DADANCO EUROPE

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Government, Institutional & Defense Buildings • Hospital & Healthcare
Schools & Universities • Commercial Offices • Green Renovations
Laboratories • Hotels

DADANCO EUROPE

"...providing true comfort
air conditioning..."

DADANCO EUROPE

ACTIVE CHILLED BEAM INDUCTION UNIT INFFUSER

About us...

In 1997 Vladimir M Petrovic and Prof Russell (Sam) Luxton formed DADANCO Pty Ltd in Adelaide, South Australia. In the late 90's and early 2000's DADANCO was given many awards around the world and had become a leading Energy Efficient HVAC solution provider in Australia.

Mestek, Inc. of Westfield, MA in USA and Dadanco Pty Ltd of Adelaide, Australia have formed a joint venture in 2007 to produce and market active chilled beams, induction units and induction diffusers for the North, Central and South American markets.

In 2012, MESTEK inc. bought out the JV from DADANCO Pty Ltd and had become a sole owner of the subject IP. As he led the company to an ultimate leadership position of Active Chilled Beams suppliers in the USA at the end of 2014, Vladimir M Petrovic founded DADANCO EUROPE to lead its operations in commercialising the DADANCO technology in Europe.

In January 2015, DADANCO EUROPE was formed by its founder, Vladimir M Petrovic and it acquired an exclusive license from DADANCO, a MESTEK Company, to manufacture DADANCO range of products.

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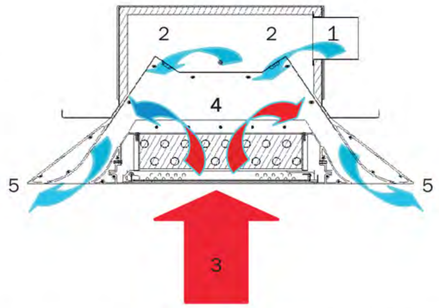
Active Chilled Beam

In Harmony With Nature...

The movement toward sustainable building designs is being driven largely by environmentally sensitive building owners and/or their prospective tenants.
There are also heightened concerns about assuring a proper indoor environment for the building occupants, at all times and in all conditions. In addition to providing temperature control, a fully effective HVAC system must also address many other issues that affect occupant comfort, productivity and health, such as ventilation air, air distribution, humidity control, noise levels, etc.
As owners and their consultants weigh their HVAC system alternatives, they often find that active chilled beam systems are the ideal "green" solution for many buildings. Indeed, active chilled beam systems are often key to meeting the new energy efficiency requirements of the Federal Energy Policy Act and/or local codes being adopted by many states and municipalities.
There is a persuasive overall economic argument for the use of active chilled beam systems over other more conventional HVAC systems. While relatively new in North America, active chilled beam systems are proven and very popular in Europe, Australia and elsewhere. More importantly, it has been proven in other parts of the world that "building green" does not necessarily mean "building expensive".

What is an Active Chilled Beam?



Active chilled beams are continuously supplied with primary air by the central air handling system. This primary air can often be as low as the ventilation air requirement, which is supplied to the active chilled beams at a constant flow and pressure.
Primary air is cooled or heated to handle a portion of the temperature-driven room sensible loads, while in the summer it is cooled and dehumidified sufficiently to handle all of the internally generated, moisture-driven, room latent loads.
Primary air (1) is introduced into the active chilled beam through a series of nozzles (2). Due to the fluid dynamic properties of nozzles, room air (3) is drawn into the active chilled beam through a secondary water coil (4) by an induction process.
Induced room air is cooled or heated by the active chilled beam's water coil to the extent needed to control the room temperature. Induced room air (now cooled or heated) is then mixed with the primary air and the mixed (supply) air (5) is then discharged into the room.

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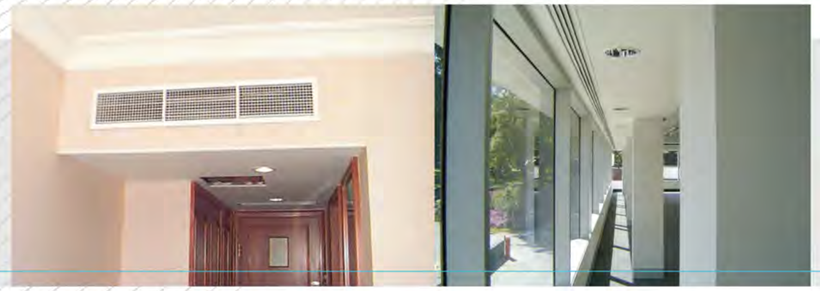
Why are Active Chilled Beams "Green" ?



