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# Operation & Maintenance Manual

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## ***Downtown Apartments***

1234 Broadway  
Philadelphia, PA 19000

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## 1 GENERAL BUILDING DESCRIPTION

Owner: The Investment Group  
 Management: Apartment Management Company  
 Usage: Rented Office Space– Basement to 3<sup>rd</sup> Floor  
 Apartments – 4<sup>th</sup> to 7<sup>th</sup> Floors  
 Size: 7 Stories  
 Age: est. 1900 (100+ years)  
 1997 – Major Renovation  
 Configuration: Common Entry, with Elevators  
 Occupancy: Affordable

### Usage by Floor:

<b>Floor</b>	<b>Common Space</b>	<b>Living Units</b>	<b>Approx. Area</b>
Basement	Storage Boiler Room & Electrical Room	None	8,000 sq. ft.
1	Rented Office Space Management Office & Lobby	None	8,000 sq. ft.
2	Rented Office Space	None	8,000 sq. ft.
3	Rented Office Space	None	8,000 sq. ft.
4	Corridor Community Rooms Kitchen & Bathrooms Social Services Offices Laundry Room & Trash Room	4 - SRO 3 - 1BR	8,000 sq. ft.
5	Corridor Kitchens (2) & Bathrooms Laundry Room & Trash Rm	22 - SRO	8,000 sq. ft.
6	Corridor Kitchens (2) & Bathrooms Laundry Room & Trash Rm	22 - SRO	8,000 sq. ft.
7	Corridor Maintenance Shop Laundry Room & Trash Room	9 – 1 BR	8,000 sq. ft.
Roof	7.5 <sup>th</sup> Floor Mechanical Room Elevator Room	None	520 sq. ft.
<b>Total</b>	<i>(includes 180 sq. ft. roof stairwell)</i>	60 units	<b>64,520 sq. ft.</b>

**Building Envelope (Structure & Insulation):**

<i>Location</i>	<i>Structure</i>	<i>Insulation</i>
Foundation	Masonry Walls (Primarily Brick), Concrete Slabs	None
Above Grade Walls	Brick Structure Drywall Interior Finish	R13 Fiberglass (per renovation plans)
Flat Roof	Concrete Slab Asphalt Membrane	R38, Pinned Under Slab (per renovation plans)

**Utilities:**      **(Metering Varies by Usage):**

<i>Usage</i>	<i>Water</i>	<i>Electricity</i>	<i>Gas</i>
Rented Offices	Separate	Separate	None
SRO's & Common Areas	Central	Central	Central
1BR Apts	Central	Individual	Central

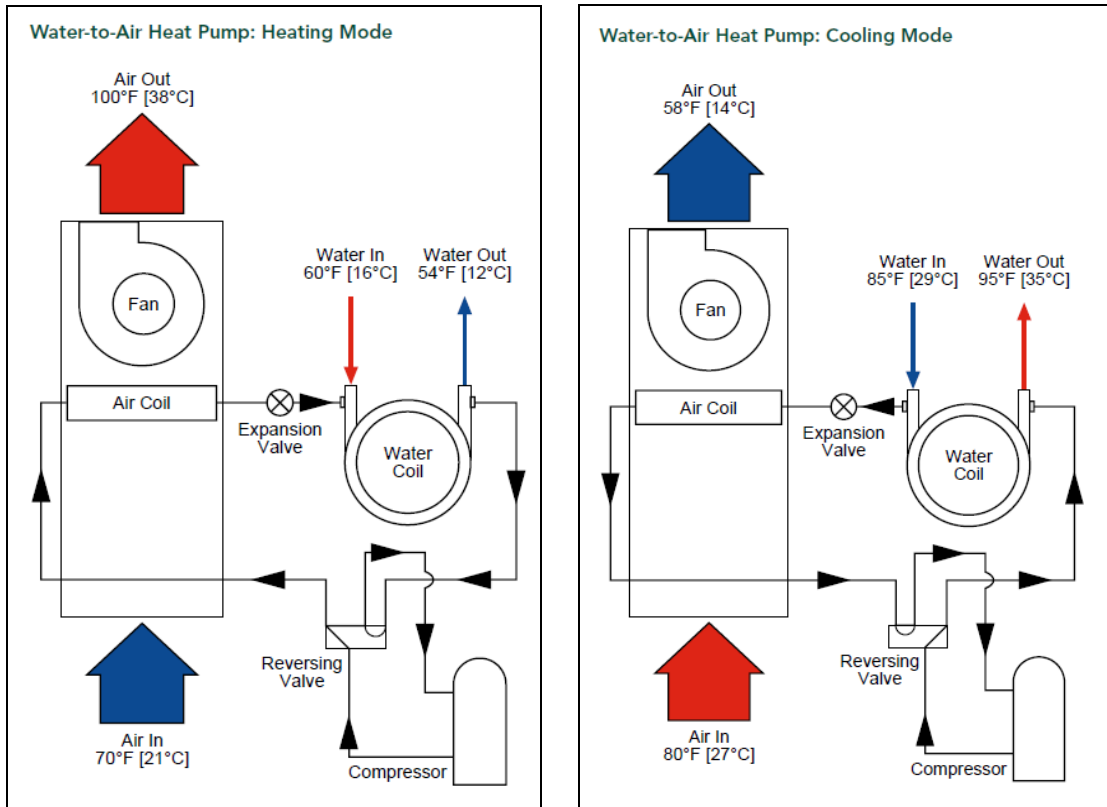
**NOTE:**

ALL OF THE INFORMATION IN THIS MANUAL APPLIES ONLY TO THE RESIDENTIAL PORTION OF THE BUILDING. IT DOES NOT INCLUDE ANY INFORMATION ON THE SYSTEMS THAT SERVE THE RENTED OFFICE SPACES.

## 2 HEATING & COOLING SYSTEMS

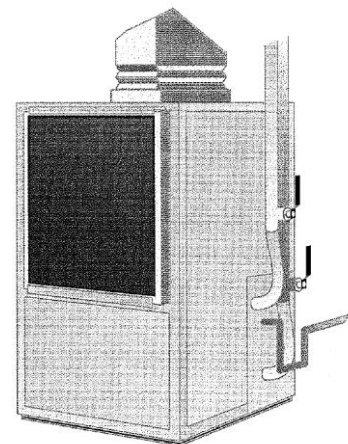
Downtown Apartments uses water source heat pumps (WSHP's) to heat and cool all spaces except the stairwells, which lack cooling and are heated with electric baseboards.

The water source heat pumps use a refrigerant loop to transfer heat between the room air and a water loop that runs around the building. During the winter, the heat pumps pull heat out of the water loop and add it to the room air. In the summer, they draw heat out of the room air and dump it into the water loop. During moderate weather, there may simultaneously be warm spaces adding heat to the loop while cool spaces are drawing heat from it.



All of the WSHP's in the building are ClimateMaster VS models of various sizes. The basic specs of these units are:

