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Titus
Redefine your comfort zone.™

chilled beams

open ceiling | k-12 education | wood grains | dual-function | energy solutions

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CHILLED BEAM PRODUCTS

ACTIVE CHILLED BEAMS

PASSIVE CHILLED BEAMS

FLOOR MOUNTED DISPLACEMENT CHILLED BEAMS

ICONS

active chilled beams

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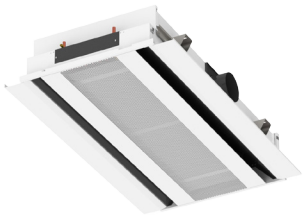
CBAL

LINEAR ACTIVE CHILLED BEAM

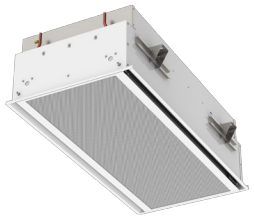
- Active linear chilled beam with 1-way or 2-way air distribution patterns
- Optimized nozzle design provides high capacity and low noise levels
- Linear design matching commercial architectural styling
- Designed to fit in standard 12-inch and 24-inch ceiling systems
- Optimized diffuser geometry maximizes occupant comfort



CBLE

LINEAR EXPOSED ACTIVE CHILLED BEAM

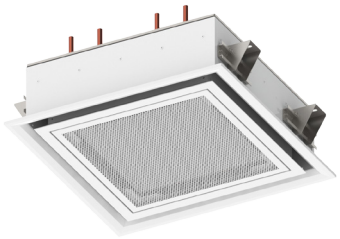
- Exposed linear chilled beam with 1-way or 2-way air distribution patterns
- Optimized nozzle design provides high capacity and low noise levels
- Linear design matching commercial architectural styling
- Integral coanda plates for ceiling independent operation
- Optimized diffuser geometry maximizes occupant comfort



CBLV

LINEAR BEAM WITH VERTICAL COILS

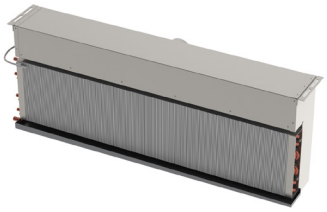
- Active linear chilled beam with 2-way air distribution pattern
- Optimized nozzle design provides high capacity and low noise levels
- Linear design matching commercial architectural styling
- Designed to fit in standard 24-inch ceiling systems
- Vertical coil configuration
- Optimized diffuser geometry maximizes occupant comfort



CBAM

MODULAR ACTIVE CHILLED BEAM

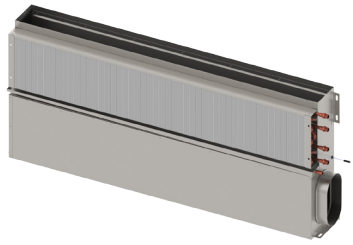
- Active modular chilled beam with 4-way air distribution pattern
- Optimized nozzle design provides high capacity and low noise levels
- Modular design matching commercial architectural styling
- Designed to fit in standard 24-inch ceiling systems
- Optimized diffuser geometry maximizes occupant comfort



CBAV

VERTICAL RECESSED ACTIVE CHILLED BEAM

- Active chilled beam for use in recessed applications
- Optimized nozzle design provides high capacity and low noise levels
- Vertical coil with condensate pan
- Designed to integrate with Titus slot diffusers
- Optimized diffuser geometry maximizes occupant comfort



CBAS

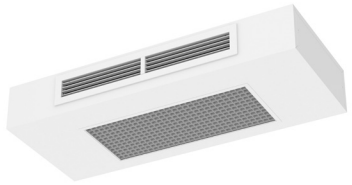
SILL MOUNTED CHILLED BEAM

- Provides comfortable, effective sensible cooling to the space
- Optimized nozzle design provides high capacity and low noise levels
- Ideal for induction unit and unit ventilator retrofit projects
- Quick and simple installation
- Available in nominal lengths up to 6 feet
- ½" Sweat or ½" MNPT coil connections

CBAB

CONCEALED BULKHEAD ACTIVE CHILLED BEAM

- Provides comfortable, effective sensible cooling to the space
- Optimized nozzle design provides high capacity and low noise levels
- Ideal for single room hospitality spaces
- Quick and simple installation
- Available in nominal lengths up to 6 feet
- ½" Sweat or ½" MNPT coil connections



CBAC

EXPOSED BULKHEAD ACTIVE CHILLED BEAM

- Provides comfortable, effective sensible cooling to the space
- Optimized nozzle design provides high capacity and low noise levels
- Durable powder coated steel cabinet with tool-less access panels
- Quick and simple installation
- Available in nominal lengths up to 6 feet
- ½" Sweat or ½" MNPT coil connections

CBAW

SIDEWALL ACTIVE CHILLED BEAM

- Provides comfortable, effective sensible cooling to the space
- Optimized nozzle design provides high capacity and low noise levels
- Ideal for multi-story residential and hospitality spaces
- Quick and simple installation
- Available in nominal lengths up to 6 feet
- ½" Sweat or ½" MNPT coil connections