In general, the design intent is for the central air handling system to circulate only the amount of air needed for ventilation and latent load purposes, with the active chilled beams providing the additional air movement and sensible cooling and/or heating required through the induced room air and secondary water coil. In this manner, the amount of primary air circulated by the central system is significantly reduced (often 75% - 85% less than conventional "all air" systems).
Active chilled beams transfer a large portion of the cooling and heating loads from the less efficient air distribution system (fans and ductwork) to the more efficient water distribution system (pumps and piping).
The net result of this shift in loads with active chilled beam systems is **lower energy consumption and lower operating costs**. Studies have shown that fan energy is the largest HVAC energy consumer in a typical commercial building in North America. With active chilled beam systems, the fan energy is significantly reduced due to the relatively low quantity and low pressure of the primary air being circulated by the central air handling system.

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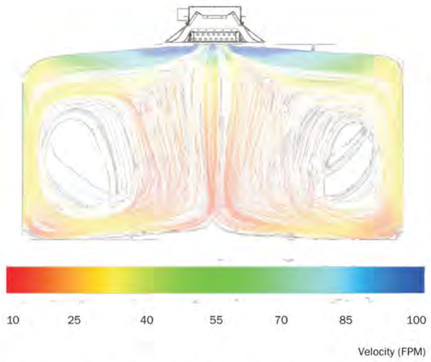
Additional benefits



Improved comfort through excellent air movement and uniform air temperatures throughout the room, with little concern about potential drafts and dumping at part load conditions. As the airflow and resulting air movement is constant at all load conditions, and the induced room air is typically 3-4 times the amount of primary air, the temperature of the mixed air being continuously discharged into the room is moderate (generally in the 60s ºF in the cooling mode and in the 80s ºF in the heating mode). Air velocity in the room is also comfortable and constant.

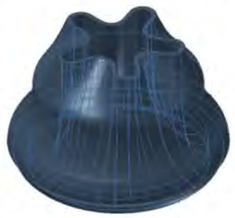
Excellent indoor air quality and odor control as the full ventilation air requirements are delivered to the zones at all times and at all load conditions.

Superior humidity control at all sensible load conditions is also assured as the constant volume primary air is delivered at the proper moisture content to satisfy the latent loads.

Very low noise levels are achieved when the active chilled beams are sized at the typical inlet static pressures of around 0.5" w.c. or lower. DADANCO new technology nozzles are whisper quiet as they rapidly induce secondary air to reduce the momentum and length of the primary air jet, which significantly reduces the noise generated by the nozzles. As there is no terminal unit fan or motor in or near the occupied spaces, the noise is further reduced when compared with the more conventional systems.

Space savings in the ceiling plenums and vertical air shafts, which simplifies the system installation. The ductwork system size is greatly reduced, and in some cases, the building's floor-floor dimension can be reduced lowering the building's installed cost or yielding more rentable floors for the same building height. Additionally, the size of the mechanical room can often be reduced due to the smaller central air handlers serving the terminal units.

Significant design flexibility can be achieved when utilizing DADANCO active chilled beams. DADANCO
active chilled beams have significant performance advantages which often results in less beams required, enabling the architects to achieve "cleaner" ceilings layouts.



Cost Considerations

With active chilled beam systems and their lower central system airflows, the size of the central air handlers and ductwork system is also similarly reduced. Often times these size reductions more than offset the increased first cost of the active chilled beams over other more conventional types of terminal units. Other factors positively affecting the overall building costs when using active chilled beam systems include:

Reduced overall electrical infrastructure in the building due to greatly reduced fan power requirements.

There are **no electrical line power connections** to the active chilled beams which can significantly reduce electrical wiring installation costs.

