APPLICATION GUIDE

BEAMS

price | BEAMS

There is an increasing need for energy efficient air conditioning systems as energy codes become more stringent. Chilled beam systems are one such alternate to traditional "all air" conditioning systems. Beams use water to move energy through a building and service the building's sensible (dry) cooling load, relying on the air-side simply to meet ventilation and latent (wet) load requirements. This drastically reduces primary air volumes supplied to a space and leads to energy savings, improved comfort levels, and ability to effectively integrate a dedicated outdoor air system (DOAS).

1/2 in. Diameter Water Pipe &
7 in. Diameter Air Duct

18 in. x 18 in. Air Duct

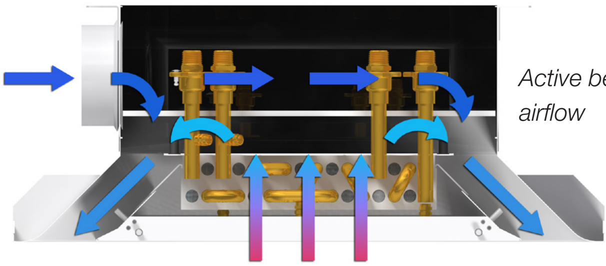
Water is more efficient at transporting energy. The smaller footprint of a beam system allows for greater mechanical and architectural flexibility.

All Air Systems	Beam Systems
Use air for both sensible and latent load	Use water for sensible load and air for latent load and ventilation
Generally re-circulate air	Generally supply up to 100% outside air

TYPES OF BEAMS

Active Beams

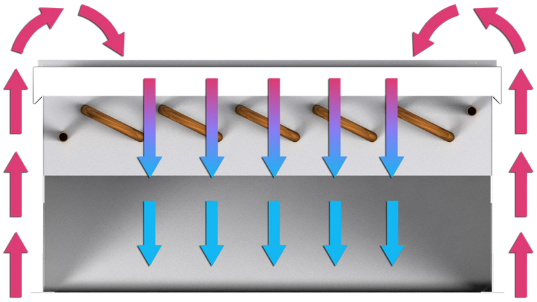
+ Supply primary air for ventilation and increased capacity.
+ High velocity primary air induces room air across the coil.
+ Distributes combined primary and induced air into the room.
+ Provide heating and cooling.



Active beam airflow

Passive Beams

+ Convective currents draw room air across the coil.
+ Require a separate ventilation system to condition latent loads, as no primary airflow is supplied.



Passive beam airflow

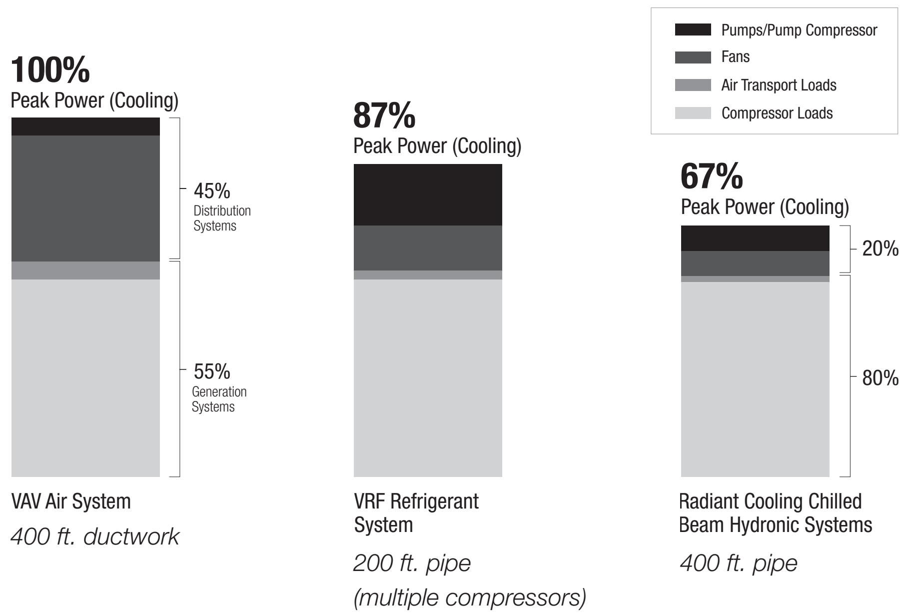
CHOOSING THE RIGHT SYSTEM: THE ENERGY STORY

Active and passive beam systems can contribute 30 - 57% energy savings depending on application.

+ Beams can contribute to energy savings in the building, which will help achieve LEED credits.
+ Relying on pumping power, as opposed to fan power, to transport energy through the building often results in energy savings.
+ Increased use of wetside economizer and a reduction in chiller lift contribute to plant efficiency.

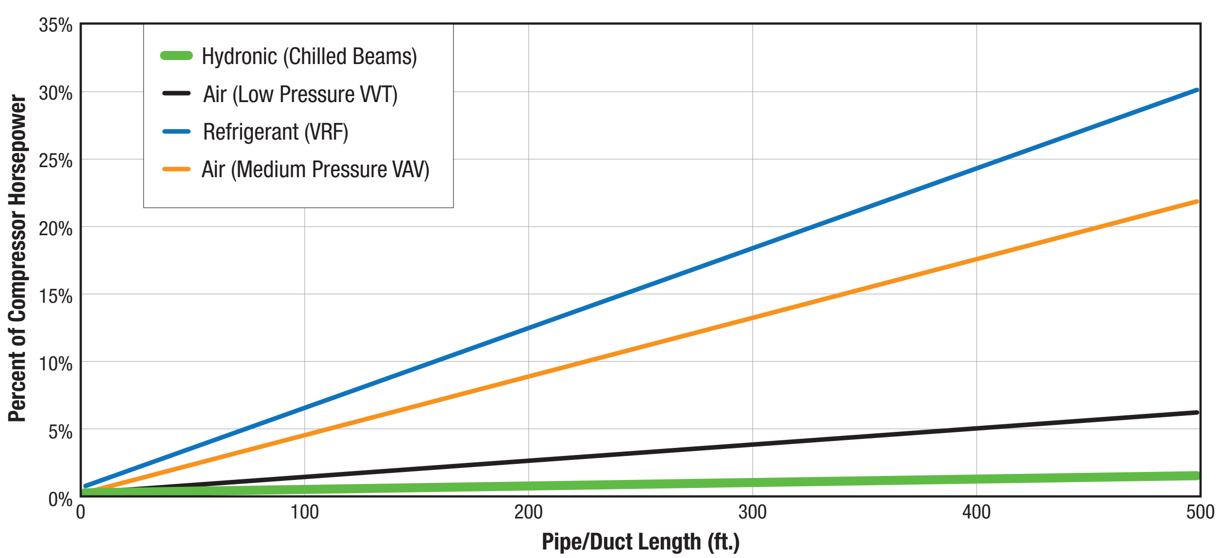
Chilled Beam Systems vs. All Air (VAV) and Refrigerant Systems (VRF)

Assuming a mid to large size project, a chilled beam system could use **33% less power** to condition a space when compared to an all air system, and 20% when compared to a VRF system.



Distribution / Pumping Energy

The graph below shows the percentage of compressor horsepower to building pipe/duct length. When compared to an all air system and a refrigerant system, hydronic chilled beams require significantly less pumping energy. AHRI Standard 1230 for rating VRF equipment only requires 25 ft. of pipe for testing. Correction factors (AHRI Standard 1230 recommends at 6% per 100 ft.) are required to adjust for longer lengths of equivalent piping.



BENEFITS

Efficiency

Water is a natural resource that uses the least amount of horsepower to deliver heating or cooling, therefore maximizing energy efficiency. Chilled beams can help transfer the majority of the sensible space load on to water coils, which can present many advantages over all air and VRF systems. When correctly applied, chilled beams **can save 30% or more when compared to both all air and VRF systems.** The ability to **customize the design to building and climate** requirements helps optimize the system.

Safety

On average chilled beams use **66-75% less CFC/HFC refrigerant than VRF**. Refrigerant used is factory sealed and isolated from building occupants.

Comfort

Chilled beams typically run at a higher discharge air temperature when compared to most other HVAC systems (with the exception of Stratified Air Systems). Chilled beams are also quieter to operate, and provide excellent air distribution, leading to better occupant comfort and increased productivity.

Versatility

With chilled beams you can customize the design to suit most buildings and climates in order to **achieve an efficiency goal.** Through tying in all the building mechanical components you can salvage energy and redistribute it throughout the building.

