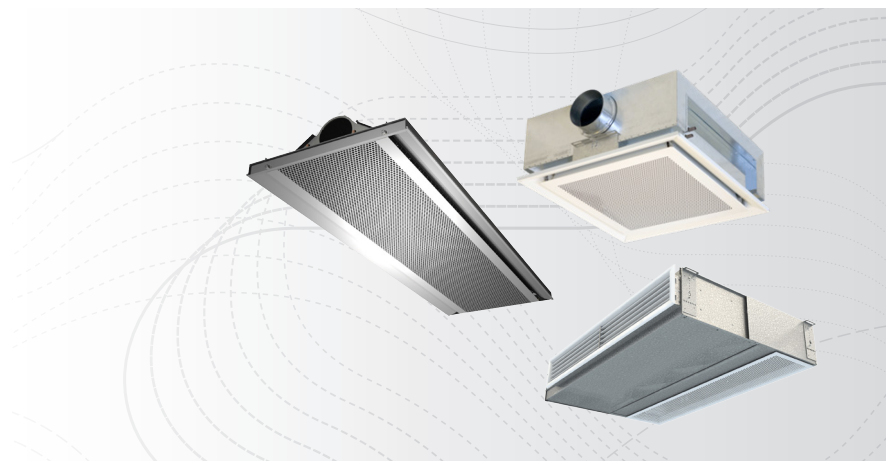


## In this issue

- Chilled Beam Basics
- Why Use a Chilled Beam System
- When Not to Use Chilled Beams
- Types of Chilled Beams



## Chilled beam basics

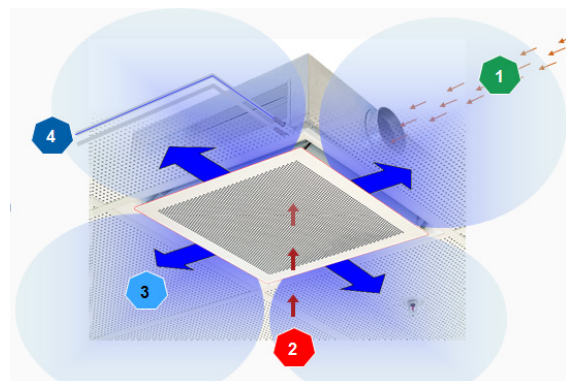
Chilled beam systems have been designed since the early 1980s in Europe with the original product being a linear passive type beam. Two-way throw active linear chilled beams appeared in the late 1980s and remained the standard until the early 2000s when Swegon developed the four-way throw "Comfort Module". These new Comfort Modules offered greater capacity, improved comfort, and greater design flexibility.

Chilled beams operate on the induction principle similar to the perimeter induction systems popular from 1960 to the late 1980s. Treated primary air (outdoor air) is supplied to a plenum in the chilled beam where it exits through nozzles which create a low pressure above the heating and/or cooling coil(s). This low pressure induces room air through the coil either heating or cooling the air before it mixes with the primary air and discharges into the space. The rate of induction depends on the air velocity through the nozzles but a typical ratio is between two and four. For example, 50 CFM (24 L/s) primary airflow to a chilled beam with an induction ratio of 4:1 will deliver 250 CFM (118 L/s) to the space.

The primary air from the DOAS unit and the chilled water supply temperature are both 57 °F or 14 °C which is above the space dew point temperature. Chilled beams provide sensible cooling only which is typically  $\frac{2}{3}$  of a commercial office building or institutional buildings total cooling load. The latent cooling takes place at the DOAS unit usually equipped with an energy recovery wheel, heating, and cooling coil. The DOAS unit is selected to condition the ventilation air, maintaining the space dew point temperature.

Chilled beams can be used for both heating and cooling available in two or four pipe configurations. In the heating mode, the primary air supply temperature is neutral and the heating coil supply temperature is typically 110 °F–135 °F (43 °C–57 °C).

Because there is no fan, no filters and no condensate pans or drains, the maintenance of chilled beam systems is minimal. Space savings is also an advantage due to the smaller duct work and low profile chilled beam design. Lastly, chilled beams offer the lowest energy cost of any HVAC system. Every commercial building that achieved net zero has used a chilled beam system as the terminal unit.



