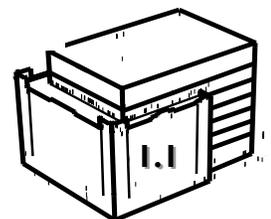
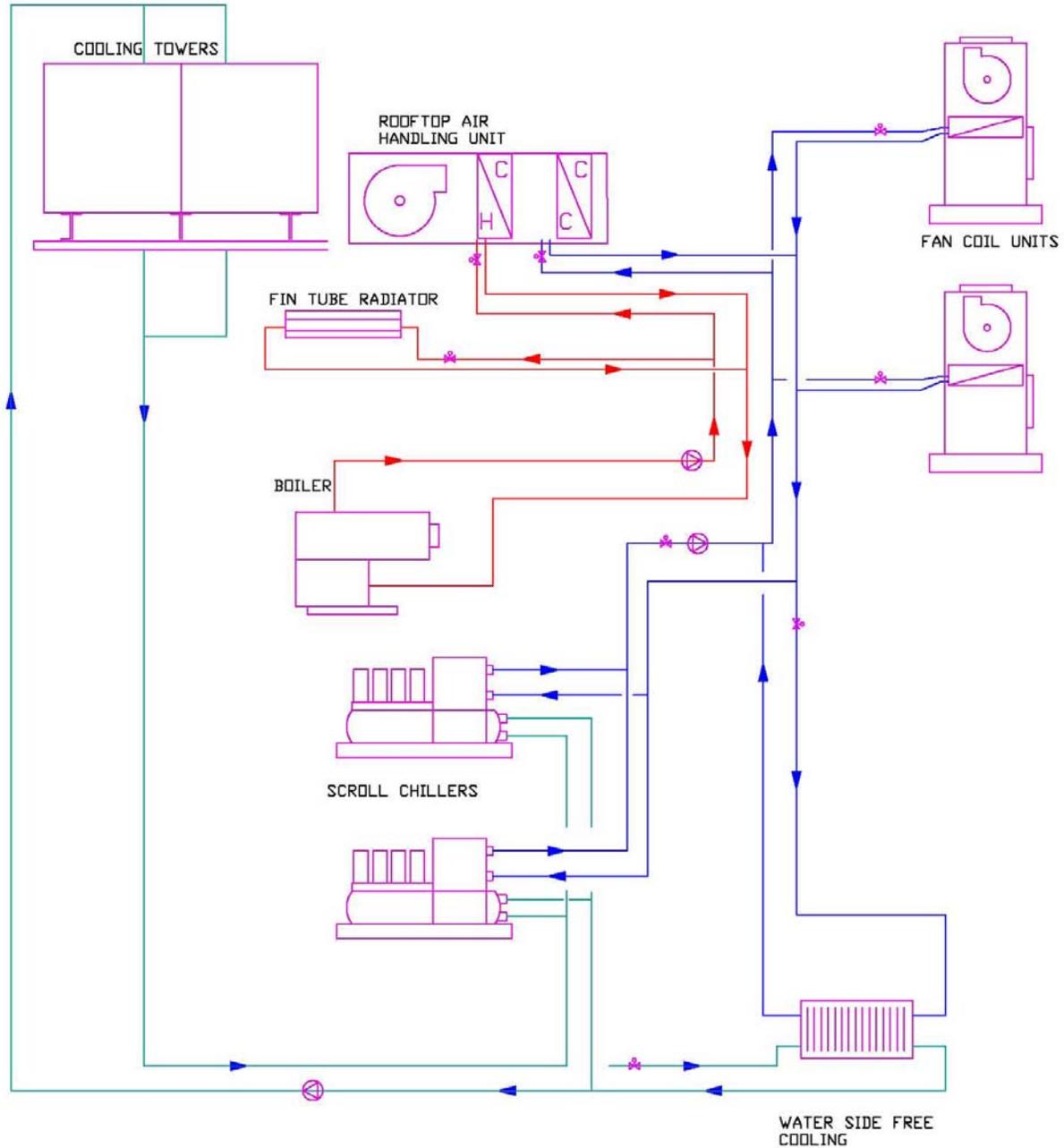


