

## **17.0 UNIVERSITY BOILER/MACHINERY POLICY**

*Note: The information in this section is intended for Facility management employees only.*

### **17.1 General Information**

The university has many different types of equipment and machinery that require scheduled and unscheduled maintenance. The purpose of this section is to provide procedures that can lower the high cost of insurance, reduce the number of unplanned outages, and extend the life of the university's boiler and machinery equipment. Specifically, procedures for maintaining boilers, air conditioning units, and electrical systems shall be offered in this section. Additional information related to occupational safety for university personnel exposed to industrial hazards is given in section 9 of this policy.

University personnel within the Facility management perform most of the maintenance associated with boilers and machinery. However, some of this maintenance is performed using an outside contractor. All Facility management employees shall be properly trained to perform any maintenance tasks either through on the job training or from previous experiences (see section 17.3).

The Facility management utilizes a maintenance computer program that will automatically generate work orders for the scheduled procedures listed in section 17.2. Any unscheduled maintenance is reported by university or Facility management personnel and is imputed into the computer program accordingly. Then, depending on the priority of this unscheduled maintenance, a work order is generated for Facility management personnel and the equipment is scheduled for repair.

### **17.2 Equipment Maintenance Procedures**

#### **17.21 Boiler Maintenance Procedures**

##### **Commercial Hot Water Heaters**

###### **Annually**

- Inspect the burner and burner controls for proper flame setting.
- Check pressure temperature relief valve for proper spring action and disk seating.
- Check for leaks at all seams on the outer casing, around the bottom, and all plumbing connections.
- Flush the vessel and check for evidence of mineral deposits.

##### **Hot Water Heating Boilers (Atmospheric)**

###### **Daily** (To be done while logging equipment)

- Read all gauges and record readings on log sheets.

- Check operational water level.

#### **Semiannual**

- Manually trip low water cut-off and check its operation.
- Check the air inlet for obstructions.
- Check the valves on the gas train for proper operation and leaks.
- Operate safety valve by lifting the test lever.
- Check the pilot light.

#### **Annually**

- Disassemble the low water cut-off and check its operation and general conditions.
- Inspect the water- side of the boiler and clean if necessary.
- Check the burner setting and adjust if necessary.
- Inspect the fire- side and clean if necessary.
- Check the expansion tank sight glass for proper air cushion.

### **Hot Water Heating Boilers (Forced Draft)**

#### **Daily**

- Read all gauges and record readings on log sheets.
- Check operational water level.

#### **Semiannual**

- Check the control linkages for the burner.
- Manually trip low water cut-off and check its operation.
- Check the air inlet for obstructions.
- Check the valves on the gas train for proper operation and leaks.
- Operate safety valve by lifting the test lever.

#### **Annually**

- Check all safeties for correct operation.
- Disassemble the low water cut-off and check its operation and general conditions.
- Inspect the water- side of the boiler and clean if necessary.
- Check the burner setting and adjust if necessary.
- Inspect the fire- side and clean if necessary.

- Check the expansion tank sight glass for proper air cushion.

## **Steam Boilers**

### **Daily**

- Read all gauges and record readings on log sheets.
- Check operational water level. If water level is noted below safe level, shut down immediately and cool slowly. Apply hydrostatic test and inspect for leaks and over-heating.
- Check water gauge glass for proper water level
- Blow down water-gauge glass and test low water cut-off for correct operation.
- Perform bottom blow down to remove any sediment.
- Make sure drain valves are tightly closed after daily tests.
- Take hardness readings to ensure water softener is working correctly.
- Take conductivity reading to ensure that automatic blow down is operating correctly.

### **Semiannual**

- Check the control linkages for the burner.
- Check the air inlet for obstructions.
- Check the valves on the gas train for proper operation and leaks.
- Operate safety valve by lifting the test lever.

### **Annually**

- Check all safeties for correct operation.
- Disassemble the low water cut-off and check its operation and general conditions.
- Inspect the water- side of the boiler and clean.
- Check the burner setting and adjust if necessary.
- Inspect the fire- side and clean.
- Replace all water- side gaskets. Check for leaks after starting boiler.

