

# CHAPTER/REGIONAL TECHNOLOGY AWARD - SHORT FORM

**1. Category (Check one and indicate New or Existing, if applicable)**

Commercial Buildings  New or  Existing

Institutional Buildings:

Educational Facilities  New or  Existing

Other Institutional  New or  Existing

Health Care Facilities  New or  Existing

Industrial Facilities or Processes  New or  Existing

Public Assembly  New or  Existing

Residential (Single and Multi-Family)

**2. Name of building or project:** \_\_\_\_\_

City/State: \_\_\_\_\_

**3. Project Description:** \_\_\_\_\_

Project Study/Design Period: \_\_\_\_\_ to \_\_\_\_\_  
Begin date (mm/yyyy) 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: Donald J. McLeavelson

**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.



The Fordham Condominium  
Make-up Air System Upgrades Project  
By Elara Engineering

**Project Statement**

Located at 25 East Superior Street in River North, the Fordham is one of the tallest residential buildings in Chicago. The high-rise condominium building stands at a height of 52-stories and offers ground floor retail tenant space, an indoor parking garage and numerous residential amenities in addition to approximately 229 individual condominium units. The building was constructed in 2004 and totals approximately 576,756 sq.ft.

Due to high utility consumption and increasing maintenance costs, Elara Engineering was called upon in 2013 to review the building's makeup air handling systems which were identified as some of the greatest contributors to the increased costs experienced by the Condominium Association. The central makeup air systems serving the Fordham are divided into two (2) zones: a low zone and a high zone. The makeup air unit serving the low zone is located on the 10<sup>th</sup> floor of the building while the makeup air unit serving the high zone is located on the 51<sup>st</sup> floor of the building. Chilled water for the building is purchased and piped to the makeup air units. Heating for the makeup air units was accomplished via electric resistance heating. At the time of Elara's initial review, the building had experienced multiple failures of the staged contactors associated with the electric resistance heating elements serving the makeup air units with failure reports dating back several years.

During the course of Elara's review of the building's makeup air units, it was noted that the building's central kitchen, toilet and laundry exhaust streams were located in close proximity to the makeup air units for each zone. It was additionally noted that the existing atmospheric domestic hot water plants within the mechanical rooms on floors 10 and 51 were approaching the end of their useful lives, operating inefficiently and had also suffered recent maintenance issues. As a result, Elara's recommendation for resolution of the makeup air unit failed contactor issue was ultimately to convert the building's makeup air unit heating from electric resistance heating to hot water heating incorporating exhaust air heat recovery. This recommendation incorporated replacement of the domestic hot water plants, which were experiencing regular maintenance outages, with new high-efficiency equipment in new locations within the mechanical rooms in order to allow for implementation of the makeup air unit conversion. In addition to addressing the failed contactor issue, Elara's recommendation also offered attractive energy savings, opportunity for additional redundancy, improved maintenance and the replacement of equipment reaching the end of its useful life.

The resulting implementation project designed by Elara in the fall of 2013 installed new high-efficiency condensing boiler plants in each mechanical room (10<sup>th</sup> floor and 51<sup>st</sup> floor) dedicated to providing hot water for new heating coils (replacing the electric heating coils) installed within the existing makeup air units. Each boiler plant consisted of one (1) high-efficiency condensing boiler with high turn down capabilities. A new run-around heat recovery system was also installed in each mechanical room and consisted of new heat recovery coils located at the discharge of the main toilet, kitchen and laundry exhaust systems for each zone to recover waste heat to be used for preheating the makeup air via new preheat coils located in each makeup air unit. Finally, in order to make room for the new heating boiler and heat recovery systems and to replace existing maintenance intensive equipment, new high-efficiency condensing domestic hot water heaters were installed in each mechanical room. The new heating boilers and domestic hot water heaters were vented independently removing the need for a draft assist fan as previously utilized for the atmospheric domestic hot water heaters. Due to previously experienced periods of