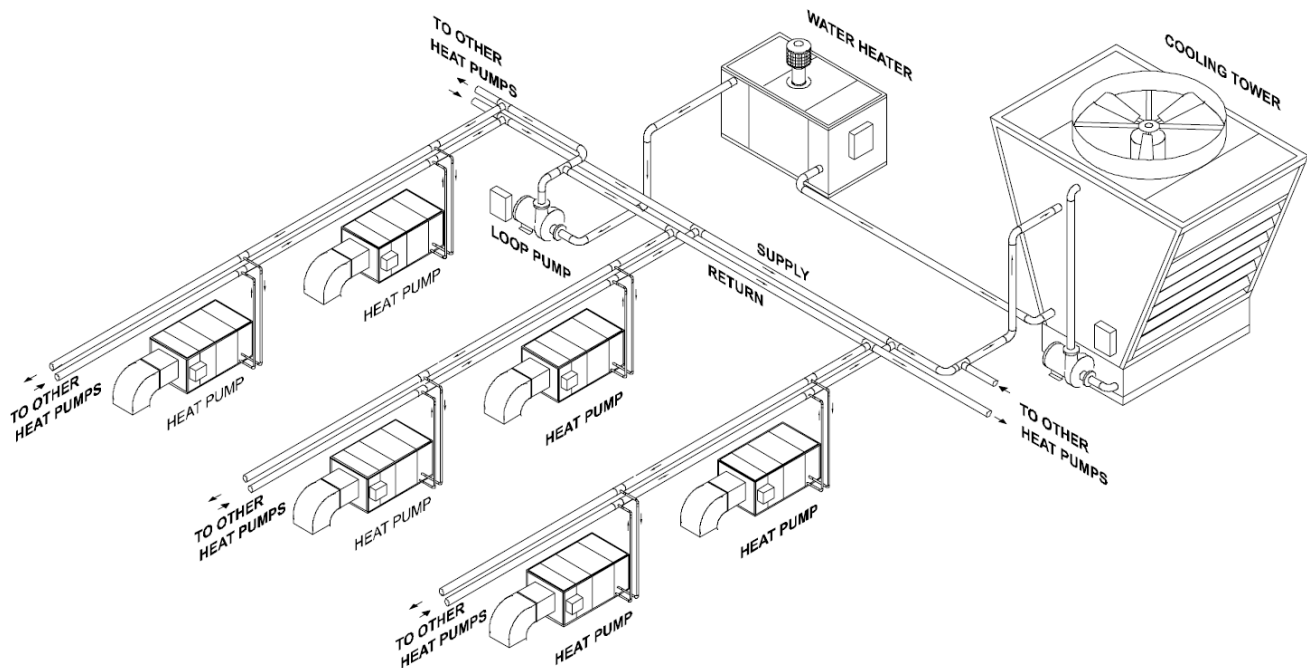
Model Number	Nominal CFM	Cooling (EAT=80/67, EWT=85)				Heating (EAT=70, EWT=70)		
		Total BTUH	EER	Input Watts	LWT Deg. F.	Total BTUH	COP	Input Watts
HS/HL 006	265	7400	11.8	630	95	8800	4.0	645
HS/HL-VS/VL 009	340	9800	11.6	845	95	12000	4.2	827
HS/HL-VS/VL 012	385	12200	11.2	1089	95	16200	4.0	1193
HS/HL-VS/VL 015	530	14100	10.5	1343	95	18800	4.0	1377
HS/HL-VS/VL 019	650	20600	12.0	1717	95	23600	3.9	1779
HS/HL-VS/VL 024	800	23400	12.2	1918	95	30000	4.5	1957
HS/HL-VS/VL 030	1000	29000	11.7	2468	95	39000	4.3	2675
HS/HL-VS/VL 036	1250	35000	11.0	3188	95	42500	3.9	3199
HS/HL-VS/VL 042	1500	41500	11.2	3705	95	52500	4.0	3846
HS/HL-VS/VL 048	1700	47500	11.0	4320	95	57000	3.8	4403
HS/HL-VS/VL 060	2000	62000	11.2	5539	95	75000	3.8	5792
HS/HL 072	2400	70000	11.0	6363	95	91000	3.9	6836
HS/HL 096	3400	95000	11.0	8640	95	114000	3.8	8801
HS/HL 120	4000	124000	11.2	11076	95	150000	3.8	11582



Each corridor and one-bedroom apartment has its own WSHP. Multiple SRO apartments are served by a single WSHP. Each WSHP is controlled by non-programmable thermostat in the space it serves. The thermostats have four adjustments: a HEAT/OFF/COOL switch, a fan ON/AUTO switch, and temperature adjustment sliders for both heating and cooling. They also have a readout that displays the actual room temperature.

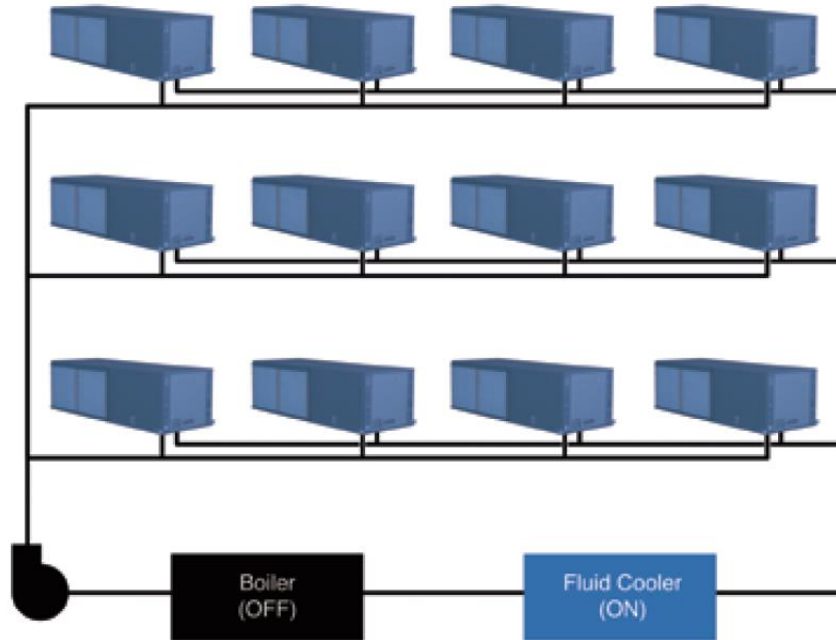


For the water loop to effectively serve the WSHP's, heat must be added to it in the winter to replenish the heat drawn out by the WSHP's. This is accomplished with a central boiler system. Similarly, in the summer heat must be removed from the loop. This is accomplished by a roof mounted cooling tower.

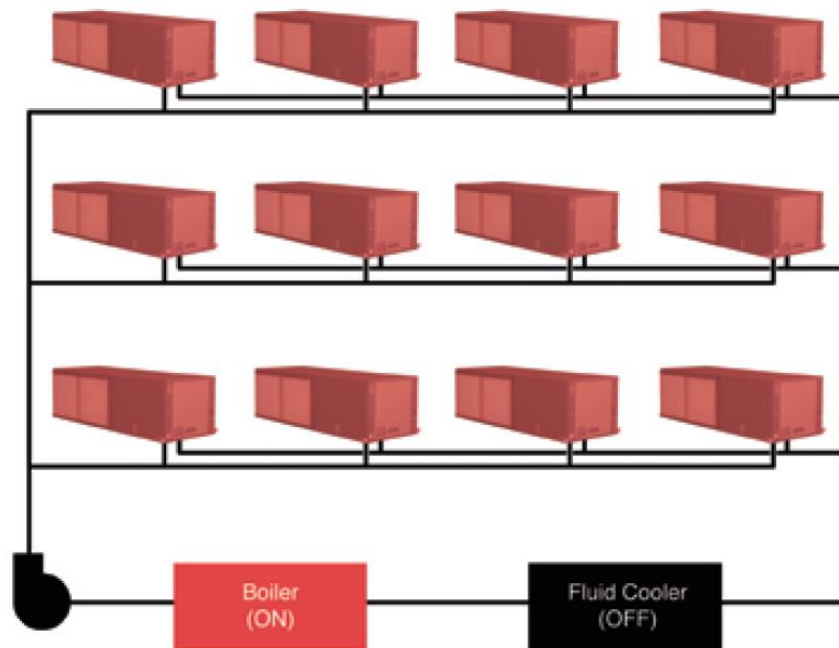


**Typical Water Source Heat Pump System**

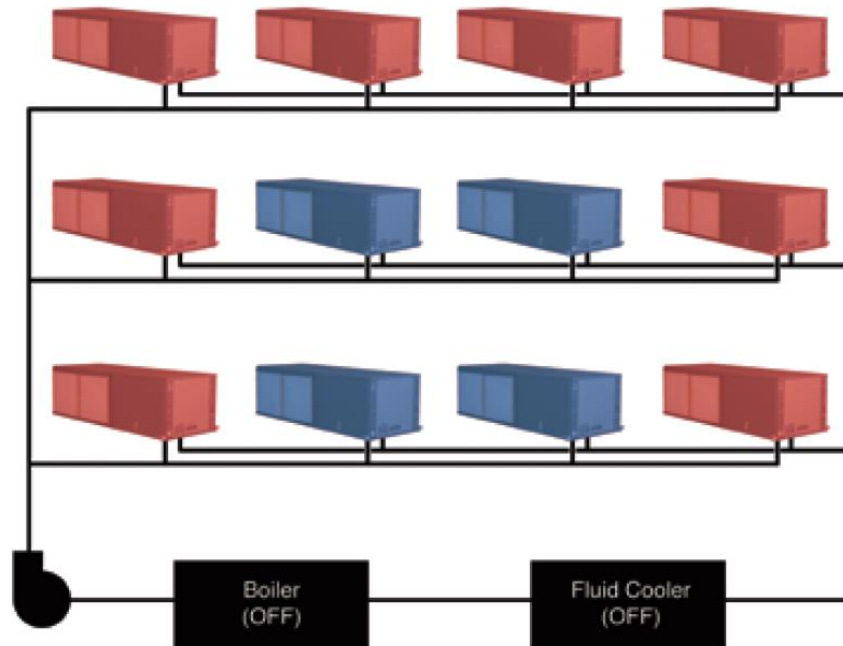
During the cooling season, the boiler is turned off (and isolated with valves from the rest of the loop) and the cooling tower is activated. The heat that is added to the loop by the heat pumps is dumped to the outdoors by this tower.