Costs

Lower upfront costs

The versatility of the system allows you to **design for every budget**. Initial costs can be controlled through the proper selection of components, the implementation of technology, a well engineered control strategy, and a competitive bid process.

Lower lifecycle cost

Hydronic systems are **designed for the life of the building**. These systems are easily upgradeable as new technology evolves providing true unmatched energy efficiency.

Minimal maintenance

Typical chilled beam designs are sensible cooling only which leads to minimal in-space maintenance in most applications. Hydronic components are interchangeable and parts are readily available.

Sustainability

Chilled beam systems provide a true path to Net Zero. These systems can provide the highest level of energy efficiency. Simple integration between green technologies and the longest lasting equipment solutions provide for a very sustainable system. These systems use comparatively low amounts of CFC/HFC refrigerants with many replacement and upgrade opportunities.

SYSTEM DESIGN

Primary Airflow

When designing an air distribution system there are many factors that affect occupant comfort, including:

+ Building skin loads
+ Occupant and equipment loads
+ Lighting loads
+ Ventilation requirements
+ Outdoor air load

The difference between a VAV system and an active chilled beam system is what factors are handled at the AHU level versus in the space being conditioned.

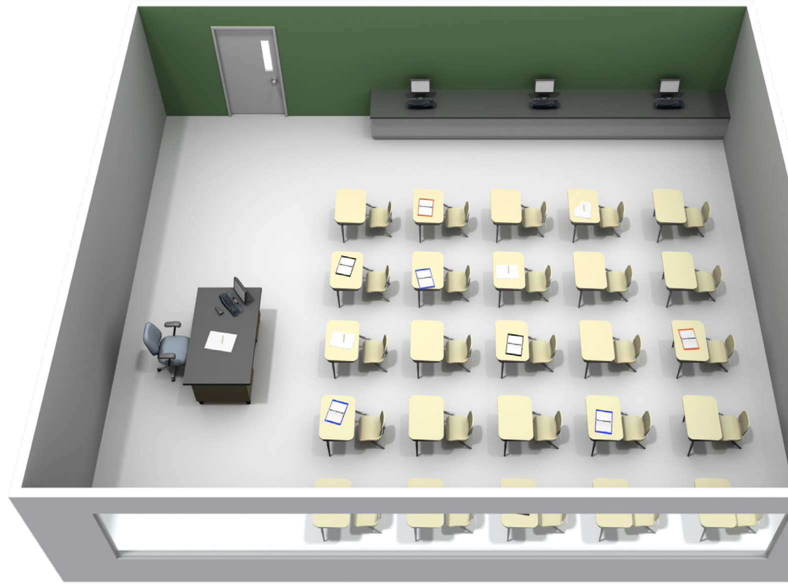
In a typical VAV system, the airflow from the AHU is used to handle all the load factors listed above. In an active chilled beam system, the coil installed in the beam will cool the majority of the sensible space load and handle the room air recirculation.

The primary airflow from the DOAS/AHU is typically sized to take care of:

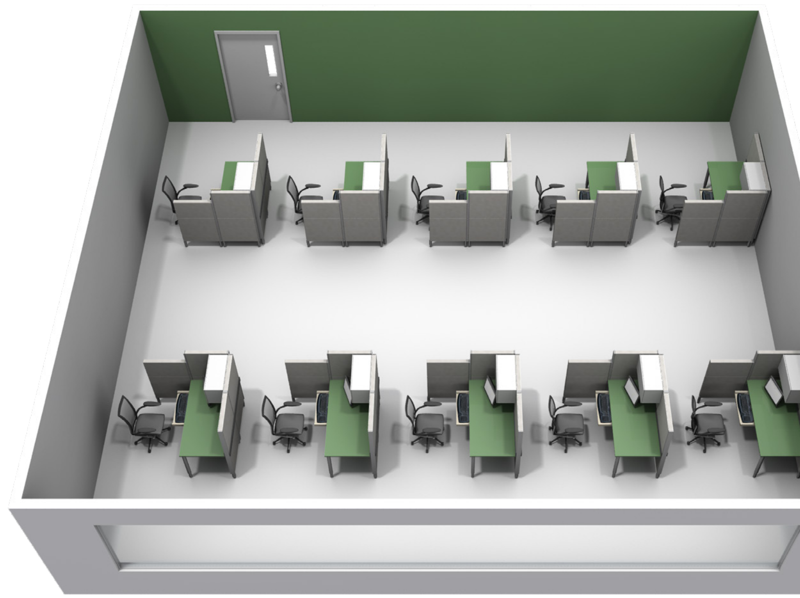
+ Ventilation rate
+ Zone latent load
+ Ventilation load
+ Partial zone sensible load

The goal with a chilled beam system is to minimize the volume of primary air required. **Depending on the application, this may lead to as much as 75% reduction in the quantity of primary air required.**

This design example compares a high density application (classroom) to a moderate density application (office) and how the system efficiency can be optimized by minimizing the required primary airflow.



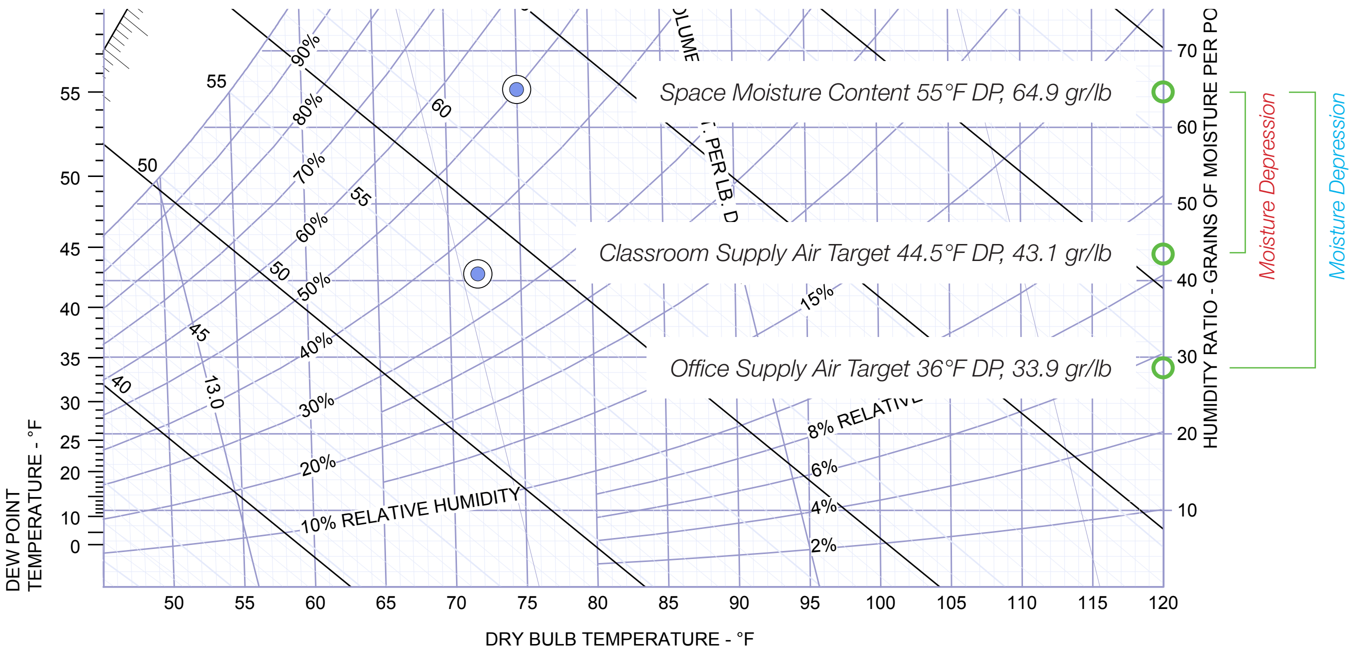
Classroom



Office

Application Details	Application	Occupants	ASHRAE 62.1 (2013) Ventilation Requirements	Results	
				Outdoor Air	Outdoor Air /Occupant
Area: 750 $ft.^2$ Set Point: 75°F Window Area: 100 $ft.^2$ T8 florescent lighting	Classroom	1 instructor 25 students	0.12 cfm/sq.ft. 10 cfm / person	350 cfm	13.5 cfm
	Office	10 employees	0.06 cfm/sq.ft. 5 cfm / person	95 cfm	9.5 cfm

Application	Latent load per occupant	Outdoor air per occupant	Moisture depression	Target DP, gr/lb.
Classroom	200 btu/h	13.5 cfm	21.8 gr/lb.	44.5° F DP, 43.1 gr/lb.
Office	200 btu/h	9.5 cfm	31.0 gr/lb.	36° F DP, 33.9 gr/lb.