Simple low cost zone valves are used for temperature control as opposed to the rather complicated and expensive controls used in other terminal unit types such as VAV units,
unit ventilators, etc.

Easy commissioning of the active chilled beams requiring only adjustments to the water balancing valves and primary air balancing dampers.

No regular maintenance of the active chilled beams as there are no moving parts (other than infrequent vacuuming of the unit's coil, as required).

Building height reduced by 10 ft to comply with town planning requirements

SANTOS House, Adelaide, Australia

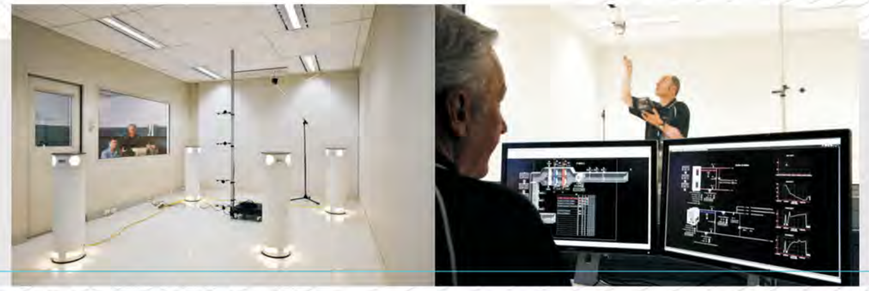
Added one extra floor for the same building height

117 York St, Sydney, Australia

Utilized low height exposed unit to fit within 8,5" available space of a heritage building

Pier 8 & 9, Walsh Bay, Sydney, Australia

DADANCO Technology and Experience



DADANCO active chilled beams utilize unique nozzle and unit fluid dynamics technology. This patented technology provides very high air entrainment ratios at low pressure drops.

A side benefit of DADANCO's technology is that this superior performance is delivered at the lowest noise levels.

DADANCO active chilled beams can typically provide higher secondary to primary airflows as compared to others, often providing unit selections with either greater capacity or reduced size. This often results in cost savings due to a smaller number of units being installed or the use of smaller units.

Conventional Nozzles

DADANCO *Nozzles*

Conventional Nozzles

DADANCO *Nozzles*

Note that the DADANCO EUROPE jet stream has a much larger surface area in contact with the surrounding air.

The Product Range

DADANCO units can be provided to fit into a standard T-bar ceiling, dry wall/plaster ceilings, and other ceiling types as required. DADANCO units can be installed exposed as well.

We have developed many different models of active chilled beams including:

- ACB 10 - with horizontal coil, typically installed concealed in a bulkhead or wall reqs intake and discharge grille, with drain pans
- ACB 20 - (2 - way discharge) with vertical coils with drain pans
- ACB 30/35 - with vertical coil, typically used for perimeter cooling and heating, or where minimal aesthetic impact on the ceiling is required, with optional drain pan
- ACB 40 - (2 - way discharge) with horizontal coils, typically flush mounted in a suspended ceiling
- ACB 50 - (1 - way discharge) with horizontal coils, typically flush mounted in a suspended ceiling

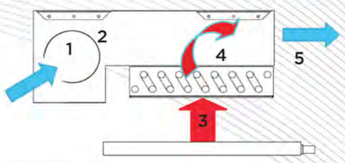
Our product range covers the following unit lengths:

- ACB 10 — 2', 3', 4', 5', 6'
- ACB 20 — 2', 4', 6'
- ACB 30/35 — 2', 3', 4', 5', 6'
- ACB 40/50 — 2', 4', 6', 8', 10'

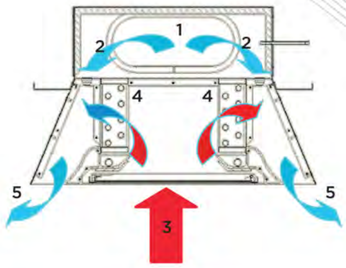
Our active chilled beams deliver superior Indoor Environment Quality (IEQ) and Air Change Effectiveness (ACE) in both perimeter and interior zones. In the perimeter, we often encourage discharge of the supply air into the zone, thereby inducing room air up and along the facade. This way, we create an almost adiabatic region along the facade and hence minimize heat transfer through the building's envelope. Such air pattern delivers uniform air temperatures in the occupied space and avoids any downdrafts at, and potential condensation on, the windows.