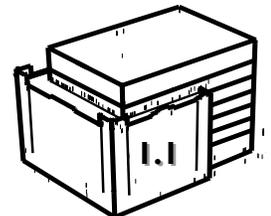
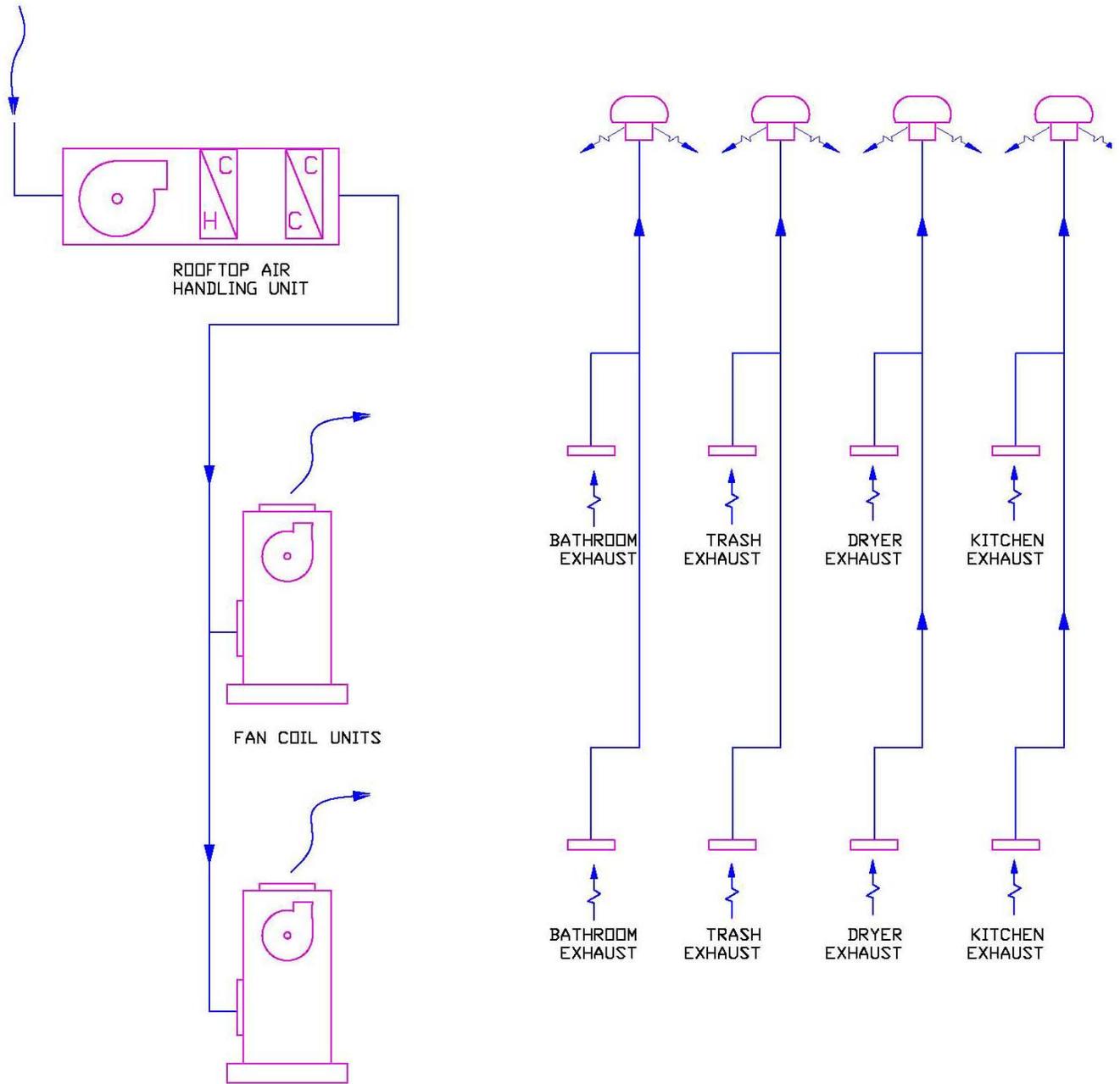
SECTION I: EXISTING SYSTEM AND PROPOSED SYSTEMS