During the heating season, the cooling tower is turned off (and emptied of water so it won't freeze) and the boiler system is activated. The boilers intermittently add heat to the loop and the heat pumps move it to the occupied spaces.

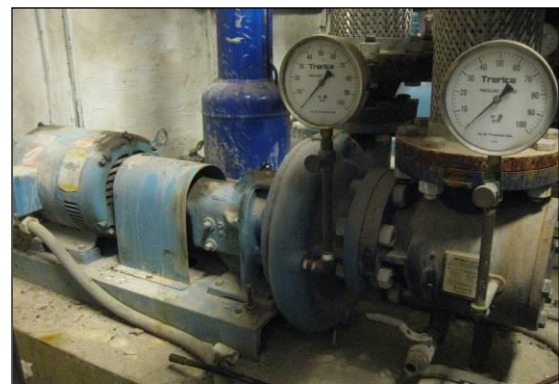


During periods of moderate weather, neither the boiler nor cooling tower may be needed, as heat is simply shifted from spaces that need to cooling to those that need heating.



Water is moved through the loop by two Bell & Gossett 1510 2.5BB, 7.5 hp pumps that are located in the basement mechanical room. One runs at all times. The other serves as a backup.

The WSHP's have no control valves to stop loop water from running through them when heating or cooling is not required. Water flows through every WSHP at all times.



The operation of the pumps is controlled by an Exeter Mfg. XL System Controller, which automatically alternates the “lead” and “lag” pumps to keep both in good operating conditions.

This unit also controls the temperature of the loop water. Target temperatures for both heating and cooling are programmed. If the target is satisfied, the boiler (or cooling tower) is disabled. If heating is needed, the boiler is activated and fires based on the boiler system controls, as described in Section 2.1.

If cooling is needed, the cooling tower is activated as described in Section 2.2.





According to ClimateMaster, the acceptable loop temperature ranges are:

### Water Limits

	HS/VS	
	Cooling	Heating
Min. Entering Water	55°F	55°F
Normal Entering Water	85°F	70°F
Max. Entering Water	110°F	90°F

The loop temperature is measured by a thermostat in the main supply pipe near where it connects to the circulator pumps.



A Wheatley TAS air separator is installed to automatically remove any air in the water loop.



**Recommended Control Settings (XL System Controller):**

Cooling Season Water Temp:	Stage 1	85°F
	Stage 2	87°F
	Stage 3	89°F
	Stage 4	89°F
Heating Season Water Temp:	Stage 1	69°F
	Stage 2	59°F
High Temperature Limit		114°F
Low Temperature Limit		49°F
Pump Alternation:		Automatic

## 2.1 CENTRAL BOILER SYSTEM

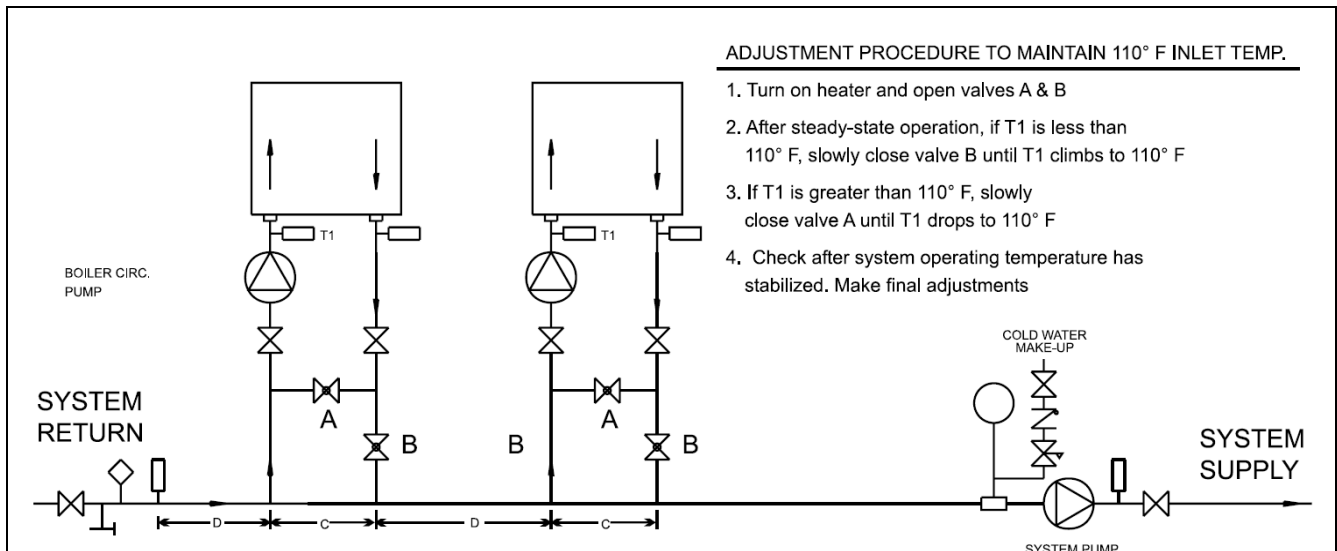
Downtown Apartments uses a central boiler system, located in a basement mechanical room, to add heat as necessary to the heating/cooling water loop. It consists of the following components:

- (2) Laars Mighty-Therm/Reddi-Therm Boilers ,
  - 80-81% Thermal Efficiency, Est. AFUE = 75%
  - 400,000 btu/hr Input
  - Natural Draft
  - Standing Pilot
- Custom Control Panel
- Honeywell T775 Staging Control



The boilers are piped in a primary/secondary loop configuration. Each boiler has its own pump and bypass loop that are designed to allow some degree of recirculation to allow the boilers to maintain a low building (secondary) loop temperature, while maintaining a high enough boiler (primary) loop temperature to avoid condensation of corrosive flue gases in the heat exchanger and flue pipe.

The boiler documentations states that the return temperature into the boiler should never fall below 110°F.



Combustion air is provided through a duct that draws air from outdoors.



Flue gases are exhausted through a large steel flue pipe that rises through the roof. This flue is shared with the domestic hot water boiler.



The general sequence of boiler operations is:

1. Exeter XL System Controller senses low temperature in the water loop, and sends signal to Honeywell T775 Staging Control to activate boiler system.
2. Honeywell T775 Staging Control senses low boiler return water temperature, and sends signal to activate one or both boilers.
3. Each boiler compares return water temperature to internal aquastat setting. If temperature is lower than setting (and all safety checks are acceptable), burner fires and pump is activated. Burner and pump shut down when aquastat set point is satisfied.
4. Boiler cycles until Honeywell Staging Control and Exeter XL System Controller are both satisfied.

**Heating System**

**Recommended Control Settings:**

Boiler Control Aquastats:	150°F
Boiler High Limit Aquastats:	190°F
Boiler Pump Control:	Auto Pump
Boiler Loop Target:	120°F

**Control Panel Switches:**

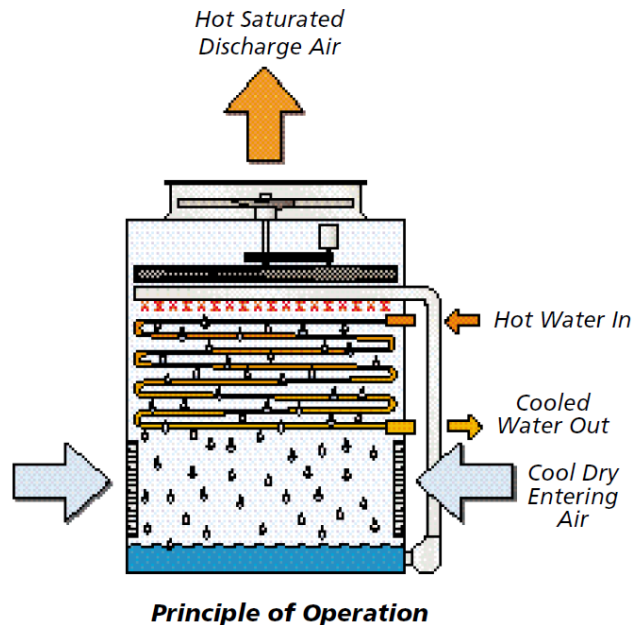
Power:	On
Boiler 1	Enable
Boiler 2	Enable

## 2.2 COOLING TOWER

Downtown Apartments uses an Evapco ATW-45B roof mounted cooling tower to reject heat as necessary from the heating/cooling water loop.



