

CHAPTER/REGIONAL TECHNOLOGY AWARD - SHORT FORM

1. Category - Check one and indicate New, Existing, or Existing Building Commissioning (EBCx)

Commercial Buildings New Existing or EBCx

Institutional Buildings:

Educational Facilities New Existing or EBCx

Other Institutional New Existing or EBCx

Health Care Facilities New Existing or EBCx

Industrial Facilities or Processes New Existing or EBCx

Public Assembly New Existing or EBCx

Residential (Single and Multi-Family)

2. Name of building or project:

City/State:

3. Project Description:

Project Study/Design Period:

Begin date (mm/yyyy)

to

End date (mm/yyyy)

Percent Occupancy at time of submission:

4. Entrant (ASHRAE member with significant role in project):

a. Name:

Last

First

Middle

Membership Number:

Chapter:

Region:

b. Address (including country):

City

State

Zip

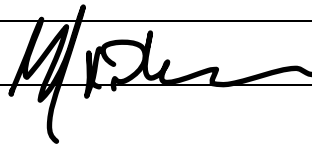
Country

c. Telephone: (O)

d. Email:

e. Member's Role in Project:

f. Member's Signature:



5. Engineer of Record:

By affixing my signature above, I certify that the information contained in this application is accurate to the best of my knowledge. In addition, I certify that I have discussed this entry with the owner and have received permission from the owner to submit this project to the ASHRAE Technology Awards Competition.

Hanover House Condominium (21 W. Goethe) MEP Upgrades

Gross Square Footage: 165,000

Number of Floors: 19

Number of Condominiums: 166

Amenity Spaces: Heated Pool, Sundeck, Common Laundry, Heated Indoor Parking, (1) Restaurant Tenant

MEP Systems: (3) HW Boilers, (2) DHW Heaters w/ Storage Tanks, (1) Chiller, (1) Cooling Tower, (1) MAU, AHUs, Exhaust Fans, FCUs, Unit Heaters, Duplex Booster Pumps

Building Construction: 1962

Project Cost: \$2,500,000

Designed: 2017-2020

Project Summary

The building's major mechanical, electrical and plumbing (MEP) systems were original to the building construction and approximately 54 years old at the time the MEP Upgrade project was conceptualized by Elara. In addition to being past their useful service lives, much of the major equipment was in poor condition and operating inefficiently, in many cases, with limited or no redundancy. Further, the existing installations were not compliant with current codes and the chiller utilized refrigerant scheduled for phase-out due to its contribution to ozone depletion. Given these existing conditions, Elara Engineering was enlisted to prepare an MEP Master Plan report which identified projects that would replace and enhance the building's major MEP systems in phases over time based on the Condominium Association's financial constraints. Elara's Master Plan prioritized projects based on critical needs and the opportunity to realize energy savings and enhance comfort and operation. Following the completion of Elara's MEP Master Plan Report in 2017, Ownership at Hanover House enlisted Elara Engineering to design the first group of prioritized projects for the building.

The first project undertaken by the building and prioritized by Elara was replacement of the heating boiler plant, dual temperature and hot water pumps, makeup air unit, horizontal dual temperature piping, and horizontal domestic hot and cold water piping. In addition to replacement of the aged piping with new, the project installed a new, modular condensing boiler plant and a new MAU in an alternate location along with demand controlled ventilation (DCV). A new open protocol direct digital control (DDC) system was also installed along with electrical upgrades associated with each impacted system. The second project undertaken by the building and prioritized by Elara was replacement of the chiller with a new high-efficiency chiller utilizing multiple compressors and refurbishment of the cooling tower.

Energy Efficiency: Highly efficient equipment selection and a new building automation system contributed to a highly efficient retrofit of mechanical systems. Additionally, the new condensing boiler plant serves high temperature and low temperature hot water loops with temperature cascaded to maximize boiler efficiency. The new MAU incorporates DCV reducing the operation time of the fans to only what is required.

Indoor Air Quality: Ventilation is provided to condominiums via a new 100% outdoor air MAU installed in a new location on the building roof and equipped with MERV 14 filters. The increased ventilation effectiveness provided by the new DCV system improves indoor air quality for occupants greatly. Additionally, the increased proportion of makeup air to exhaust reduces the building negative pressure and decreases infiltration thereby protecting the building façade and reducing draft.

Innovation: Current code requires that the amount of air brought into a building must equal the amount of air exhausted from the building. Since the existing constant volume MAU was only sized for 44% of the building's total exhaust, the existing MAU could not be replaced with a like unit and there were significant spatial constraints within the existing penthouse. Further, a larger MAU would represent additional heating and cooling load to the central plants. As a result, Elara designed a new roof mounted MAU that utilizes direct expansion cooling and a duct mounted hot water coil to provide tempered outside air to the building. The new MAU incorporates a demand controlled ventilation (DCV) strategy utilizing duct mounted temperature and static

pressure sensors. With DCV in place, the new MAU could be sized similar to the existing due to diversity and reuse the existing ductwork while complying with current code and enhancing indoor air quality. Additionally, creative sequencing of the recommendations was imperative to reducing the overall cost of the projects (see below) and allowed the building to maintain occupancy with minimal interruption throughout construction.