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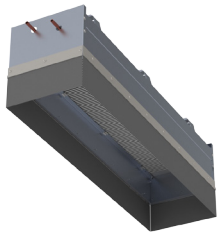
passive chilled beams

CBPE

EXPOSED PASSIVE CHILLED BEAM

- Provides comfortable, effective sensible cooling to the space
- Ultra quiet, natural convection driven operation
- Perforated or Linear Bar Grille options for exposed models
- Exposed or concealed installation



CBPR

RECESSED PASSIVE CHILLED BEAM

- Provides comfortable, effective sensible cooling to the space
- Ultra quiet, natural convection driven operation
- Perforated or Linear Bar Grille options for exposed models
- Exposed or concealed installation

floor mounted displacement chilled beam

PAGES: U96-U102

TAO

FLOOR MOUNTED DISPLACEMENT CHILLED BEAM

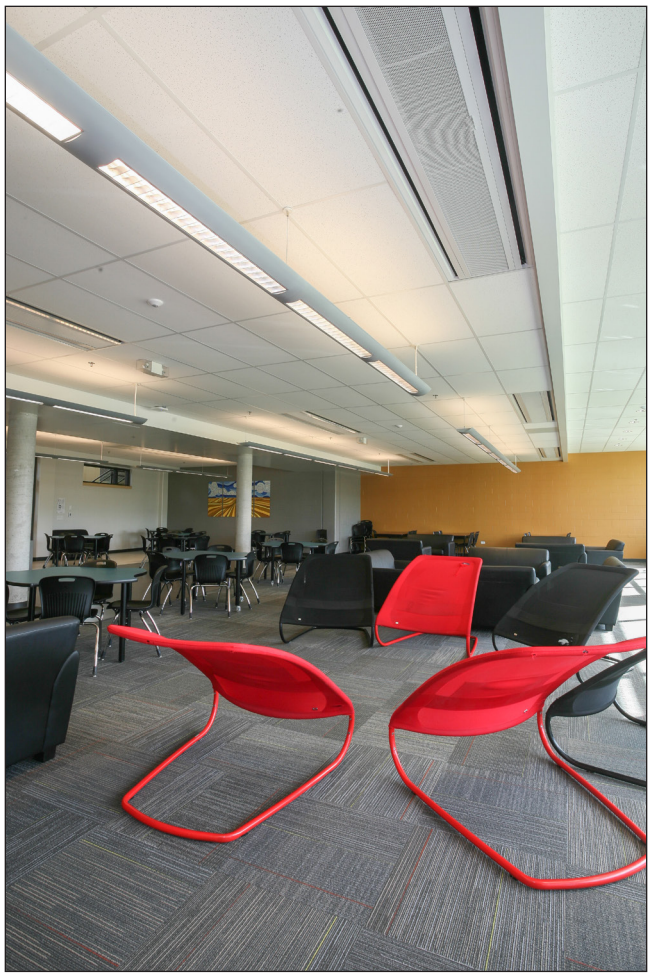
- Heavy gauge casing construction
- Separate heating and cooling
- Removable condensate pan
- Low sound levels
- Perfect for school applications

Overview

The Titus chilled ceiling product line is comprised of chilled beams, both active and passive beams, and floor mounted displacement chilled beams. These products offer optimized performance and provide high levels of thermal comfort for the occupant. In addition to increased occupancy comfort, use of the chilled ceiling products reduce the amount of energy required to heat and cool a building.

The chilled ceiling products provide sensible cooling and heating to the space by utilizing the more efficient heat transfer capacity of water, as opposed to air. This decouples the latent and sensible loads, reducing the energy cost of sensible cooling. With passive beams and radiant products, an additional system is necessary to meet the ventilation and latent cooling needs of the space. The Titus active chilled beams integrate the supply of ventilation air creating an active diffuser. Using the ventilation air to pressurize a plenum with aerodynamically designed nozzles, high velocity jets of air are created forcing induction of room air over the water coils integral to the units. Forced induction dramatically improves the heating and cooling capacity over passive beams and radiant products. Titus active chilled beams harness the energy of the supply air to further reduce total energy consumption.

Titus offers a chilled ceiling product to meet the requirements of any design or installation. CBPE and CBPR models of passive beam accommodate both exposed and recessed mounting applications. Active chilled beams are available in 1, 2, and 4-way throw patterns. There is even a model for high sidewall applications. In addition to the variety of product solutions available, the appearance of the units can be customized through standard options, which enables seamless integration into any architectural style, traditional or contemporary.



