant #HY-2 as required. Replace filter as necessary.
9. Follow manufacturer's instructions regarding preventive maintenance.

GUIDE NUMBER M-17: POWER LIFTS

(Vert-A-Lift, etc. or other lift devices used in building maintenance)

Frequency: Monthly

Special Instructions: Daily battery charging, cleaning, and minor maintenance shall be done by personnel using the lift.

Checkpoints:

1. Visually check for needed repairs, leaks, etc.

2. Check battery water level and specific gravity.

3. Check electrical terminals. Tighten and clean as required.

4. Check and tighten critical structural bolts.

5. Lubricate in accordance with manufacturer's instructions.

GUIDE NUMBER M-18: FLOOR SCRUBBER, AUTOMATIC

(Battery-powered scrubber vacuum)

Frequency: Monthly

Special Instructions: The daily charging of the batteries shall be done by the operator.

Checkpoints:

1. Check condition and adjustment of squeegee brushes, etc. and replace as needed.

2. Check electrical terminals. Clean and renew as needed.

3. Check the specific gravity of battery electrolyte and replace to determine that batteries are good and being properly charged.

4. Visually check machine for need of repairs, leaks, etc.

5. Lubricate in accordance with manufacturer's instructions.

GUIDE NUMBER M-19: SNOW BLOWER, WALKING TYPE

Frequency: Every 50 hours

Application: Gasoline-powered, walk-behind type. Maintenance should be scheduled every 50 hours of operation. Routine daily lubrication should be accomplished by the operator.

Checkpoints:

1. Change engine oil. (Oil should be changed and gasoline drained at end of season prior to storage).

2. Service air and fuel filters.

3. Check for rust and apply paint or preservative as appropriate.

4. Clean and gap or replace spark plug.

5. Inspect for proper adjustment and operation.

GUIDE NUMBER M-20: LOAD LEVELERS

Frequency: Quarterly

Application: This is for below-grade units that raise or lower the truck to match the dock.

Safety: When working in pit, lock and tag electric controls, place barricades signs around entrance, and use a 4x4 timber or other device to block unit.

Checkpoints:

1. Check all moving parts for signs of wear and looseness.
2. Check and secure all connecting pins, nuts, rollers, and retaining rings.
3. Wrench test all set screws.
4. Clean trash and dirt from pit area.
5. Wipe ram with soft cloth and solvent.
6. Clean dirt buildup from motor, hydraulic pump, frame, and housing.
7. Lubricate moving parts as required.
8. Check oil in reservoir for proper level and condition. Change oil when needed. In large units, laboratory analysis of oil sample may be required annually to determine if oil needs changing.
9. Clean up, remove all tools, and check operation of unit.

GUIDE NUMBER M-21: DOCK BOARDS

Frequency: Monthly

Safety: Block dock boards in up position with a 4X4 timber. This timber shall be especially prepared (cut to the correct length) for this purpose and placed securely under the board.

Checkpoints:

1. Clean trash and dirt from pit.
2. Check clevis pins for wear and presence of clevis pin retainers.
3. Check springs and cable for wear.
4. Lubricate moving parts as required.
5. Check for proper operation.

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GUIDE SET P

GUIDE NUMBER P-2: FIRE CONTROL VALVES FOR WATER DISTRIBUTION SYS

Frequency: Annual

NOTE: Some states require specific training and licensing for persons installing and maintaining sprinkler systems. Therefore, comply with local codes.

Special Instructions: The work required by this procedure can cause the activation of an alarm and/or a supervisory signal. The building manager and the control center or fire department that will receive the alarm and/or signal must be notified prior to start of work. When a valve is left unattended in a position that will interrupt fire protection water supply, it must be tagged in accordance with Section 10. Most fire system control valves are normally in the open position. If a valve is found closed at the time of the inspection, confirmation must be obtained through the building manager's office on the correct normal valve position. This work should be done when other scheduled maintenance is being performed that involves water flow through valve(s).

Checkpoints:

1. Remove any obstructions to easy accessibility of valve.

2. Determine that safe ladders or access ways are in place where needed.

3. Inspect for damage to valve or accessories, including tamper locking devices.

4. Determine that valve is properly identified.

5. Ensure non-rising stem and underground valves are marked with direction in which to open. If not, permanently mark the valve with proper direction to open.

6. Lubricate outside stems, and other friction points used for operating the valves.

7. Remove any tamper locking devices and completely close (or open) valves. Check that water flow has ceased when valve is closed.

8. Inspect for leaks.

9. Reopen (or close) valve and check for leaks at stem and joints.

10. Replace tamper seals or locks.

GUIDE NUMBER P-3: FIRE EXTINGUISHER, PORTABLE, STORED-PRESSURE

Frequency: Annual

Special Instructions: This maintenance is a thorough examination for deficiencies requiring repair or replacement. Deficiencies must be repaired or the extinguisher replaced. Hydrostatic test must be performed on damaged or corroded shells. Extinguishers removed from service must be immediately replaced with one of suitable extinguishing capabilities. The monthly inspection must be performed at the same time this maintenance is performed. Unless otherwise indicated, this guide is applicable to stored-pressure type extinguishers, with or without pressure gauge, regardless of the extinguishing agent used, e.g., multipurpose dry chemical, Halon, carbon dioxide (C02), etc. See Guide P-5 for additional requirements. Review HBK MS-56 for additional information on fire extinguishing equipment.

Checkpoints:

1. Read the Form 4705 inspection tag and note if hydrostatic testing is required before the next annual maintenance. Report those due for testing to maintenance supervisor or control office for accomplishment before due date. See HBK MS-56 for test frequency.

2. Inspect the shell for corrosion, mechanical damage (denting or abrasion), paint condition, presence of repairs (welding, soldering, brazing, etc.), and broken hanger attachment concealing surface damage (nicks or corrosion).

3. Inspect the nameplate for illegible wording, corrosion, and loose plate. Replace labels with the new, pictographic type. See HBK MS-56, Section 442.

4. Inspect the nozzle for damage, deformation, cracks, blocked openings, damaged threads (corroded, cross-threaded, or worn), and aging (brittleness).

5. Inspect hose assembly for damaged hose (cut, cracked, worn, or plugged), damaged couplings or swivel joint (cracked or corroded), damaged threads (corroded, cross threaded or worn), and inner tube cut at couplings.

6. Ensure the valve-locking device is in place and inspect for damage (bent, corroded, or binding).

7. If extinguisher has a pressure gauge, tap gauge lightly to determine if pointer is stuck or jammed. Inspect for missing pointer; missing, deformed, or broken crystal; illegible or faded dial; corrosion, dented case, and damaged crystal retainer. Read gauge. If not in operating range, remove, replace, and submit extinguisher for recharging or hydrostatic test.

8. If extinguisher is a non-gauge type, inspect for immovable or corroded pressure-indicating stem.

9. For C02 and Halon fire extinguishers, weigh the extinguisher and compare to gross or full weight stamped on shell body. If underweight more than 10%, it must be recharged; if other evidence of damage exists, test hydrostatically.

