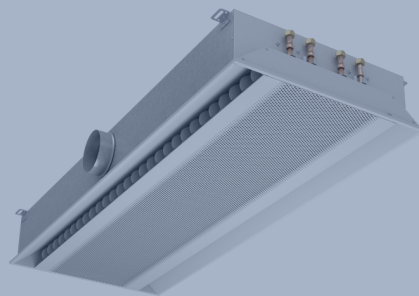




ACTIVE CHILLED BEAMS DESIGN BASICS

TROX[®] TECHNIK

ACTIVE CHILLED BEAMS DESIGN BASICS

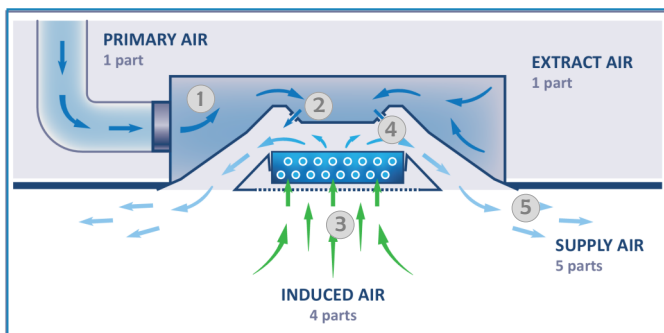


> AUSTRALIA'S FAVOURITE

> COMFORT TESTED

> EUROVENT CERTIFIED

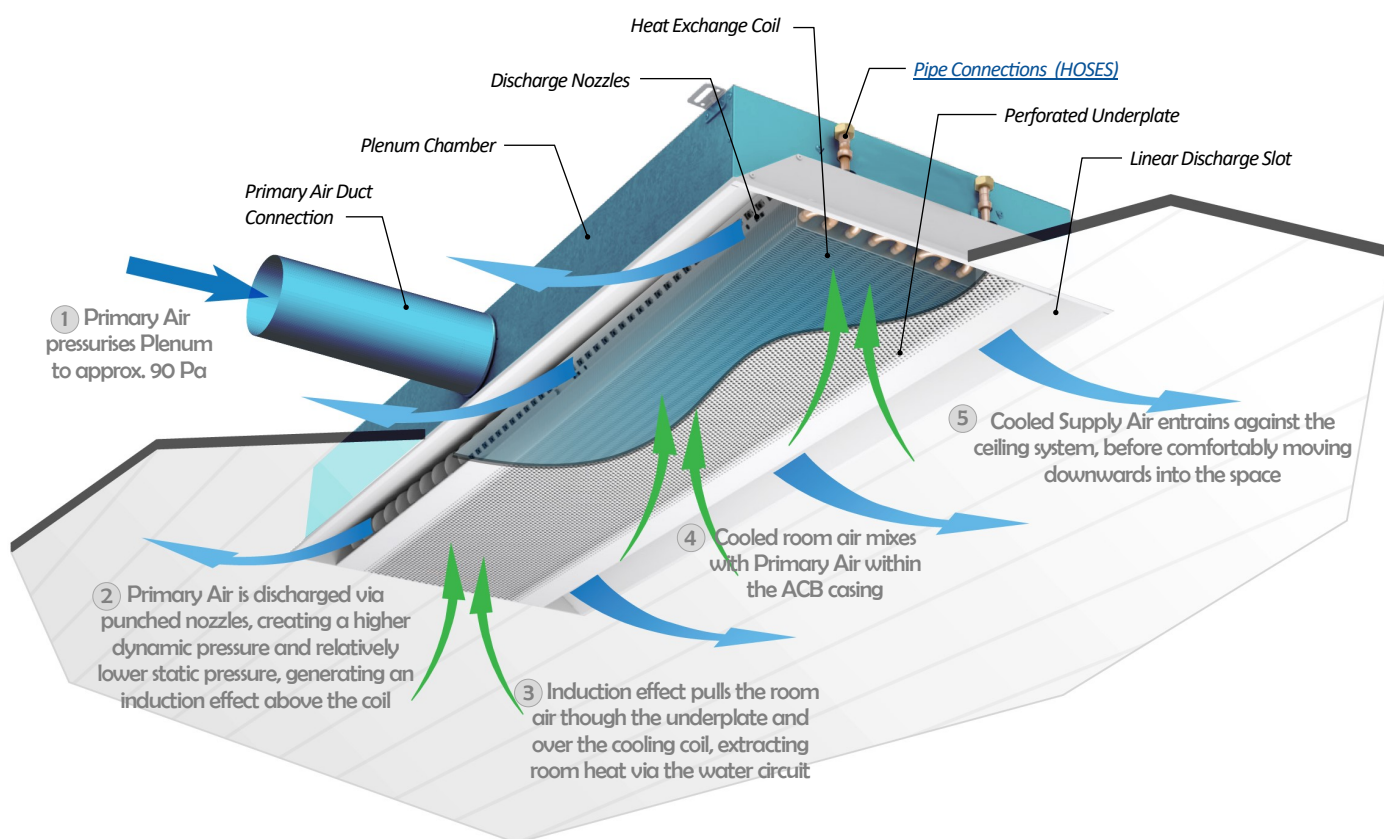
Design Principles



An active chilled beam (ACB) is a high-efficiency low-pressure induction unit, that uses the supply of a relatively small volume of conditioned Primary Air to draw a much greater volume of room air over a heat exchange coil, then supplies this cooled / heated air to the room via linear discharge slots within the unit casing.

The design of ACB's has been finessed over the past 3 decades, such that current designs can meet the cooling and **heating** requirements of most modern buildings with 'closed' envelopes.

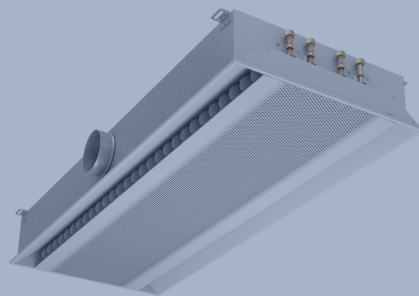
All guidelines are based on the TROX DID642 product.



The above illustrations show a 2-pipe ACB in cooling mode. The Primary Air provides the 'fresh air' ventilation requirements for occupants, and is conditioned to ensure that humidity in the space is optimal for comfort and that the coil is not operating [below the dew point](#).

Consideration must be given to [ACB positioning](#) - relative to walls and adjacent ACB's - and to the setting of the adjustable air deflection blades, to ensure that optimal product performance and environmental comfort is realised.

ACTIVE CHILLED BEAMS DESIGN BASICS



> AUSTRALIA'S FAVOURITE

> COMFORT TESTED

> EUROVENT CERTIFIED

Basic Design Parameters

PCA requirements for Chilled Beams specify the following:

	sqm (Perimeter/Centre Zone)	
	Maximum Control Zone Area	Chilled Beam Coverage
'Premium' Grade Office	<= 75/100	<= 15/25
