



# Public Library

## HVAC – Master Plan

417 Spruce Street  
Leavenworth, Kansas

*PE*

*Professional Engineers, Inc.*  
14955 West 117<sup>th</sup> Street, Suite B • Olathe, Kansas 66062  
Phone (913) 390-6002 • Fax (913) 390-6006

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## **Executive Summary**

The majority of the HVAC system at the Leavenworth Library was upgraded in 2008 including two packaged Rooftop Units and a split system HVAC unit. These units along with two others are reported to be in fair working order by the mechanical service vendor and have significant remaining useful life.

During the 2008 project, a coil and refrigeration system was replaced to serve the existing 60 ton VAV Unit. This unit is 26 years old and serves the majority of the Library. The 60 ton VAV Unit has exceeded its useful life and additional repairs will not provide significant value to allow this make it unit to function properly. Minor repairs can be made to allow it to limp along for another summer or two, but its replacement needs to be a part of the overall HVAC Master Plan.

The speed drive serving the 60 ton VAV Unit has failed and the unit is currently set at a constant speed. Accordingly, it is unable to adjust airflow across the coil in lower load conditions to more effectively control space humidity. Further, due to the failure of the unit economizer, the outside air damper actuators have been locked into a permanent position. This may not provide adequate ventilation to the space and with no free cooling economizer, the unit costs more to operate.

This unit serves VAV boxes located throughout the Library that provide cooling control for numerous zones. Unfortunately, these boxes and controls have also failed and presently have the controls locked in open position. This results in excessive energy use and poor humidity control. The system as a whole should be replaced but if it must be phased, the boxes will need to be upgraded before the unit can be replaced.

There are 4-15 ton condensing units serving the 60 ton VAV HVAC that have been located in a poorly circulated area and cannot fully reject heat without the current "soaker hose" system spraying on the coils. The soaker hoses have damaged the life of the condensing units. One condensing unit has been upgraded and moved to the roof. Even if all condensing units were upgraded and properly located, it would be more cost effective to replace the equipment.

The heating system consists of an older 1986, low efficiency boiler with a failed control system. There are no automated controls for the boiler or local cabinet heating units throughout the facility. Replacement with a new high efficiency boiler, pumps and controls should result in quick payback of roughly 3 to 5 years while improving temperature control.

During our site investigations, it was found that the exhaust ducts were not connected to the exhaust riser through the roof. Accordingly, restroom exhaust is being mixed back into the return air stream instead of being exhausted to the exterior as required by code. The unconnected ducts also allow outside air infiltration into the return plenum and need repair.

Site investigations also found relief hoods are in disrepair that allow uncontrolled infiltration of outside air and humidity into the return air plenum when the system is not relieving air. Since the existing AHU economizer has failed, the occurrence of relief is limited.

# Library HVAC Phasing Plan

## Year Priority

- 1A Repair exhaust ducts and relief vents at roof
- 1B Temporary repairs to existing boiler controls
- 1C Add Energy Management System and control valves
  
- 2A Replace VAV boxes and speed drive on existing AHU
- 2B Replace boiler, pumps and accessories
- 2C Energy Management System for Boiler control
  
- 3A Provide structural upgrades to roof framing systems
- 3B Provide VAV Rooftop units, use existing duct where feasible
- 3C Energy Management System for VAV Rooftop control

## Notations

It is predicted that 10 to 20% could be saved by combining the scope and funding.

It is important to note that the boiler upgrade may be affordable in the current 2012 HVAC budget if specific accessories were addressed in later phases.

### **2012 Leavenworth Library HVAC Upgrades – Phase 1**

- 1A Repair Exhaust ducts where riser has been disconnected from roof and able to blow exhaust into the return air plenum. Repair Relief hood openings where failed dampers are allowing free infiltration of outside air into the return air plenum when the system has cycled down or remains open when not in relief.
- 1B The existing boiler is controlled manually by the Head Librarian with only limited complaints; using the on and off switch and loop temperature adjustment. There are no local controls at the hot water cabinet heaters located throughout the library.
- 1C Provide an Energy Management System (EMS) and hot water control valves at the cabinet heaters or at branches of heaters to significantly improve local control and reduce overall energy consumption.

### **2013 Leavenworth Library HVAC Upgrades – Phase 2**

- 2A Replace failed VAV Boxes and replace the variable speed drive on the existing air handling unit. Add control for the EMS and AHU parameters.
- 2B Replace End of Life Boiler to significantly improve energy efficiency and reduce monthly gas costs.
- 2C Provide automated boiler control to improve comfort, alarm notifications and reduce energy consumption.

### **2014 Leavenworth Library HVAC Upgrades – Phase 3**

- 3A Provide structural upgrades and roof curb installations to allow for new equipment upgrade.
- 3B Replace 60 ton VAV HVAC unit and associated condensing units to improve space temperature and humidity control. The benefit of having two 30 ton VAV Rooftop units vs one 60 ton unit, for provide partial redundancy should also be considered.
- 3C Provide automated VAV Rooftop control to improve humidity control, improve comfort, alarm notifications and reduce energy consumption

### **Additional Considerations for Review and Budgeting**

- A Architectural Review of Existing Boiler Room Fire Ratings
- B Water Infiltration and Site Drainage Review
- C Structural Framing Review for new RTUs
- D Facility ADA Accessibility and Fire Alarm Review
- E Breaker Testing and Electrical Assessment
- F Arc Flash Study and Hazard Labeling

See attached Phasing Plans indicating design development concepts.