Takeaway Design Tips

A typical space is conditioned to 75°F dew point (DP), 64.9 gr/lb. The saturated primary air has the same moisture content at 55°F, meaning that further dehumidification of the primary air is required. The dew point and gr/lb. are integral to chilled beam design.

To ensure the most efficient design possible, the goal is to satisfy the zone latent load with a quantity of primary air as close as possible to the ventilation rate requirement. Limitations with lowest achievable dew point may require primary air flow above the ventilation rate in certain cases. For example, the office supply air target of 36°F dew point might not be practical to achieve, so the primary air volume would be increased to offset for the higher dew point.

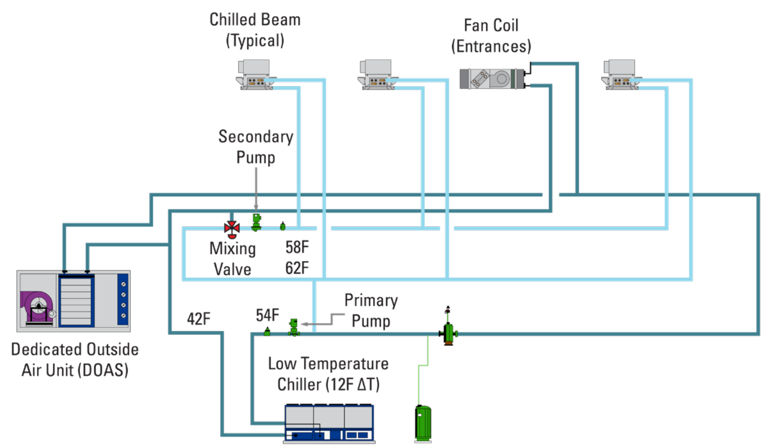
+ Various different types of **low dew point units** are available in the market
  - Desiccant wheel units:
    + Active regeneration
    + Passive regeneration
  - DX dehumidifying unit with hot gas reheat
+ Typical ventilation rate range Office Space: 0.11 to 0.15 cfm/sq.ft.; Classroom: 0.45 to 0.55 cfm/sq.ft.
+ Office Space with 10 – 15 gr/lb depression between primary air and space condition may require 0.2 to 0.3 cfm/sq.ft. of primary airflow
+ Typical primary air requirement for any application with chilled beams will require between 0.2 - 0.7 cfm/sq.ft.

Secondary Water Loop

A beam system will often include low temperature chilled water for the outdoor air or primary air system, and higher temperature chilled water (or secondary water loop) for the active or passive beams. There are several possible secondary water loop configurations that would provide the required supply water temperature in an efficient manner and meet the design load depending on project budgets, availability, and overall building design.

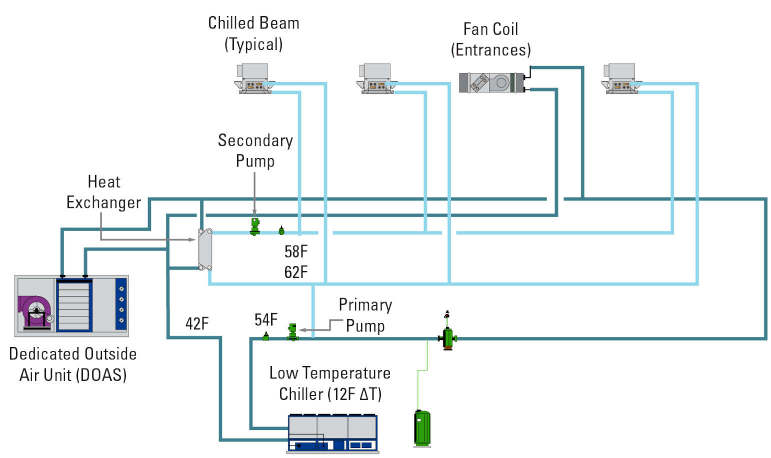
Closed Loop Mixing Valve

+ Low initial cost.
+ Ideal for small to mid size projects where first cost is the primary driver.
+ Easy way of adding secondary chilled water loop to an existing low temperature chilled water loop.
+ Intermediate piping arrangement.



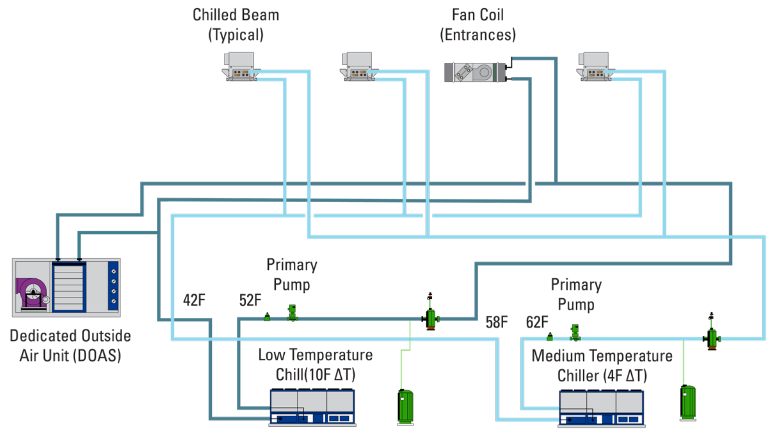
Heat Exchanger

+ Moderate initial cost.
+ Ideal for small to mid size projects where first cost and simple operation are the primary drivers.
+ Easy way of adding secondary chilled water loop to an existing low temperature chilled water loop.
+ Simple piping arrangement.
+ Ideal where separation of the primary and secondary chilled water loop is advantageous.



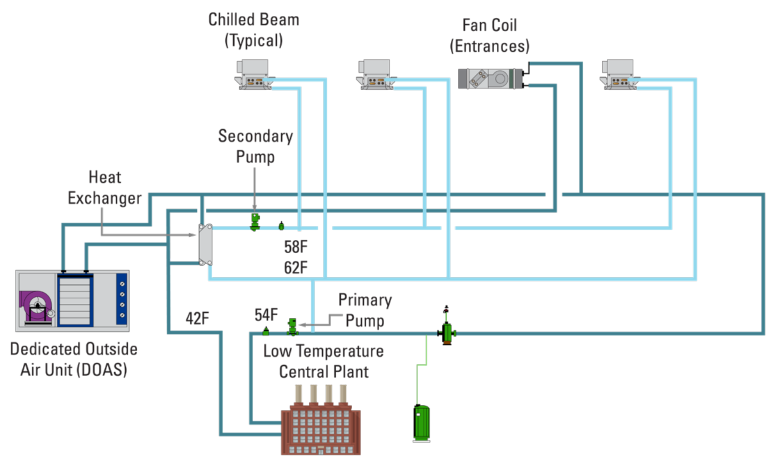
Dedicated Chiller

- Relatively higher initial cost.
- Ideal for mid to large sized projects where secondary chilled water loop can be put on separate chiller.
- Higher chiller efficiency (could improve chiller efficiency by 25%) provides further energy use reduction.
- Simple piping arrangement.
- Optional dual (primary and secondary) chiller with common header setup to reduce redundancy and initial cost.



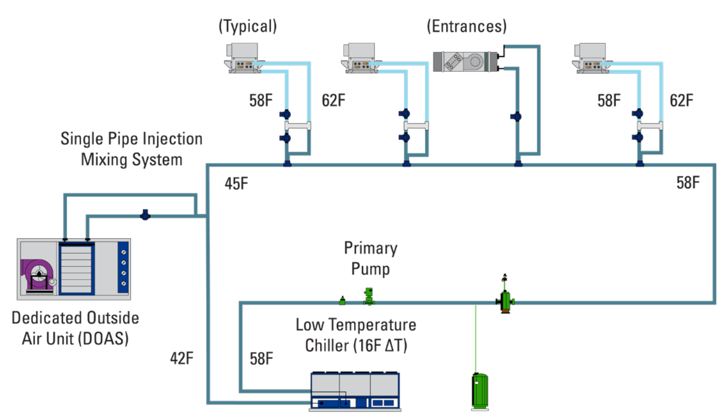
District Chilled Water Loop

- Moderate initial cost.
- Return loop on district cooling is typically close to the entering water temperature required for beams and can be tapped into with heat exchanger setup.
- Potential for increased chiller efficiency at the central plant.