Linear Active Chilled Beams

CBAL

- Active linear chilled beam with 1-way or 2-way air distribution patterns
- Optimized nozzle design provides high capacity and low noise levels
- Linear design matching commercial architectural styling
- Designed to fit in standard 12-inch and 24-inch ceiling systems
- Optimized diffuser geometry maximizes occupant comfort

CBAL-12

CBAL-24

healthcare | dual-function | k-12 education | universities | wood grains | energy solutions

See website for Specifications

MODELS:

CBAL: 12-inch / 24-inch

FINISHES:

Standard Finish - #26 White
Optional Finish - #84 Black

OVERVIEW

Titus active chilled beams features the aerodynamic properties of Titus ceiling diffusers and benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being discharged through a series of nozzles located along the length of the beam. The nozzles inject the primary air into the mixing chamber at velocities capable of inducing room air through one or two coils and where it mixes with the primary supply air. This mixture of air is then discharged into the space through the ceiling slot diffusers. This provides high cooling outputs with low amounts of primary air. The reduced volume of air results in the reduction of the air handler capacity and size, smaller duct sizes, and the overall energy consumption.

Primary air from the air handling unit is tempered and dehumidified to handle the latent load. The remaining loads in the space are addressed with the heat exchanger which is incorporated into the chilled beam. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

CBAL's are offered for both, cooling and heating, in 12" and 24" widths and lengths from 2 to 10 ft. They can be easily integrated into different grids styles within a suspended ceiling or even in drywall ceilings. The low overall height of the CBAL product line is ideal for reducing the space required for false ceiling in any application.

CBAL-24 installed in the ceiling of a school

ADVANTAGES

- Removal of high thermal loads is possible in this air/water system
- The size of the air duct system is reduced to a minimum, due to the low supply of primary air
- Substantial reduction in the operating costs, due to low primary air volume
- Improvement of the thermal comfort inside the room
- Suitable for several standard ceiling grids
- Contributing sound levels below NC-30

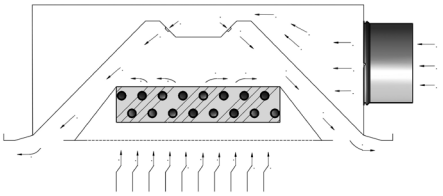
CBAL-24 STANDARD FEATURES

- 1-way or 2-way air distribution patterns
- 24-inch width
- 2 foot to 10 foot lengths, 1 foot increments
- Perforated or linear bar induced air grille
- Left hand or right hand coil connections
- Side or top air inlet locations
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Hinged induced air grille for roomside coil access
- Commissioning port with roomside access for balancing
- Mounting brackets with adjustments in two directions
- Durable powder coat finish
- ½" Sweat water coil connections
- Coil air vent

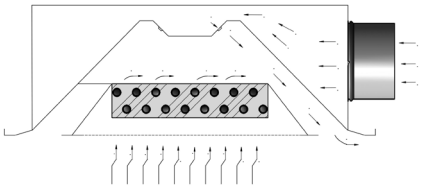
OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" or ¾ MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Lay-in, narrow tee and drop face border types
- Coil lint screen
- Constant volume regulator

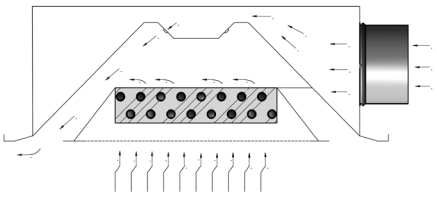
CBAL-24 2-Way



CBAL-24 1-Way (front)



CBAL-24 1-Way (back)



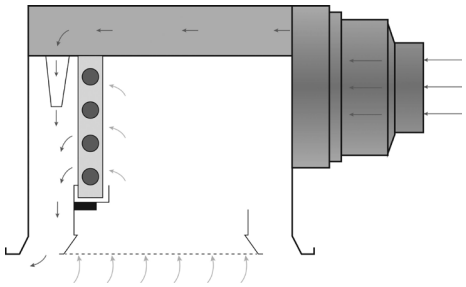
CBAL-12 STANDARD FEATURES

- 1-way or 2-way air distribution patterns
- 12-inch width
- 2 foot to 10 foot lengths, 1 foot increments
- Perforated or linear bar induced air grille
- Left hand or right hand coil connections
- Side or top air inlet locations
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Hinged induced air grille for roomside coil access
- Commissioning port with roomside access for balancing
- Mounting brackets with adjustments in two directions
- Durable powder coat finish
- ½" Sweat water coil connections
- Coil air vent
- Condensate tray with drain connection for field plumbing (12-inch version only)

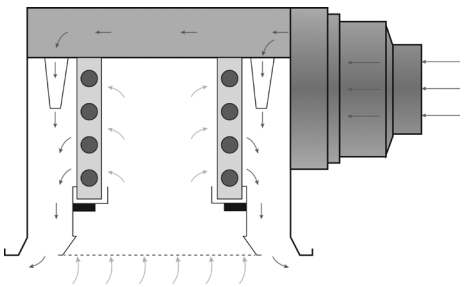
OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Lay-in, narrow tee and drop face border types