It is a closed-circuit cooling tower. The heating/cooling loop water is never exposed directly to air (as required by the heat pump manufacturer). It flows through the inside of coils in the tower. Water from a separate reservoir in the tower is pumped up and drains back down over the outside of the coils while two fans blow air across them. This arrangement causes the exterior water to absorb heat (from the loop water inside the coils) and evaporate so it can be carried out of the tower with the air stream.



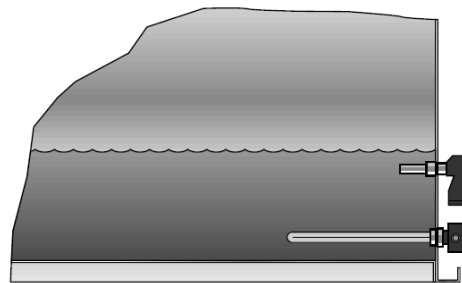
The cooling tower has an integral control system. The reading from a temperature sensor in the tower reservoir is used to activate the recirculation pump and one or both fans. A control panel allows the operator to select either manual or automatic operation of both fans and the pump. The set points for automatic operation are preset by the factory and should not be adjusted.



The cooling tower also includes a 5000W heater that will keep the water in the reservoir from freezing. However, it should only be needed in the late fall and early spring. During the winter the entire cooling tower should be drained of water.

### Electric Basin Heaters

Electric immersion heaters are available factory installed in the basin of the cooler. Standard Heaters are sized to maintain a +40°F pan water temperature with the fans and pumps off and an ambient air temperature of 0°F. They are furnished with a combination thermostat/low water protection device to cycle the heater on when required and to prevent the heater elements from energizing unless they are completely submerged. All components are in weather proof enclosures for outdoor use. The heater power contactors and electric wiring are not included as standard.



#### **Recommended Control Settings:**

Fan #1 and Fan #2:	Auto
Pump:	Auto
Heater:	Off

### 2.3 STAIRWELL HEATERS

The stairwells are heated with Berko BKO Series electric baseboards. Some have “temper-proof” integral thermostats that require a plug to be removed on an end cap to allow set point adjustment. As of June, 2011, most of the baseboards serving the rear stairwell had no thermostats and were run at all times.



**Recommended Control Settings:**

Thermostat:                      Lowest Possible Setting

### 2.4 ELEVATOR ROOM COOLING

Excess heat is removed from the rooftop elevator room with a 1.5 ton Carrier PA10J (outdoor) & FF1 (indoor) split system air conditioner. It is controlled by a slider-type manual thermostat in the elevator room. It is critical for the longevity of the elevator controls that this room be maintained at a temperature of 90°F or lower.



**Recommended Control Settings:**

Thermostat:                      85°F

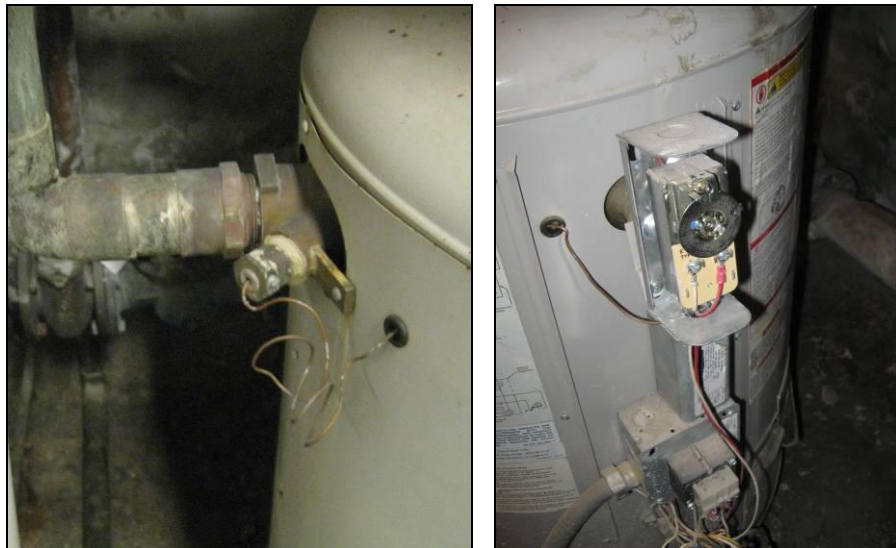
### 3 WATER HEATING SYSTEM

Downtown Apartments creates domestic hot water using a central system that includes a natural gas boiler and an indirect-fired storage tank. The boiler is an A.O. Smith Burkay Copper Coil unit. The storage tank is an Ajax 225 gallon model.

A Bell & Gossett Series 100 pump continuously circulates water between the boiler and the tank. (It never shuts off.) A thermostat on the boiler measures the temperature of the return water and fires the boiler when this temperature falls below the set point.



*Domestic Hot Water System and Boiler Circulator Pump*



*Temperature Sensor and Thermostat*



Hot water flows from the storage tank to the occupied spaces in the building. The temperature of this water is displayed on a thermostat on the side of the storage tank.



A Taco 1/25 hp pump re-circulates domestic hot water through the building to maintain the loop temperatures and keep hot water close to each apartment. This pump runs at all times.



**Recommended Control Settings:**

Boiler Control Aquastat: 140°F

Tank Temperature: 130°F

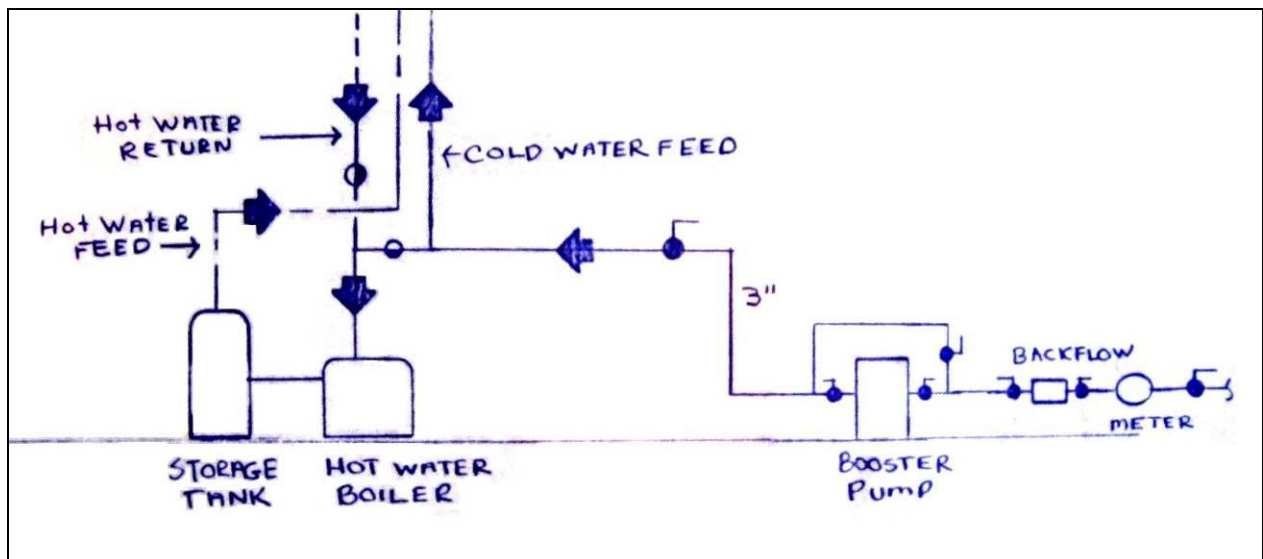
#### 4 DOMESTIC WATER PRESSURE BOOST SYSTEM

An Alyans VSPM-8070-7.5 booster pump system is used to raise the pressure of the domestic water so it is adequate at the upper floors. This system boosts the pressure in both the hot and cold water lines.