10. Ensure that seal or tamper indicator is not missing or broken. Replace extinguisher if seal or tamper indicator is missing or broken.

11. Complete the applicable portions of Form 4705, Fire Inspection Tag.

GUIDE NUMBER P-4: FIRE EXTINGUISHER, PORTABLE, GAS C02 – CARTRIDGE

Frequency: Annual

Special Instructions: This maintenance is a thorough examination for deficiencies requiring repair or replacement. Do not operate any extinguisher if either the shell or cartridge shows signs of mechanical damage or corrosion. The cartridge must be removed and depressurized prior to disposal. Hydrostatic test must be performed on damaged or corroded shell (see Guide P-5). Deficiencies must be repaired or the extinguisher replaced. An extinguisher removed from service must be immediately replaced with one of suitable extinguishing capabilities. The monthly inspection must be performed at the same time this maintenance is performed. This guide is applicable to gas (C02) cartridge type dry chemical extinguishers. Review HBK HS-56 for additional information on fire extinguishing equipment.

Checkpoints:

1. Inspect for dents, broken hanger attachments or handle, corrosion at seams, damaged threads, and legible operating instructions. Replace in accordance with HBK MS-56, Section 442.

2. Check for signs of damage or tampering. If seal is broken, remove cartridge and check actual weight versus gross weight stamped on cartridge. Replace any cartridge that has lost its gas. (Weigh replacement cartridge.) Refill shell to proper level with extinguishing agent.

3. Inspect for damaged, jammed, bent, or corroded puncture lever, pin, and fastener on puncture mechanism for gas cartridges.

4. Inspect valves and carrying handles for corroded or damaged handles, springs, stems, fasteners, joint, threads, and jammed levers.

5. Replace cracked, cut, or brittle hose, nozzle, or horn and damaged couplings. Remove obstructions in nozzle, horns, or hose. Check for leaks.

6. If necessary, replace seal or tamper indicator if no other deficiencies exist.

7. Complete the applicable portions of Form 4705, Fire Inspection Tag.

GUIDE NUMBER P-5: HYDROSTATIC TESTING OF PRESSURE AND CARTRIDGE

Frequency: 5 Years (Except as noted below)

Special Instructions: Hydrostatic testing of extinguishers requires experienced personnel and suitable testing equipment. Adequate facilities must be provided. Fire extinguishers must be tested and recharged by a commercial firm. Review HBK MS-56. Determine if an extinguisher can be replaced with a new one at less expense. Test frequency for extinguishers with brazed-brass or mild-steel shells is every 12 years.

Checkpoints:

1. Operate stored pressure and cartridge type extinguisher and check performance.

2. Dismantle and remove all traces of extinguishing agent (dry chemical or dry powder) from inside of shell and hose assembly.

3. Insert plug into shell opening (External cartridge type extinguishers only).

4. Fill with water and connect the test pump.

5. Secure shell in protective cage and apply proper test pressure. Pressure to be applied at rate so test pressure is reached within one minute.

Factory Test Pressure (Shown on Nameplate)	Hydrostatic Test Pressure
350 PSI or greater	The larger of 300 PSI or 75% of Factory Test Pressure
Less than 350 PSI	75% of Factory Test Pressure

6. Observe shell and gauge for any distortion or leakage. After 1 minute, release pressure. Destroy shells that fail this test.

7. All dry chemical and dry powder extinguishers must have all traces of water removed from extinguishing agent, shell, hose, and nozzle. A heated air stream is recommended with its temperature not exceeding 150 degrees Fahrenheit.

8. Weigh replacement cartridge to ensure that it is full of gas.

9. Recharge extinguisher according to manufacturer's instructions.

10. Affix permanent record, Form 4705 or equivalent, on extinguisher with year of hydrostatic test.

GUIDE NUMBER P-6: FIRE EXTINGUISHING SYSTEMS, FIXED

Frequency: Semiannual

Special Instructions: The work required by this procedure can cause the activation of an alarm and/or a supervisory signal. The maintenance manager and control center or the fire department that will receive the alarm or signal must be notified prior to start of work. When replacement cylinders are received from supplier, verify that hydrostatic test date is current. This guide is applicable to all fixed C02 and Halon systems unless otherwise indicated.

Checkpoints:

1. Check cylinder for the date of the last hydrostatic test (date stamped on cylinder).

2. Replace those cylinders for hydrostatic testing if the elapsed time exceeds the test interval specified in HBK MS-56 for the specific extinguisher type.

3. Weigh remaining cylinders. Replace for repair and/or recharging those Halon cylinders that show a net weight loss in excess of 5% or pressure loss of more than 10%. Replace for repair or recharging those C02 cylinders that show a net weight loss in excess of 10% or a pressure loss of more than 10%.

4. Check entire system for evidence of leaks.

5. Verify all devices (manual pull stations, detectors, abort switches, valves, etc.) are suitably protected to prevent damage which would cause them to be inoperative.

6. Verify all warning and instruction signs installed at entrances, inside protective areas, and near operating devices are current and in usable condition

7. Test system according to manufacturer's instructions.

8. Check for proper alarm and signal operation.

GUIDE NUMBER P-7: GREASE TRAPS

Frequency: Monthly

Special Instructions: Use appropriate protective clothing, especially safety glasses.

Checkpoints:

1. Clean out trap and sterilize.

2. Inspect for clogging, scale, and improperly positioned or missing harries.

3. Tighten loose parts as necessary.

GUIDE NUMBER P-9: MANHOLES, SEWER

Frequency: Quarterly

Special Instructions: Wear suitable protective clothing.

Checkpoints:

1. Remove cover.
2. Observe flow.
3. Examine structural features of sewer line, interior of manhole, manhole frame, and cover, etc.
4. Touch up paint as required.
5. Report any deficiencies or needed repairs.

GUIDE NUMBER P-10: SEWAGE EJECTORS (PNEUMATIC TANK EJECTORS)

Frequency: Annual

Special Instructions: Lockout ejector. Review manufacturer's instructions.

Checkpoints:

1. Remove cover plates, inspect check valves in compressor discharge lines, and suction and discharge lines of sewage pot. Check freedom of motion and wear on clapper or clapper seat.
2. Remove sewage pot inspection plate. Inspect and clean float ball or bucket and rod.
3. Inspect float assembly linkage, shaft; keys, keyways; look for wear, binding, etc.
4. Change oil in immersed float switch. Check packing.
5. Remove any obstructions from water line. Check strainer.
6. Check solenoid valve for freedom of motion.
7. Stop all leaks.
8. Remove cover plate of separator in vent line. Remove any obstructions in vent.
9. Slide valve and piston valve (if applicable). Examine linkage for freedom of motion and excessive wear; replace or adjust as required.
10. For rotary air compressors, check shaft packing. Repack if needed.
11. Change lubricant, flush, and replenish.