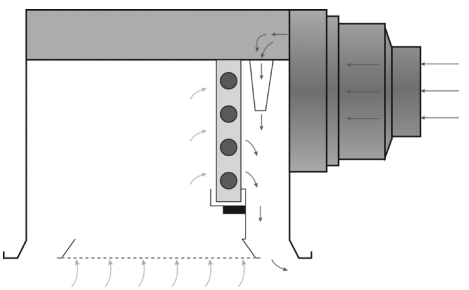
CBAL-12 1-Way (back)



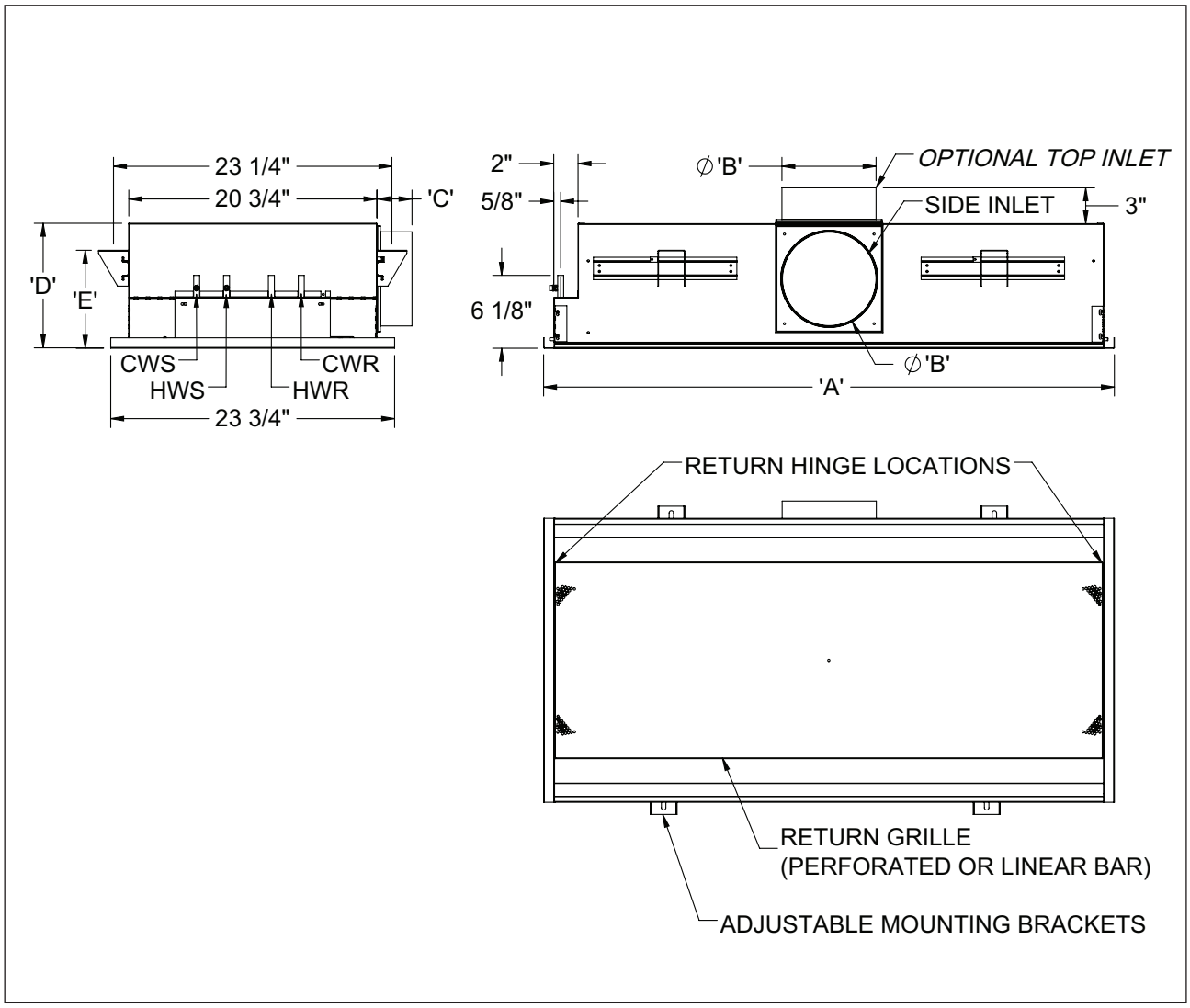
CBAL-12 2-Way



CBAL-12 1-Way (front)



CBAL-24" UNIT DIMENSIONS



Nominal Unit Length (ft)	'A' (IN)
2	23¾
3	35¾
4	47¾
5	59¾
6	71¾
7	83¾
8	95¾
9	107¾
10	119¾

Nominal Inlet Dia. (ft)	'B' (IN)	'C' (IN)	'D' (IN)	'E' (IN)
5	4 7/8	3	8 3/8	6¼
6	5 7/8	3	8 3/8	6¼
8	7 7/8	3	10 3/8	8¼
8**	7 7/8	--	8 3/8	6¼