## **Pressure Vessels**

### **Air Receivers**

#### **Quarterly**

- Test safety devices for correct operation.

- Check automatic condensate drain device for correct operation.
- Look for evidence of corrosion. If any corrosion is found, take necessary steps to rectify.

## **17.22 Air Conditioning Maintenance Procedures**

### **Window Units, Residence Halls**

#### **Three Times Yearly, Between Semesters**

- Clean or replace evaporator air filter.
- Check unit for correct operation and make necessary repairs.

### **Window Units, Academic and Administrative Buildings**

#### **Quarterly**

- Clean or replace evaporator air filter.
- Check unit for correct operation and make necessary repairs

### **Fan Coil Units**

#### **Quarterly**

#### **Quarterly**

- Clean or replace evaporator air filter.
- Check unit for correct operation and make necessary repairs.

### **DX Units**

#### **Quarterly**

- Clean or replace evaporator air filter.
- Check unit for correct operation and make necessary repairs.

### **Computer Room a/c units (Liebert Units)**

#### **Every other month (Done by HVAC Technician)**

- Check filter and switch
- Check belt, pulleys, fan, and fan switch
- Check compressor oil
- Clean condenser coil and refrigerant lines
- Check and clean pan drain
- Check suction and head pressure, expansion valve, refrigerant level

### **Chillers**

### **Daily**

- Log all operating parameters.
- Listen for unusual noises and vibrations.
- Check oil level and look for oil leaks.
- Check purge unit on low-pressure machines for excessive run time.

**Annually** (Annual inspection will be shared by an outside service contractor and Facility management employees)

- Open condensers and brush tubes. Look for signs of corrosion and/or scale deposits.
- Leak check machine.
- Inspect starter and checkpoints for pitting if starter is a mechanical type.
- Replace oil and oil filters on low-pressure machines. Replace oil filters on high-pressure machines. Collect oil sample for analysis on all machines. If oil analysis indicates oil should be replaced on high-pressure machines, then oil is replaced.
- Replace refrigerant filters.
- Check for correct operation and clean purge units on low-pressure machines.
- Check all safeties for correct operation.
- Check electronic sensors for accuracy.
- Run machine and log all operating parameters. Include pressure drop across evaporator and condenser to insure adequate water flow.

### **Cooling Towers**

#### **Two or Three Times Per Week**

- Conduct water analysis to ensure that conductivity level is correct and automatic blow down is operating properly.
- Conduct water analysis to ensure corrosion protection is present.

#### **Annually**

- Drain and clean towers.
- Clean hot basins, spray nozzles, and fill.
- Clean strainers.
- Inspect towers for rust and take appropriate action.
- Check and repair float valve if necessary.
- Inspect and replace or adjust fan belt if necessary.
- Check fan rotation for imbalance.

- Grease fan motor.
- Change oil in gear reducer. Marly and BAC gear reducers' oil is to be changed only every five years.

### **Air Handlers**

#### **Quarterly**

- Replace air filters.
- Grease fan shaft and motor bearings.
- Check condition of coils and condensate pans. Clean as needed.

### **Exhaust Fans**

#### **Annually and as needed**

- Check fan for correct operation.
- Inspect fan belt and replace if needed.

### **Circulating Pumps**

#### **Annually**

- Grease pump motor as per manufacturer recommendation.

### **Air Compressors**

#### **Annually**

- Replace oil.
- Replace oil coalescent filter and air inlet filters.
- Inspect starter contacts and replace if necessary.
- Check alternating control on duplex units for correct operation.
- Check pressure control for correct operation.
- Check discharge air on each compressor to ensure that compressor is not passing oil.
- Check refrigerated air dryer for proper operation and service as per manufacturer recommendation.

## **17.23 Electrical Maintenance Procedures**

### **Weekly**

- Check status of protective relay assemblies and security lighting at the Rex Street and Reinhardt Street substations.

**Monthly**

- Check batteries at Rex Street Substation as per PM checklist

**Quarterly**

- Check batteries at Rex Street Substation as per PM checklist.