12. Examine mounting bolts alignment, etc. Adjust or tighten as necessary.
13. Inspect, lubricate, pack, or re-service all valves as required.
14. Examine motor, controls, starter, etc. Clean and lubricate as necessary.
15. Clean and touch up or repaint as required.
16. Clean up area. Remove tags and restore to service.
17. Observe operating cycle time. Blowing period should be 30 to 60 seconds.

GUIDE NUMBER P-11: SUMP PUMPS

Frequency: Annual

Checkpoints:

1. Pump out and remove pit sediment.
2. Inspect and clean strainer.
3. Flush pit and wipe pump down.
4. Repack (if required) and lubricate pumps.
5. Check bail, float, rod, and guides.
6. Inspect motor, switch, controls, etc. Clean, adjust, and lubricate as required.
7. Check pump operation; observe operation of check valve(s).
8. Inspect piping, pipe supports, etc.
9. Touch up paint as required.
10. Clean up area.

GUIDE NUMBER P-12: TANKS, WATER (ALL TYPES)

Frequency: Every 3 Years

Checkpoints:

1. Examine exterior of tank, including fittings, manholes, and hand-holes, for leaks or signs of corrosion. Correct as indicated.
2. Drain and flush tank.
3. Open tank and remove rust, scale, and buildup by scraping, wire brushing, or shot cleaning.

4. Inspect thoroughly the interior of the tank; record the size and depth of pits, presence of cracks, and condition of openings, fittings, welds, rivets, and joints.

5. Coat with epoxy or other approved protective coatings.

6. Inspect structural supports and repair or replace damaged insulation or covering.

7. Clean, test, and inspect sight glasses, valves, fittings, drains, and controls.

8. Touch up or repaint exterior of covering as required.

9. Perform hydrostatic test if required by inspector. Hydrostatic test shall be supervised by qualified pressure vessel inspector.

10. Fill and return to service.

GUIDE NUMBER P-13: VALVES, REGULATING

(Steam valves at pressure reduction stations)

Frequency: Annual

Application: Single or double seated; diaphragm or spring loaded, pilot operated valves.

Checkpoints:

1. Clean strainer ahead of valve.

2. Check valve head and seats for wear or cuts.

3. Replace valve if seats need regrinding and have valve overhauled by manufacturer.

4. Examine steam quality for foreign matter if valves are damaged.

5. Examine pilot lines for dirt.

6. Check steam gauges.

7. Check diaphragms for failures.

8. Check binding valve stem.

9. Adjust weighted lever or spring control tension.

GUIDE NUMBER P-14: VALVES, MANUALLY OPERATED (Main line or critical)

Frequency: Main line or critical: Annual; Other over 2 inches: 5 Years

Application: For valves other than those used on Fire Protection systems. Maintenance for valves used on fire protection systems is described under the appropriate guide for the specific item of fire protection equipment.

Checkpoints:

1. Exercise valve from one limit to the other (fully open to fully closed) to test freedom of motion. Lubricate stem and moving parts with graphite.

2. Determine if valve seats and holds properly.

3. Check packing gland, adjust, and lubricate. Repack as required.

4. For valves equipped with wheel and chain for remote operation, check for freedom of motion.

GUIDE NUMBER P-15: VALVES, MOTOR OPERATED

Frequency: Annual

Checkpoints:

1. Clean unit and examine 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. Apply graphite to moving parts of valve.

5. Lubricate motor and gear box as necessary.

6. Inspect contacts, brushes, motor controls, switches, etc. Clean and adjust as necessary.

GUIDE NUMBER P-16: BACKFLOW PREVENTERS

Frequency: Annual

Equipment Required For Test

Differential Pressure Gauge Test Kit

Purpose of Test

To test the operation of the differential pressure relief valve and the check valves.

Test Differential Relief Valve

The differential relief valve must operate to keep the zone between the two check valves at least 2 PSI less than the supply pressure.

1. Bleed all air from check valves.

2. Close Valve B on the discharge side of the backflow preventer.

3. Connect the "hip" side of the differential pressure gauge to test cock #2 and the "low" side to test cock #3.

4. Open test cocks #2 and #3.

5. Slowly open the bypass valve #1 until the differential gauge needle starts to drop. Hold the bypass in this position and observe the reading on the gauge when the first discharge is noted from relief valve. The differential pressure at the time the relief valve opens must be at least 2 PSI.

6. Close all gauge valves.

Test Check Valve 1

The check valve must be at least 3 PSI more than relief valve opening pressure.

1. Observe the differential gauge with bypass valve #1 closed and test cocks #2 and #3 open. The gauge should remain at a reading of at least 5 PSI. If it drops below this, the check valve is leaking and must be inspected.

2. Also, the reading must be at least 3 PSI more than Relief Valve opening pressure.

Test Check Valve 2

The check valve must be tight against reverse flow under all pressure differentials.

1. Connect the "right" side of the differential pressure gauge to test cock #4 (third hose).

2. Open test cocks #2, #3 and #4. With bypass valve #1 closed and bypass valve #2 open, observe gauge reading. The differential pressure should not drop to the relief valve opening point.

Restore operation

Restore all valves and test cocks to their original positions. Note: This procedure is for a FEBCO Model 825Y Reduced Pressure Backflow Preventer. The manufacturer's instructions for the particular backflow preventer being tested must be followed.

GUIDE NUMBER P-17: STEAM TRAPS, ALL TYPES

Frequency: Annual (All types, low or high pressure)

Special Instructions: Check trap operation under steam pressure. Remove and replace faulty traps or trap elements.

1. Thermostatic Traps (Bellows or Diaphragm Type)
    a. Remove cap or bonnet.
    b. Clean interior of trap, valve, and seat.
    c. Inspect bellows or diaphragm and note by sound whether it contains liquid charge.
    d. Replace bellows or diaphragms as necessary.
    e. If valve seat is cut, replace seat.
2. Float and/or Thermostatic Traps
    a. Remove bonnet.
    b. Inspect linkage and float operation for leakage, defective operation, or deterioration.
    c. Examine, clean, and check operation of bellows as in 1 above.
3. Inverted Bucket Trap
    a. Remove bonnet.
    b. Clean interior trap.
    c. Inspect valve linkage mechanism and seating of valve.
    d. Examine condition of bucket.
    e. Examine vent or race, inlet, and outlet for evidence of corrosion.
4. Impulse Trap
    a. Remove bonnet.
    b. Inspect valve disc, inlet valve, and outlet surface.
    c. See that fulcrum point is free of dirt.
    d. Clean body of trap.