Temperature Reset Module (TRM)

- Low initial cost
- Ideal for systems needing both dehumidification and dry cooling
- Provides local mixing to simplify waterside system layout
- Allows for better entering water temperature control and response time to humidity increase in each zone



COMMERCIAL OFFICE SPACES

Using chilled beams improves energy efficiency through significant reductions in fan power and reheat requirements.

CONFERENCE ROOMS

+ Occupancy can fluctuate throughout the day, so modulation in the space should be considered.
+ Applicable products include:
    - ACBR: Recessed Active Chilled Beam (pictured in render)
    - ACBL: Linear Active Chilled Beam
    - ACBC: Cabinet Displacement Chilled Beam

ADDITIONAL CONSIDERATIONS

+ Volume Flow Regulators (VFR) ensure constant airflow in smaller zones
+ VAV boxes allow for Demand Control Ventilation (DCV) when coupled with CO_2 / occupancy sensors and set point based override for reduction in energy use.

INTERIOR PRIVATE OFFICES

+ Small offices typically have low enough loads for a single chilled beam. These will typically located in the middle of the room for optimal air distribution.
+ Applicable products include:
    - ACBM: Modular Active Chilled Beam

PERIMETER ZONE

+ Chilled beams on the perimeter could treat both heating and cooling loads throughout the year. Beams can be used in either recessed, lay-in, or exposed applications (Coanda wings would be required).
+ Along the perimeter, chilled beams can be used in a 2-pipe or 4-pipe application. 6-way valves will allow for changeover between heating and cooling for a 2- pipe chilled beam.
+ Applicable products include:
    - ACBL: Linear Active Chilled Beam (pictured in render)
    - ACBR: Recessed Active Chilled Beam
    - ACBC: Cabinet Displacement Chilled Beam
    - PCBL: Linear Passive Chilled Beam

INTERIOR OPEN OFFICE SPACES

+ Chilled beams in the interior will typically provide cooling only, assuming heating requirements are accounted for on the perimeter. Beams can be used in either recessed, lay-in, or exposed applications.
+ For additional aesthetic appeal, slimline connections with additional active beams or inactive beams can be applied for a long continuous appearance.
+ Applicable products include:
    - ACBL: Linear Active Chilled Beam (pictured in render)
    - ACBR: Recessed Active Chilled Beam
    - PCBL: Linear Passive Chilled Beam

Performance

	Chilled Beams	VAV	VRF
CFM	19,500	65,000	16,250
Peak Fan HP	21	70	17
Peak Additional Pumping HP	2	-	9
Fan and Pumping Energy Consumption kwh/ yr	7,627	10,283	8,618
Percent Energy Use in Comparison to Chilled Beams	-	35% higher	13% higher

Notes

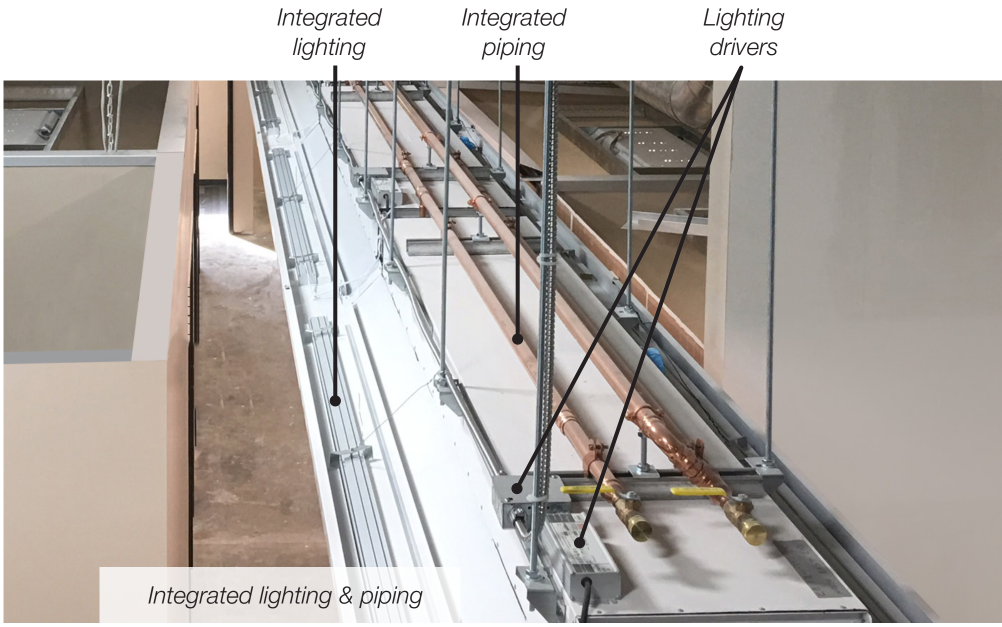
1. These comparisons are based on a 40,000 sq.ft. office floor plate with 35 btuh/sq.ft. of space peak cooling load
2. Fan efficiency 65%, motor efficiency 90%, water pump efficiency 80%
3. Air system total static 4 in.w.g.
4. Chilled beam system secondary water requirement based on 57°F EWT, 5°F water ΔT, 300 ft. of pipping at 4 ft. head loss per 100 ft.
5. VRF pumping energy based on AHRI 1230 and 200 ft. of pipping
6. Compressor COP 3.8
7. Annual cooling energy consumpton (fan and pumping energy only) allows for load fluctuation

Selling Features

Integrated Lighting and Piping

+ Lights can be integrated into Coanda Wings when installing beams into an open ceiling.
+ Piping can be integrated into the beams to reduce the visible clutter in an open ceiling, providing a clean look. The integration of piping into the beam typically reduces the contractors installation time and overall cost.


Integrated lighting



Integrated lighting & piping

Retrofit Opportunities

+ Buildings with perimeter induction units can use the Retrofit Induction Unit (RIU) to upgrade their system. The RIU is designed to match the existing footprint and to be connected into the existing piping and duct work. These units can utilize the existing cabinets or can be ordered with new cabinets.
+ Buildings with perimeter fin tube can utilize ACBL24's in the ceiling and use existing hot water piping and duct work. This will increase the usable floor space and improve air quality. Variable air volume (VAV) diffusers/boxes can be used in interior spaces to upgrade the system from constant volume to VAV.

EDUCATIONAL FACILITIES

Energy savings, low noise levels, thermal comfort and high air quality are critical design criteria for schools, and beam systems provide all four. Reduced fan power leads to energy savings and reduced noise levels.

DEDICATED OUTDOOR AIR SYSTEM (DOAS)

+ Supplies dehumidified, filtered, and conditioned outdoor air, to the beam system to maintain air indoor quality.

CABINET DISPLACEMENT CHILLED BEAM

+ Supplies low velocity conditioned air at ground level, which improves ventilation effectiveness, thermal comfort, and reduced noise levels capable of satisfying the requirements of the ANSI 12.6 standard.

DEMAND CONTROL VENTILATION

+ Consideration for minimizing primary air during off-peak hours, school holidays, and unoccupied classrooms through occupancy or CO_2 sensors to further increase energy efficiencies in the system.

ACCESSORIES

+ The Cabinet Displacement Chilled Beam can be combined with accessories like additional shelving and access compartments to HVAC controls so as to minimize usable space impact.

Performance

	Chilled Beams	VAV	VRF
CFM	360	900	450
Peak Fan HP	0.39	0.97	0.48
Peak Additional Pumping HP	0.03	-	0.22
Fan and Pumping Energy Consumption kwh/ yr	123	163	208
Percent Energy Use in Comparison to Chilled Beams	-	32% higher	69% higher

Notes

1. These comparisons are based on a 750 sq.ft. classroom with 1.5 tons of space peak cooling load
2. Fan efficiency 65%, motor efficiency 90%, water pump efficiency 80%
3. Air system total static 4 in.w.g.
4. Chilled beam system secondary water requirement based on 57°F EWT, 5°F water ΔT, 300 ft. of pipping at 4 ft. head loos per 100 ft.
5. VRF pumping energy based on AHRI 1230 and 200 ft. of pipping
6. Compressor COP 3.8
7. Annual cooling energy consumpton (fan and pumping energy only) allows for load fluctuation

Additional Design Considerations

Alternate layout

+ Where floor space is not available, linear active beams can be utilized in the ceiling.

Retrofit Opportunities

+ Chilled beams are the most cost effective system replacement for existing unit ventilator systems while minimizing in-space maintenance.