Original Design: Traditional Central Heating and Cooling

Heating and Cooling System Schematic



Original Design Ventilation Schematic:



Existing system summary:

The condominium building has a central heating and cooling system. Two 1.3 MMBtu (E-1b) boilers heat a circulating water loop supplying the rooftop unit coils and fin tube radiators in the perimeter rooms. Two 104 ton scroll chillers (E-1a) and two cooling towers maintain a chilled water loop which supports the fan coil units and the rooftop units. The two roof top air handling units provide tempered ventilation. The largest, a 15000 CFM unit, supplies outdoor air to individual fan coil units in the apartments and to the basement, and a 1755 CFM unit supplies air to egress corridors. Two fans on the roof supply unconditioned ventilation to the boiler room and to pressurize the stairwell, and several exhaust fans reject air from the apartments.

The building was checked against the following standards and codes and met or exceeded all ventilation, envelope, and exhaust requirements for its location in NJ. The envelope conditions can be found in A-3, and ventilation rates in C-7:

ASHRAE 90.1 2004

ASHRAE 62.1 2004

International Building Mechanical Code

Critique of the Existing System

Relative to the design goals, these are the important factors that impact the success of the original system:

1. Luxury Value and ProfitLimitations:

High first cost with no return

The building design intent is high quality, but the owners will make more profit if they can invest in features that condo owners can see and touch.

2. SustainabilityAssets:

-Efficient chiller

The two scroll chillers have four stages each, and have an EER of 15-20 depending on the load (E-1a). This is a better efficiency than if each apartment had a separate heat pump on the cooling tower loop.

-Eliminated heating fans

Heating the apartments with fin tube radiators instead of with the fan coil units will bring down the fan energy consumption.

-Efficient Gas Boiler

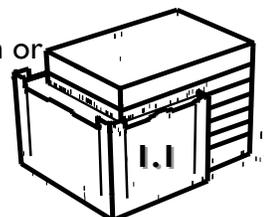
The natural gas fired condensing boiler is up to 98% efficient. (E-1b)

-LEED rating

Design documents state that the design building energy consumption will be at least 20% more efficient than the base case model. (A-4)

-Heat Rejection for DHWH

When the heat pumps are in cooling, they can reject heat to tap water to lessen or eliminate the DHWH cost



Limitations:**-Pollution**

This system, although efficient, uses grid electricity and natural gas for heating and cooling

-On the edge of a Silver LEED rating

It would be advantageous if the mechanical system can have a greater than 20% energy savings over base case.

3. Space Conditions and ControllabilityAssets:**-High Ventilation**

Since New Jersey Code does not allow intermittent ventilation, the total airflow rates exceed the ASHRAE 62.1 ventilation recommendations. (C-5)

-Individual Control

Fan coil units and fin tube radiators are fed from the central hot water / chilled water loops directly, and not upstream or downstream of other apartments. This maintains accurate individual control to the hot water and chilled water valves.

-Building Control

The rooftop units temper the outdoor air, so even if the apartment conditioning is turned off, the apartments will not be receiving a large ventilation load. Tempering the constant ventilation therefore prevents pipes from freezing and mold growth, without overriding the individual apartment systems.

Limitations:**-No humidification****-High expense to temper the large outdoor air flow****-Heating air circulation**

The fin tube radiators will not have as good air circulation as fan moved heating.

4. Owner's Responsibility:Limitations:**-Responsibility ambiguity:**

Condo owners cannot modify the mechanical systems easily, and disputes cannot be attributed directly to each residence.

-Billing management:

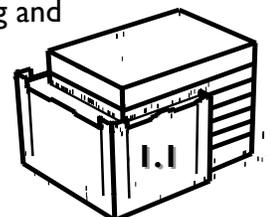
The utility cannot charge the apartments directly, so the owner must manage this.

-High management requirement:

The central heating and cooling system will require that the building owner manages its maintenance, and manages billing of each condominium for the total utilities.

Challenges to create a successful proposal:

Most of the design choices were the most logical choice to keep energy consumption low, the first costs low, meet the LEED ratings and provide quality heating and cooling. Since this is already an efficient system, and a large percentage of the building



energy use is incandescent lighting consumption, improving the mechanical system savings may not be reflected directly in the total energy use.

