

Chilled Beam Systems

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You may soon see chilled beam systems installed in new buildings. This technology has been popular in Europe for several years, and offers several benefits in this era of Green Buildings, LEED, and sustainability. We have started commissioning chilled beams on a few projects, and this design is catching on with many engineers and facilities here in the US. It can be an energy efficient alternative to VAV systems.

Background:

Chilled beams are cooling units flush mounted in ceiling grids, consisting of a fin/tube coil encased in a cabinet. The term “beam” is a bit misleading as these units have nothing to do with a beam, but rather look similar to large linear slot diffusers or ductless mini-split system fancoil cassettes. Nor are these units considered radiant cooling panels. However, chilled beams can actually provide both heating and cooling, with no fans, moving parts, electrical components, or internal controls. They operate similarly in concept to the old perimeter induction units installed in 1950’s and 1960’s era office buildings.

Chilled beam design uses the concept (specific heat principle) that

it is more efficient and cost effective to remove heat with water (and small piping) than air (and large air ducts). All Chilled beams receive chilled water from the building’s central chiller plant to produce cooling.

There are two types of chilled beams: passive and active. Passive beams have only a chilled water coil and depend on natural convection to convey air currents from the room across the coil for cooling effect. Active type chilled beams receive a small amount (about 50-100 cfm each unit) of air from a central AHU to provide motive velocity to induce room air from the room across the internal chilled water coil in convective action. This air is usually conditioned (cooled and dehumidified) 100% outside air from the AHU, which is directed through internal nozzles for induction effect, and provides the required code ventilation and latent cooling. Warm room air rises up to the ceiling mounted chilled beams where the air is then cooled by the coil and falls by gravity to floor level.

Chilled beams can also provide heating if 4-pipe units or seasonal changeover 2-pipe system is used. Primary air from the ventilation AHU can be heated. Or designers can include a perimeter hot water heating system to work in conjunction with cooling-only chilled beams.

Sizing and Capacity:

Chilled beam modules are typically 2 feet wide by either 4, 6, or 8 feet long in physical dimensions. Each unit can provide in the range of 3000 – 6000 BTUH of total cooling from the combination of a chilled water coil and the incoming primary air. A typical private perimeter office may use two – 6 foot long units centrally located in the ceiling. Chilled beams are also available in square shape.

Controls:

Because of their exposed coils, chilled beams do not have internal drain pans and any condensation can drip down to the occupied space. Therefore it is important to prevent condensation by maintaining the cooling coil above the room dewpoint temperature. Latent cooling capacity is quite

limited so chilled beams should be installed in areas of high sensible heat ratio, such as offices. Some chilled beams may be furnished with optional internal drip pans to hold a little condensate,

but are not piped to a drain. To help prevent condensation, the entering chilled water temperature to the beam should be about 55 – 60 degrees F., and the primary conditioned ventilation air shall be above 60 degrees with low humidity.