Coil piping arrangements can be either 2-pipe for cooling only/change-over systems or 4-pipe design.

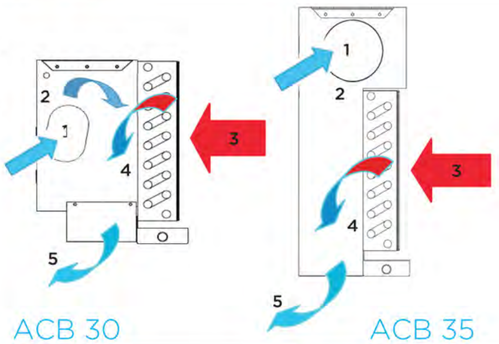
1. Primary air; 2. Primary air nozzles; 3. Secondary air; 4. Secondary water coil; 5. Supply air



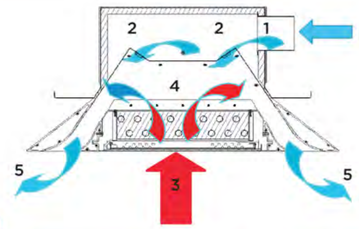
ACB 10



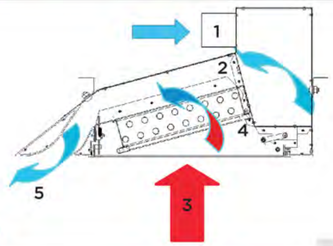
ACB 20



ACB 30 ACB 35



ACB 40



ACB 50

And Brand NEW Barometric Active Chilled Beam ACB4B

Same external appearance as standard ACB40 chilled beams

The ACB4B is designed to simplify laboratory active chilled beam system designs and make them more cost effective than previously possible.

Many lab applications require multiple different outdoor air ventilations rates, depending on the use of the space. For example, under normal operating conditions, a lab may require 2 ACH of fresh air. But when fume hoods are turned on, that requirement may increase to 6 ACH.

Since typical chilled beams are not designed to handle primary air variations that large, this excess ventilation air is typically supplied to the space by a separate VAV box or air valve with its own associated ductwork, controls and air outlets.

The Dadanco ACB4B is designed to function as a standard ACB during periods with lower ventilation rates, and it also has the capability to provide much higher primary airflow rates when required, such as a laboratory "purge mode".

These higher primary air flow rates can be delivered through the Dadanco ACB4B with relatively low additional pressure drop, and without any additional ductwork or controls.

At pressures below the damper opening pressure, the ACB4B operates in the same way as a standard active chilled beam. The barometric damper section contains a hinged door in the primary air plenum that is normally held closed by the force of several springs. As pressure in the primary air plenum increases, the door opens and allows large primary air volumes to flow through the beam at pressure drops dramatically lower than a standard ACB would require.

Spring pre-tension can be adjusted to change the pressure at which the damper opens. When damper is open, coil capacity is the same as a standard ACB40 chilled beam of the same coil length, nozzle configuration, primary air pressure, and water flow rate. When the damper plate is closed, all primary air is discharged horizontally through the standard supply air slots. When pressure increases, additional primary air delivered through the damper plate is discharged vertically through the hinged return grille.

ACB4B Barometric Damper Section: Passively Responds to changes in

Induction Units

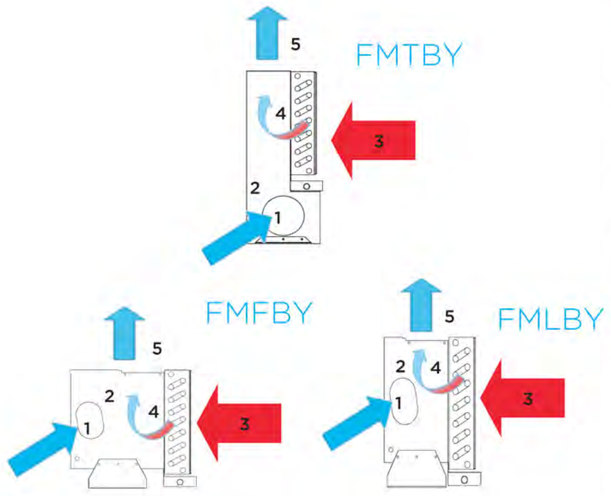
In the past, induction HVAC systems were very popular in North America and elsewhere in the world. They were the preferred perimeter system choice in larger buildings due to the relatively small size of the ductwork system required.

