

Tuesday, June 25, 11:00 AM-12:30 PM

SEMINAR 29 (INTERMEDIATE)



Applications and Analysis of Passive Chilled Beams

Track: HVAC&R Systems & Equipment

Room: Plaza Ballroom F

Sponsor: 05.03 Room Air Distribution

Chair: Christopher S. Lowell, Member, Halton, Scottsville, KY

Passive chilled beams are one type of beam that provides sensible cooling by relying on the negative buoyancy of room air that is cooled by the hydronic coils suspended in ceiling fixtures, causing it to descend toward floor level. Passive beams must be coupled with a separate air distribution system that delivers fresh air and maintains humidity control. This seminar presents current understanding and applications of passive chilled beams through performance testing, modeling investigations, and case studies.

Learning Objectives:

1. Understand what a passive chilled beam is.
2. Understand the main differences between active and passive beams.
3. Describe how passive beams should be positioned in the space in relation to air distribution devices and heat sources.
4. Understand how CFD can help in determining airflow patterns and resulting thermal comfort of occupants in an occupied space with passive chilled beams.
5. Understand the spatial advantages of a hybrid system featuring passive beams and UFAD.
6. Understand the energy savings of air-water systems in a real life comparison.

1. Application Cases and Design Considerations for Passive Beams

Emmanuel Bizien¹ and Risto Kosonen, Ph.D., Member², (1)Halton, Ivry-sur-Seine, France, (2)Oy Halton Group, Helsinki, Finland

Passive beams have been used for many years, but very little information of successful application cases or design practices is available. This presentation gives examples of passive beam applications in office spaces. It presents experimental data demonstrating how performance of passive beams can be affected by thermal plumes rising above heat sources in the space. The speaker also talks about basic principles of air distribution design for office spaces equipped with passive beams.

2. Analysis of Location of Passive Chilled Beams on Thermal Comfort of Occupants

Kishor Khankari, Ph.D., Member, AnSight LLC, Ann Arbor, MI

Passive chilled beams are an attractive option as part of an HVAC system due to their simple and energy efficient operation. The location of passive chilled beams with respect to the location of sensible heat load and supply air diffusers can play an important role in determining the airflow patterns, temperature distribution, and the resulting thermal comfort in the occupied spaces. This presentation, with the help of Computational Fluid Dynamics (CFD) analyses demonstrates the effects of these factors under various scenarios.

3. Passive Beams with Underfloor Air Distribution: An American Tale

Fred Betz, P.E., Member, PEDCO E&A Services, Cincinnati, OH

This presentation is a case study of a call center building featuring passive chilled beams with underfloor air distribution, which was the winner of ASHRAE's 2010 Technology Award. The building is one of three similar facilities located in a campus setting in northern Kentucky. The other two buildings are served by all-air VAV systems. The presenter discusses the owner's reasoning for adopting the hybrid air-water system and documents the building HVAC energy savings and occupant satisfaction with the facility.