Detention Center

Centrifugal Chillers

The existing Trane centrifugal chillers are approximately twenty-one years old and are experiencing issues with their operation. The chillers are designed to operate in series and were designed with a rated efficiency of 0.89 kW per ton. However, due to age and tube fouling, it is estimated that the chillers are currently operating at a rated efficiency of 1.10 kW per ton. In addition, according to the facility staff at the Detention Center (DC), the chillers lose their vacuum once or twice each operating season and shut down on safety.

Existing Trane Centrifugal Chillers

ESG proposes to replace the two existing Trane centrifugal chillers with two new Trane high-efficiency centrifugal chillers having a rated output of 150 nominal tons each. It is also recommended that the chiller plant be re-piped for parallel operation with a main chiller plant header pipe. Chiller 3 will remain and operate as the standby chiller in the new plant. The recommended chillers are Trane 3-pass water cooled Series R, Model RTHD rated at 150 nominal tons.

We propose two 150-ton units for reasons of redundancy. Based on the block load analysis of Detention Center, we estimate the design cooling demand for DC to be roughly 250 tons. By having three chillers, two units at 150 tons each, and the existing #3 chiller at 100 tons, should the biggest chiller go out of service (i.e., one of the 150 ton units), the remaining chillers can still meet the design demand.

CENTRIFUGAL CHILLER SCHEDULE (@100% LOAD)							
Evaporator Section				Condenser Section		Electrical	
Ent. Temp.	Lvg. Temp.	Flow (gpm)	PD Ft of H_2O	Flow @ 85/96^oF (gpm)	PD Ft of H_2O	Volts	Unit Power (kW)
56 ^oF	44 ^oF	298	5.9	375	8.5	208	97.5

CENTRIFUGAL CHILLER PART LOAD PERFORMANCE			
% Load	Capacity (tons)	kW	Efficiency (kW/ton)
100	150	97.5	0.650
75	112.5	64.8	0.576
50	75	39.6	0.528
25	37.5	27.7	0.739

Install Variable Speed Drives on the Cooling Towers

The existing Evapco cooling tower fan operates with a 2-speed/single winding motor. The existing BAC cooling tower operates with a two-speed motor. This measure recommends the installation of variable speed drives (VSD's) on the both cooling tower fans to reduce electricity consumption during low cooling load time periods. The VSD will vary the speed of the fan in relation to the actual load on the chiller plant. Rather than cycling the cooling tower fan on and off to maintain the condenser water temperature, the VSD will vary the fan speed to maintain the temperature of the water supply. The VSD will reduce the fan horsepower as well as reduce the wear and tear on the motor and the motor drive.

Replace Two Older Boilers

Boilers 1 and 2 were installed during the original construction and are approximately twenty-one years old and experiencing problems with operation. Boiler 3 was installed during the Detention Center expansion and appears to be in good condition.

ESG recommends that new high efficiency heating water boilers be installed to replace the two older Cleaverbrooks boilers. Four Futera III boilers by RBI will be installed to replace the two existing Cleaver Brooks boilers. Each RBI boiler is rated at 1,750 MBH input with a rated output of 1,523 MBH output. The new RBI boilers will provide increased turn-down capacity for lower load operation at higher combustion efficiencies. The new boilers will be installed in the same location as the existing boilers and will be connected to the existing gas supply and make-up water.

Existing CB Boilers

The boilers were selected based on the Detention Centers expressed need for system redundancy. Adequate redundancy is based on the central heating plant being capable of meeting the peak demand of the building without the largest boiler on line. The peak heating load of the building is estimated at 5,000 to 5,500 MBH. The new boiler plant consists of four (4) 1,523 MBH output boilers. With the largest boiler offline (Cleaver Brooks CB100), the total boiler plant capacity is 6,092 MBH. The existing CB Boiler will provide back-up to the new boilers and should only be operated when needed during peak load periods.

Variable Speed Drives

This scope of work includes the installation of variable speed drives (VSDs) on specific mechanical systems to control the speed of the fan or pump to reduce electrical consumption. ESG proposes to install Variable Speed Drives on the Cooling Tower, AHU-1, chilled water pump and heating water pump.

Chilled Water Valves

In conjunction with installing VFDs on chilled water pumps, we propose to replace the existing 3-way valves on AHU cooling coils with 2-way valves, so the chilled-water flow through the coil can be varied in proportion to the cooling demand, determined by measuring the coil leaving discharge air temperature.

Replace Old Heating Water Pumps

HW Pumps

Several heating water pumps located in the older section of the Detention Center are original and are in poor condition. Howard County Government has started replacing several pumps already. Two remaining pumps serving the heating system will be replaced with new pumps and premium efficiency motors.

We propose to replace the two hot-water pumps with two new similar units.

Kitchen Hood Controls

ESG proposes to install Intelli-Hood® controls on existing kitchen exhaust hoods. These variable-speed controls for commercial kitchen ventilation systems can save fan energy by improving the efficiency of the hoods. When the cooking appliances are turned on the fan speed increases based on exhaust air temperature as well as the level of smoke. During actual cooking, the speed increases to 100% until smoke/vapor is removed.

Please see Scope of Work Section in the appendix for details on this proposal and also refer to the Building Description Section for thorough descriptions of existing conditions.