“CHILLED BEAMS” IN NEW SCHOOLS

What is a Chilled Beam?

The following provides a detailed description of the current standard for cooling individual classrooms in new NYC DOE schools The SCA’s current standard for cooling individual classrooms in new schools is a system utilizing what are called “Chilled Beams”. To provide cooling, chilled water runs through piping, or “coils” in each unit, and the orientation of the unit is horizontal, similar to a beam. The Chilled Beam system is energy efficient and is very quiet - an important feature in a learning environment.

Design Theory

The chilled beam system is designed to provide only “sensible cooling”; that is to change only the temperature in the room, not to dehumidify. Proper chilled beam operation requires that the chilled water piping inside the chilled beam unit, called “coils”, remain dry (no condensation collecting on the coils as in a typical air conditioning unit), and therefore fresh air supplied to the room must be dry air. Dehumidification is done by a roof-top “Dedicated Outdoor Air System” (DOAS), which filters and dehumidifies fresh air before it is ducted to the individual rooms.

A question may be why shouldn’t the chilled beam coils do both the sensible cooling and the latent dehumidification, and why is it better for the coils to be kept “dry”? The reason is that the chilled beam system works with another engineering principle called “induction”. Induction takes place when the ducted fresh air (called “primary” air) moves quickly into the chilled beam unit creating a “Venturi Effect”, pulling room-side air (through a specially designed chilled water coil) into the stream of ducted air, and then the mixture is released into the room. This phenomenon of room air being drawn into the stream of ducted air (without the assistance of fans) is known as “induction”. If the coils were wet, the air would not flow so easily across them, and we would not get the amount of induction air the system is designed for, and so the chilled beams would not work well. Thus the system is designed for “dry” coils.

In addition, dry coils will not to get “gummed-up” with deposits of dust from the room air. Properly operated chilled beams (with dry coils) will require only occasional vacuuming to remove any small amount of dust; if the coils get wet, they would require actual “cleaning”.

The Central Unit

The rooftop DOAS unit is where the dehumidification takes place. The DOAS is a “central” unit; it operates in one location to provide for all of the spaces it serves. The DOAS provides filtered fresh “ventilation air” and latent dehumidification centrally. The DOAS unit provides primary air that is so dry it can “absorb” moisture from the air in the rooms. Moisture in the room air (“latent loads”) comes from infiltration (even from around closed windows), certain equipment, and from the moisture given off by the occupants. Dry air means that the chilled beam coils have to meet only sensible (temperature) cooling requirements of the rooms, and that coils stay “dry” as desired.

Why the Windows Need to Remain Closed

If windows are opened and humid air comes in, the chilled beam coils will get wet and won't operate properly. If humid air condenses on the chilled water coils and drips into the condensate pan, a water sensor will close the chilled water valve and the room cooling will stop until the water is removed from the pan. For this reason, rooms with chilled beams have "custodial locks" on the windows (operated by Allen wrench rather than handles). Operable windows should be used only in case of emergency, if the ventilation system goes down. Ventilation air is continually provided (all year long) by the central DOAS unit, so there should be no need to open the windows as fresh air is always being provided.