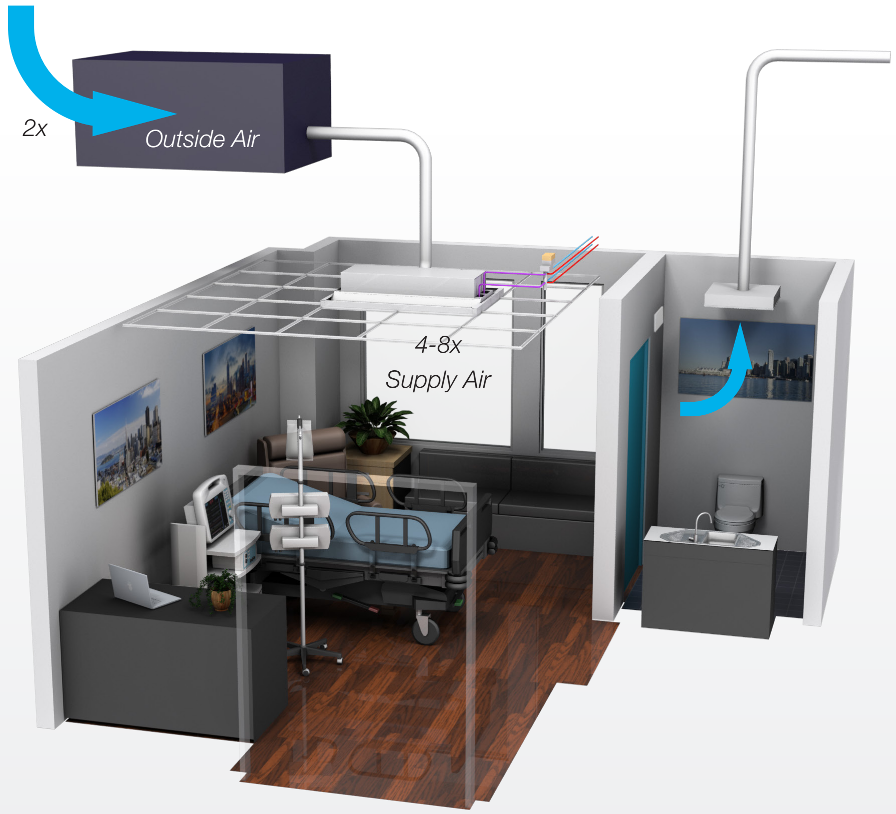
HEALTHCARE FACILITIES

Hospitals are unique applications generally requiring a minimum number of air changes per hour. A certain number of these air changes are required to be treated outdoor air. Chilled beams can be utilized to maximize the effect of the treated outdoor air by inducing the room air through the chilled beams to satisfy these total air change requirements with considerably less outside air. This can allow for much less ductwork in the system as well as increasing the amount of usable floor space in each floor of the building.

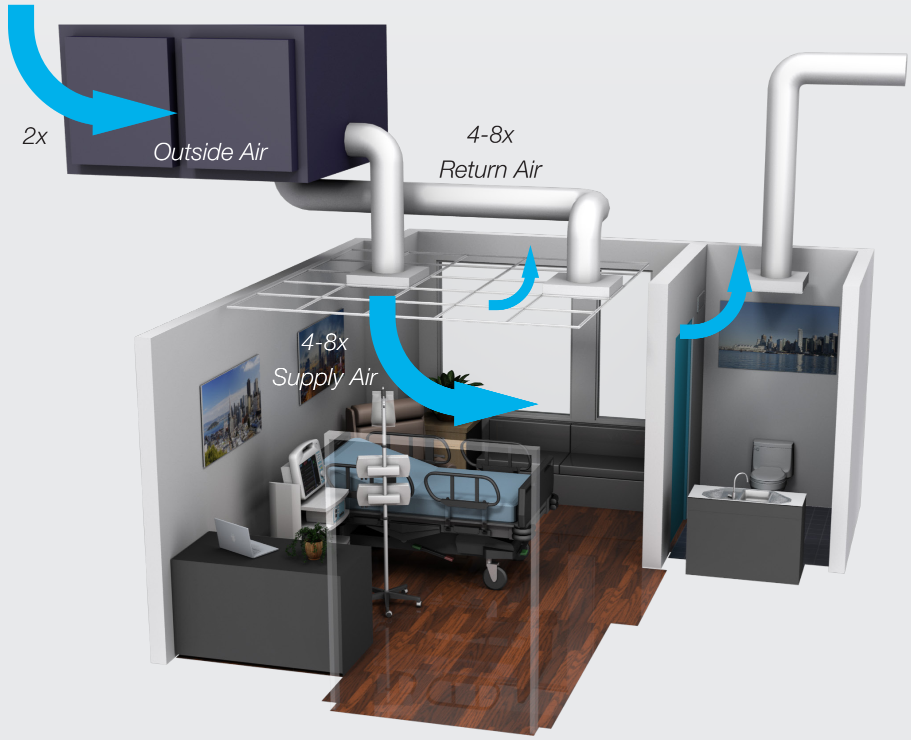
By using chilled beams in patient rooms, as opposed to a traditional all air system, we are able to significantly reduce the amount of reheat required to the space under part load conditions. This will in turn realize large savings in reheat energy.

Chilled beams can be designed to ensure a high level of occupant comfort in terms of noise, velocity, and temperature differential - all exceptionally important to patient well being.

Patient Room with Active Chilled Beam



Patient Room with Overhead Mixing



Performance

	Chilled Beams	VAV
CFM	60	180
Peak Fan HP	0.06	0.19
Peak Additional Pumping Zone Fan HP	0.01	-
Fan and Pumping Energy Consumption kwh/ yr	234	334
Percent Energy Use in Comparison to Chilled Beams	-	43% higher

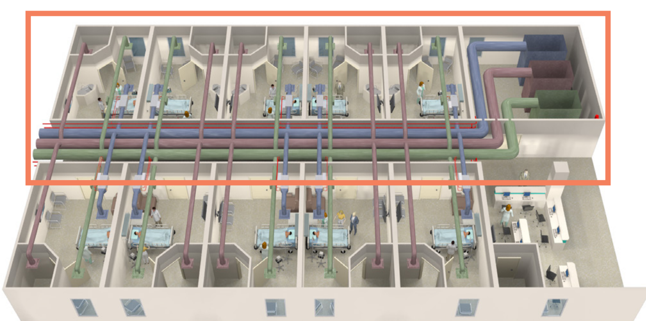
Notes
1. These comparisons are based on a 200 sq.ft. patient toom with 25 btuh/sq.ft. space peak cooling load
2. Fan efficiency 65%, motor efficiency 90%, water pump efficiency 80%
3. Air system total static 4 in.w.g.
4. Chilled beam system secondary water requirement based on 57°F EWT, 5°F water ΔT, 300 ft. of pipping at 4 ft. head loos per 100 ft.
5. Compressor COP 3.8
6. Annual cooling energy consumpton (fan and pumping energy only) based on 24 hour operation

Design Considerations

Space Savings & Increased Revenue

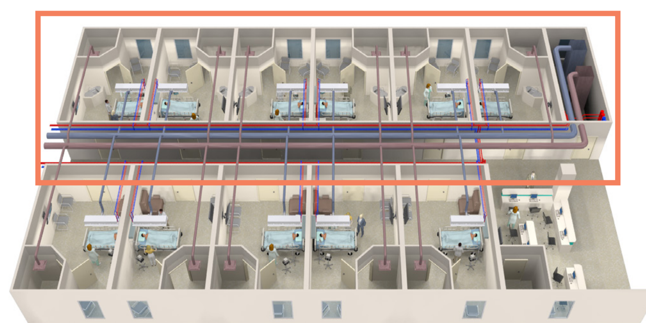
+ Reducing the overall size of ductwork and risers, as a result of decreased primary air requirements, can result in more useable interstitial space as well as more useable floor space.
+ Additional space may lead to additional revenue. Typical revenue generated by in-patient facilities can be as much as $1,000/sq.ft./year.