*Side Inlet Only

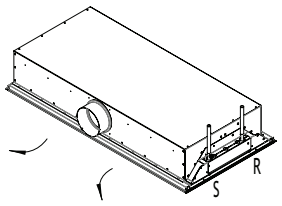
**Top Inlet Only

Integrated ¼" pressure port for balancing/commissioning accessable from roomside opposite coil connection

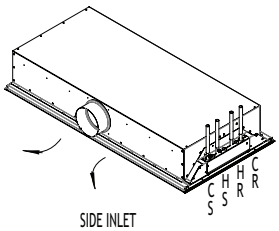
All dimensions are in inches

CBAL-24" CASING ARRANGEMENTS / SIDE INLET 1-WAY

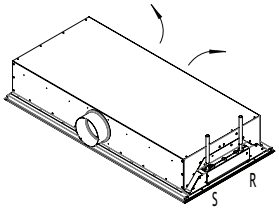
24 INCHES CASING ARRANGEMENTS



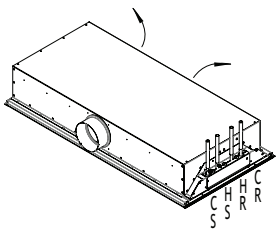
SIDE INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW FRONT



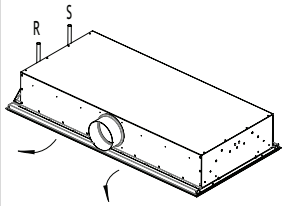
SIDE INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW FRONT



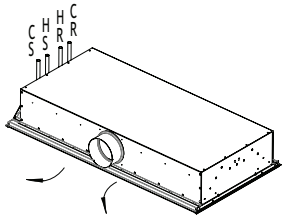
SIDE INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW BACK



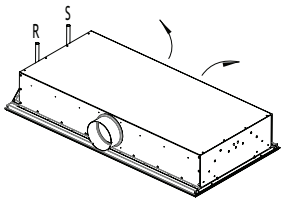
SIDE INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW BACK



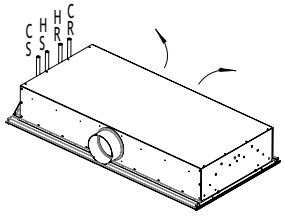
SIDE INLET
1 WAY 2 PIPE
LEFT HAND
AIR FLOW FRONT



SIDE INLET
1 WAY 4 PIPE
LEFT HAND
AIR FLOW FRONT

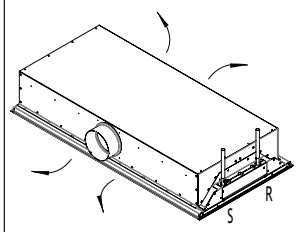


SIDE INLET
1 WAY 2 PIPE
LEFT HAND
AIR FLOW BACK

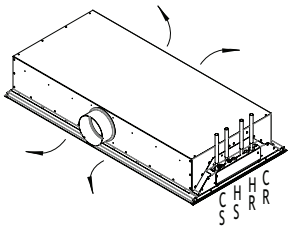


SIDE INLET
1 WAY 4 PIPE
LEFT HAND
AIR FLOW BACK

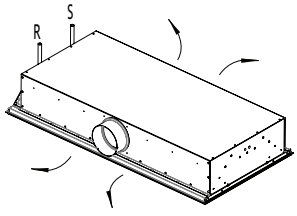
CBAL-24" CASING ARRANGEMENTS / SIDE INLET 2-WAY



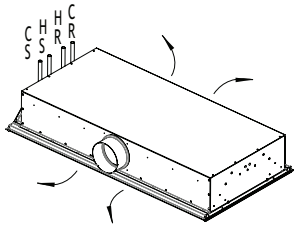
SIDE INLET
2 WAY 2 PIPE
RIGHT HAND



SIDE INLET
2 WAY 4 PIPE
RIGHT HAND

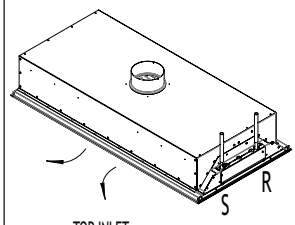


SIDE INLET
2 WAY 2 PIPE
LEFT HAND

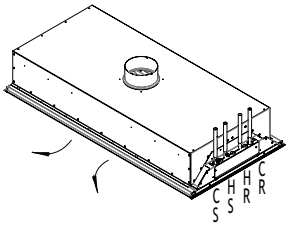


SIDE INLET
2 WAY 4 PIPE
RIGHT HAND

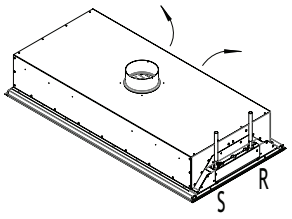
CBAL-24" CASING ARRANGEMENTS / TOP INLET 1-WAY



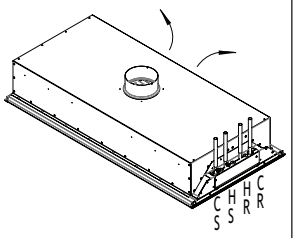
TOP INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW FRONT