After the energy crisis in the 1970s, induction systems fell out of favor due to their relatively high fan energy consumption, as well as noise level concerns resulting from the system's high operating static pressure requirements. These disadvantages were associated with the induction nozzle technology available at that time.

Many of these older buildings with existing induction HVAC systems are going to be renovated at some point. Some building owners may choose to simply replace the old induction units without any significant changes to the HVAC system. With the new nozzle technology available today, however, there is an opportunity to dramatically improve the building HVAC system performance, without the need to increase the size of the existing ductwork system.

Due to the new nozzle design and increased entrainment ratios, DADANCO is able to utilize 2 row coils with 12 fins per inch, where the older units had less heat transfer surface. This dramatically increases cooling and heating output of the DADANCO induction units for the same primary airflows.

DADANCO nozzle can be used to address many of the shortcomings of existing induction HVAC systems, whether they be related to floor space/appearance, noise levels, cooling capacities or energy consumption.



The Product Range

DADANCO offers a range of induction unit models and sizes from 2 through 6 feet.

Units are available to replace and upgrade most of the older induction unit models that are no longer in regular production from their original manufacturers, including but not limited to:

- Carrier models 36SV, 36SL, 36SC, 36ST, 36SH
- York HI_I models MCV, HCV, HCH and HCL
- Trane models HPH, HPV and HPL

...and many others.

1. Primary air; 2. Primary air nozzles; 3. Secondary air; 4. Secondary water coil; 5. Supply air

Benefits

The induction units in older buildings were often mounted on or in front of the perimeter wall. This reduced usable floor space and detracted from the room's appearance and flexibility in furniture arrangement. When renovating these buildings, owners often replace the building windows and perimeter walls with an all-glass façade. In these cases the floor mounted induction units can seriously detract from the building's appearance. If **freeing up floor space and eliminating the floor mounted units** is an objective, it may be possible to replace the existing wall/floor mounted induction units with ceiling-mounted induction units or Active Chilled Beams.

If reducing noise levels is an objective, this can be achieved with the new induction units. Whether utilizing existing operating pressures (typically 2" of w.c. or higher) or sizing units at the lower inlet static pressures (0.5" of w.c. or less), DADANCO Induction Units, utilizing the new nozzles, are whisper quiet and will provide significant noise reduction over the original units (typically not exceeding NC 30-35).

The internal cooling loads in many older buildings have increased over time for a variety of reasons, such as more heat generating electronic equipment in the rooms, changes in intended room utilization, etc. If **increasing the unit cooling capacities** is an objective, the new induction units can be sized to maximize the cooling capacities while still operating at no more than the original primary airflows and operating static pressures.

Studies have shown that fan energy and lighting most often consume the most energy in typical commercial buildings. If **reducing operating costs** is an objective, the new induction units can be sized to minimize the primary airflows and system operating pressures, resulting in dramatically lower fan energy requirements.

DADANCO Induction Units are compact and generally smaller than the original, older induction units. If **fitting new induction units into the existing cabinets** is an objective, the new DADANCO units will enable seamless connection to existing chilled water and primary air infrastructure and will fit into the existing enclosures.

Inffuser

DADANCO's INFFUSERS are quite simply an induction diffuser that uses special nozzles located in the underside of the air plenum to mix primary air (ducted from the central air handling plant) with the secondary air that is induced from either the ceiling return air plenum (via * ***External entrainment***) or room (via * ***Internal entrainment***), to increase the total amount of air delivered to the space.

