



Elizabethtown COLLEGE

Heating to Air Conditioning - Spring Edition

Controlling temperatures in our buildings during the transition between heating and cooling seasons is always a difficult task as we experience comfortable outside air temperatures during the evening and warmer temperatures during the day. Temperatures may vary considerably as cold and warm fronts move across Pennsylvania.

Building Heating Ventilating & Air-Conditioning (HVAC) Technology

State of the art building systems are capable of providing comfortable indoor temperatures during these periods of highly variable temperatures. This is accomplished with what is commonly called a "four pipe" system controlled by direct digital controls, referred to as DDC. A "four pipe" system serves the building heating and cooling air handlers with four pipes, a heating water supply and return pipe and a cooling water supply and return pipe. The DDC temperature control system operates the control valves in the building air handlers by modulating the control valves to individual heating and cooling coils to maintain comfortable conditions. As many larger buildings use water-cooled evaporative cooling towers to reject heat from the building to the outdoors they cannot provide chilled water when the outdoor temperatures fall below 32 degrees as the cooling tower water will freeze and damage the tower. Some cooling towers serving humidity controlled buildings with large heating loads from computers, lights, and other equipment, have evaporative cooling towers with heated water sumps to allow them to provide cooling and dehumidification below 32 degrees.

There are other techniques to provide winter cooling such as "free" coolers in which cold outside air is used to cool a mixture of propylene glycol and water that is used to cool portions of the building. Direct expansion cooling systems reject heat directly to the atmosphere rather than through an evaporative cooling tower. Heat pumps have the capability to switch between cooling and heating modes depending on the needs of the space and the outside air temperature. Since heat pumps do not use water to reject heat they can operate year round regardless of exterior temperatures.

A cost effective cooling technique, with capability to supply outside air is referred to "economizer" mode. In this mode the outside air dampers are opened during the cool evenings to reduce the interior space temperature and the dampers are closed to the minimum position as the outside air temperature increases. This technique is limited by:

- 1) The outside air temperature during the evening.
- 2) Occupants will experience cooler than normal building temperatures in the early morning as the building is cool from the introduction of outside air.

The building will warm up due to the heat generated by the occupants, equipment, lights and warming outside air temperatures entering the building via solar gain, the air handling system and infiltration. However, the occupants may experience cooler than desired temperatures until the building warms.

Our Building's HVAC Capabilities

At Elizabethtown we have a mix of heating and cooling systems, few of which can be called state of the art as they provide heat via what is commonly referred to as a "two pipe" system. A "two pipe" system provides heating and cooling water via two pipes and a common heat/cooling coil. There are both technical and operational realities that limit the ability of a "two pipe" system to maintain indoor air temperatures at comfortable levels. We do have two hybrid buildings (Musser and Hoover) which have "two pipe" systems to the main air handling systems and "one-pipe" systems serving the secondary HVAC systems. In the case of Brossman Commons, portions of the building are served with a "four pipe" system. The Hoover Business Building is a four pipe system as is the under construction SMEC Lyet wing.

Transition Considerations

When to switch between heating and cooling in the spring and cooling and heating in the winter for our two pipe systems is always a difficult decision. Making the switch too early in the spring will result in comfortable buildings when the outdoor temperature is above 70, but cold buildings when it falls to 50 degrees, sometimes a few hours later. Unfortunately, switching from heating to cooling in a large building is a time consuming task requiring the cleaning and preparation of the cooling tower, filling of the tower and supply lines, changing numerous valves, resetting controls, bleeding air from the system, starting and stopping pumps, etc. Given the magnitude of the work involved in the change over, once the decision is made to switch the building occupants must live with the decision until the reverse switch takes place in the fall.

To make the situation worse, the mix of air conditioning systems in our buildings makes the seasonal changes very difficult to accomplish in a manner that treats all spaces uniformly. Some systems, like heat pumps, can be switched automatically. However direct expansion systems take a little more time to switch while evaporative cooling systems with cooling towers take a lot of time to switch. We also use several hundred window air conditioners in Ober, Myer and Royer. While the installation of one window air conditioner takes only a few minutes, installation of several hundred takes a long time.

Residential window air conditioners are removed by Facilities over fall break and reinstalled over spring break.

When Will I Have Air Conditioning?

Here are the answers you are waiting for - what are we going to do and when?

We have analyzed NOAA climatological data for the past five years and reviewed the historical record for the start up of campus wide cooling and the ability of our buildings HVAC systems to operate in the economizer mode. The climatological data shows **mid April** as the period when the daytime temperature consistently remains above 70 degrees. However, after mid April there are days when the daily highs do not reach 50 degrees. Thus, after the switch over takes place, there will be days when the cool outside air temperatures will create cool indoor temperatures and there will be nothing we can do, except to wait for Mother Nature to warm the outside air. Occupants in areas served by heat pumps and "two pipe" systems will be comfortable, while occupants in areas served by "one pipe" systems will be too cool.

The HVAC staff has been doing preparation work to be ready for the upcoming air conditioning season for several weeks by preparing cooling towers, cleaning chiller tube bundles, checking refrigerant levels, etc. Over spring break we completed the installation of window air conditioners in Ober, Royer and Myer. However, we are waiting and watching the long range temperature forecast to determine when we will begin the switch of our "one pipe" buildings from heating to cooling mode.

Thank you for taking the time to better understand the issues we deal with during the transition between heating season and cooling season and for your patience as we deal with these issues.

Joe Metro
Director of Facilities Management
& Construction

Facilities Management
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