Additionally, automatic isolation valves were installed on the dual temperature risers serving the residential fan coil system to allow for quick isolation in the event of a leak and also to avoid interruption to the condominium units where the previous manual isolation valves were located. In addition to improving maintenance and reducing interruption to building occupants, the automatic isolation valves can now be controlled to isolate portions of the dual temperature riser system (i.e. quadrants) throughout the year including swing seasons to improve occupant comfort and save energy. For example, south facing portions of the building can be isolated during swing seasons when the dual temperature system is still providing hot water to avoid overheating.

Operation and Maintenance: The installation of new equipment with more sophisticated control programs, proper service clearances and automatic isolation improves overall operation and maintenance. The existing boilers were undergoing regular tube replacements and general repairs prior to their replacement (estimated at \$15,000 annually) and experienced multiple failures. Further, the horizontal domestic water and dual temperature piping at the top of the building was subject to failure due to visible corrosion and the chiller and cooling towers were in poor condition impacting building operations.

Additionally, the new chiller installed at the building utilizes multiple compressors and two (2) new condenser water pumps were installed to provide redundancy in the building's cooling system. Similarly, three (3) modular boilers were installed incorporating one (1) boiler that will only be needed for peak conditions and backup along with redundant hot water pumps. Also, reducing the negative pressure of the building reduces future risk to the building façade. The new building automation system is likely the greatest contributor to improved operations and maintenance due to the front end monitoring, changeover and alarming. Annual maintenance savings resulting for the first two master plan projects is estimated at \$25,000.

Cost Effectiveness: Prioritization of the master plan projects identified by Elara not only considered critical needs and the operating impact to building occupants, it also sought to minimize cost wherever possible. The boiler plant replacement project was identified as a priority over the chiller replacement to eliminate the non-sealed combustion, original boilers which were housed in the same penthouse mechanical room as the chiller. By installing new, sealed combustion equipment for the boiler plant, the new chiller equipment installed in the next phase did not require the construction of a separate room resulting in substantial cost avoidance. Additionally, the new boilers are modular requiring less space within the penthouse mechanical room. Further, the existing cooling tower was installed in the 1990s and was refurbished rather than replaced to avoid the cost associated with new equipment and its installation. The implementation of DCV avoided costs associated with a larger capacity MAU to meet current code that would have required pipe and ductwork replacements and additional heating and cooling capacity at the central plants. A new open protocol DDC system was also installed allowing for the integration of other equipment and control strategies in the future that can be implemented and serviced by a variety of contractors.

Finally, energy efficient systems and operational strategies result in lower utility costs. Electric and natural gas savings resulting from the first two master plan projects are estimated at \$56,754 annually. Additionally, \$30,099 in incentive funding was obtained due to the use of energy efficient equipment.

Environmental Impact: The selection of high-efficiency condensing boilers with low NO_x burners reduced the amount of harmful emissions ejected to the environment. Further, the new chiller eliminated the use of R-22 refrigerant which has been phased out of production due to its contribution to ozone depletion and instead uses environmentally friendly refrigerant. Gas and electricity savings are also a result of the project thereby reducing overall carbon emissions. Harmful asbestos was also safely removed from the building as part of this project.