TOP INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW FRONT

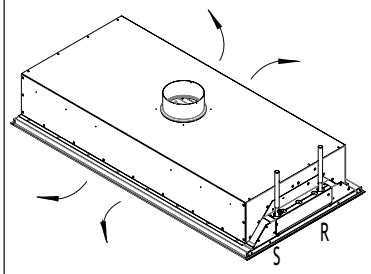


TOP INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW BACK

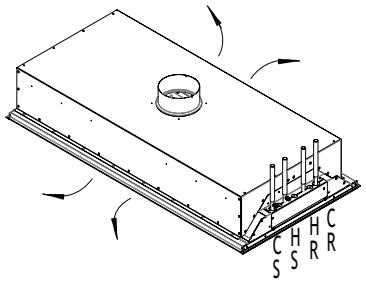


TOP INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW BACK

CBAL-24" CASING ARRANGEMENTS / TOP INLET 2-WAY



TOP INLET
2 WAY 2 PIPE
RIGHT HAND



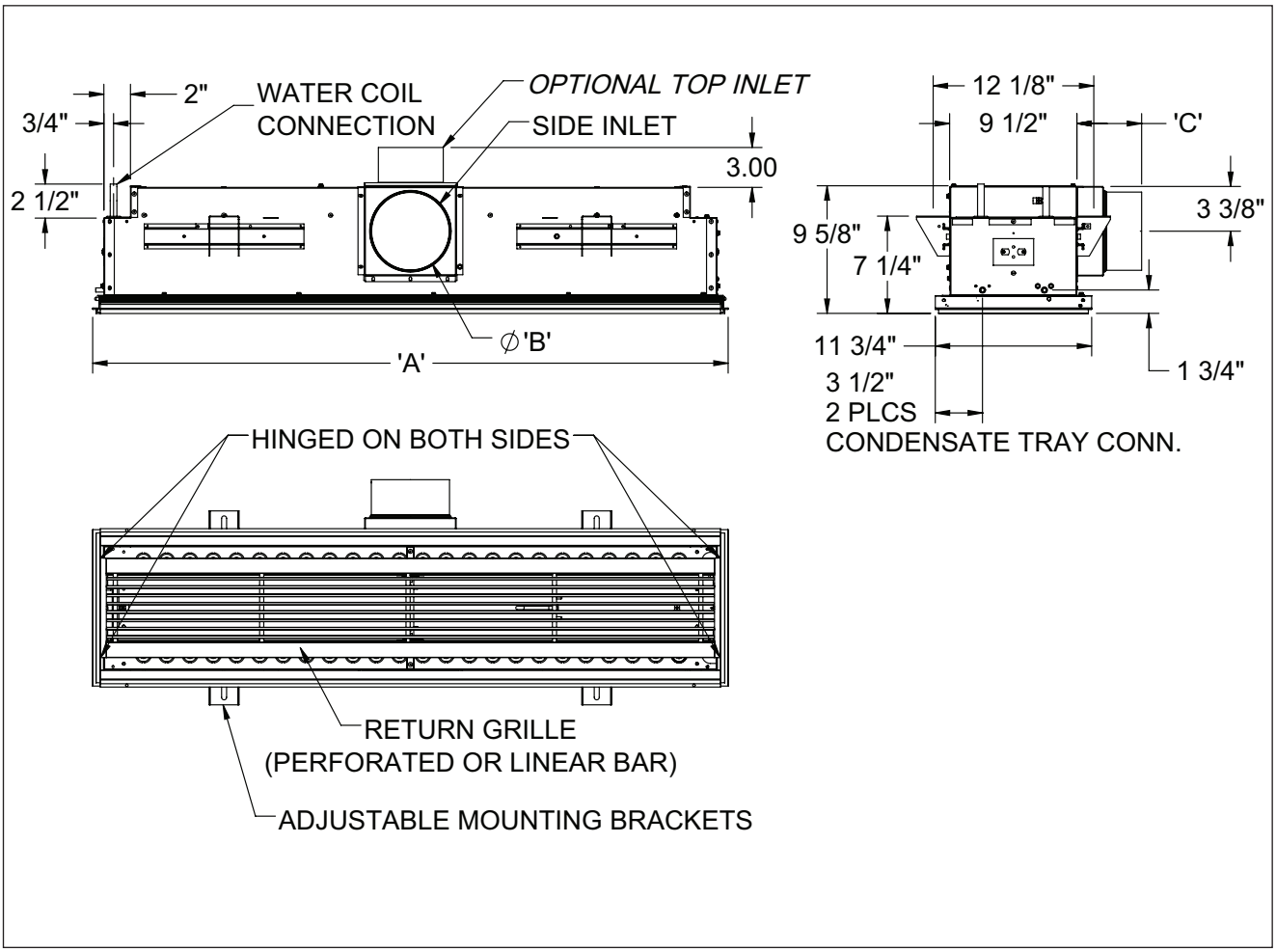
TOP INLET
2 WAY 4 PIPE
RIGHT HAND

R - Return S - Supply;

