## 25 - AIR HANDLING SYSTEM — STARTUP, SHUTDOWN, AND FILTER REPLACEMENT

**Title:** Air Handling System — Startup, Shutdown, and Filter Replacement **Doc. No.** 2015-MMTS-25

**Approval Signatures and Date**

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| Prepared/Reviewed by: | | Date: 10/28/15 |
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|---|---|---|---|---|---|
| | Initial Release | | Annual Review/No Revision Required | | Annual Review/Update (see history below) |

***NOTE:*** *This document will be reviewed at least annually to ensure its suitability.*

**Revision History**

| Rev. No. | Change description | Author |
|---|---|---|
| 2 | Replaced verbiage in §25.3. Refer to "MMTS Initial Operations Observations, Communications and Improvements for Implementation Crosswalk- July 10, 2015". | Burton Packard and Renee Rodriguez |
| 1 | Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015 | Burton Packard and Renee Rodriguez |

***NOTE****: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

**Reference Documents**

| Document number | Document title |
|---|---|
| QP.EMS.HG.0007 | Management of Change (Tier 1) |
| 2015-MMTS-15 | Inspection, Testing, and Maintenance |
| 2015-MMTS-23 | Operations Under Adverse Conditions |
| 2012-MSSP-37 | Mobile Mercury Transfer System Air Handling and Carbon Adsorber Design Basis/Technical Data |
| | Aaon RN SERIES – Packaged Rooftop Units, Heat Pumps, & Outdoor Air Handling Units: Installation, Operation, |

| | |
|---|---|
| | & Maintenance, R90721, Rev. B, 140225 |
| | Twin City Fans & Blowers – Heavy Duty Centrifugal Fans: Installation, Operation & Maintenance Manual, ES-995, September 2012 |

## 25.1 PURPOSE

This procedure outlines startup and shutdown operations, and filter replacement of the Air Handling System for the MMTS. The MMTS air handling system consists of two separate systems: (1) the heating, ventilation and air conditioning (HVAC) system manufactured by Aaon, and (2) the exhaust ventilation system manufactured by Twin-City Fan. The HVAC system is physically located on the roof of the building, however the controls are in the Ventilation Equipment Area. The exhaust ventiliation system and controls are all located in the Ventilation Equipment Area.

## 25.2 SCOPE

The procedure covers operation, maintenance and filter replacement for the HVAC system that provides conditioned air for personnel and the exhaust ventilation system, which provides air flow through the fume hoods, snorkel suction throughout MMTS, and filtered discharge of MMTS air into the atmosphere.

## 25.3 OPERATIONS

Prior to entry into the MMTS Ventilation Equipment Area verify the "green" status light is established for safe entry.

If "red" status light is illuminated, utilize a portable mercury vapor analyzer to verify safe entry. Verify that mercury levels are safe to enter the Ventilation Equipment Area. The exhaust ventilation fan control panel and the electrical breaker panel are in the equipment room. If no status light is on, follow the same steps as if the status light were red.

Prior to entry to MMTS process areas the "safe status" should be assured via outputs from the PCDAS/MMS and/or portable mercury vapor analyzers.

Prior to starting MMTS daily operations, the supervisor or designated operator shall ensure:

- That the air handling is operating properly if it is already in the "on" mode, or
- Turn on the system following startup procedures, and ensure that it is operating properly.

At the end of the workday, the Facility Manager or designated operator determines if the system is to remain in the "on" mode, or be turned off until the next workday. This will depend on the expected outside temperature conditions, overnight, over a weekend, or over an extended holiday. The designed mode is to manage on/off operation via the setback thermostat on the HVAC system. However, if the system is to be manually turned off, shutdown procedures shall be followed.

***Notes for operation of HVAC and exhaust fan equipment:***

- ***The HVAC can be on without the exhaust fan.***

- ***The exhaust fan cannot be on without makeup air; the HVAC provides the makeup air. Makeup air could be provided by opening windows and doors when the weather permits.***
- ***The wall-mounted HVAC slider switch may be used to set back the temperature at the end of the day; colder in winter and warmer in summer during off-hours when the MMTS is unoccupied.***
- ***The exhaust fan may be turned off at the end of the day after mercury sources are closed. Shutting off the exhaust fan at the end of the day improves energy efficiency and reduces maintenance costs.***
- ***If the exhaust fan is turned off overnight, the fume hood alarm silence switches must be set to silence (turned from alarm to silence).***
- ***If the wall-mounted HVAC slider switch has been used to set back the temperature at the end of the day, the supervisor pushes the reset button at the start of the next day to return to the operating setpoints.***