'A' Grade Office	<= 85/120	<= 20/35

For example, a Premium grade office should have at least 5 chilled beams in each 75 sqm perimeter control zone.

The values below are most often applied to Australian projects.

	Typical Range	Optimum
Supply Water Temperature (°C)	14 to 16	14.0
Return Water Temperature (°C)	16 to 19	17.5
Room Temperature (°C)	23.5 to 24.5	24.0*
Primary Air Temperature (°C)	11 to 15	12
Primary Air Static Pressure (Pa)	80 to 110	90

Design parameters for chilled beams operating in the Australian market have developed over the years and the advice provided here is informed by latest experience.

Product performance has been independently validated and the duties summarized here can be delivered with low noise, and excellent comfort - with [PMV in the range -0.5 to +0.5](#) and [PPD less than 10%](#) - where the units are arranged appropriately.

All guidelines are based on the TROX DID642 product.

Cooling performance for TROX Active Chilled Beams is measured in accordance with **EN 15116** and independently validated under the Eurovent certification program.

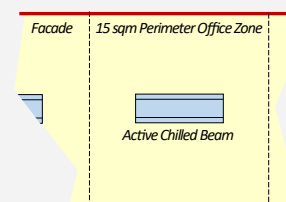


'Rule of Thumb' is that the Primary Air Volume supplied to the beams should not exceed 25 L/s per meter of product, albeit this may be increased in certain situations (contact ACS for further information).

* chilled beam systems have demonstrated [improved comfort](#) at temperatures greater than 24°C

System Cooling Duties

Applying the above Optimum values to differing chilled beam lengths within a **15 sqm Premium Grade** perimeter office zone, whilst delivering 25 L/s/m primary air volume to the beams, the following cooling capacities are realised for TROX DID642.