HR - Heating Return HS - Heating Supply;

CR - Cooling Return CS - Cooling Supply

CBAL-12" UNIT DIMENSIONS



Nominal Unit Length (ft)	'A' (IN)
2	23¾
3	35¾
4	47¾
5	59¾
6	71¾
7	83¾
8	95¾
9	107¾
10	119¾

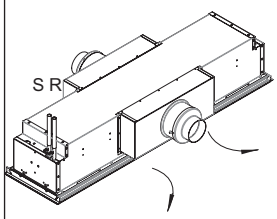
Nominal Inlet Dia. (ft)	'B' (IN)	'C' (IN)
4	3⅞	7
5	4⅞	4⅞
6	5⅞	4⅞

*Side Inlet Only

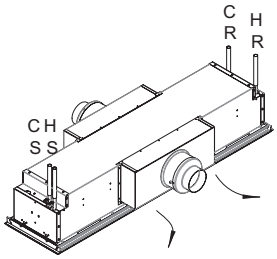
Integrated ¼" pressure port for balancing/commissioning accessable from roomside

All dimensions are in inches

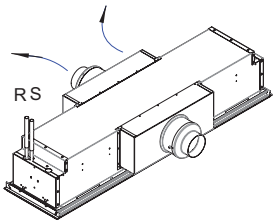
CBAL-12" CASING ARRANGEMENTS / SIDE INLET 1-WAY



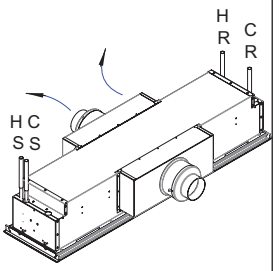
SIDE INLET
1 WAY, 2-PIPE
LEFT HAND
AIR FLOW FRONT
(RIGHT HAND
AIR FLOW BACK)



SIDE INLET
1 WAY, 4-PIPE
LEFT HAND
AIR FLOW FRONT
(RIGHT HAND
AIR FLOW BACK)

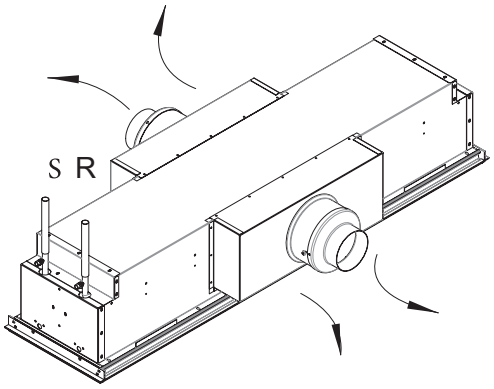


SIDE INLET
1 WAY, 2-PIPE
LEFT HAND
AIR FLOW BACK
(RIGHT HAND
AIR FLOW FRONT)

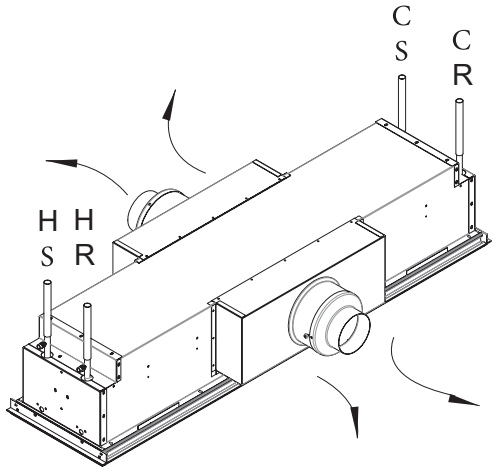


SIDE INLET
1 WAY, 4-PIPE
LEFT HAND
AIR FLOW BACK
(RIGHT HAND
AIR FLOW FRONT)

CBAL-12" CASING ARRANGEMENTS / SIDE INLET 2-WAY

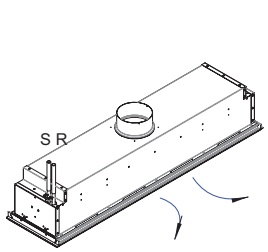


SIDE INLET
2 WAY, 2-PIPE
LEFT HAND
(RIGHT HAND)

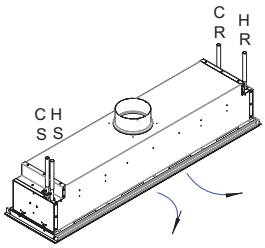


SIDE INLET
2 WAY, 4-PIPE
LEFT HAND
(RIGHT HAND)

