MEMORANDUM

Date	January 13, 2015
Project #	2014239
Project Name	MState Detroit Lakes Boiler System Pre-Design
Project Location	Detroit Lakes, Minnesota
Description	Boiler System Pre-Design Evaluation and Recommendations for Improvements

Existing Boiler Plant and Heating System:

The existing heating plant at MState Detroit Lakes is a low pressure steam system. There are two low pressure steam boilers in the power plant. One is a Burnham Model 4NL-1157 capable of 6,298 MBH output. The boiler was installed in 1988. According to the maintenance staff this boiler runs continuously all winter. It can handle the entire building load, but never shuts off during cold weather. The boiler runs on natural gas with propane as a back-up fuel to allow natural gas to be billed at the interruptible rate (20% reduction). There is another steam boiler in the boiler room, but it has been condemned and tagged out by the boiler inspector.

The steam piping and equipment is contained within the boiler room. All piping leading outside of the boiler room is hot water. The steam from the boiler feeds three heat exchangers and one domestic water heater in the boiler room. Two of the heat exchangers have 2 heating distribution pumps each. One heat exchanger has 2 sets of 2 heating pumps. This results in 4 independent heating distribution systems. There is one large steam fired domestic water storage tank heater in the room. It provides domestic hot water for almost the entire building.

Tight Area for Maintenance

There is a tremendous amount of maintenance associated with the current system which includes 8 pumps, about 20 steam traps and multiple valves, strainers, fittings and electrical components. Not only is there quite a bit of maintenance required, but the space to access the equipment in some cases is very tight and could be considered dangerous.

Proposed change from a Steam to Hot Water Boiler Plant:

To match the existing heat load of the existing boiler plant it is recommended that there should be three - 3 MMBH hot water high efficiency boilers installed. This would allow two boilers to operate as primary with the 3rd one as back-up. High efficiency, condensing, boilers that can switch between propane and natural gas are recommended. State-of-the-Art, high efficiency, condensing boilers can get upwards of 96% efficiency during the milder seasons of the year. The greatest energy savings would be

obtained from resetting the hot water temperature from 180F to 110F as the outside air temperature increases from -20F to 55F. The cooler the water supplied by the condensing boilers the higher the energy efficiency the boilers are capable of. The boilers provided will have to have stainless steel heat exchangers for the condensing flue gases and the glycol water mixture.

The three existing steam heat exchangers and all the steam and condensate piping in the boiler room will be replaced with the new hot water boilers and associated how water heating distribution system. The 8 pumps will be replaced with 2 sets of two pumps. One set of pumps will be the primary boiler loop and the second set of pumps will pump the entire system. All four of the different hot water piping circuits will be tied together to form one interconnected system.

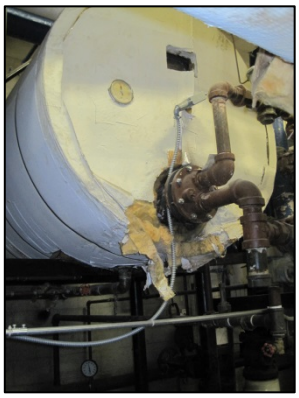
Existing Steam Heat Exchangers and Steam and Condensate Piping will be replaced

To improve the efficiency of the hot water system the new pumps will be provided with variable frequency drives. The variable frequency drives will speed up or slow down the pumps based on water pressure requirements of the heating system. All three-way control valves will be replaced or have their bypass leg shut off to allow the system to operate on a variable water volume sequence.

In order to tie all four of the heating systems together the quality of the existing water or water/glycol solutions will need to be tested. Cleaning and flushing of the existing systems will be required to ensure that the piping systems are left in good condition upon the completion of the construction project. Pre-testing of the water will be required to identify potential problem areas.

All of the systems will require a mixture of glycol water because several of the systems currently have glycol water in them. For those pieces of equipment that may be exposed to freezing temperatures the glycol will have to be maintained in the new consolidated system.

A significant part of the project will be the installation of the new pumps and associated accessories consisting of shut-off valves, fittings, check valves, flow meter fittings, balancing valves, air separators, expansion tanks, etc… In addition new electrical starters and panels will be required for the boilers and pumps.



Existing Steam Fired Domestic Water Heater

The domestic water for the building is currently a storage tank and steam tube bundle affair. The steam water heater will need to be replaced with 2 high efficiency gas fired domestic water heaters each with 100 gallon storage tanks and a capacity of approximately 250 MBH each. The existing domestic hot water and hot water recirculating system will be tied into. The recirculating system will have new recirculating pumps provided. The

recirculating system may require some new balancing valves to be installed. The water heater would be direct fired with direct sealed combustion.

Construction Requirements:

Construction will consist of removing the existing low pressure steam boilers, all of the existing steam and condensate piping, heat exchangers, domestic water heater and tank, pumps, electric equipment, controls, chimneys, combustion air intake and concrete pads. According to the maintenance personal there is no asbestos in the room. The boiler room should be placed under a negative pressure during the demolition to keep the demolition dust contained in the boiler room. Holes in outside walls and roofs will need to be patched per MState requirements. There are about 10 concrete equipment pads, installed below pumps and boilers that will need to be removed. The concrete floor will need to be reconditioned due to the spalling that will occur while removing the concrete pads.

Pump and Boiler Concrete pads will need to be removed

The new boiler construction will consist of installing three new gas fired, high efficiency, condensing type boilers, as the heat source for the campus. The contractor will provide and install new heating piping from the boilers to the existing supply and return piping, balancing equipment, piping insulation, gas piping, exterior roof and wall work as required for new boiler stacks and combustion air intakes. New automatic temperature controls will be provided to allow monitoring of the boiler plant from the building and internet. Change-over equipment so the boilers can be switched from natural gas to propane will be provided.

Estimated Construction Cost:

The overall construction cost including general, mechanical and electrical construction as well as permits, Bond etc…is estimated at $874,500 with design fees at 9% equal to $78,705. Total construction cost including fees is $953,205.

Submitted by,
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