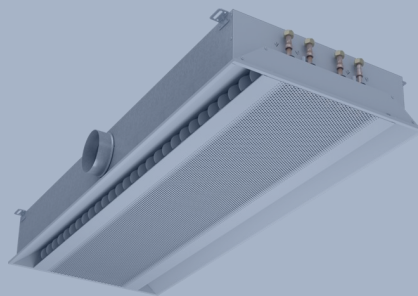
	Primary Air Volume (L/s)	Coil Sensible Cooling (W)	Primary Air Sensible Cooling (W)	TOTAL Sensible Cooling (W)	Sound Power Level LWA (dB(A))
1.2m Active Chilled Beam	30	706	432	1138	24
1.5m Active Chilled Beam	38	912	547	1459	25
1.8m Active Chilled Beam	45	1107	648	1755	26
2.4m Active Chilled Beam	60	1499	864	2363	29

Primary Air Volume (L/s/sqm)	Total Cooling (W/sqm)	VAV @ 12°C Air (L/s/sqm)
2.0	76	5.3
2.5	97	6.8
3.0	117	8.1
4.0	158	10.9

VAV system requires **2.5 times more** primary air to deliver the same cooling

Minimum volume of primary fresh air: [1.4 L/s/sqm to 2.0 L/s/sqm](#)

ACTIVE CHILLED BEAMS DESIGN BASICS



> AUSTRALIA'S FAVOURITE

> COMFORT TESTED

> EUROVENT CERTIFIED

System Considerations

Maintenance

An ACB contains no moving parts or consumable items, hence no periodic replacement of components is required. Dependent on the cleanliness of the environment, there will be a requirement to inspect and potentially remove any build up of dust that may occur on the heat exchange coil. This is a simple and non-intrusive process, typically [conducted every 3-5 years](#) in a commercial office.

Longevity

So long as [appropriate water conditions](#) are maintained - velocities and dosing - ACB's can be expected to remain operative and efficient for the life of the building (at least 25 years).

Energy Efficiency

An ACB will remove a large proportion of heat from the space via the chilled water circuit. Water has a higher thermal conductivity and specific heat capacity than air, and will consequently remove the heat with significantly lower volume flow. In this way, removing heat with water is inherently more energy efficient than removing the same heat with air.

Turndown Capability

On the hottest design day, ACB's in perimeter zones may require more primary air supply than is necessary to meet minimum ventilation requirements. Adopting a turndown approach - controlling the primary air to a beam zone using a VAV controller - enables the system to consume less energy during periods of low load or low occupancy.

Occupant Thermal Comfort

The primary purpose of any HVAC system has to be the provision of a safe and comfortable environment for building occupants. Appropriately designed ACB systems have proven over many years to provide [excellent thermal comfort](#) and low noise for building occupants. Together with our manufacturing partners, ACS offer offsite project-specific testing to establish and optimise the thermal comfort of the selected design.

Elevated Room Setpoint

Project testing and [additional research](#) identifies that ACB's and radiant passive systems have the potential to provide excellent thermal comfort at room temperatures exceeding the 24°C default that is typically employed on most commercial office projects in Australia.

Primary Air Requirement

The primary air to the beams will often be 100% fresh air, treated to remove excessive moisture and introduced at a similar temperature to the supply water. The volume of primary air required will generally be significantly less than that required by a VAV system delivering similar cooling duties.

Active Chilled Beams have demonstrated an ability to provide effective cooling and heating, with low noise and low energy use, to many modern building types. Furthermore, these systems have minimal maintenance requirements, are simple to control and will likely endure for the life of the building.

The relatively high supply-air temperature delivered by the units in cooling mode, coupled with an engineered discharge pattern with directional control, has helped these systems achieve excellent comfort conditions when tested for numerous Australian and overseas projects.

Noise

Over the years, ACB's have been engineered to operate at extremely low noise levels; typically L_w NR 30 or less.

Exposed Installation

Although usually integrated into suspended ceilings or plasterboard soffits, ACB's can be designed or retro-fitted to enable effective operation in an ['exposed' environment](#) where ceilings are removed.

Flexibility of Use

The 'base build' design would usually have a degree of flexibility to accommodate future tenant requirements, however it may be necessary to introduce additional units or supplementary systems if tenants require significant additional cooling loads or fresh air volumes.

Pipework & Controls

It is usual to control a zone of chilled beams simultaneously via an ON/OFF strategy, ensuring that 100% cooling is available when required. The total cooling capacity of an ACB is not highly sensitive to the water flow volume, hence 'reverse-return' or 'header' pipework arrangements may be employed.

Heating

ACB's [are very effective heating devices](#) when provided with heated Primary Air or heated water. Furthermore, the relatively low supply-air temperature - typically 18°C to 22°C - translates to excellent comfort for room occupants.

Condensation

ACB's usually operate in closed environments where Relative Humidity (RH) is controlled to provide optimal comfort. In cooling mode, chilled beams will usually be supplied with chilled water that is maintained above room dew point. [Mitigation strategies](#) can be employed to ensure that condensation is prevented even where windows are opened and the ACB's operate below dew point.



Quay Quarter Tower

Location	Sydney
Product	3000+ TROX DID642
Scale	88,000 sqm
Builder	Brookfield Multiplex
Engineers	ARUP
Installer	ECIV
Completed	2022