
HAVERFORD TOWNSHIP FREE LIBRARY, HAVERFORD, PA

**ASSESSMENT REPORT OF
MECHANICAL, ELECTRICAL, AND PLUMBING SYSTEMS**

March 13, 2013

SUMMARY

The following report is based on our observations at our site visit on February 28, 2013 and review of documents including existing plans, proposed architectural renderings, and an existing conditions report prepared by Bruce E. Brooks and Associates from 2003.

OVERVIEW OF EXISTING MECHANICAL SYSTEMS

The heating system consists of an aging 1200-MBH Weil-McLain oil-fired boiler which supplies hot water that is pumped via inline pump to perimeter finned-tube convectors. Hot water is also piped to hot water coils within the two main air handlers. The oil tank is located under the rear parking lot.

Cooling and ventilation are provided by two large air handlers which are zoned with variable air volume valves (VAVs). The air handler in the basement mechanical room serves the first floor and basement levels. The second floor air handler serves the entire second floor. Ventilation air is ducted from the exterior through these two air handlers. Each air handler has chilled water and hot water coils to control temperature. All units are pneumatically controlled. The computer room has a (much newer) dedicated packaged rooftop Carrier air handler.

Chilled water is provided by a 90-ton water cooled York chiller in the basement mechanical room, which is cooled through a rooftop Marley cooling tower. Water is pumped via (2) 5-HP B&G pumps, one each for chilled water and condenser water.

Toilet room exhaust is ducted to a rooftop exhaust fan which did not appear to be operating at the time of our survey.

MECHANICAL SYSTEMS RECOMMENDATIONS

In general, the existing mechanical systems are degraded, inefficient, and at the very end of (or beyond) their expected useful lifetime. The types of systems installed however, are still very viable for this building. Changing to a different type of system is not necessary if the existing system components are replaced with modern versions with higher efficiency and controls as follows:

1. Boiler
 - a. Remove existing oil fired boiler and replace with (2) new high efficiency gas fired sealed combustion direct vent boilers. Each boiler shall be sized for 60% of the total load in order to provide staging and redundancy.
 - b. Locate boilers with minimum 36" clearance on all sides as per PA "L&I" (Boiler Division) Code requirements.
 - c. Extend new direct vent intake and vent piping to new sidewall or rooftop vent terminals.
 - d. Extend new gas supply from new gas service (see plumbing section).
 - e. Provide condensate neutralizers and extend to floor drain or sump.
 - f. Furnish each boiler with matched circulation pump.
 - g. Install boiler control panel with sequencer controls.
2. Hot Water Supply System
 - a. Replace existing inline pumps with new modulating pumps with variable frequency drive motors.
 - b. Re-insulate all existing and new hot water piping with fiberglass insulation as required by the Energy Code.
 - c. Replace any perimeter finned-tube convectors as necessitated by the architectural floor plan revisions. Replace any convector which is presently damaged. (Assume 50% replacement)
 - d. Install new 2-way/3-way modulating control valves for each heating zone. System shall be zoned so that each individual room has its own control, or in the case of large open spaces, each exposure.
 - e. Provide new expansion tank, air separator, and domestic water makeup.

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- f. Replace all existing hot water unit heaters and cabinet unit heaters.
 - g. Provide new insulated piping to new hot water coils in air handlers and VAVs.
 - h. Contractor to assess the interior conditions of the existing hot water piping system and piping wall thickness/condition. Existing hot water piping may be reused if corrosion is not evident.
3. Second Floor Air Handler (AH-1)
- a. Remove the existing air handler and replace with a new custom double wall unit with modulating variable frequency drive forward curved supply fan, hot water coil, chilled water coil, filter box, and mixing section.
 - b. New ventilation duct to extend to new rooftop intake vent. Sized for full economizing and new relief vent. Economizing controls, dampers, and sensors to be installed.
 - c. Provide interlock to new digital control system.
 - d. Provide new vibration spring isolators.
 - e. Provide new duct smoke detectors. (Interlock by Fire Alarm Contractor)
4. Basement Air Handler (AH-2)
- a. Remove the existing air handler and replace with a new custom double wall unit with modulating variable frequency drive forward curved supply fan, return fan (in duct), hot water coil, chilled water coil, filter box, air blender, and mixing section.
 - b. New ventilation duct to extend to areaway louvers. Sized for full economizing and new relief duct to areaway louvers. Economizing controls, dampers, and sensors to be installed.
 - c. Provide interlock to new digital control system.
 - d. Provide new vibration spring isolators.
 - e. Provide new duct smoke detectors. (Interlock by Fire Alarm Contractor)
5. Rooftop Air handler
- a. Existing unit shall remain.
 - b. Existing to be tied into new digital control system.
 - c. Contractor shall perform rebalancing and test refrigerant charge.