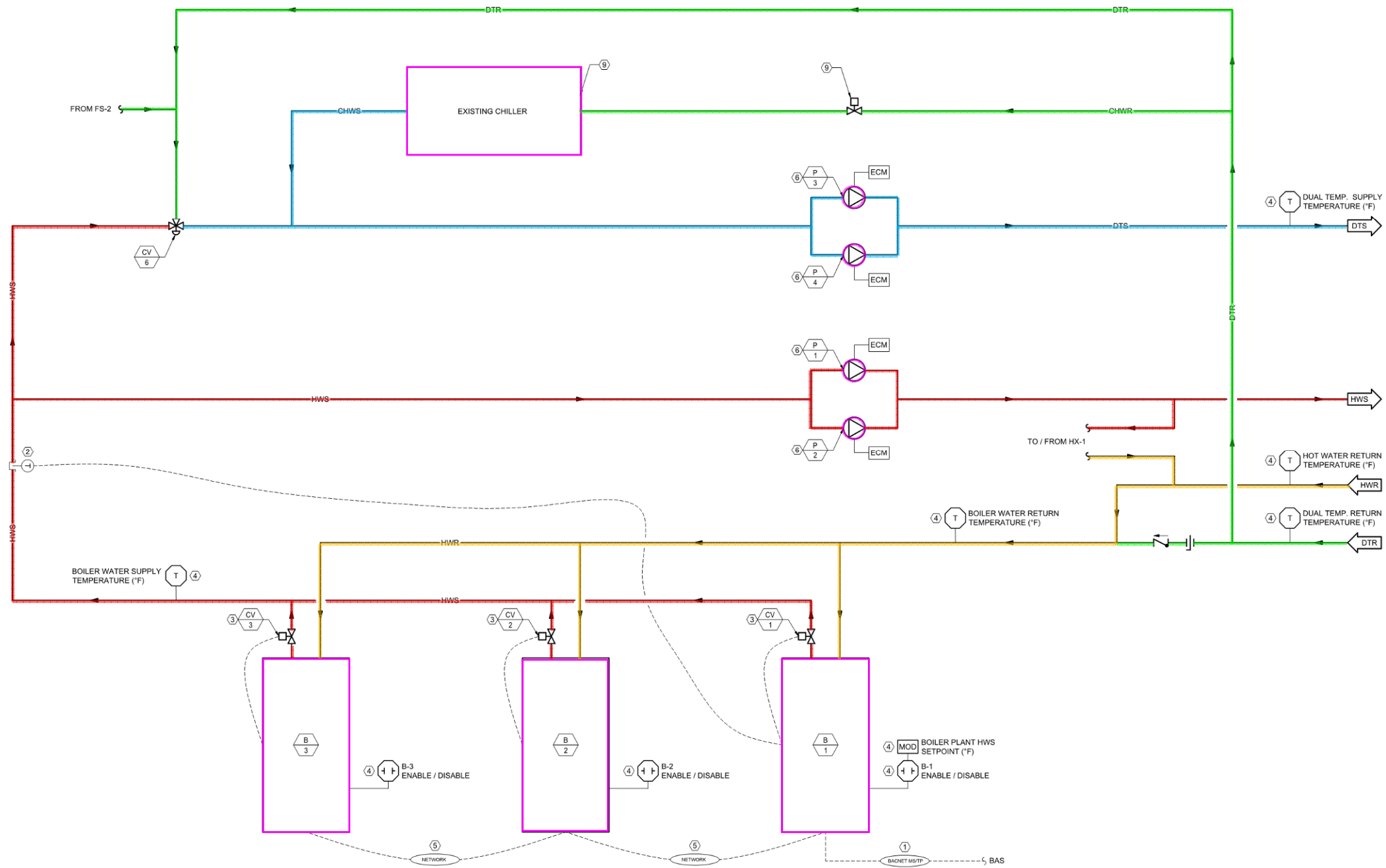


FIGURE 1: BOILER PLANT CONTROL DIAGRAM



FIGURE 2: NEW BOILERS

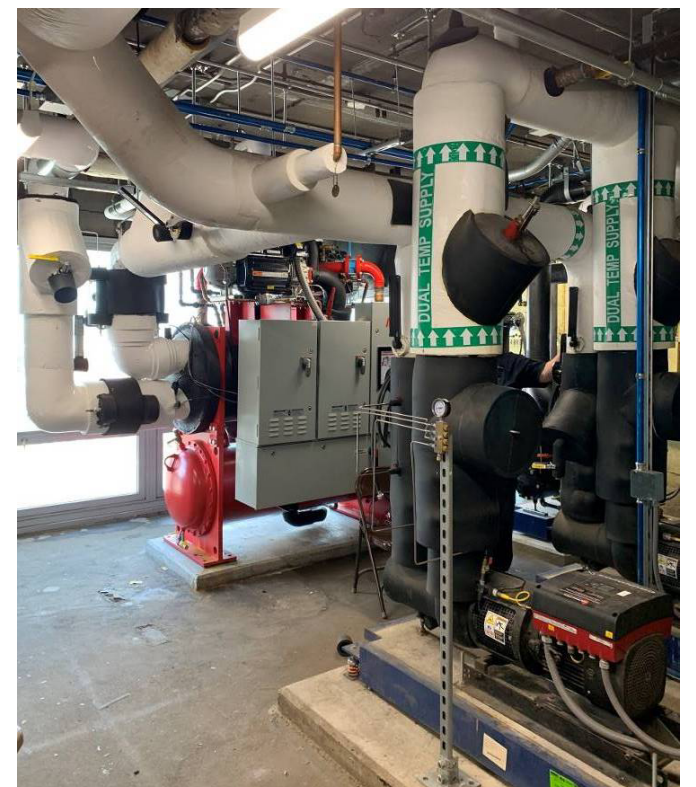


FIGURE 3: NEW DUAL TEMPERATURE PUMPS