GUIDE NUMBER P-18: PUMPS, CENTRIFUGAL

Frequency: Annual

Checkpoint:

1. While pump is in operation, check performance, bearing temperature, stuffing box operation, pressure gauge, and flow indicators.
2. Shut down, lockout, and drain pump housing. Suction and discharge valves should hold.
3. Remove gland.
4. Examine shaft sleeve for wear; replace as necessary.
5. Adjust gland evenly, finger tight.
6. On pumps with oil ring lubrication, drain oil, flush, then fill to proper oil level with new oil.
7. Perform lubrication in accordance with manufacturer's instructions.
8. Clean strainers.
9. Put pump into operation. Stop and start pump. Check undue vibration noise, pressure, and action of check valve.
10. If test is satisfactory, start pump again, and adjust to slight leakage through gland.
11. When pump reaches normal operating temperatures, check pump and drive alignment.

GUIDE NUMBER P-19: RADIATORS, HEATING

Frequency: Once Every 5 Years

(Prior to heating season).

Checkpoints:

1. Remove and inspect seat of trap. Clean out trap.
2. Replace thermal element with new or tested unit.

NOTE: Replace defective seats in traps fitted with removable type.

3. Check radiator valve for free turning and seating at same time. Check packing.
4. If radiator has automatic temperature regulating valve, remove valve cover and remove dirt by vacuuming.
5. For hot water radiators, check bleed valve.
6. Check for sediment - clean if necessary.

GUIDE NUMBER P-20: ROOF, BUILT-UP

Frequency: Semiannual

Workhours per Frequency: Calculate annual work hours by using the standard times for building/components and checkpoints listed below.

Check point	Item	Time
	Review inspection materials	30 minutes per inspection
	Assemble equipment	10 minutes per inspection
1	Outside building walls	2 minutes per 100 lineal ft.
2	Inside ceiling and walls (top floor)	2 minutes per 1000 sq. ft. ceiling area(office) 1 minute per 1000 sq. ft. ceiling area(workroom)
3	Roof Perimeter	1 minute per 20 lineal ft.
4	Gutter	15 minutes per 100 lineal ft.
5	Expansion/control joints	1 minute per 20 lineal ft.
6	Roof penetrations	.5 minutes each
7	Roof drains	.5 minutes each
8	Roof Mat	5 minutes per 1000 sq. ft.

Application: This provides for the visual inspection of built up roofing system and correction of minor defects that can be repaired in fifteen minutes or less (per defect) with small tools and cold process material. Cleaning roof drains and gutters is also included.

Safety: Comply with all safety rules for working on roof-top. Check all tools and equipment for safe condition (ladders, rope safety lines, etc.). Review HBK EL-801, Supervisor's Safety Handbook.

Special Instructions: Use reduced size copy of roof plan to mark major defects and required repairs beyond the scope of this maintenance. If inspection indicates that water is entering the roof or if you have reason to believe the roof insulation is wet, request a roof moisture survey.

Checkpoints:

1. Observe condition of outside building walls for evidence of moisture penetration.

2. Observe condition of ceilings, walls, etc., on all top floors. Look for indications of leaks, damage, paint peeling, etc.

3. Walk entire outer edge of roof. Check roof edges, parapet wall, flashings, etc., for bad caulking, open joints, expansion cracks, and damage. Make minor corrections as needed.

4. Clean all trash and debris from gutters.

5. Walk entire length of expansion and control joints. Check each side closely for damage, making minor corrections as needed.

6. Check all roof penetrations for damage or problems. (Air ducts, fans, support steel, pitch pockets, etc.)

7. Clean all trash and debris from drains. Check each drain for proper drainage, tightness, gravel stop, etc. Carefully inspect roof mat around each drain.

8. Walk roof in not more than 20' wide paths removing all trash and debris. Check roof condition for 10' on either side. Check for damage, exposed roof felts, blisters, loss of flood coat or aggregate, soft spots, boils, blisters, alligatoring of bitumen, etc.

9. All locations requiring large repair will be marked by spray paint, noted on roof print, and identified by location and number. Prepare a report on condition of roof and recommended repairs.

GUIDE NUMBER P-21: DRAINS, AREAWAY, DRIVEWAY, STORM

Frequency: Semiannual

Special Instructions: Perform work in autumn after leaves have fallen, and in spring.

Checkpoints:

1. Clean drain and area leading to drain.

2. Remove debris and trash.

3. Test drain for free water flow by flushing with hose.

GUIDE NUMBER P-22: EXPANSION JOINTS IN PIPING

Frequency: Annual

Application: Slip-type joints only. (Bellows-type joints to be replaced when a leak occurs.)

Checkpoints:

1. Slip-type joint with packing gland

    a. Examine joint closely; look for evidence of displacement, loose, defective anchors or bolts, and alignment of joint with piping, guide rods, etc. Correct what can be done with pressure on. Report remaining items.

    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.

GUIDE NUMBER P-23: ALARM CHECK VALVES AND ACCESSORIES

(for wet pipe sprinkler systems)

Frequency: Annual

Special Instructions: The work required can cause the activation of an alarm and/or a supervisory signal. The field office manager and the control center or fire department that will receive the alarm and/or signal must be notified prior to start of work. If drains are not piped to outside of building, take necessary steps to prevent water damage during full flow drain test. Rate of discharge from two-inch drain may exceed capacity of floor drain. Preventive maintenance should be scheduled for the control valve (main supply) of the wet pipe sprinkler system at this time. (See Guide Number A-2). Review manufacturer's instructions.

Checkpoints:

1. Close main supply valve for the sprinkler system, then open 2" drain valve.

2. Immediately close drain valve when water pressure on incoming side of alarm check valve has dropped 10 to 20 PSI. If pressure rises within 1 minute, main supply valve is not seating properly. In such case, open drain valve and alternately open and close supply valve several times in an attempt to flush the valve seat. If not successful, supply valve needs to be repaired.

3. With both 2" drain valve and supply valve open, check operation of alarm check valve, water motor gong and its drain, and all other alarm or supervisory signals such as water flow paddle alarms pressure switches, etc.

4. When applicable, check if booster, jockey, and fire pumps equipped with automatic start are operating.

5. Perform any other steps required in manufacturer's instructions.

6. Check for proper water flow through 2" drain. If water flow is weak (considerable drop in water pressure when 2" drain is wide open), supply valves may not be fully open or there may be other piping obstructions.

7. Record the flow full drain residual pressure (lowest pressure on supply side gauge).

8. Close 2" drain.

9. Check that water flow through water motor going is stopped to ensure that clapper of alarm check valve is properly seated.

10. Record static pressure (pressure on supply side gauge).

GUIDE NUMBER P-24: DRY PIPE, DELUGE AND PREACTION VALVES

Frequency: Annual

Special Instructions: The work required by this procedure can cause activation of an alarm and/or a supervisory signal. The control center or fire department that will receive the alarm and/or signal must be notified prior to start of work. If drains are not piped to outside of building, take necessary steps to prevent water damage during full flow drain test. Rate of discharge may exceed capacity of floor drain. On pre-action and deluge valves, the associated fire detection system must also be serviced. Whenever possible, the operation of the pre-action or deluge valves should be tested by the initiation of the fire detection system using the appropriate simulated fire condition, i.e., heat or smoke. Preventive maintenance should be performed on the control valve (main supply) at the time since its functional purpose can be tested (stop water flow). See Guide Nos. P-1 and P-2. Review manufacturer's instructions.