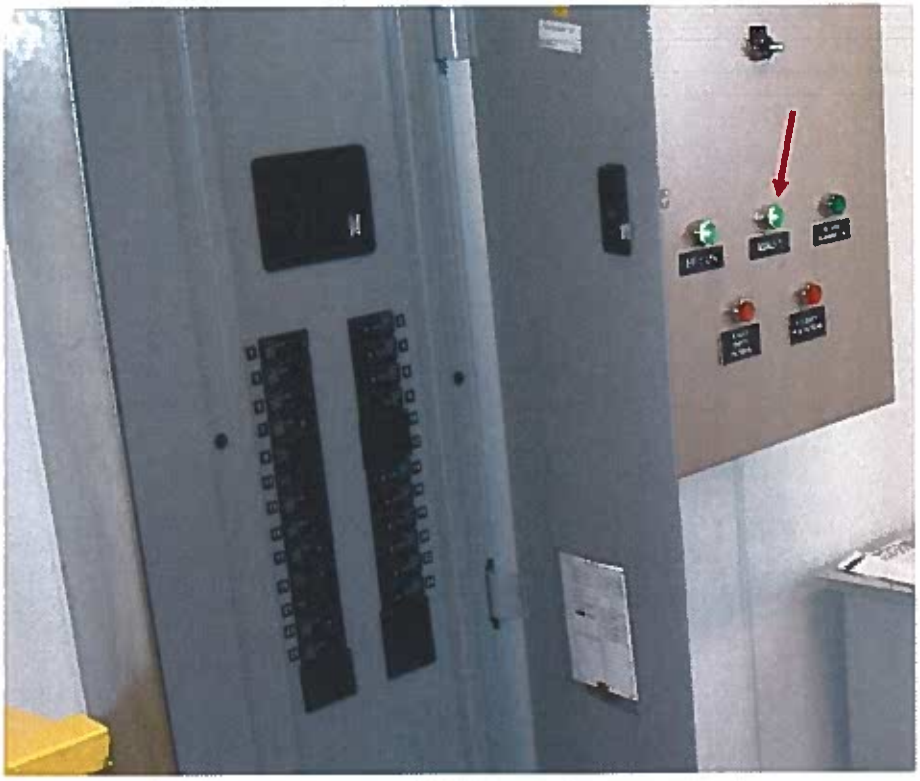
***NOTE**: Roughing filters (for particulates) must always be used for both the HVAC and exhaust ventilation fan when operating the Air Handling System. In addition to routine filter inspections, the roughing filters must be inspected after severe dust storms.*

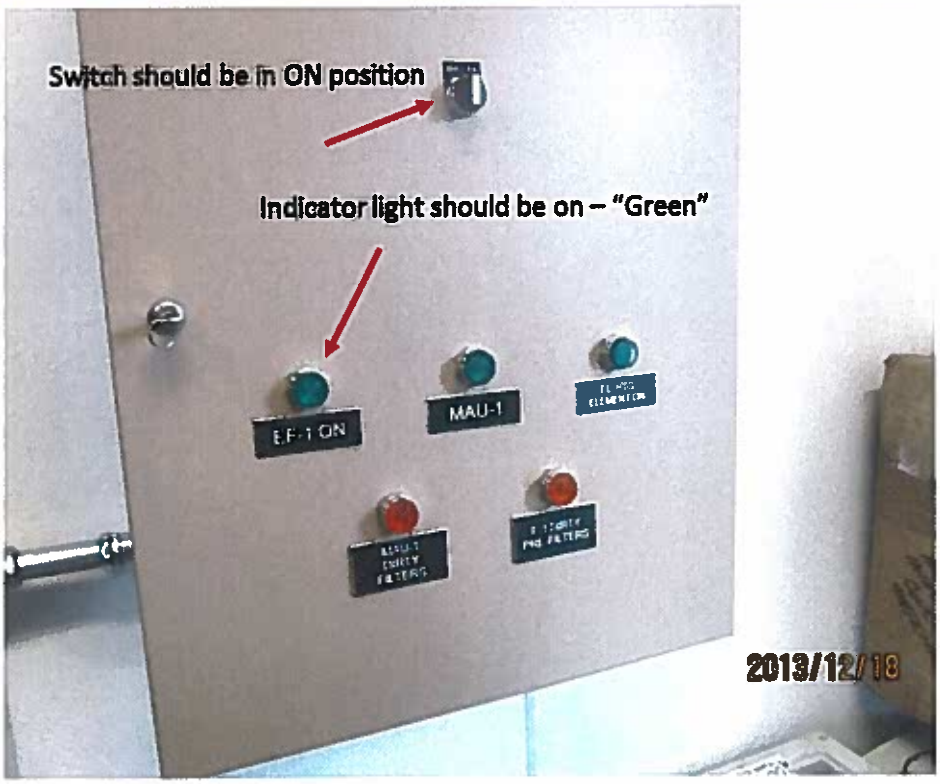
***NOTE**: End-of-day operations require that all drums, including waste drums, must be closed; no waste materials may remain in the fume hoods; flasks remaining in the fume hoods must have their plugs installed; fume hood doors must be closed; and all snorkels must be dead-headed. Afternoon operations are managed such that the number of loaded mercury drums stored in the MMTS overnight is minimized and their lids are tightly sealed.*

### 25.3.1 Startup Procedure

Normally the HVAC unit will be left on overnight. If it has been turned off previously, start this system first because it must be on prior to starting the exhaust ventilation system. The HVAC system provides the make-up air for the exhaust ventilation fan.

