



# Elizabethtown College

## **Air Conditioning to Heating – Fall Edition**

Controlling temperatures in our buildings during the transition between the heating and cooling seasons is a difficult task as we experience comfortable outside air temperatures during the evening and warmer temperatures during the day. Fall temperatures may vary considerably as cold and warm fronts move across Pennsylvania. This memo will provide you with information about our heating, ventilating and air conditioning (HVAC) systems and how they impact your comfort.

### **Building Heating Ventilating & Air-Conditioning (HVAC) Technology**

State of the art building systems are capable of providing comfortable indoor temperatures during periods of highly variable temperatures. This is accomplished with what is commonly called a "four pipe" system controlled by direct digital controls. Four pipe refers to as DDC. A "four pipe" system serves the building heating and cooling air handlers with four pipes, heating water supply and return pipes and cooling water supply and return pipes. The DDC temperature control system operates control valves in the building air handlers by modulating the control valves in heating and cooling coils to maintain comfortable conditions. As many larger buildings use water-cooled evaporative cooling towers to reject heat from the building 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 operate below 32 degrees.

There are other techniques to provide winter cooling:

- "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.

Another 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 Buildings HVAC Capabilities**

At Elizabethtown we have a mix of heating and cooling systems:

- Two Pipe Systems - A "two pipe" system provides either heating or cooling water via two pipes and a common heat/cooling coil. There are operational realities that limit the ability of a "two pipe" system to maintain indoor air temperatures at comfortable levels during seasonal transitional periods. As they can be used to heat or cool-but not at the same time. We do have two hybrid buildings (Nicarry and Brossman Commons) which have "four pipe" systems in the main air handling systems and "two-pipe" systems serving the secondary HVAC systems. Thus, occupants in the "four pipe" areas may be comfortable while those in "two pipe" areas are not comfortable.
- Four Pipe Systems - Some of our academic buildings, Nicarry, SMEC, and Hoover have four pipe systems that are able to heat and cool simultaneously.

## **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. Unfortunately, switching from cooling to heating in a large building is a time consuming task requiring changing a multitude of valves, reset controls, bleeding air from the system, starting and stopping pumps, etc. Given the amount 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 phone calls and e-mails when the outside temperature rises and the building is warm.

To make the situation more difficult, the mix of air conditioning systems in our buildings makes the seasonal changes 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 have 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. We remove window A/C units during fall break and reinstall them during spring break to minimize disruption.

## 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 highs reach 70 degrees. Thus, after the switch from cooling to heating takes place there will be days when the outside temperatures are 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 "four pipe" systems will be too cold.

The HVAC staff begins preparation work in September to be ready for the heating season. Over fall break we remove the window air conditioners in Ober, Royer and Myer. We then wait and watch 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 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.