Checkpoints:

1. Determine that legible manufacturer's maintenance instructions are posted in a convenient location near valve.

2. Trip valve and perform all steps in accordance with the manufacturer's instructions, including a full flow drain test. Observe operation of any quick opening devices while making trip tests.

3. Observe operation of water motor gong, and other alarms or supervisory signals such as water flow paddle alarms, pressure switches, etc.

GUIDE NUMBER P-25: FIRE HOSE (1 1/2", Racked in Buildings)

Frequency: Annual

Special Instructions: Hose may be maintained in post office workrooms, and other areas where there is a collection of combustibles and persons trained in hose use. When replacement is made, the new hose shall be synthetic fiber jacketed, rubber or latex lined, and equipped with shutoff nozzles regardless of the type previously used. The following work is to be performed in conjunction with Guide No. P-26.

Checkpoints:

1. Unrack hose and check for wetness or deterioration.

2. Uncouple hose and examine it.

3. Remove and discard deteriorated hose. (See HBK MS-56 for guidance on hose replacement.)

4. Remove nozzle and check for obstruction.

5. Re-couple and then re-rack hose on new folds.

GUIDE NUMBER P-26: FIRE DEPARTMENT HOSE CONNECTIONS

(Stand pipe Outlets)

Frequency: Annual

Special Instructions: The work required by this procedure can cause the activation of an alarm and/or a supervisory signal. The control center or fire department that will receive the alarm and/or signal must be notified prior to start of work. When cracking valve, do not stand directly in front of opening.

Checkpoints:

1. Remove obstructions to easy accessibility of hose connection

2. Inspect cutoff valves and check valves (usually located at base of stand pipe riser) for corrosion or leakage. Exercise cutoff valve and repack if necessary.

3. Remove cap from hose connection and check threads.

4. Crack valve until water weeps through valve. Then close valve and check for leaks.

5. Screw cap onto valve until it is hand-tight.

GUIDE NUMBER P-27: FIRE DEPARTMENT PUMPER CONNECTIONS

(Stand pipe or Sprinkler)

Frequency: Annual

Special Instructions: Never stand directly in front of connection when removing cap.

Checkpoints:

1. Remove any obstructions to easy accessibility.
2. Inspect for collision damage and missing parts.
3. Remove caps; check for internal obstruction and signs of leaking check valve.
4. Inspect swing check for free movement (Siamese type).
5. Inspect threads.
6. Replace missing parts and screw caps on hand-tight when applicable; install new frangible caps.
7. Inspect check valve for corrosion and leakage at joints.
8. Check ball drip for free movement.
9. Inspect drain for corrosion blockage, and cross connection.

GUIDE NUMBER P-28: FIRE HYDRANTS (Dry Barrel or Wet Barrel)

Frequency: Annual

Special Instructions: Dry barrel hydrants should be checked in the fall before the first frost.

Checkpoints:

1. Remove any obstructions which hinder accessibility.
2. Outlets must be at least 18" above plumb position.
3. Make sure that dry barrel type hydrants are used in unheated areas (indoor or outdoor) where freezing is encountered.
4. Check for leakage at hose outlet, etc.
5. Examine condition of gaskets, packing gland, and threads.
6. Examine barrel for cracks.
7. Remove outlet caps; check for ease of removal, and replace all but one 2 1/2" cap.

8. Dry barrel type - shut hydrant; check for drainage by back suction or by dropping weight on string into barrel to check for water.

9. Dry barrel type - if water is present, unplug drain valve. If water table is higher than drain hose, plug the hole.

10. Flush hydrant and check water flow. Flush until water is clear.

11. Cap hydrant; open hydrant 2 turns.

12. Check for leaks.

13. Dry barrel type - repeat items 8 and 9 above.

14. If drain is manually plugged, pump water out of barrel.

15. Lubricate all threads.

16. Check to see that nozzle caps are hand-tight.

GUIDE NUMBER P-29: SPRINKLER HEADS - SPRINKLED AREAS

Frequency: Annual

Special Instructions: This work should be scheduled immediately prior to the scheduled maintenance on dry pipe valves or alarm check valves (wet pipe). Needed replacement of sprinkler heads should be performed at that time.

Checkpoints:

1. Inspect and identify damaged, bent, corroded, painted, whitewashed, or weeping sprinkler heads, all of which will need replacement.

2. Remove any insect nests attached to sprinkler heads.

3. Replace light coat of oil on sprinkler heads located in areas conducive to insect nests.

4. For sprinkler heads that are subject to above normal temperature (adjacent to steam pipes, furnaces, ovens, hot gas, vents, exhaust, etc.), check color coding of sprinkler heads for the proper temperature range. Identify the sprinkler heads with improper temperature ranges, all of which will need replacement.

5. Check that minimum distance of 18" to 36" is maintained between sprinkler heads and racks, palletized stock, or other stacked materials.

6. Remove any ladders, stock, or material that is being supported by the sprinkler piping.

7. Replace broken pipe hangers. Refasten any that are loose.

8. Make sure sprinkler heads are in upright or pendant position.

9. Check that all water is drained from low points on dry piping systems.

GUIDE NUMBER P-30: HOT WATER HEATERS (Converters)

Frequency: Annual

Application: This guide applies to converters and heat exchangers that use steam to heat water for hot water heating systems.

Checkpoints:

1. With system in operation, check for steam and water leaks (interior and exterior).
2. Drain and flush tanks (storage and expansion)
3. Remove rust and scale; note rate of corrosion.
4. Apply coating, paint, or touch-up as required.
5. Remove coil or element; clean and examine condition.
6. Clean, adjust, and calibrate as required: thermometers, aquastats, pressure reducing and relief valves and gauges, temperature relief and steam regulating and control valves.
7. Check operation and condition of all traps.
8. Clean pump. Blow out dirt from motor; check controls, switches, and starters. Check condition of packing or seal and replace as required.

GUIDE NUMBER P-31: HOT WATER HEATERS - DOMESTIC TYPE

(Gas or Oil Fired)

Frequency: Annual

Application: This applies to domestic-type hot water heaters like those in residences, but which can be much larger (50 to 400 gallon tank) and have a circulating pump.

Checkpoints:

1. Check for leaks.
2. Flush tank to remove scale and sediment.
3. Check thermostat and controls for proper setting.
4. Clean combustion chamber at fireside heat transfer surfaces.
5. Set burner for efficient operation on oil fired units. Take flue gas CO_2 reading to determine proper burner adjustment.
6. Clean and lubricate circulating pump.

7. Operate try lever on pressure-temperature relief device (valve). Water should now flow freely and stop when try lever is released. Replace valve if defective.

