



Elizabethtown COLLEGE

Transition from Air Conditioning to Heating

Controlling temperatures in our buildings during the transition between the 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.

A cost effective cooling technique, which is able to supply outside air, is referred to as an "economizer" mode. In this mode the outside air dampers are fully 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 gradually 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.

Our Building's HVAC Capabilities

At Elizabethtown we have a mix of heating and cooling systems, none of which could 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 either heating or 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 during seasonal transitional periods. We do have two hybrid buildings (Nicarry and Brossman Commons) which have "two pipe" systems to the main air handling systems and "one-pipe" systems serving the secondary HVAC systems. Thus, occupants in the "four pipe" areas may be comfortable while those in "one pipe" areas are not comfortable.

Transition Considerations

When to switch between cooling and heating in the fall is always a difficult decision. Making the switch too early in the fall 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 cooling to heating in a large building is a time consuming task on the technicians, change a multitude of valves, reset 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 spring. A wrong decision can create a lot of angry phone calls and e-mails when the outside temperature rises and the building is warm.

To make the situation worse, the mix of air conditioning systems in our buildings makes the seasonal changes very difficult to handle 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.

When Will I Have Heating?

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 to late October** as the period when daytime temperatures consistently remain below 70 degrees. Prior to mid-late October there are periods of temperature

excursions well below 70 degrees, but there are also periods when the daily high reaches 70 degrees. Thus, after the switch from cooling to heating takes place there will be days when the outside temperatures reach over 70 degrees. The warm outside temperatures will make spaces warmer than desired and there will be nothing we can do except to wait for Mother Nature to cool 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 cold.

The HVAC staff has been doing preparation work to be ready for the heating season for several weeks. Over fall break we removed the window air conditioners in Ober, Royer and Myer. However, we are waiting and watching the temperature forecast to determine when we will begin the one week process to switch our "one pipe" buildings from cooling to heating.

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

Facilities Management
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