4 Rooms



Mixing System

5 Rooms



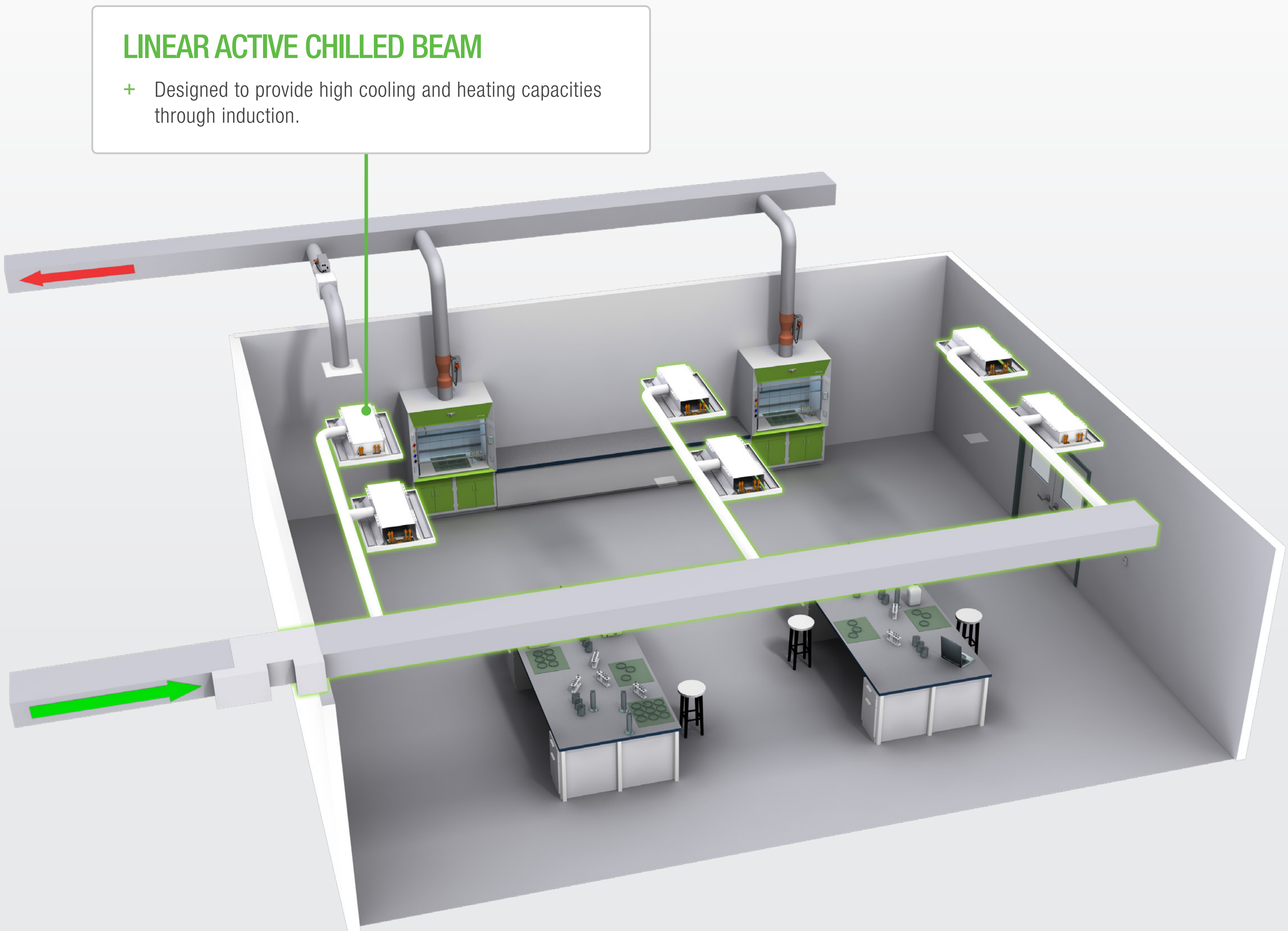
Chilled Beam System

Façade & Mechanical System Savings

+ Reduced duct size and lower ceiling space requirement can possibly reduce slab-to-slab height. Reduced structure height can help reduce capital cost of the project.
+ Reduction in airflow can lead to savings on both the air handling unit and the ductwork. Reducing the overall mechanical system cost.

LABORATORIES

Laboratories fall under three different categories in regards to air distribution: Ventilation Driven, Load Driven, and Fume Hood Driven. The categories differ in the amount of air required for ventilation, safety, cooling, and fume hoods. When focusing on significant energy and space savings, the Ventilation and Load Driven labs are most compatible with beam systems. Significant reduction in reheat energy, ductwork, air handler size, and ceiling space are a few of the advantages of beam systems.



Performance

	Chilled Beams	Standard System Design
OA Air Handler Sizing	18,000 cfm	27,000 cfm
Ductwork	30,000 lb	37,500 lb
Exhaust Fan Capacity	18,000 cfm	27,000 cfm
Cooling System Capacity	20 tons	35 tons
Floor to Ceiling Height[1]	10 ft.	9 ft.
Mechanical System Cost[2]	$722,000	$741,000

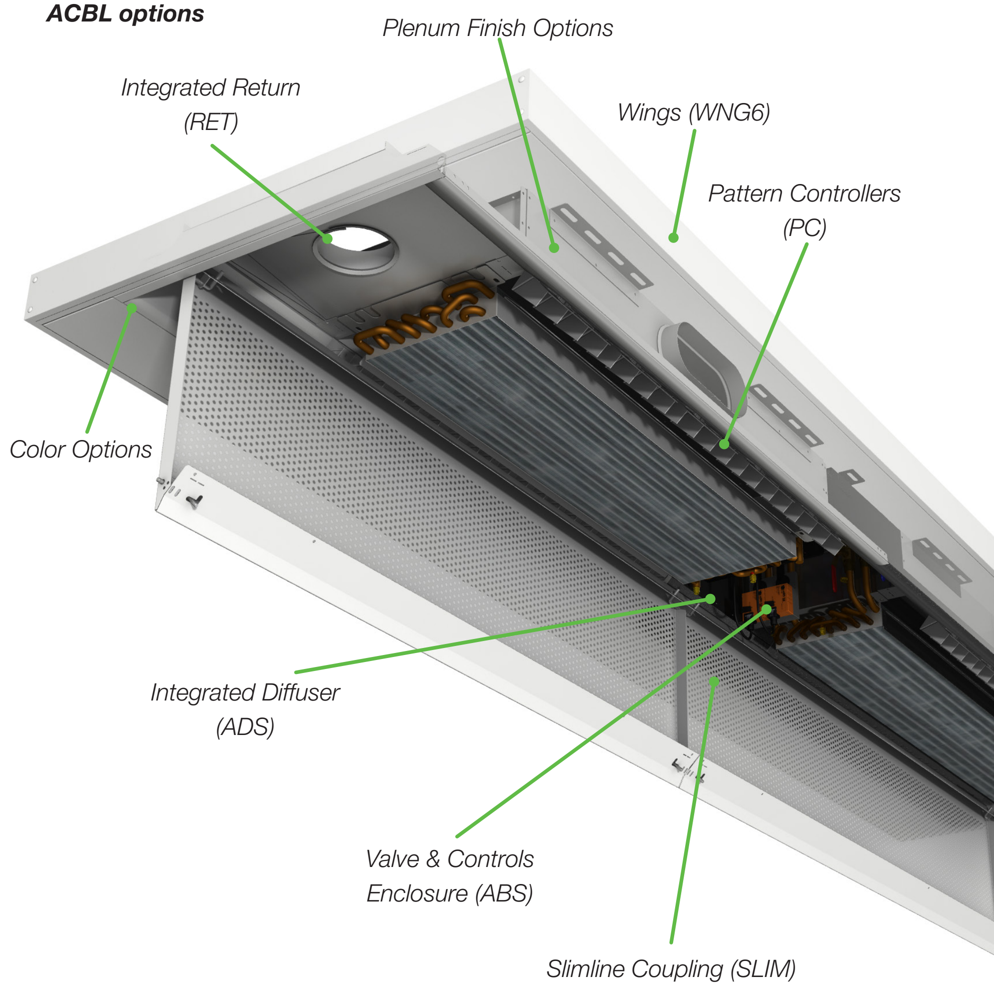
Notes
1. Floor to floor height kept constant; active chilled beam allowed for ceiling to be raised 1 ft.
2. Laboratory portion of the building is 10,000 sq.ft. or 25% of the building. HVAC costs include laboratory system only.

Source: Rumsey, P.E., P. and Weale, P.E., J. (2006). Chilled Beams in Labs - Eliminating Reheat & Saving Energy on a Budget. ASHRAE Journal, 49, p.25.

Design Considerations

+ The integrated diffuser includes a separate air inlet that can be combined with a manual or VAV damper. When more airflow is required, an integrated diffuser can be used to adjust the airflow to the zone.
+ Laboratories often have a small footprint. Pattern controllers can help spread and reduce the throw to other beams in close proximity to each other to manage velocity and turbulence in the occupied zone.