GUIDE NUMBER P-32: DRINKING WATER COOLERS

Frequency: Annual

Checkpoints:

1. Clean coils (vacuum) and fan blades.

2. Inspect P-trap, water supply valves, connections, and bubbler valve for proper operation.

3. Check belt for tightness and wear (if applicable).

4. Lubricate motor (if applicable).

5. Inspect for and repair leaks in refrigerant lines.

GUIDE NUMBER P-33: FIRE PUMPS, ELECTRIC MOTOR DRIVE

Frequency: Annual

Special Instructions: Review manufacturer's instructions. Lockout motor. Give special attention to notifying all required officials that the fire pump will be out of service. Notice shall include estimated period of downtime and other special problems that may develop. If these work procedures can cause activation of an alarm and/or supervisory signal, the control center or fire department must be notified prior to start of work.

Checkpoints:

1. Clean motor with clean rag or vacuum. Clean inaccessible areas with clean dry air of not more than 30 PSI.

2. Visually inspect windings for cleanliness. Check for coating of oil or grease without disassembling motor.

3. Perform lubrication according to manufacturer's recommendations.

4. Inspect for moisture and protection from water.

5. If motor has not been operated for an extended period, check insulation resistance with a megger.

6. Check motor mountings, supports, and couplings for tightness or other defects.

7. Remove lockout and operate pump long enough to observe general operation. Note pressures, sound, vibration, odor, or temperatures.

8. If pump has automatic starting equipment, start it by activating the mechanism so the automatic devices are tested at the same time as the pump.

9. Secure pump and leave in ready-to-run condition.

10. Notify proper officials that unit is back in service.

11. Clean up area and return tools to proper storage.

12. Initiate work orders that may be required for repairs or correction of observed defects.

GUIDE NUMBER P-34: FIRE PUMPS, INTERNAL COMBUSTION ENGINE DRIVE

Frequency: Annual

Special Instructions: Have approved fire extinguisher available. Do not allow flames or smoking in area. Use safety fuel cans only. Give special attention to notifying all required officials that the fire pump will be out of service. Notice shall include estimated period of downtime and other special problems that may develop. If these work procedures can cause activation of an alarm and/or supervisory signal, the control center and the fire department must be notified prior to start of work.

Gasoline or Natural Gas Engines:

1. Check distributor point dwell. Replace points, capacitor, rotor, and spark plugs after 100 hours of operation.

2. Set timing and distributor advance. Check at idle and operating speed.

3. Adjust governor and carburetor for proper operation and speeds.

4. Check fuel supply. Discard fuel over 9 months old and replace with new.

5. Change engine oil and filter and perform other lubrication of engine and pump.

6. Inspect cooling system for cleanliness, leaks, and anti-freeze solution. Check V-belt for proper tension. Adjust as necessary.

Diesel Engines:

1. Change fuel filters.

2. Inspect and adjust racks, injectors, or unit injectors according to manufacturer's instructions.

3. Check governor for proper speed; adjust as necessary.

4. Check fuel level, presence of water in fuel tank, or other contamination.

5. Change engine oil and filter. Perform other lubrication on engine and pump.

6. Inspect cooling system for leaks, cleanliness, and antifreeze solution. Check V-belt for proper tension. Adjust as necessary.

Diesel and Gas Engines:

1. Check mountings, supports, and couplings for tightness or defects.

2. Remove tags and operate pump long enough to observe general operation. Note pressure, sound, vibration, odor, and temperatures.

3. If pump has automatic starting equipment, start it by activating the mechanism so the automatic devices are tested at the same time as the pump.

4. Secure pump and leave in ready-to-run condition.

5. Notify proper officials that the unit is back in service.

6. Clean up area and return tools to proper storage.

7. Initiate work order that may be required for repairs or correction of observed defects.

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APPENDIX C Building and Building Equipment Operating Guides

C-1 CENTRAL CHILL WATER AND BOILER PLANT OPERATING INSTRUCTIONS

The operating route sheets for central chill water and boiler plant equipment shall include the following information:

1. When the plant is to be placed in operation in accordance with local weather conditions.

2. The normal operating hours of the plant during the heating or cooling season.

3. The frequency of the physical inspections and checks to be made of the equipment and the time to perform.

4. Information on utilities conservation in regard to billing data and guidelines to avoid peak demands.

5. Information to be included in the plant log.

6. Water-treatment procedures including the frequency of feeding, testing, and the time to perform.

7. Special conditions and operations attendant to the particular installation.

C-2 CENTRAL CHILL WATER PLANT OPERATION

Continuous attendance of central chill water plants is not authorized. The amount of time needed for the chill water plant operating route is to be based on the actual number of refrigeration machines and accessory equipment in operation (not on the total number of units installed) and on the functions described below. Operating functions required on other cooling system equipment remote from the central plant area will be performed on separate routes as needed. See other parts of this section to determine appropriate criteria applicable to local equipment. Calculate the time required for plant operation and enter on PS Form 4895 as outlined below and in Section 2-6.

1. Startup and Secure (Col. 11)

    a. One-half hour will be allowed to start and put the chiller plant into operation, inspect the equipment within the plant area, and complete the operating log.

    b. Fifteen minutes will be allowed to shut down equipment in the plant area.

    c. Where 24-hour-per-day operation is justified, the startup and shutdown allowances will be eliminated from the time required to perform the plant operating route.

2. Operating Checks (Col. 12)

    Inspect operating equipment every 2 hours and record readings in the log. This includes all operating equipment in the plant operating route area. Allowable time is not to exceed 10 minutes per machine.

3. Water Treatment (Col. 13)

Water treatment includes activities such as feeding, testing, and blow down (see HBK MS-24). The frequency and time for this work must be determined locally.

C-3 CENTRAL PLANT HIGH PRESSURE BOILER OPERATION

USPS shutdown procedures will be followed. Continuous attendance of central boiler plants is not authorized. The amount of time needed for the boiler plant operating route will be based on the actual number of boilers in operation, not on the total number of units installed, and on the functions described below. Operating functions required on other heating system equipment remote from the central plant area will be performed on separate routes as needed. Low-pressure steam (below 15 PSI) and hot water heating boiler operating criteria and allowances are covered in Appendix D. Hand-fired or stoker-fired boiler operations will be estimated on a local basis and reviewed by the Area office. Calculate the time required for plant operation and enter on PS Form 4895 as outlined below and in Section 2-6.

Workhours Per Day

1. Startup and Secure (Col. 30)

   One-half hour will be allowed to start and put the boiler plant into operation, make a thorough inspection of the equipment within the plant area, and complete the operating log. One-half hour will be allowed to shut down boiler equipment in the plant area. Where boilers are required to be in operation 24 hours per day, the startup and shutdown allowances, except for the initial starting and final shutdown, will be eliminated from the work hour requirements.

2. Operating Checks (Col. 31)

   a. An operational check must be made of all boilers in operation, four times per shift, not to exceed 15 minutes per inspection. For shifting of equipment, i.e., placing additional equipment in service 15 minutes per shift is allowed.

   b. An allowance for checking out the central control board will be in accordance with paragraph 3c of this section.