The system includes two 7.5 hp pumps. One runs at all times and the other serves as a backup. For maintenance reasons, this system is designed to periodically switch from the "Lead" to the "Lag" pump. This keeps both pumps in working order so one is always available if the other fails.

The pumps are maintenance-free and require no lubrication.

Variable frequency drives (VFD's) are installed to modulate the input power, providing less flow when demand is low and more during periods of peak demand. This provides more consistent water pressure and significantly reduces pump energy consumption.



The VFD's allow the output pressure of the pumps to be adjusted. They are factory set to provide a constant 80 psi in the basement. This can be read at a pressure gauge at the manifold above the pumps.



**Recommended Control Settings:**

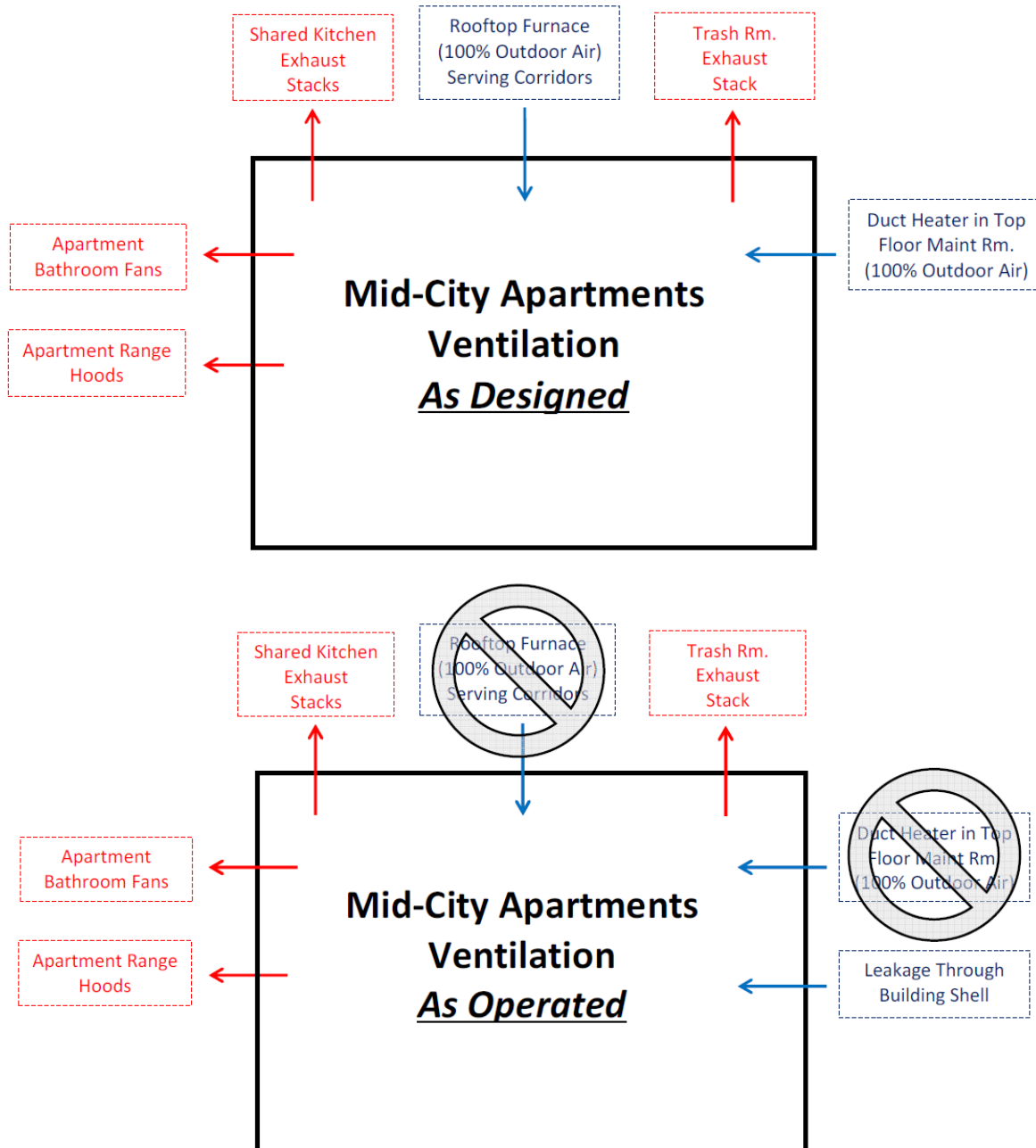
Pump #1:	Auto
Pump #2:	Auto
Auto Alternate:	Auto (Center Setting)
Output Pressure:	80 psi

## 5 VENTILATION SYSTEMS

Downtown Apartments was designed to use both supply and exhaust ventilation to provide fresh air for occupants and remove airborne contaminants from the building.

As designed, the building adds fresh air to the corridors through a rooftop mounted furnace and an air handler (duct-heater) in located in a mechanical room between the 7<sup>th</sup> floor and the roof. Stale air is removed using individual apartment bath fans and range hoods, as well as range hoods in the shared kitchens and a rooftop fan serving the trash rooms.

As of June, 2011, the fresh air supply fans have been disabled. (They are functional, but are not powered.) Therefore, the building relies only on the exhaust fans for ventilation. The exhausted air is replaced by fresh air that leaks in through openings the building shell.



## 5.1 ROOFTOP FURNACE

A Greenheck KSU-112-B-2-20 gas-fired rooftop furnace is installed to draw in 100% outdoor air, temper it to the indoor temperature, and deliver it air to supply registers in the elevator lobby area of each floor. The controls on this unit are internal. It does not include any cycling controls or room-air thermostats. As of June, 2011, this unit was functional, but it had not been in use for at least 3 years.

The unit includes cleanable air filters and a damper to shut off air flow when it is idle.



## 5.2 FRESH AIR FAN WITH DUCT HEATER

A Delta Flo EH-9N-320/980615 electric duct heater is installed in the mechanical room between the 7<sup>th</sup> floor and roof. It is designed to draw in 100% outdoor air from a rooftop gooseneck, temper it to the indoor temperature, and deliver to supply registers on the north end of each corridor. The controls on this unit are internal. It does not include any cycling controls or room-air thermostats. As of June, 2011, this unit was functional, but it had not been in use for at least 3 years.



### 5.3 TRASH ROOM EXHAUST

A Penn Ventilator DX roof-mounted, belt-drive, centrifugal downblast exhaust fan is used to draw air out of each trash room. It is controlled by a circuit breaker and runs at all times.



### 5.4 SHARED KITCHEN EXHAUST AND AIR FILTRATION

Moisture and odors are drawn out of the shared kitchens on the SRO floors by Kenmore range hoods (rated at 190 cfm) that are manually activated by integral switches.

In addition, the air in these spaces is filtered by Honeywell F115 C 100S Large Space Air Cleaners that are manually activated by switches in the spaces they serve.



## 5.5 APARTMENT BATHROOM EXHAUST

Moisture and odors are drawn out of the apartment bathrooms with Broan 670 ceiling mounted fans (rated at 50 cfm) that are manually activated by switches in the spaces they serve. The exhaust air leaves the building through roof-mounted goosenecks.



## 5.6 APARTMENT KITCHEN RANGE HOODS

Moisture and odors are drawn out of the apartment kitchens with Kenmore range hoods (rated at 190 cfm) that are manually activated by integral switches. The exhaust air leaves the building through roof-mounted goosenecks.



## 6 APPLIANCES

The one-bedroom apartments are all equipped with Kenmore 253.36601894 refrigerators and electric ranges.

The shared kitchens are equipped with larger Kenmore side-by-side refrigerators and electric ranges.

No dishwashers are present at Downtown Apartments, nor are any vending machines.

A laundry room is located at the northeast corner of each floor. Each of these rooms provides residents with a top-loading Whirlpool clothes washer and a front-loading natural gas dryer. These machines are owned and maintained by a laundry service company.

The clothes dryers are vented to outdoors through a riser that terminates on the roof.