IDL20e
(Linear 2-way discharge)

When used in conjunction with low temperature supply air systems that operate with primary air temperatures in the range of the correct selection based on the space design conditions, INFFUSERS will ensure that the mixed air (primary plus secondary) that they deliver is above the room dew point, without the need for local fans, filters, controls or power supply at the outlet. INFFUSERS have been successfully used in conjunction with primary air temperatures as low as 43˚F, however such application must be referred to DADANCO for approval. INFFUSERS are an ideal replacement outlet for conditioned spaces that suffer from poor or inadequate air movement. They are available as either a 4' long or continuous 1 slot 1-way or 2 slot 2-way linear diffuser, or as a 2' x 2' 4-way diffuser, all with the option of either *Internal or *External entrainment.

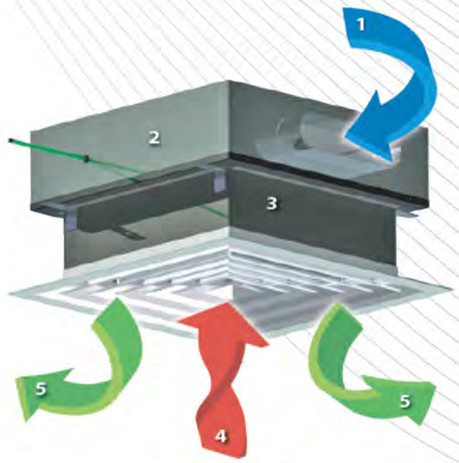
DADANCO's technology nozzles rapidly induce secondary air to reduce the momentum and height of the potential core zone, significantly reducing noise generation.

IDS60e
(Square 4-way discharge)

DADANCO INFFUSERS are whisper quiet at inlet static pressures in the range of 0.1-0.3" w.c., and are suitable for use in any air distribution system where increased air movement and tempered primary air temperatures would be of benefit.

What is Internal or External entrainment...

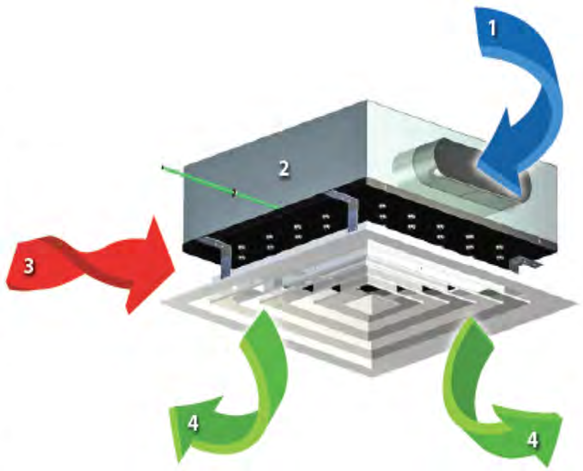
With **Internal entrainment** models, the conditioned primary air from the central air handling plant (1) is ducted into the INFFUSER plenum (2). This air leaves the plenum through a series of nozzles located in its underside into a sub divided mixing chamber behind the diffuser (3). This process induces secondary room air (4) up through the central area of the diffuser into the inffuser mixing chamber directly from the room where it is mixed with the primary air. This mixed (and tempered) air (5) is then discharged into the room via the outer areas of the diffuser.



Internal Entrainment

With **External entrainment** models, the conditioned primary air from the central air handling plant (1) is ducted into the INFFUSER plenum (2). This air leaves the plenum through a series of nozzles located in its underside. This process induces secondary air from the ceiling return air plenum (3) into the discharge path from the nozzles where it mixes with the primary air. This mixed (and tempered) air (4) is then discharged into the room via the diffuser.

In both cases, the primary air is tempered by the induced secondary air before the combination is discharged into the room via the diffuser.



External Entrainment

Common applications...

Any air distribution system where an increase in the quantity of supply air delivered to the room at a more temperate temperature is of benefit such as those spaces that suffer from:

- Need for more cooling capacity delivered with existing infrastructure
- Poor or inadequate air distribution
- Dumping or draft issues under cooling
- Stratification problems under heating

Any air distribution system being designed to save energy or striving to achieve LEED certification and, therefore, the use of low temperature primary air (45-50ºF), in order to reduce primary airflow volume by 20-30% is of benefit, such as in spaces where:

- There are building constraints that limit space available for the central air handling plant
- There are building constraints that limit the space available for supply/return ductwork and terminal outlets
- The zones have low-to-medium sensible cooling and heating load densities
- The zone is running at, or near to, minimum fresh air requirements and tight humidity control is essential