3. Water Treatment (Col. 32)

   Water treatment includes feeding and testing activities (see HBK MS-24). The frequency and time required for this work must be determined locally. Also, time for receiving oil deliveries, adjusting of burners, and changing of oil burner tips should be included here.

C-4 CENTRAL CONTROL PANEL (Including General Monitoring System)

The purpose of the panel is to simplify operations by providing necessary information to the operator as to what equipment is operating, and if the system(s) is being maintained within the prescribed predetermined conditions.

Workhour allowances to complete operational checks of the central control panel are based upon the refrigeration tonnage installed. The time allowance is as follows:

Tonnage Installed	Workhour Allowance
300 to 500 tons	7 minutes (0.12 hr.)
500 to 1000 tons	10 minutes (0.17 hr.)
1000 to 4000 tons	15 minutes (0.25 hr.)
over 4000 tons	20 minutes (0.33 hr.)

A complete operational check of the central control panel shall be made four times per 8-hour shift. These operational checks are made during the heating and air-conditioning seasons as required. Calculate the annual time required and enter on PS Form 4895, line 37. Include travel time in calculation of operating routes. Travel time is the actual time to the various work locations on the route and is determined by using the most expedient and feasible means of completing the route at a normal pace from beginning to end without stopping or unusual delay.

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APPENDIX D OPERATOR DUTIES

D-1 SUGGESTED OPERATOR DUTIES

The suggested operator duties in this section, supplemented by the equipment manufacturers operational instructions and local knowledge or history of operational needs, shall be used in preparing local checklists for operation of building equipment.

The Postal Service depends on operations personnel and their supervisors to keep the building manager informed of any unusual building conditions that may be observed. If the need for repair or replacement is considered important or of an emergency nature, the Senior Maintenance Official should be verbally notified immediately.

1. AIR COMPRESSORS

   Observe operation for one cycle. Note the pressure and functioning of controls, safety and protection devices, and relief and unloader valves. Check air inlet and cleaner. Clean, if needed. Check discharge lines and storage tank. Drain water from tank and lines. Look for signs of misalignment or unusual belt wear. Check belt tension and condition of pulleys, belts and guards. Check motor and controls. Be alert to any unusual sound, vibration, odor, temperature, or abnormal condition.

2. AIR CONDITIONING MACHINES

   a. Compressor Room

      1) Before starting the compressor, check source of energy supply (prime mover). Check indicator lamps and replace any that have burned out. Note pressure-temperature relationship. Start purge recovery unit. If system uses low-pressure refrigerants, check oil and refrigerant levels. Check to see that chilled water and condenser water valves are open. Start auxiliary oil pumps. Check the water supply to oil cooler. Check the hot-gas bypass valve. Check the capacity control dampers or vanes. Start the condenser water pumps, operate the cooling tower fan as recommended by manufacturer, and check water pressures. Place the compressor in service. If capacity controller is manually operated, open slowly.

      2) With equipment running, make routine inspections of pressures, temperatures, fluid levels and flows. Check for water leaks from pump packing and valve stems. Take readings and record on log sheets. Occasionally, note superheat of suction gas. If refrigerant leaks are suspected, check with leak detector. Add refrigerant and oil as needed. Check scale traps. Occasionally remove covers from pressure switches and other controls, and check for loose screws, springs and contacts. Treat chilled water and condensing water as prescribed. Be alert to any unusual sound, vibration, knocking, odor, or temperature.

3. Condensing Water Circuit

   a. Check circulation of water and temperatures. Note the amount of make-up water that is being used.

b. Observe operation of float valve and mechanism. Leaks, even small ones, should be noted and reported to the supervisor. If required, take water samples and treat the water as prescribed in HBK MS-24. Inspect sumps, tanks, and collection pans for cleanliness, slime formation, or algae growth.

c. Check spray heads and removal instructions. Evaporative condensers should be checked for unobstructed passage or air and water. Check drains, overflow pipe, and continuous bleed lines.

4. Rotating Equipment

Inspect starters and contractors for evidence of unusually high temperature of the contact points. Take suitable precautions for the voltage involved. Check condition of brushes and the presence of unusual wear or poor contact. Observe belt tension, pulley alignment condition of guards. Observe packing and check for leaks. Be alert to any unusual noise, vibration, odor, or temperature. Note oil level and lubricants. Make adjustments or corrections as needed. Observe condition of associated piping, valves, pipe covering, and insulation.

5. Air Handlers

a. Openings. Check openings for entry or discharge of outside air; check screens to prevent entry of birds; check rain deflectors, flashing, and louvers.

b. Filter Bank. Note pressure drop across filter bank, condition of filter frames and media, presence of places for air to escape or bypass filter.

c. Dampers. Note operation of fresh air, return air, and relief air dampers. Look for freedom of motion, condition of damper and linkage, presence of dirt or buildup and response to control signals.

d. Coils. (Chilled water, preheat, and reheat.) Check that proper circulation exists. Note fins; remove or report any obstruction to the airflow. Look for rusting, corrosion, or buildup.

e. Fans. Observe condition of housing, coverings, supports, shafts, bearings, belts and guards. Observe operation. Be alert to any unusual noise, vibration, odor, or temperature in either fan or motor.

f. Controls. Check control units, valves, relays, piping and gauges. Note if there is freedom of motion in all moving parts; check responsiveness of control units and those being controlled. Be sure the controls that protect against freeze ups work properly.

g. Plenums and Ducts. Observe condition of material, covering, tightness of doors, closing devices, access openings, supports, canvas connections, gauges, test connections, valves, dampers and splitters.

6. AIR-CONDITIONING MACHINES - PACKAGED UNITS

These units are sealed so very little attention is required other than to make a general observation of the unit and associated equipment when the operating schedules are maintained. Occasionally it is recommended to check the discharge air and to observe airflow to and from the machine. Operation of cooling water equipment should be checked over and chemical treatment given as prescribed.

7. BATTERIES

Check specific gravity, voltage, temperature, and solution level of pilot cell(s). The pilot cell is considered one cell of a bank electrically connected as one unit and should be the weakest cell of the bank. Inspect for leaks and add water as needed. Maintain the charging voltage at the minimum rate that will keep battery charged. Clean tops of batteries and corroded terminals as necessary. Observe support for deterioration.

8. BOILERS. HEATING

Complete boiler log (PS Form 4846 or PS Form 4846A) for each boiler, performing checks, inspections, and tests indicated on the log form.