6. Water Cooled Chiller
 - a. Remove existing chiller and replace with a new centrifugal water cooled chiller with variable speed compressor motor and/or modulating or multiple stages of compressor unloading for efficient part-load control.
 - b. Provide interlock to new digital control system.
7. Cooling Tower and Condenser Water System
 - a. Remove existing cooling tower and replace with new tower with variable speed super low speed fan, variable speed spray pumps, positive closure dampers, and basin heater.
 - b. Provide new electrostatic water treatment system.
 - c. Provide new vibration isolation rails.
 - d. Provide interlock to new digital control system. Provide all new temperature and pressure sensors.
 - e. Provide heat tracing for water piping.
 - f. Provide new piping curbs and sealing for all roof penetrations.
 - g. Contractor shall assess interior condition of existing condenser water piping walls. Existing condenser water piping may be reused if corrosion is not evident.
 - h. Replace existing condenser water pump with new base mounted centrifugal modulating pump with variable frequency drive. Provide interlock to new digital control system
8. Chilled Water System
 - a. Replace existing chilled water pump with new base mounted centrifugal modulating pump with variable frequency drive. Provide interlock to new digital control system. Provide all new temperature and pressure sensors. Insulate new pumps.
 - b. Re-insulate all existing and new chilled water piping with fiberglass insulation as required by the Energy Code.
 - c. Install new 2-way modulating control valves for each air handler.
 - d. Provide new air separator and domestic water makeup.
 - e. Provide new insulated piping to new chilled water coils in air handlers.
 - f. Contractor shall assess interior condition of existing chilled water piping walls. Existing chilled water piping may be reused if corrosion is not evident.

9. Variable Air Volume Units

- a. Replace all existing VAV's and install new single zone VAV's on all zones. Additional zones shall be added such that spaces with different exposures and/or uses shall be zoned separately with separate controls.
- b. Hot water coils with 2-way modulating valves shall be installed for any exterior zones without perimeter convectors.
- c. Provide interlock to new digital control system.
- d. Perimeter zone VAV's to be fan powered parallel type VAV boxes.

10. Ductwork

- a. New ductwork shall be extended as necessary for areas that are rezoned.
- b. All supply and outside air ductwork shall be externally wrapped with fiberglass insulation with all service jackets.
- c. Contractor shall assess interior condition of any duct which is to be reused. Existing ductwork may be reused if of acceptable size/gauge and is professionally cleaned and internally coated/sealed.

11. Air Devices

- a. All air diffusers shall be replaced.
- b. Diffusers shall be a combination of linear diffusers and square lay-in type.
- c. All return and exhaust grilles shall be replaced.

12. Exhaust System

- a. Provide a new rooftop exhaust fan to replace the existing.
- b. Provide new exhaust system and associated controls for the new refrigerant detection system.

13. Controls

- a. All existing pneumatic controls shall be removed.
- b. Replace with a new direct digital control system. System shall be open protocol such as BACnet or Lon Works. Software shall be Honeywell Tridium web-based framework. No proprietary equipment/systems are permitted.
- c. Extend system wiring to all equipment as noted.

- d. Provide PC workstation with software and web access.
- e. Program all sequences and front end.
- f. Provide owner training in system operation.
- g. Provide new sensors throughout.

14. Water Treatment

- a. Provide new water treatment systems for hot water, chilled water, and condenser water systems.
- b. Provide one year's chemicals.

15. Testing and Balancing

- a. Provide testing and balancing of all air and water systems.

16. Refrigerant Detection System (Code required)

- a. Provide a refrigerant detection system in the main boiler room complete with all sensors, alarms, controls, exhaust fan, and intakes with motor operated dampers.

17. Generator Exhaust Venting, Fan, and Louvers

- a. Mechanical contractor shall extend new high temperature generator vent piping to roof in accordance with manufacturer's guidelines. Replace existing.
- b. Mechanical contractor shall install new intake/exhaust louvers, exhaust fan, control dampers, ducting, actuators, etc. as necessary to provide combustion air and cooling air to the new generator.

OVERVIEW OF EXISTING PLUMBING SYSTEMS

The main toilet rooms are stacked in the original building area. Additionally there are janitor closets with mop sinks. There is a new kitchenette in the third floor employee area.

The sanitary drainage system runs out via gravity to a 6" sewer line. A 2" domestic water service feeds the building. A duplex ejector pump is installed to pump waste from the elevator sump and mechanical room floor drains.

There is an underground fuel oil storage tank under the rear parking lot which feeds the existing generator and boiler. There is currently no gas to the building.