**Annually**

- Check lighting in buildings and repair as needed.
- Check exit signs in building and repair as needed.
- Check emergency/security lighting in building and repair as needed.
- Check electrical distribution panels for abnormal conditions
- Re-torque battery connections at Rex Street Substation as per PM checklist.
- Periodically hire outside contractor to test relay assemblies at Rex Street and Reinhardt Street Substations.
- Periodically, hire outside contractor to conduct thermo graphic inspection of 480V motor control centers, distribution panels, electrical disconnects, and starters. Also, perform oil analysis of pad mounted transformers.

**AC Generators****Monthly**

- Check all fluid levels.
- Change oil and filters when needed.
- Run generator and check all running parameters.

**17.24 Elevator Maintenance Procedures**

- All University elevators and wheelchairs lifts are inspected at least twice yearly by a State-contracted certified elevator inspector. Additionally, a trained member of the EH&S Director's office inspects elevators at least once every other month.
- Deficiencies noted on these inspections are corrected by either the University-contracted maintenance vendor, or other University personnel.
- Regular preventative maintenance in accordance with industry-accepted practices is performed regularly on all University elevators and wheelchair lifts.
- The University maintenance vendor is responsible for responding to all callbacks (troubles with elevators) within 2 hours, entrapments within 1 hour.

- Service tickets, inspections, and other records regarding the University's elevators are maintained at the Facility Management department.
- A complete set of fire service keys for the university elevators is maintained at the EH&S Office. Emergency student maintenance workers are trained on the location of these keys, and how to use them in the event of an emergency. This information is documented in their training handbook.

### **17.3 Testing and Training for Equipment**

All Facility management personnel who work with boiler or machinery shall have the minimum required training, as stated by civil service guidelines, on the operation and maintenance procedures for this equipment. The Manager of Environmental Systems and the Electrical, Plumbing and HVAC Foreman are responsible for supervising these maintenance workers and assuring their safety while performing procedures listed in section 17.2 except those performed by outside contractors (see section 2.7 for more information. When performing these tasks, all proper personal protective equipment shall be utilized at all times (see section 9.21). The following information pertains to specific training procedures for these maintenance personnel.

#### **Hiring New HVAC and Electrical Maintenance Employees**

- The Manager of Environmental Systems and the HVAC and Electrical Foreman shall conduct interviews with prospective HVAC and Electrical Maintenance employees.
- Using the reference information given in the job application or resume', the interviewers shall contact former employers to verify technical competence.
- Additionally, the prospective employee may be asked to complete a written test that contains technical questions applicable to the trade he or she is applying for. Questions on this test shall not pertain to specific equipment maintained by the university. Rather, the purpose of this test is to establish basic technical knowledge for all boiler and machinery equipment.

#### **HVAC Maintenance Personnel Training**

- These procedures pertain to all HVAC Technicians job titles issued by Civil Service.
- New HVAC Technicians shall work with another experienced HVAC Technician initially. This is to apprise the new technician of the locations of all applicable



equipment and specific technical information required for him or her to perform the job safely and efficiently.

- New employees shall always work in the presence of an HVAC Technician or until they are appropriately promoted to another HVAC position.
- Training (including OJT) shall be documented. All records associated with this training shall be maintained by the EH&S office. HVAC employees shall have a minimum of 2 years' experience in an electrical field, in accordance with Civil Service requirements.

### **Electrical Maintenance Personnel Training**

- These procedures pertain to Electricians and all other electrical maintenance employees of the facility management electrical maintenance shop (Civil Service job titles).
- New Electricians shall work with another experienced Electrician initially. This is to apprise the new Electrician of the locations of all applicable equipment and specific technical information required for him or her to perform the job safely and efficiently.
- New electrical maintenance employees shall also work in the presence of an experienced Electrician initially. Once the Electrical Foreman and/or the Manager of Environmental Systems deem the Maintenance employee capable, these persons shall be allowed to work independently.
- Training (including OJT) shall be documented. All records associated with this training shall be maintained by the EH&S office. Electricians shall have a minimum of 2 years' experience in an electrical field, in accordance with Civil Service requirements.

### **Equipment Testing**

All equipment safety inspections and/or annual testing is arranged as per the procedures outlined in section 17.2. Specifically, boiler inspections shall be conducted yearly and certificates of inspection shall be maintained in the Facility management office and on the boiler and hot water heaters in the field.