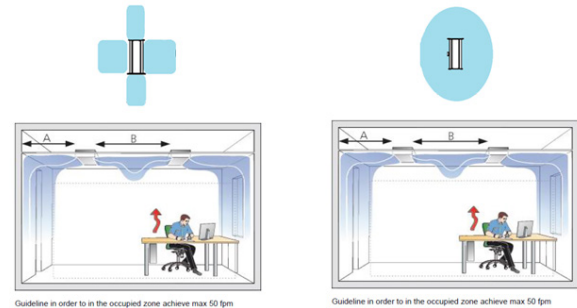
- 1 Primary air**  
Summer (57 °F, 14 °C)  
Winter (70 °F, 21 °C)
- 2 Induced room air**  
Summer (75 °F, 24 °C)  
Winter (68 °C, 20 °C)
- 3 Blended primary and induced air**  
Summer (62 °F, 16 °C)  
Winter (85 °F – 29 °C)
- 4 Water supply**  
Summer (57 °F, 14 °C)  
Winter (120 °F – 49 °C)

## Why use a chilled beam system?

The advantages of chilled beams over the more common systems of today such as fan coil, VAV, heat pump or VRF revolve primarily around improved comfort (both thermal and noise), reduced maintenance (no fan, filter or condensate pan/drain) and reduced operating cost (reduced latent cooling, higher chiller efficiency, reduced fan power, and longer free cooling period). Essentially, we can move a greater amount of energy via water than air. Another major advantage is the low profile design which allows for shallow ceiling cavities, and the ductwork is much smaller being sized for only the ventilation load.

### IMPROVED COMFORT

Thermal comfort and noise are the two greatest complaints in commercial buildings and these two measures are increasing becoming more central to tenant leasing decisions. Chilled beam systems offer the highest degree of comfort for two simple reasons. The air velocity to the space is less than 50 FPM (0.25 m/s). This low velocity eliminates re-generated noise allowing noise levels of less than NC25. The second advantage also relates to the low velocity air as it creates very effective air blending of first, the primary and induced air, and secondly, the secondary mixing of the blended air and space air making the final mixed air temperature delivered to the space very close to the room temperature, eliminating drafts.



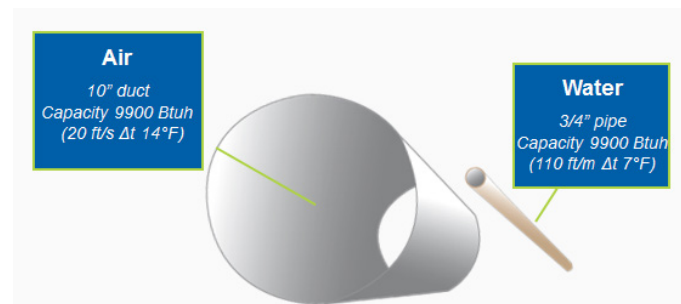
### REDUCED MAINTENANCE

Chilled beam units have no filters, no drain pans and no fans. Since the chilled beam cooling coil is non-condensing, sensible cooling only, the coil is dry with wider fin spacing minimizing the pressure drop, eliminating the need for a condensate drain. The primary air creates the induction of room air eliminating the need for a fan and its associated maintenance.



### ENERGY SAVINGS

There is much debate over the energy savings but chilled beam systems are more efficient making the real question: "by how much?" The energy savings come in three ways. First, in a typical building, the ventilation load, or latent load, is about 1/3 of the total building load. This means that our fan energy is less because we're delivering 1/3 of the air volume through the dedicated outdoor air system (DOAS unit) on a design day. The induction air through the chilled beam handles the sensible load. The second savings comes from the chiller. Due to the 57 °F (14 °C) chilled water supply temperature, the chiller efficiency is higher than a chiller supplying 42 °F (5.5 °C) water. The third savings comes from reduced latent cooling. Only the ventilation air is cooled to below the dew point temperature minimizing the latent heat of condensation. The final savings is the extended free cooling window in supplying 57 °F (14 °C) chilled water as opposed to 42 °F (5.5 °C).