## 7 LIGHTING

Numerous light fixtures are utilized in the common areas:

<i>Location</i>	<i>Lamp</i>	<i>Ballast</i>	<i>Controls</i>	<i>Notes</i>
Corridors	4-Pin 40W CFL	Electronic	Breaker, 24 hrs	Only 1 lamp is necessary in each fixture for adequate light levels.
Stairwells & Balconies	T9 Circline Fluorescent	Magnetic	Breaker, 24 hrs	
Trash Rooms	T9 Circline Fluorescent	Magnetic	Manual Switch	
Corridor Exit Signs	LED	N/A	Breaker, 24 hrs	
Balcony Exit Signs	Incandescent	N/A	Breaker, 24 hrs	
Lobby/Office/Comm. Rm.	T8 Fluorescent	Electronic	Manual Switch	
Elevator Cars	T12 Fluorescent	Magnetic	Breaker, 24 hrs	
Laundry Rooms	T8 Fluorescent	Electronic	Manual Switch	
Front Canopy (Ext.)	Metal Halide, 175W		Unknown	
Rear Flood Lights (Ext.)	Metal Halide		Unknown	



**Corridor Light Fixtures**



**Balcony & Stairwell Light Fixtures**

The hard-wired fixtures in the apartments all utilize fluorescent lamps and electronic ballasts.



**Apartment Bath Light Fixture**

## 8 WATER FIXTURES

Apartment water fixtures are summarized below:

<i>Location</i>	<i>Flow Rate</i>
Kitchen Faucet	2.2 gpm
Bathroom Faucet	2.0 gpm
Showerhead	2.5 gpm
Toilet	1.6 gpf



## 9 ELEVATORS

Two Dover Traflomatic IV traction elevators serve the building. The motors and controls are located in a rooftop elevator room. During the 1997 renovation, the elevators were upgraded to (15 hp) AC motors and solid state controls.



## 10 SMOKE, FIRE & CARBON MONOXIDE SAFETY

Hardwired smoke detectors are present in the corridors. They are controlled by a central fire alarm control panel located in the electrical room at the south end of the basement.

A sprinkler system is installed in the building

No carbon monoxide detectors are present in the building



## 11 SECURITY SYSTEMS

A security camera system is installed in the building. It is intended for real-time use only. It does not record any images. As of July, 2011, this system was non-functional.



## 12 BUILDING DRAINAGE & MOISTURE MANAGEMENT

The building roof is low-sloped with an asphalt membrane. Water drains from the roof through rooftop ports into the city storm water system.



Dryers, bathrooms, and kitchens are mechanically vented to move moisture vapor generated in the building to outdoors. (See #5 – Ventilation Systems for details.)

The building is surrounded by concrete walks and attached buildings. Grading is sufficient to effectively move water away from the building.

## 13 TRASH MANAGEMENT

A trash chute is present at the northeast corner of each floor in the building. The chute drops down to a compactor room on the ground floor.

Due to rodent issues, the use of the trash chute has been discontinued. Instead, trash cans are present in each trash room. They are manually moved to the ground floor for disposal by the maintenance staff.



## **APPENDIX A:      *Preventive Maintenance Schedules***

The following preventive maintenance is recommended for the equipment serving the building.

### **Water Source Heat Pumps:**

	<b><i>Component</i></b>	<b><i>Task</i></b>	<b><i>Frequency</i></b>
<b>1</b>	Air Filter	Inspect and Replace if Necessary	Monthly
<b>2</b>	Condensate Pan	Check for algae growth. If present, consult a water treatment specialist for proper chemical treatment.	Quarterly
<b>3</b>	Fan Motor	Lubricate and check amperage draw. Amperage should not exceed rated load amps by 10%. Replace if excessive.	Annual
<b>4</b>	Cabinet	Inspect for leaks and deteriorated hoses. Replace or repair components as necessary	Annual
<b>5</b>	Compressor	Check amperage draw. Amperage should not exceed rated load amps by 10%. Replace if excessive.	Annual
<b>6</b>	Heat Exchangers	Inspect and clean	Annual
<b>7</b>	Loop Water	Test the inlet and outlet water temperatures by measuring the surface temperature of the pipes that protrude through the cabinet with an infrared thermometer. Calculate the difference between the inlet and outlet water temperatures. It should be 4-8°F in heating mode and 9-12°F in cooling mode. If it higher than these levels, the heat exchangers may be scaled. Consult a water treatment specialist for de-scaling treatment.	Annual

### **Water Loop Circulator Pumps:**

	<b><i>Component</i></b>	<b><i>Task</i></b>	<b><i>Frequency</i></b>
<b>1</b>	Bearings	Lubricate at the grease fittings on the motor and pump housing with NLGI grade 2 lithium base petroleum grease, such as Mobil Polyrex EM.	Semi-Annual
<b>2</b>	Motor	Clean the motor and ensure that the ventilation openings are clear. Verify that all electrical connections are tight.	Quarterly
<b>3</b>	Motor	Measure the insulation resistance with a “Megger” and record it in a log book. Immediately investigate any significant drop in resistance from the prior reading.	Quarterly

**Air Separator:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Blowdown Valve	Open valve to purge the air separator of foreign particles.	Quarterly

**Boilers:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Heat Exchanger	Inspect for black carbon soot build up. If present, have a qualified technician remove the soot and optimize the fuel-air mixture.	Annual
2	Pilot & Burner Flames	Inspect the flames. They should be blue and not lifting off the ports. If problems exist, have a qualified technician clean and tune the system.	Annual
3	Venting System	Inspect for blockage, leakage, and corrosion.	Annual
4	Venting System	Test for spillage of flue gases at the draft hoods with a smoke pen or mirror. No spillage should be evident after a 60 second warm-up period.	Annual
5	Venting System & Combustion Safety	Test draft pressure and generation of undiluted carbon monoxide. Determine appropriate actions based on Building Performance Institute Standards. Test Steady State Efficiency. If it is below 79%, have a qualified heating technician clean and tune the system.	2 years
6	Combustion Air Openings	Ensure that all combustion air openings in the cabinet are unobstructed.	Annual
7	Low Water Cutoff	Test to ensure proper operation.	Annual
8	Pressure Relief Valve	Test operation by lifting the lever at the end of the valve several times. The valve should seat properly and operate freely.	Annual

**Cooling Tower:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Suction Strainer	Inspect and clean the strainer assembly in the cold water basin.	Monthly
2	Cold Water Basin	Flush the basin to remove any accumulated dirt or sediment. Ensure that the suction strainer is in place during flushing, and is thoroughly cleaned before refilling the basin.	Quarterly
3	Cold Water Basin	Measure the depth of the water level. It should be 6" above the strainer with the fans off and the pump running. Adjust the float as necessary to attain the correct level.	Monthly
5	Recirculation System	Observe spray pattern above coils and clean nozzles as necessary.	Monthly
6	Fan Blades	Inspect for cracks, missing balancing weights, and vibration. Repair as necessary.	Quarterly
7	Fan Shaft Bearings	Lubricate at the grease fittings NLGI grade 2 lithium base petroleum grease, such as Mobil Polyrex EM.	Quarterly
8	Fan Belt	Adjust tension so that the belt will deflect approximately 3/8" when moderate pressure is applied midway between the sheaves.	Monthly
9	Fan Inlet Screens	Remove dirt and debris that may be restricting air flow.	Monthly
10	Basin Water Heater	Inspect elements for scale build-up. Clean as necessary.	Annual
11	Metal Finish	Scrape & coat galvanized surfaces with Z.R.C. Cold Galvanizing Compound. Clean and polish stainless steel surfaces with stainless steel cleaner.	Annual
12	Basin Water	Inspect water in basin for biological contamination. Consult a water treatment specialist for a regular treatment routine if necessary.	Monthly
13	Loop Water	Test the pH of a water sample. It should be between 6 and 8.5. If it is outside of this range, consult a water treatment specialist for treatment.	Semi-Annual
14	Loop Water	Flush the entire system and adjust the pH to between 6.0 and 8.5.	2 Years