- The HVAC system is started by turning on the electrical breakers #10 and #12 in the electrical breaker panel in the Ventilation Equipment Area. Turning on the breakers should be done by a qualified SOC electrician. Verify that the HVAC system has started (green indicator light "MAU-1" on the control panel should be on).






- Start the exhaust ventilation fan from the control panel in the Ventilation Equipment Area. Turn the control switch to "ON". Verify that the exhaust fan has started. The fan is

relatively loud when it starts; there should be no problem hearing it (also green indicator light "EF-1" on the control panel should be on).

- Verify the set-point of the HVAC system is set for human comfort with exhaust ventilation fan set to be on continuously during operations.

- Switch the fume hood alarm silence switches from silence to alarm.

### 25.3.2 Shutdown Procedure

*The end-of-day procedures apply whether the Air Handling System is turned on or off. End-of-day operations require that:*

- *All drums including waste drums must be closed.*
- *No waste materials remain in the fume hoods.*
- *Flasks remaining in the fume hoods must have their plugs installed.*
- *Fume hood doors are closed, and all snorkels are dead-headed.*
- *Afternoon operations are managed such that the number of loaded mercury drums stored in the MMTS overnight is minimized and all drum lids are tightly sealed.*
- Shut off the exhaust ventilation fan from the control panel in the Ventilation Equipment Area.
- The HVAC system will continue to operate and control building temperature as long as it is on.

- Verify the set-point of the HVAC system is set for overnight operation, with logic applied to minimize operation of the exhaust fan.

### 25.3.3 Periodic Maintenance

- Regular maintenance outlined in 2015-MMTS-15 is necessary to ensure reliable operation.
- A log is to be kept of all maintenance activities including inspections, component replacements, filter replacements, and any periodic test results. Names and dates are to be included.

***NOTE**: The following information is taken from 2015-MMTS-15*

**Table 28.1. Summary table for inspection and testing of the air handling equipment**

| Equipment item | Inspection/test frequency |
|---|---|
| Exhaust ventilation fan | Daily |
| | Annually |
| HVAC heat pump | Daily |

| | |
|---|---|
| | Annually |
| HVAC roughing filters | Monthly or more frequently per weather conditions |
| Exhaust ventilation HEGA filters | TBD |
| Exhaust ventilation roughing filters | Monthly or more frequently as operations and weather conditions suggest |
| Fume hoods | Annually |
| Snorkels | Annually |
| OG and HVAC ducts | Annually |
| | |
| HVAC registers | Annually |
| Spare fans | Quarterly |

### 25.3.4 Conduct daily inspections

Inspect the indicator lights on the control panel labeled "MAU-1 DIRTY FILTERS" for the HVAC unit filters, and "F-1 DIRTY PRE-FILTERS" for the exhaust ventilation fan roughing filters daily (see photo in Section 25.3.1).

### 25.3.5 Conduct monthly inspections

For the HVAC unit, perform the following actions monthly:

***WARNING**: Electric Shock Hazard. Shut off all electrical power to the HVAC unit to avoid shock hazard or injury from rotating parts. Refer to the Aaon operation and maintenance manual for all precautions and details.*

- Inspect and replace pre-filters and filters.
- Inspect condensate drain pan for possible plugging and microbial growth. Cleaning of microbial growth should only be done by a qualified service technician.
- Fans, evaporator coils and blower wheels should be inspected for excessive dust build-up and cleaned if required.

For the exhaust ventilation system, perform the following actions monthly:

*WARNING: This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be certain all power switches are locked off. Refer to Twin City operation and maintenance manual for all precautions and details.*

- Inspect the motor for dirt buildup, and clean if needed.

- Inspect V-belt drives for dirt buildup, burrs, or obstructions. Inspect sheaves for wear and belts for fraying and misalignment.
- Inspect fan wheel for dirt buildup, corrosion, and signs of stress or fatigue (distortion or cracks). Clean if needed.
- Inspect structural components, such as structure, vibration mounts and bolts for tightness, signs of corrosion, stress or fatigue (distortion or cracks). Clean if needed.
- Inspect duct connections, including flexible connections, for distortion, signs of degradation or stress (cracks) and that bolts are tight.
- Lubricate the fan drive bearings every two months per the schedule shown on the housing decal.

### 25.3.6 Conduct annual inspections

- The HVAC unit should be checked at least once each year by a trained, qualified service technician.
- All original fan motors and bearings are furnished with factory lubrication. The bearings may need to be lubricated periodically. The schedule will depend on the operating duty, temperature variations or other server atmospheric conditions. Bearings should be lubricated when at normal operating temperatures, but not running. Rotate the fan shaft by hand and add only enough grease to purge the seals.

*NOTE: Do Not Overlubricate!*

- The exhaust ventilation fan motor should be lubricated every 5 years. Lubrication requirements are attached to the motor. Use the motor manufacturer's recommendations for lubrication.

*NOTE: MMTS Facility Manager must consider Management of Change implications for any issues or problems noted.*

## 25.4 RECORDS

- Operation (e.g., runtime), and maintenance log
- Management of Change records