PLUMBING SYSTEMS RECOMMENDATIONS

1. Plumbing Fixtures
 - a. Remove and replace all existing water closets with new handicapped dual flush sensor operated flushometer type.
 - b. Remove and replace all existing lavatories with new handicapped sensor operated low flow type.
 - c. Remove and replace all existing urinals with new low flow sensor operated flushometer type.
 - d. Provide new dual level handicapped electric water coolers throughout.
 - e. Existing kitchenette fixtures to remain.
2. Water Heaters
 - a. Provide a new high efficiency gas fired sealed combustion tank type 40 gallon water heater for the main toilets with recirculating pump and mixing valve. Extend venting to acceptable sidewall or rooftop terminal.
 - b. Provide a new high efficiency gas fired sealed combustion tank type 40 gallon water heater for the janitor's closets with recirculating pump. Extend venting to acceptable sidewall or rooftop terminal.
3. Piping Insulation
 - a. Re-insulate all existing and new hot and cold domestic water piping with fiberglass insulation as required by the Energy Code.
4. New Gas Service
 - a. Extend a new gas service to the building. Coordinate installation and metering with PECO gas.
 - b. Extend black steel gas piping to the new boilers and new water heaters.
 - c. Exterior exposed gas piping shall be painted to prevent corrosion.
5. Sump Pumps
 - a. Furnish and install a new elevator sump pump with oil detection sensor for the new elevator.

- b. Remove and replace the existing duplex ejector pump and sump in the main mechanical room.
6. Existing Oil Storage System
 - a. Piping system to be removed within the building.
 - b. Existing fuel sump pit near generator to be abated and in filled.
 - c. Existing underground storage tank to be filled with sand and abandoned in place in accordance with Federal and State EPA guidelines.
 - d. The condition of the existing underground oil storage tank is unknown. We recommend obtaining the services of a professional to test and investigate the existing condition.
7. Generator Oil Piping
 - a. Provide fuel oil fill pipe and vent from generator to new exterior fill station.

OVERVIEW OF EXISTING ELECTRICAL SYSTEMS

The building is served by a 13.2 kV primary electrical underground service. The substation with metering and transformers is located in the main basement mechanical room. The distribution is 3-phase 208 V and is protected with a 1000 Amp main breaker. Water infiltration is evident at the floor level of the mechanical room in the area of the substation.

The electrical panels in the building are Federal Pacific which is no longer manufactured and replacement parts are not available. Most panels are full and many breakers are taped to prevent accidental shut-off of lighting. The staff has addressed the desire to have additional outlets.

A Kohler diesel genset is located in the main mechanical room and feeds emergency lighting.

ELECTRICAL SYSTEMS RECOMMENDATIONS

1. Substation
 - a. The primary switch and transformer may be acceptable for continued service. Engage a test engineer to perform an infrared scan of the

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- switch and transformer as well as the NETA recommended servicing of the transformer. The service report will determine the reliability of the equipment for continued use.
- b. Remove and replace the 1000 Amp 208/120 V 3Ø, 4W panelboard.
 - c. Alternately, replace 15kV switch and 300 kVA transformer.
2. Generator
- a. Remove and replace 40 kW genset with new 50 kW genset. The genset is to be provided with a 24 hour sub base fuel tank. Coordinate with plumbing contractor for fuel supply and vent piping to exterior fill port.
 - b. Remove existing generator and appurtenances. Provide new 50 kW generator with soundproof exterior weatherproof housing and subbase fuel tank. Coordinate location on property. Extend cable and conduit to new ATS and emergency power distribution.
3. Lighting Fixtures
- a. Remove existing T12 fluorescent, incandescent and HID fixtures. Replace with new more energy efficient T-5, T-8, LED or compact fluorescent fixtures.
4. Lighting Controls
- a. Reuse existing manual controls for maintenance only.
 - b. Provide motion sensor or central lighting control to meet present energy code requirements.
5. Fire Alarm System
- a. Existing Silent Knight system is less than 10 years old. Perform manufacturer recommended upgrades/maintenance.
6. Mechanical Equipment
- a. Coordinate with mechanical for equipment replacement. Adjust circuit breakers and branch circuit wiring as necessary.
7. New Elevator
- a. Provide new electrical as necessary for new elevator installation.
8. Panel Replacement

- a. All FPE panelboards are to be removed and replaced in kind with 42 space panelboards of similar capacity. By adding 42 space panels, sufficient space should be available for additional branch circuits and receptacle outlets throughout the facility.

FIRE PROTECTION SYSTEMS

The building is not currently sprinklered. There is however, smoke detection throughout. It is not the intention to fully sprinkler this building at this time unless required by the Township.

BUDGETARY PRICING

The following prices are approximate construction costs for the work noted above:

Mechanical:	\$825,000
Plumbing:	\$240,000
Electrical:	\$450,000

Total MEP:	\$1,515,000
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Sprinkler System (if required):	\$125,000
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