**Domestic Hot Water System:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Heat Exchanger	Inspect for black carbon soot build up. If present, have a qualified technician remove the soot and optimize the fuel-air mixture.	Annual
2	Burner Flames	Inspect the flames. They should be blue and not lifting off the ports. If problems exist, have a qualified technician clean and tune the system.	Annual
3	Venting System	Inspect for blockage, leakage, and corrosion.	Annual
4	Venting System	Test for spillage of flue gases at the draft hood with a smoke pen or mirror. No spillage should be evident after a 60 second warm-up period.	Annual
5	Venting System & Combustion Safety	Test draft pressure and generation of undiluted carbon monoxide. Determine appropriate actions based on Building Performance Institute Standards. Test Steady State Efficiency. If it is below 79%, have a qualified heating technician clean and tune the system.	2 years
6	Combustion Air Openings	Ensure that all combustion air openings in the cabinet are unobstructed.	Annual
7	Safety Relief Valve	Test operation by lifting the lever at the end of the valve several times. The valve should seat properly and operate freely.	Annual
8	Circulator Pump	Lubricate both the motor and pump bearings with SAE 20 or 10W-30 non-detergent oil. Add 1 teaspoon to the pump bearings and 6-8 drops to the motor bearings.	Quarterly

**Domestic Water Booster Pump System:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	General	Inspect all components for dirt and debris. Clean as necessary. Clean the motors and ensure that the ventilation openings are clear. Verify that all electrical connections are tight.	Quarterly
2	Pumps	Inspect for leaks and replace seals as necessary.	Quarterly

**Elevator Room A/C System:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Air Filter	Inspect the filter on the return side of the air handler and replace if significant debris is present.	Monthly
2	Evaporator Coil	Remove the air filter from the air handler and clean any debris from the evaporator coil. Clean the condensate drain pan and drain line. Replace the air filter	Annual
3	Blower	Remove the access panel from the air handler. Inspect and clean the blower wheel, housing, and motor	Annual
4	Condenser Coil	Clean any debris from the external surfaces of the condenser coil.	Annual
5	Refrigerant Charge	Have a qualified technician measure and adjust the refrigerant charge in the system.	2 Years
6	Compressor	Have a qualified technician measure the amp draw. The rated load is 9.0 A. If the actual amp draw is above 10.0 A, rebuild or replace the compressor.	2 Years

**Trash Room (Roof-Mounted) Exhaust Fan:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Fan Shaft	Lubricate with a low pressure grease gun using a lithium-thickened multipurpose lubricating grease such as Gulf EP-2.	Annual
2	Fan Belt	Adjust tension so that the belt will deflect no more than 1/64" per inch of span when moderate pressure is applied midway between the sheaves.	Annual

**Bathroom Exhaust Fans:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Fan Motor	Listen for excessive or unusual noises. If present, replace the motor and impeller.	Annual
2	Grille	Remove and clean with a mild detergent (such as dishwashing liquid) and a soft cloth.	Annual
3	Fan Housing	Unplug and remove the motor. Gently vacuum the fan, motor, and interior of housing.	Semi-Annual

**Range Hoods:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Fan Motor	Listen for excessive or unusual noises. If present, replace the motor and impeller.	Annual
2	Grease Filter	Remove and clean with a mild detergent (such as dishwashing liquid) and a soft cloth. DO NOT immerse in water or put in dishwasher. Inspect the “Clean Sense” strips on the filter. If the blue and yellow have blended to green, replace the filter.	Annual
3	Fan Blades	Gently clean with mild detergent and a soft cloth.	Semi-Annual

**Shared Kitchen Air Filters:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Pre-filters	<ol style="list-style-type: none"> <li>1. Grasp the edge of the air cleaner cover near the plenum and remove the cover from the support brackets. Set it aside.</li> <li>2. Remove the prefilters. Check the prefilters and replace them if they are fully coated with dust and lint (approximately every 1 to 3 months).</li> <li>3. Replace the CPZ™ cartridge when a continuous noticeable odor is emitted from the air cleaner (approximately every 4 to 12 months).</li> <li>4. Replace the primary filter when there is a noticeable loss of air volume circulation (approximately every 10 to 24 months).</li> <li>5. Reassemble the air cleaner and turn the power on.</li> </ol>	Quarterly

**Fire Safety:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Fire Alarm System	Test all smoke/fire detectors and system communication components. Repair as necessary.	Semi-Annual
2	Sprinkler System	Test sprinkler heads and water delivery components (e.g. pumps). Repair as necessary.	Semi-Annual

**Rooftop Fresh Air System/Furnace:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Air Filters	Inspect the filters and clean with mild detergent if significant debris is present.	Monthly
2	Burner System	Inspect for accumulation of scale on both the upstream and downstream sides of the mixing plates. Any scaling or foreign matter should be removed with a wire brush. Inspect each burner port. If any are plugged (even partially) clear them with a piece of wire or a #47 drill bit.	Annual
3	Burner Flames	Inspect the flames. They should be blue and not lifting off the ports. If problems exist, have a qualified technician clean and tune the system.	Annual
4	Combustion Safety	Test generation of undiluted carbon monoxide. Determine appropriate actions based on Building Performance Institute Standards. Test Steady State Efficiency. If it is below 79%, have a qualified heating technician clean and tune the system.	2 years
5	Flame Rods	Inspect and clean. Replace if any significant cracks are present in the porcelain coating.	Annual
6	Fresh Air Damper	Inspect the damper with the system both "On" and "Off". Ensure that the damper opens when the system is running and closes when it is idle.	Annual
3	Blower	Remove the access panel from the air handler. Inspect and clean the blower wheel, housing, and motor	Annual
7	Blower Shaft Bearings	Lubricate at the grease fittings NLGI grade 2 lithium base petroleum grease, such as Mobil Polyrex EM.	Quarterly
8	Blower Belt	Adjust tension so that the belt will deflect approximately 3/8" when moderate pressure is applied midway between the sheaves.	Monthly

**Apartment Refrigerators:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Condenser Coil	Clean with a vacuum and brush specifically intended for this purpose. Use care to avoid damaging the coils or fins.	Annual
2	Defrost Evaporation Pan	Clean with a damp cloth and inspect the drain lines to ensure they are not kinked or obstructed.	Annual
3	Door Gaskets	Clean with mild detergent and a soft cloth. Inspect for air leaks and replace if necessary.	Annual

**Elevators:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Cables and Tracks	Clean and lubricate in accordance with manufacturer's specifications.	Quarterly
2	Motors	Clean the motors and ensure that the ventilation openings are clear. Verify that all electrical connections are tight.	Quarterly
3	Motors	Measure the insulation resistance with a "Megger" and record it in a log book. Immediately investigate any significant drop in resistance from the prior reading.	Quarterly
4	Hoisting Machines	Lubricate motors and bearings in accordance with manufacturer's specifications.	Quarterly
5	Controls	Verify proper operation of safety and positioning controls.	Quarterly

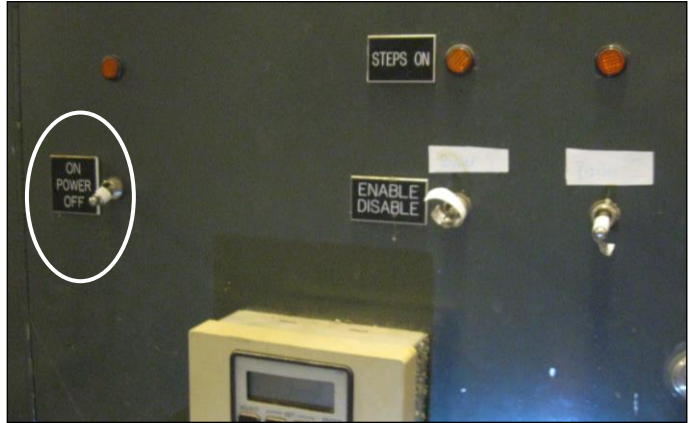
**Building Drainage:**

	<b>Component</b>	<b>Task</b>	<b>Frequency</b>
1	Roof Drains	Clear any debris that has accumulated at the roof drain screens.	Quarterly

## **APPENDIX B: Heating/Cooling Changeover Procedures**

### **Heating-to-Cooling:** *(Typically Mid-May)*

1. Shut down the central boilers by setting the "POWER" toggle on the control panel to the "OFF" position



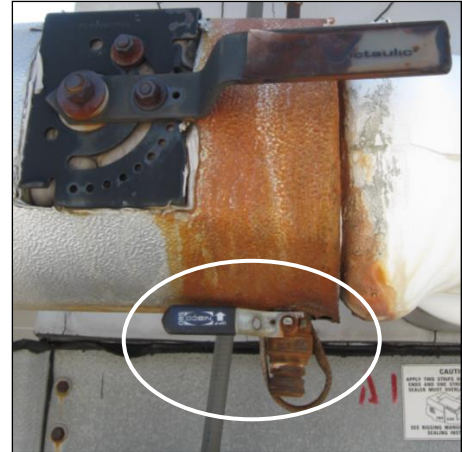
2. Close the appropriate valves to isolate each boiler from the main water loop.