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ACTIVE CHILLED BEAM PROJECTS

EUROPE

City Exchange Building, Leeds, UK

Replacement of an existing all air system with active chilled beams
20 Floors — 35 Units per floor
Total 692 Active Chilled Beams
Consulting Engineer: FHP Partnership

Redvers House, Sheffield, UK

Replacement of an existing A/C system
8 Floors — 38 Units per floor
Total 309 Active Chilled Beams
Consulting Engineer: FHP Partnership

James C Maxwell Building, University of Edinburgh, UK

New Construction — Laboratory
Total 40 units
Consulting Engineer: Forth, Edinburgh

Cheshire Police HQ, Chester, UK

New construction regional police headquarters
4 Floors — 160 Induction Units per floor
Total 536 units
Consulting Engineer: URS Liverpool

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ACTIVE CHILLED BEAM PROJECTS

NORTH AMERICA

50 South Wacker Drive, Chicago, IL

Renovation of existing commercial office building
Total 750 Active Chilled Beams
Product: ACB 50
Consulting Engineer: Posko Associates
Mechanical Contractor: AT Mechanical
General Contractor: Turner Construction
Owner: AEW Capital Management

Barron Area High School, WI

New Addition
Total 120 Active Chilled Beams
Product: ACB 40, ACB 50
Contract Manager: TRANE Madison, WI
Owner: Barron Wisconsin School District

Silverman Hall at Northwestern University, Evanston, IL

New Construction
3 Floors — 100 Units per floor
Total 300 Active Chilled Beams
Product: ACB 40
Engineer: Affiliated Engineers Inc.
Owner: Northwestern University

Taco Canadian Headquarters, Toronto, ON

New construction
Total 29 units
Product: ACB 40 and ACB 50
Owner: TACO, Inc.

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ACTIVE CHILLED BEAM PROJECTS

AUSTRALIA

Santos Headquarters, 60 Flinders St, Adelaide

15 Floors — 64 Active chilled Beams per floor
Total 942 Active Chilled Beams
Product: ACB 50 and ACB 30
Air Change Effectiveness greater than 0.95
Consulting Engineer: BESTEC
Owner: Flinders Link

Walsh Bay, Pier 8 & 9, Sydney

Renovation of existing Heritage woolsheds to prime grade office space
350 Exposed Active Chilled Beams with condensate drains
Product: ACB 20
Consulting Engineer: ADAMUS Consulting Practice
Developer: Multiplex Construction
Anchor tenant: NEWS Corp

Suncorp Tower,259 George St, Sydney

Replacement of existing Carrier induction units with active chilled beams
43 Floors—15 Active Chilled Beams per floor (perimeter only)
Total 576 Active Chilled Beams
Product: ACB 50
Consulting Engineer: Norman, Disney and Young (Sydney)
Owner: Suncorp Properties

Maroondah Hospital, Melbourne

Total 150 Active Chilled Beams
Product: ACB 40
New Construction
Consulting Engineer: BASSETT

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ACTIVE CHILLED BEAM PROJECTS

TROPICAL CLIMATES

Science Block A & B at United World College, Singapore

Product: ACB 10
Engineer: Super Solutions Pty Ltd
Owner: United World CollegeOwner: AEW Capital Management

GTI Office Complex, Mumbai, India

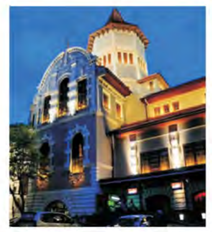
45,000 sq. ft. of office space
Total 180 Active Chilled Beams
Product: ACB 30
Engineer: Barry Webb Associates
Construction Manager: Thakur Construction

Hilton, Colombo, Sri Lanka

Complete office renovation
Product: ACB 30
Engineer: Super Solutions Pty Ltd
Building Manager: HILTON Corporation

Junior Secondary Schools, Trinidad and Tobago

Number of Schools: Sixteen
550 Active Chilled Beams per School
Total: 8,800 Active Chilled Beams
Product: ACB 20
Project Manager: EFCL
Engineer: Planning — Endeco
Owner: Government of Trinidad and Tobago



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