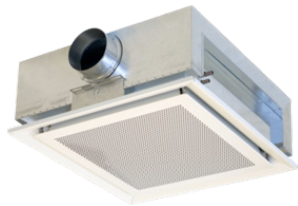


## When not to use chilled beams

Chilled beam systems work best where the sensible cooling load is less than 40 BTUs/sq ft (125 W/sq m). Other applications to avoid are high humidity loads like swimming pools and high infiltration areas like lobbies with open doors. Finally, buildings with ceiling heights greater than 4 m (14 ft) are not good applications for chilled beam systems especially in the heating mode. For these applications, a conventional ventilation system is better suited.



## Types of chilled beams



### Parasol

4-way Comfort Module  
Ceiling-Mounted Unit

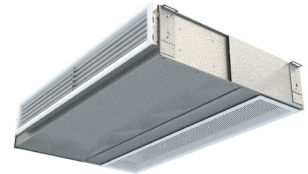
Introduced in 2004, The 4-way comfort module offers additional capacity and exceptional comfort.



### Pacific

Linear 2-way Active  
Chilled Beam

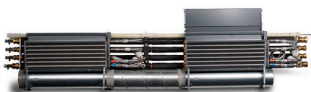
The linear active 2-way throw chilled beam available in lengths up to 120 in (3048 mm)



### Paragon

1-way Chilled Beam  
designed for bulk head  
installation

Typical applications are hotel rooms, dormitory rooms, hospital suites.



### Primo

1-way Wall-Mounted Unit

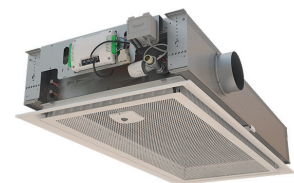
Typical installations are induction system retrofits and new commercial office buildings.



### Adriatic

1-way Active Chilled Beam

Typical application is open ceiling concepts.



### ADAPT Parasol

Demand Control  
Ventilation (DCV)  
Comfort Module

More to come on DCV  
in our next issue!

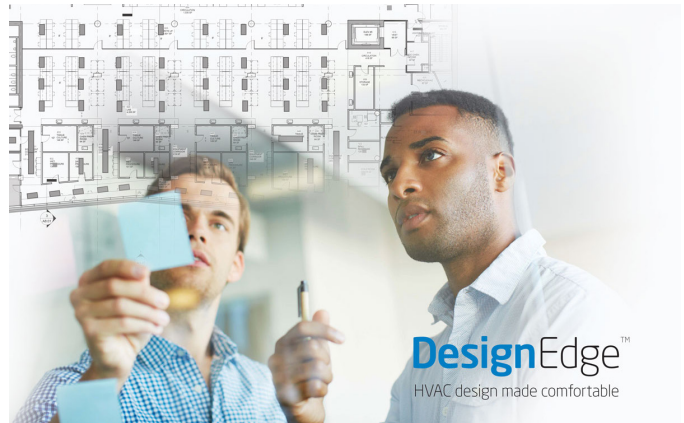
## Summary

Chilled beam systems offer many advantages over conventional HVAC systems such as shorter ceiling cavities, lower operating cost, lower maintenance cost, and a longer life span. Together these advantages give chilled beam systems an exceptionally

lower life cycle cost than conventional air systems. Chilled beam systems can be installed in any climatic environment but should not be used in applications where there is a very high indoor sensible load or where ceiling heights are greater than 14 ft (4 m).

## Next Issue - April 2015

- **Demand Control Ventilation (DCV)**  
Achieve up to 30% energy savings over CV ventilation system
- **Swegon GOLD DOAS unit**  
Up to 85% Energy Recovery Wheel, EC Motor Technology, Integrated Controls, and WLAN or Wi-Fi
- **DesignEdge™**  
This chilled beam system application engineering program is a free service to help you minimize your design time
- **Swegon Comfort Center**  
Our new training facility opens in April! Stay tuned for our open house and chilled beam system design training courses



Please feel free to contact us if you would like more information on chilled beam systems or to schedule a technical training session.

Best regards,

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