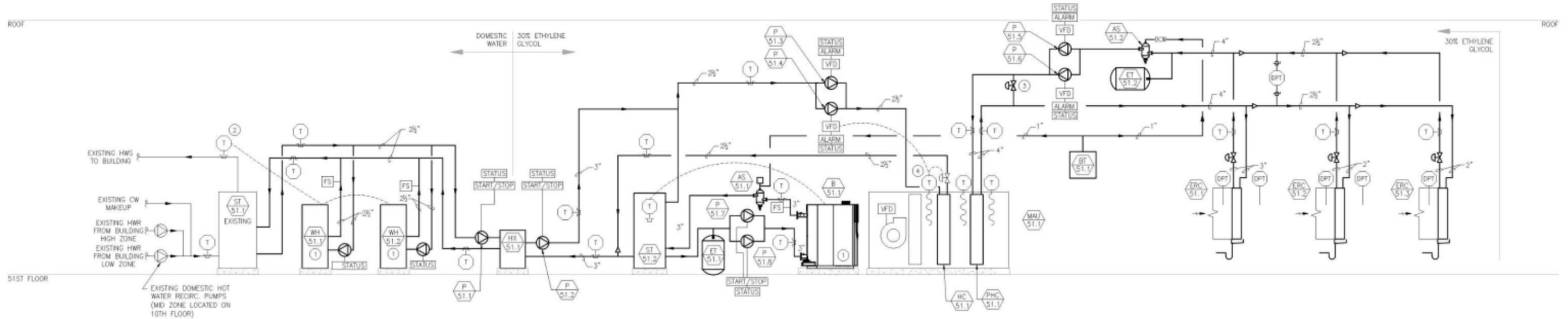
electric heat failures in the makeup air units and of the domestic water heaters, Elara incorporated the addition of a heat exchanger to allow for additional system redundancy without having the added cost of additional domestic water heaters and boilers. Additionally, the building's existing natural gas main route through both mechanical rooms was determined to have adequate capacity to support the new equipment without the need for upgrade. All new equipment was integrated with the building's existing central building automation system and incorporated upgrades to the front end of the system.

The project was successfully implemented during the 2013/2014 heating season for a cost of approximately \$882,000 and successfully obtained \$48,956 in utility incentive funding secured through the efforts of Elara. A year-to-year comparison of actual pre and post retrofit utility bills revealed a total annual utility cost savings of \$194,039 which exceeded Elara's initial projection of savings for the project. This represents a simple payback of approximately 4.3 years.

Perhaps more valuable results than utility cost savings are the avoided costs such as future equipment repair and increasing maintenance burdens. Although these costs can not be immediately measured, they are undeniable savings. Finally, this project had many immeasurable ancillary benefits such as reduced maintenance, service disruptions and carbon emissions.

#### **Justification for Claim of Excellence**

1. **Energy Efficiency:** High-efficiency equipment, the implementation of a runaround heat recovery and integrated control systems all contributed to highly efficient systems.
2. **Indoor Air Quality:** N/A
3. **Innovation:** The immediate problem at hand was presented as failed contactors for staged electric heating elements within the building's existing makeup air units. Although a "quick fix" solution was explored in the form of SCR controllers, Elara identified the opportunity to improve the energy efficiency of the existing makeup air systems and implement a long-term solution that maximized the value of the owner's initial investment.
4. **Operation and Maintenance:** Existing maintenance intensive equipment was removed as part of this project (electric heating coils with failed contactors and the existing DHW heaters). The installation of new equipment with better control and proper service clearances improves overall operation, maintenance and reliability.
5. **Cost Effectiveness:** Through the efforts of Elara, the Condominium Association successfully obtained \$48,956 in incentive funding through local utility providers to help offset the initial cost of the system upgrades. Due to the existing electric heating coil contactor failures, we were able to better invest funds into new makeup air unit and domestic hot water heating systems with payback as opposed to allocating the money to apply a fix to the problem without providing any significant savings over time other than potential maintenance avoidance. Additionally, Elara was able to identify a solution that worked within the existing spatial conditions of the existing mechanical rooms without the need to invest in significant infrastructure upgrades.
6. **Environmental Impact:** Implementation of higher efficiency equipment combined with a higher level of operational control help offset any environmental impacts associated with energy consumption. Electricity savings are also a result of the project thereby reducing overall carbon emissions.



Typical Mechanical Room Control Schematic

MAU Project - Year to Year Electrical Savings		
Pre-Retrofit Annual Consumption	kWh	6,950,802
Pre-Retrofit Energy Cost	\$	606,077
Post-Retrofit Annual Consumption	kWh	4,543,262
Post Retrofit Energy Cost	\$	396,151
Annual Savings	kWh	2,407,539
<b>Total Annual Electric Cost Savings (\$)</b>	<b>\$</b>	<b>\$209,926</b>
Percent Reduction	%	35%

Electrical Consumption Comparison

MAU Project - Year to Year Natural Gas Increase		
Pre-Retrofit Annual Consumption	Therm	79,106
Pre-Retrofit Energy Cost	\$	61,018
Post-Retrofit Annual Consumption	Therm	99,703
Post Retrofit Energy Cost	\$	76,906
Annual Savings	kWh	(20,597)
<b>Total Annual Natural Gas Cost Savings (\$)</b>	<b>Therm</b>	<b>(\$15,887)</b>
Percent Reduction	%	-26%

Natural Gas Consumption Comparison