ACBL options



ZONE BASED SELECTION

The Beam Selection Software provides a platform to select beams using a typical zone load calculation. Unmodified zone load calculations and ventilation requirements can be entered in the software to run a selection set for each zone or all zones.

price® The Science of Comfort™

4 Auto Selections: AUTO SELECT ALL ROOMS/ZONES | SELECT INDIVIDUAL ROOM/ZONE

Total quantities for the project					
Primary Air:	0	CFM	Beams:	0	QTY
Chilled Water:	0	GPM	Beams:	0	L/Feet
Hot Water:	0	GPM	No. Zones:	0	Zones

3 Tutorials: TUTORIALS | BEAM TYPES — Review: DEEP DIVE — Review: BUILDING CONDITIONS — Open: THROW DATA — Request: CONFIGURE & QUOTE

5 ...l Outputs for Zone (not per beam)

Cooling Sensible	Cooling Latent	Heating	Primary Air Flow	Chilled Water	Hot Water
BTUH	BTUH	BTUH	CFM	GPM	GPM
11,131	1,322	14,093	190	1.6	0.62
11,131	1,322	14,093	190	1.6	0.62
8,575	800	11,947	115	2.4	0.59
9,152	870	13,696	125	2.4	0.7
8,575	800	11,947	115	2.4	0.59
9,152	870	13,696	125	2.4	0.7
8,122	730	12,146	105	1.3	0.5
8,122	730	12,146	105	1.3	0.5
8,493	1,113	11,996	160	0.8	0.55
7,442	974	11,435	140	0.75	0.58
8,493	1,113	11,996	160	0.8	0.55
7,442	974	11,435	140	0.75	0.58
7,413	1,391		200	0.5	
7,413	1,391		200	0.5	
9,512	1,113		160	2.4	
10,133	1,322		190	1.5	
8,311	974		140	2.4	
8,311	974		140	2.4	
9,512	1,113		160	2.4	
10,133	1,322		190	1.5	
8,311	974		140	2.4	
8,311	974		140	2.4	
5,980	765		110	0.7	
5,980	765		110	0.7	
4,866	696		100	0.7	

6 Selection Parameters per Active Beam

Zone/Room Selection Options	Model	2 or 4 Pipe Coil	Coil Circuit	Beam Length	Beam Width	Primary Air Flow	Primary Air Target Pressu	Primary Air Exact Pressure	Air Inlet Size	Chilled Water	Hot Water
				ft (nom)	in (nom)	CFM	in W.G.	in W.G.	in	GPM	GPM
Default	ACBL-HE24-2W	2	Dual	10	24	190	0.69	0.60	8E	1.6	0.62
Default	ACBL-HE24-2W	2	Dual	10	24	190	0.69	0.60	8E	1.6	0.62
Default	ACBL-HE24-2W	2	Dual	10	24	115	0.46	0.37	8E	2.4	0.59
Default	ACBL-HE24-2W	2	Dual	10	24	125	0.53	0.43	8E	2.4	0.7
Default	ACBL-HE24-2W	2	Dual	10	24	115	0.46	0.37	8E	2.4	0.59
Default	ACBL-HE24-2W	2	Dual	10	24	125	0.53	0.43	8E	2.4	0.7
Default	ACBL-HE24-2W	2	Dual	10	24	105	0.75	0.70	6E	1.3	0.5
Default	ACBL-HE24-2W	2	Dual	10	24	105	0.75	0.70	6E	1.3	0.5
Default	ACBL-HE24-2W	2	Single	10	24	160	0.52	0.44	8E	0.8	0.55
Default	ACBL-HE24-2W	2	Single	8	24	140	0.60	0.54	8E	0.75	0.58
Default	ACBL-HE24-2W	2	Single	10	24	160	0.52	0.44	8E	0.8	0.55
Default	ACBL-HE24-2W	2	Single	8	24	140	0.60	0.54	8E	0.75	0.58
Default	ACBL-HE12-2W	2	Dual	10	12	200	0.65	0.61	6E	0.5	
Default	ACBL-HE12-2W	2	Dual	10	12	200	0.65	0.61	6E	0.5	
Default	ACBL-HE24-1W	2	Dual	10	24	160	0.66	0.40	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	10	24	190	0.88	0.56	8E	1.5	
Default	ACBL-HE24-1W	2	Dual	8	24	140	0.73	0.49	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	8	24	140	0.73	0.49	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	10	24	160	0.66	0.40	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	10	24	190	0.88	0.56	8E	1.5	
Default	ACBL-HE24-1W	2	Dual	8	24	140	0.73	0.49	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	8	24	140	0.73	0.49	8E	2.4	
Default	ACBL-HE24-2W	2	Single	6	24	110	0.65	0.61	8E	0.7	
Default	ACBL-HE24-2W	2	Single	6	24	110	0.65	0.61	8E	0.7	
Default	ACBL-HE24-2W	2	Single	4	24	100	0.65	0.56	6E	0.7	

RESET DEFAULT BUILDING PARAMETERS

1 Set Points

Project Name			Owner
Test Project			
			Revision
			001
Project Elevation (ft)			Date
0			5/7/2018
Room Conditions		**Cooling**	**Heating**
Dry Bulb °F		75.0 °F	70.0 °F
Relative Humidity % RH		50 %	50 %
Wet Bulb	°F	62.7 °F	58.5 °F
Dew Point	°F	55.2 °F	50.6 °F
Dew Point	gr/lb	64.6	54.5
On-Coil Temperature °F (if different to Room Dry Bulb)		75.0 °F	70.0 °F
Noise NC		35	
Room Attenuation (dB)		10	
Primary Air Conditions (ducted to room)			
Dry Bulb °F		55.0 °F	55.0 °F
Relative Humidity % RH		85 %	80 %
Wet Bulb	°F	52.5 °F	51.6 °F
Dew Point	°F	50.6 °F	49.0 °F
Dew Point	gr/lb	54.6	51.3
Max Airside ΔP in w.g.		0.75	
Entering Water Conditions			
Temperature °F		58.0 °F	130.0 °F
Fluid Type (Cooling)		Water	
Glycol Concentration %			
Fluid Type (Heating)		Water	
Glycol Concentration %			
Max Waterside ΔP ft w.g.		10.0	

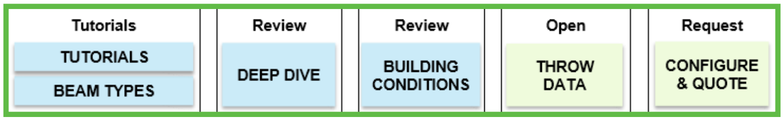
Enter room conditions, primary air conditions, and water conditions to create a beam system. Primary air conditions can be adjusted to optimize primary airflow requirements.

2 Zone Inputs

Room or Zone Number/Name	Sensible Load	Latent Load	Heating Load	Min Outside Air	Number of Beams in Zone
	BTUH	BTUH	BTUH	CFM	
ACB-50-10D	10,929	1,316	13,044	189	1
ACB-50-10D	10,929	1,316	13,044	189	1
ACB-50-10C	8,449	796	11,201	114	1
ACB-50-10F	9,028	866	12,754	124	1
ACB-50-10C	8,449	796	11,201	114	1
ACB-50-10F	9,028	866	12,754	124	1
ACB-50-10E	8,197	727	11,730	105	1
ACB-50-10E	8,197	727	11,730	105	1
ACB-50-10A	8,602	1,108	11,927	159	1
ACB-50-8A	7,551	969	11,356	139	1
ACB-50-10A	8,602	1,108	11,927	159	1
ACB-50-8A	7,551	969	11,356	139	1
ACB-55-10A	6,810	1,385		199	1
ACB-55-10A	6,810	1,385		199	1
ACB-50-10B	8,090	1,108		159	1
ACB-50-10H	8,491	1,316		189	1
ACB-50-8B	7,029	969		139	1
ACB-50-8G	7,029	969		139	1
ACB-50-10B	8,090	1,108		159	1
ACB-50-10H	8,491	1,316		189	1
ACB-50-8B	7,029	969		139	1
ACB-50-8G	7,029	969		139	1
ACB-40-6D	6,085	762		109	1
ACB-40-6D	6,085	762		109	1
ACB-40-4A	4,999	692		100	1

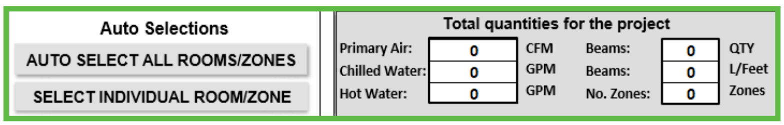
Enter the load requirements (heating and cooling), and select the number of beams per zone. These values set goals for the auto selection to calculate an optimized system.