9. RESERVED

10. ELEVATORS

Establishment of elevator equipment/machine room operating checklists and routes is applicable only to locations in which USPS personnel are assigned to the servicing and maintenance of elevators. Such routes are not to be established where the maintenance is performed by contract except to periodically visit the areas and observe the equipment in operation. The building manager or maintenance contractor should be notified if unusual or unsafe conditions are observed. Inspection of elevator maintenance work performed by contract is to be made by the building manager or a supervisor familiar with the contract's maintenance requirements.

a. Inspection

Make a general inspection of all items in the machine room. Use the senses of sight, hearing, touch, and smell in observing the functioning of the equipment. Include in the general inspection of the machine room such items as:

b. Motor-Generator Unit. Look for arcing, feel the bearings for temperature and for machine vibrations, and listen to it briefly. Note oil level or need for lubrication.

c. Hoist Machine, Motor and Brake Unit. Observe operation, feel for temperature or vibration, and note lubrication condition. Observe brake action. Note amount of slide, leverage and freedom in clevis pins.

d. Control Panels and Devices. Inspect all equipment, paying particular attention to contractors, connectors, reverse phase relays, switch pins and timers. Look for arcing, poor contacts, excessive temperature, sluggish action, chattering, unusual or hard

slamming, or other deficiencies. Examine and clean the tape and chain selector drives as necessary. Note presence of or need for lubrication.

e. Governor. Observe action of the governor. Look for freedom of action of moving parts and cable. Observe electrical connections and note the presence of or need for lubrication.

f. Operation

g. It is not necessary for a USPS mechanic to ride each elevator for the sole purpose of observing the operation. During the course of a day's activities the elevators are ridden several times by employees who should observe and report any faults in the operation. If all employees are properly instructed in this regard, it will result in quicker correction of faulty elevator operations. However, if the preventive maintenance standards are properly followed, equipment failures will be sharply reduced.

11. ESCALATORS

A general check of escalators can be made by the maintenance employees who starts and stops them. Included in the items to be checked are: functioning of the start and stop switch; smoothness of operation; presence of unusual noise or vibration; condition of handrail, side panels, lights, treads and combs. Look for and correct loose trim, protruding screws or bolts, or any other feature that could damage clothing or injure personnel.

12. FIRE PUMPS

a. Electric Motor Drive

Operate the pump long enough to observe general performance and pressure delivered. Note any unusual sound, vibration, odor, or temperature. Feel bearings for vibration and temperature. Note packing gland and operation of relief valve. If the pump is started automatically when a flow occurs or when the pressure drops, start it by activating the flow or pressure mechanism. This will test the mechanisms at the same time as the pump. Leave pump in ready-to-run condition.

b. Internal Combustion Engine Drive

Check the fuel supply, oil level, radiator, and battery. Operate long enough to bring engine to normal operating temperature. Make a general observation of the engine, clutch and pump. Note pressures, functioning of gauges, and relief or safety valves. Check pump packing. If pump has automatic starting equipment, start it on automatic to test the integrity of the devices. Leave unit in ready-to-run condition.

13. HEATING SYSTEM

Observe the operation of all units in the heating system. Note flow of steam and return of condensate. If returning condensate is hotter than your hand can stand, some traps (radiator or steam line) are probably blowing through. If this condition exists, report it to your supervisor. If the system is vacuum return, observe vacuum maintained and check the

operation of the pumps. In systems using hot water, check heating elements or coils and operation of circulating pumps. If the system is controlled by outside temperature, check to determine if the controls are functioning properly.

14. HOT WATER GENERATORS AND STORAGE TANKS

Make a visual inspection; note water temperature, steam supply pressure, operation of controls, gauges, and thermometers. Check condition of insulation, steam traps, strainers and piping. Look for leaks and be alert to any unusual noise or vibration.

15. MOTOR AND GENERATORS

Feel the bearing housing for evidence of heat or vibration. Look for seepage of oil or grease along the shaft. Observe brushes and commutators. Look for sparking, discoloration, poor surface condition, black spots or other abnormalities. If required, clean commutator with a cleaning stick. Check brush holders, brush spring pressure and pigtail connections. Check starter controls. Note the presence of or need for lubrication. Observe pulleys, belts, couplings and guards. Any misalignment or abnormal belt wear should be investigated and corrected. Be alert to any unusual noise, vibration, odor or temperature.

16. PUMPS, GENERAL PURPOSE

Make a general inspection; be alert to any unusual noise, vibration, odor or temperature. Feel the bearings and check packing gland. For pumps operating on automatic, observe at least one cycle to see that controls are functioning and that all components work properly. Observe piping and valves. Report any observed leaks to supervisor. Particular attention should be given to the following pumps:

a. Condensate return to boiler or central plant

b. Chilled water

c. Condenser water

d. Booster pumps from city line to house tanks

e. Circulating, hot water, drinking water, and similar applications

17. STEAM PRESSURE REDUCING STATION

Observe the operation, noting pressures and the functioning of external pilots (the operation of internal pilots cannot be observed). Check the operation of traps on both the high and the reduced pressure lines, and observe the condition of the insulation. Make a general inspection of the station, noting anything of an unusual nature. Relief valves are tested periodically on a scheduled basis, so unless they are malfunctioning, no action other than visual observation is needed.

18. SUMP PUMPS

Observe the operation noting the functioning of float mechanism or other controls as well as the pumping action. Check the strainer and inspect pit for silt, mud and obstructions. Does

the check valve hold and seat properly? Look for vibration or malfunctioning the pump unit or the connected piping.

19. CUBICLE ROOMS. TRANSFORMER VAULTS AND SWITCHBOARD ROOMS

Check each area for ventilation, lighting, and general condition of equipment. Observe the watt-hour and demand meters. Observe all indicating lights and replace any that are burned out. Observe relays for proper functioning and target position. Check oil circuit breakers and transformers for proper oil levels. Check the network protectors for proper operation and record the counter reading where applicable. Check the emergency lights for proper operation and any other instruments as directed. Report any malfunctioning or needed repairs to the supervisor.

20. FIRE EXTINGUISHERS

All fire extinguishers shall be inspected monthly on an operating route. This inspection is a quick check that an extinguisher is available and will operate. It is intended to give reasonable assurance that the extinguisher is fully charged and operable. If any deficiencies are revealed, the deficiency must be corrected or the extinguisher replaced as soon as possible. Ensure that access to, or visibility of, the extinguisher is not obstructed. Verify that the operating instructions on the extinguisher nameplate are legible and face outward. Ensure that seals or tamper indicators are not broken or missing. Inspect for obvious physical damage, corrosion, leakage, clogged nozzle, or cut hose. Ensure that the pressure gauge is within the operable range. For extinguishers without gauges, and with unbroken seals or tamper indicators, determine their fullness by lifting and comparing estimated weight to weight stamped on shell. Verify that it is the correct extinguisher for that location by comparing the location markings on the shell and mounting. Complete the applicable portions of PS Form 4705, Fire Inspection Tag.

21. EMERGENCY LIGHTS

All emergency lights shall be inspected monthly on an operating route. This inspection is a quick check to ensure that the light is in place and will operate. This is done by verifying it is in its designated place and there is no obvious physical damage or condition which would prevent operation. In addition, the test button should be depressed (or light unplugged) for at least 30 seconds to ensure that the light turns on and stays bright.