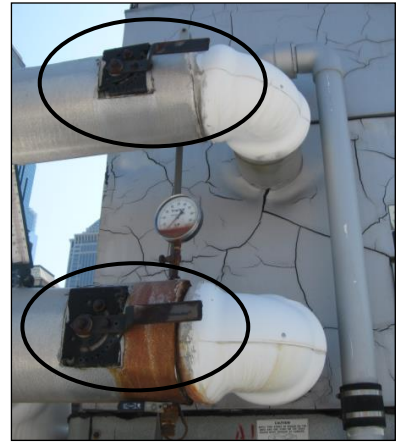
3. Shut off the gas valve at each boiler to stop the pilot lights from burning fuel during the cooling season.



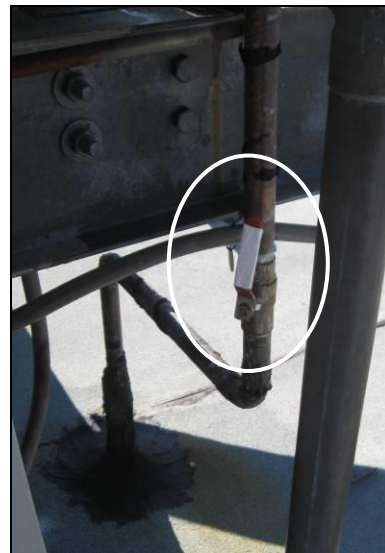
4. Ensure that the cooling tower coil drain valve and cap are closed.



5. Open the main loop isolation valves to fill the cooling tower coils with loop water.



6. Open the chiller sump water supply valve above the ceiling on the 7<sup>th</sup> floor.
7. Close the sump drain valve and open the sump fill valve. Ensure that the float valve is operating correctly. It should stop the water flow when the sump level is approximately 6" above the suction screen in the sump.



8. Turn on power to the cooling tower and ensure that both fans and the pump are set to “Auto” operation. Turn the heater to the “Off” position.
9. Perform a visual and audible inspection of the pump and fans.
10. Remove a sample of the loop water from using the valve and port on the cooling coil drain port (see #4). Test the pH of the water with pH test strips. It should be between 6.5 and 8.0. If it is outside this range consult a water treatment specialist.



11. Switch the Exeter XL water loop control system in the boiler room from heating to cooling operation. The loop target temperature should not exceed 110°F (as displayed on the front of the controller).
12. Ensure that the controller is in “Auto Pump Alternation” Mode.



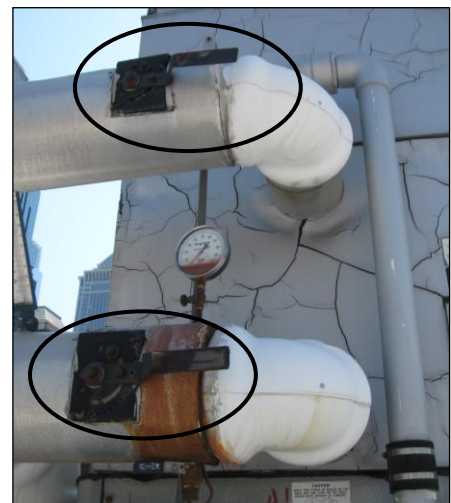


**Cooling-to-Heating:**  
***(Typically Mid-October)***

1. Shut down the cooling tower by using the main disconnect handle on the control panel.



2. Isolate the cooling tower from the main water loop by closing the isolation valves on the supply and return lines.



3. Drain the water from the cooling tower coils by removing the drain cap and opening the drain valve. A hose can be attached to direct the water to the roof drain port.



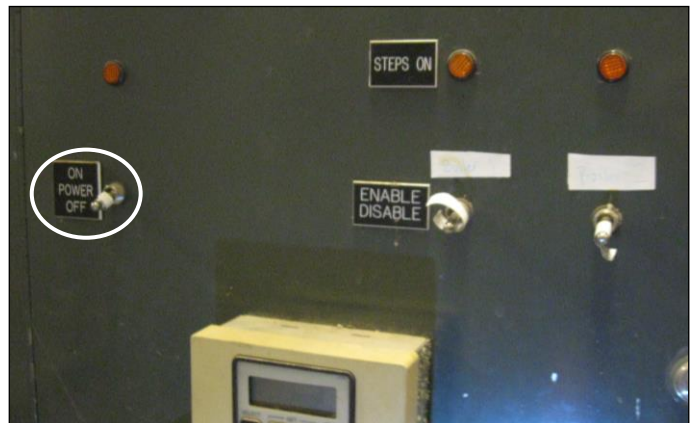
4. Close the sump fill valve and open the drain valve to empty the sump.



5. Close the water supply valve to the roof. It is located above the ceiling on the 7<sup>th</sup> floor. Drain the water from the roof supply line so it will not freeze over the winter. A drain port is located near the supply valve.
6. Open the appropriate valves to allow water to flow through each boiler from the main water loop.



7. Turn on power to the central boilers by setting the "POWER" toggle on the control panel to the "ON" position. Ensure that the toggle switch for each boiler is set to the "Enable" position. Set the pump control on each boiler to the "Auto Pump" position.



- Turn on the gas valve at each boiler and relight the pilot according to the instruction in the boiler operations manual.



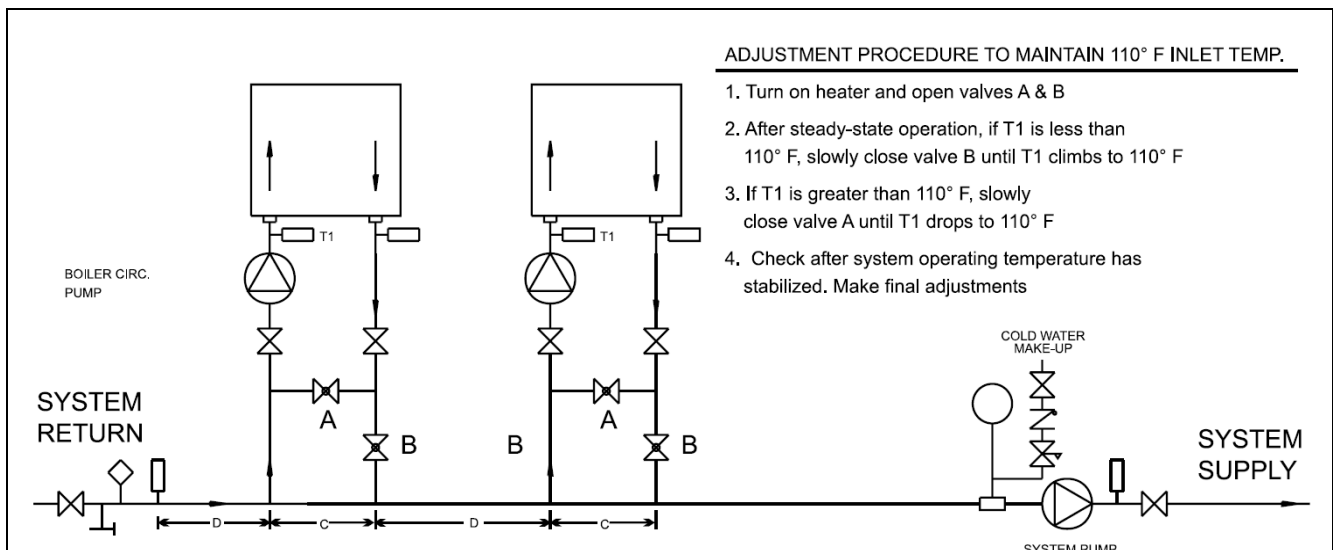
- Switch the Exeter XL water loop control system in the boiler room from cooling to heating operation. The loop temperature should not exceed 90°F (as displayed on the front of the controller).
- Ensure that the controller is in “Auto Pump Alternation”.



- Adjust the Honeywell T775 staging control to attain a target temperature of 120°F in the boiler loop.



12. Complete the following adjustment procedure (copied from the Mighty Therm boiler manual) to attain a boiler inlet (return) temperature of at least 110°F.



13. Complete annual cleaning, tuning, and inspection of the boilers according to the Preventive Maintenance Schedule.

**APPENDIX C:      *Mechanical Equipment Installation and Operation Manuals***