3 Beam Details

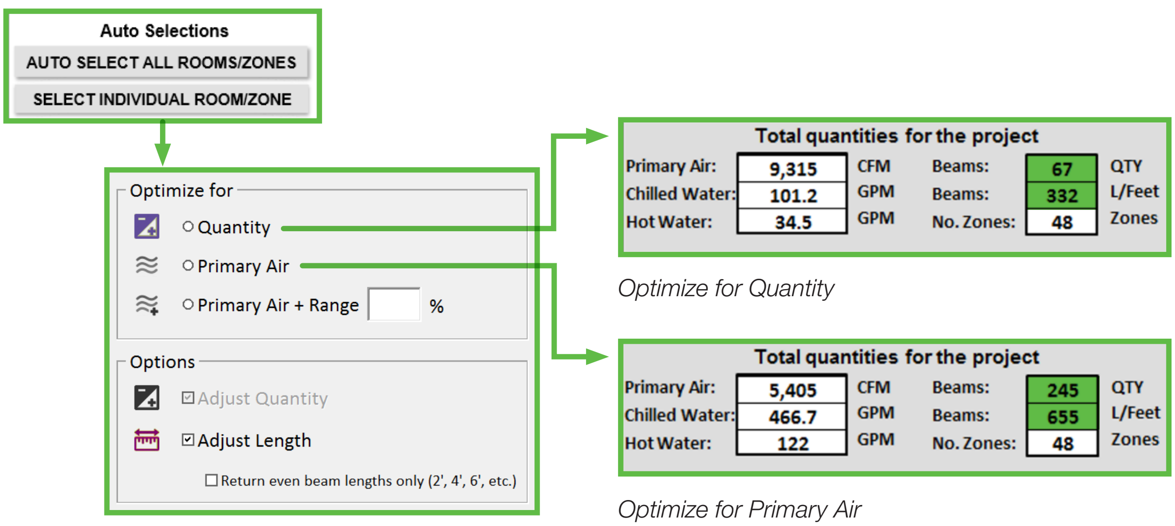


The buttons above provide support and information related to beam system configuration, layout, and quoting. A schedule that can be added to tender documents is also available.

4 Fine Tuning Selection



The auto selection feature can be used to run selection for one zone, or all zones in the space. The selection can also be optimized based on quantity of beams or primary airflow. The Primary Air + % Range option can be used to optimize a selection for project specific priorities.



Optimize for Quantity

Optimize for Primary Air

5 Zone Outputs

5a: This section displays the performance outputs for each chilled beam zone. Red cells are outputs that do not meet the required inputs and require review.

5b: This section displays the performance outputs after review and revision. By varying primary airflow, unit length, water flow rate, or a combination of these inputs, the desired outputs are achieved.

Total Outputs for Zone (not per beam)					
Cooling		Heating	Primary Air Flow	Chilled Water	Hot Water
Sensible	Latent				
BTUH			CFM	GPM	
11,131	1,322	14,093	190	1.6	0.62
11,131	1,322	14,093	190	1.6	0.62
8,575	800	11,947	115	2.4	0.59
9,152	870	13,696	125	2.4	0.7
8,575	800	11,947	115	2.4	0.59
9,152	870	13,696	125	2.4	0.7
8,122	730	12,146	105	1.3	0.5
8,122	730	12,146	105	1.3	0.5
8,493	1,113	11,996	160	0.8	0.55
7,442	974	11,435	140	0.75	0.58
8,493	1,113	11,996	160	0.8	0.55
7,442	974	11,435	140	0.75	0.58
7,413	1,391		200	0.5	
7,413	1,391		200	0.5	
9,512	1,113		160	2.4	
10,133	1,322		190	1.5	
8,311	974		140	2.4	
8,311	974		140	2.4	
9,512	1,113		160	2.4	
10,133	1,322		190	1.5	
8,311	974		140	2.4	
8,311	974		140	2.4	
5,980	765		110	0.7	
5,980	765		110	0.7	
4,866	696		100	0.7	

5a

Total Outputs for Zone (not per beam)					
Cooling		Heating	Primary Air Flow	Chilled Water	Hot Water
Sensible	Latent				
BTUH			CFM	GPM	
11,131	1,322	14,093	190	1.6	0.62
11,131	1,322	14,093	190	1.6	0.62
8,575	800	11,947	115	2.4	0.59
9,152	870	13,696	125	2.4	0.7
8,575	800	11,947	115	2.4	0.59
9,152	870	13,696	125	2.4	0.7
8,251	730	12,146	105	1.4	0.5
8,251	730	12,146	105	1.4	0.5
8,741	1,113	11,996	160	0.9	0.55
7,555	974	11,435	140	0.8	0.58
8,741	1,113	11,996	160	0.9	0.55
7,555	974	11,435	140	0.8	0.58
7,413	1,391		200	0.5	
7,413	1,391		200	0.5	
9,512	1,113		160	2.4	
10,133	1,322		190	1.5	
8,311	974		140	2.4	
8,311	974		140	2.4	
9,512	1,113		160	2.4	
10,133	1,322		190	1.5	
8,311	974		140	2.4	
8,311	974		140	2.4	
6,152	765		110	0.8	
[illegible]	[illegible]		[illegible]	[illegible]	

5b

6 Chilled Beam Parameters

Light green cells are inputs.

Enter/adjust beam models, coil type, lengths, airflows, target static pressure, inlet size, and water flow rates to adjust performance capabilities.

Selection Parameters per Active Beam											
Zone/Room Selection Options	Model	2 or 4 Pipe Coil	Coil Circuit	Beam		Primary Air			Air Inlet	Chilled Water	Hot Water
				Length	Width	Flow	Target Pressu	Exact Pressure	Size		
				ft (nom)	in (nom)	CFM	in W.G.		in	GPM	
Default	ACBL-HE24-2W	2	Dual	10	24	190	0.69	0.60	8E	1.6	0.62
Default	ACBL-HE24-2W	2	Dual	10	24	190	0.69	0.60	8E	1.6	0.62
Default	ACBL-HE24-2W	2	Dual	10	24	115	0.46	0.37	8E	2.4	0.59
Default	ACBL-HE24-2W	2	Dual	10	24	125	0.53	0.43	8E	2.4	0.7
Default	ACBL-HE24-2W	2	Dual	10	24	115	0.46	0.37	8E	2.4	0.59
Default	ACBL-HE24-2W	2	Dual	10	24	125	0.53	0.43	8E	2.4	0.7
Default	ACBL-HE24-2W	2	Dual	10	24	105	0.75	0.70	6E	1.3	0.5
Default	ACBL-HE24-2W	2	Dual	10	24	105	0.75	0.70	6E	1.3	0.5
Default	ACBL-HE24-2W	2	Single	10	24	160	0.52	0.44	8E	0.8	0.55
Default	ACBL-HE24-2W	2	Single	8	24	140	0.60	0.54	8E	0.75	0.58
Default	ACBL-HE24-2W	2	Single	10	24	160	0.52	0.44	8E	0.8	0.55
Default	ACBL-HE24-2W	2	Single	8	24	140	0.60	0.54	8E	0.75	0.58
Default	ACBL-HE12-2W	2	Dual	10	12	200	0.65	0.61	6E	0.5	
Default	ACBL-HE12-2W	2	Dual	10	12	200	0.65	0.61	6E	0.5	
Default	ACBL-HE24-1W	2	Dual	10	24	160	0.66	0.40	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	10	24	190	0.88	0.56	8E	1.5	
Default	ACBL-HE24-1W	2	Dual	8	24	140	0.73	0.49	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	8	24	140	0.73	0.49	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	10	24	160	0.66	0.40	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	10	24	190	0.88	0.56	8E	1.5	
Default	ACBL-HE24-1W	2	Dual	8	24	140	0.73	0.49	8E	2.4	
Default	ACBL-HE24-1W	2	Dual	8	24	140	0.73	0.49	8E	2.4	
Default	ACBL-HE24-2W	2	Single	6	24	110	0.65	0.61	8E	0.7	
Default	ACBL-HE24-2W	2	Single	6	24	110	0.65	0.61	8E	0.7	
Default	ACBL-HE24-2W	2	Single	4	24	100	0.65	0.56	6E	0.7	

In addition to the information covered above, the Beam Selection Software provides additional selection output such as the discharge air temperature, induction ratio, sound and other important information for your project. A free copy can be downloaded from our website and our Beam Team is available to address any questions or concerns.

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