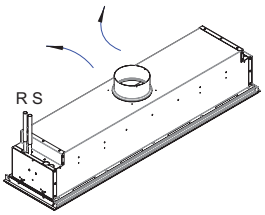
CBAL-12" CASING ARRANGEMENTS / TOP INLET 1-WAY



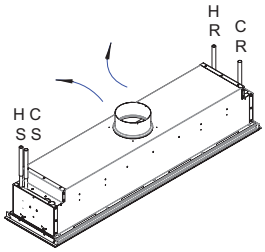
TOP INLET
1 WAY, 2-PIPE
LEFT HAND
AIR FLOW FRONT



TOP INLET
1 WAY, 4-PIPE
LEFT HAND
AIR FLOW FRONT



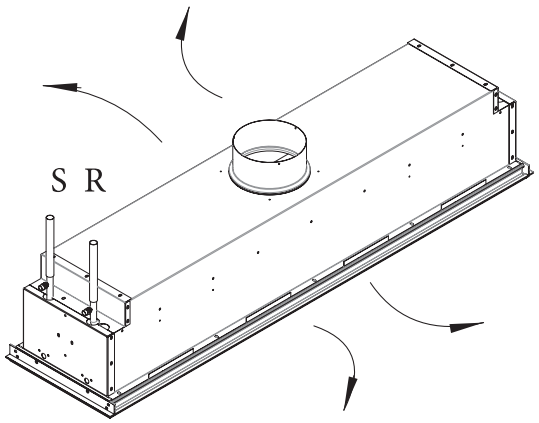
TOP INLET
1 WAY, 2-PIPE
RIGHT HAND
AIR FLOW BACK



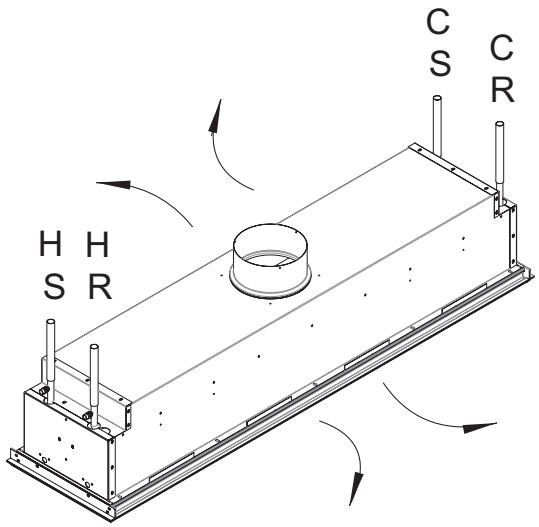
TOP INLET
1 WAY, 4-PIPE
RIGHT HAND
AIR FLOW BACK

R - RETURN S - SUPPLY
HR - HEATING RETURN HS - HEATING SUPPLY
CR - COOLING RETURN CS - COOLING SUPPLY

CBAL-12" CASING ARRANGEMENTS / TOP INLET 2-WAY



TOP INLET
2 WAY, 2-PIPE



TOP INLET
2 WAY, 4-PIPE

CBAL-24 / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	4	15	0.25	15	1333	0.70	1572	2.90	1635	6.40	1685	1.50	5.9	0 - 1 - 4
			20	0.44	15	1684		2021		2119		2197			1 - 2 - 7
			25	0.68	15	1936		2356		2482		2557			1 - 3 - 10
	B2	4	20	0.17	15	1251		1482		1549		1605		4.8	1 - 1 - 5
			30	0.39	15	1657		2014		2119		2185			1 - 3 - 10
			40	0.69	22	2025		2569		2724		2845			2 - 5 - 14
	B3	5	40	0.19	15	1392		1703		1799		1850		4.0	2 - 4 - 12
			60	0.43	23	1962		2518		2693		2834			4 - 8 - 18
			80	0.77	30	2542		3217		3482		3628			7 - 12 - 21
	B4	6	70	0.19	19	1544		1923		2035		2109		2.5	2 - 6 - 14
			105	0.44	29	2259		2847		3061		3206			6 - 11 - 20
			140	0.75	22	2734		3528		3831		3987			10 - 14 - 23
6	B1	4	20	0.18	15	1838	1.00	2230	4.10	2368	9.30	2375	2.10	5.9	0 - 1 - 4
			30	0.41	15	2268		2846		3022		3119			1 - 2 - 9
			40	0.72	22	2783		3559		3840		3944			2 - 4 - 13
	B2	5	30	0.16	15	1731		2142		2267		2326		4.8	1 - 2 - 6
			45	0.36	16	2293		2906		3118		3194			2 - 3 - 12
			60	0.64	24	2922		3793		4113		4275			3 - 6 - 17
	B3	6	60	0.18	16	1927		2469		2666		2740		4.0	2 - 5 - 14
			90	0.40	26	2863		3779		4109		4334			5 - 10 - 21
			120	0.72	33	3289		4397		4865		5174			8 - 14 - 26
	B4	10*	105	0.18	15	2156		2783		3016		3113		2.5	3 - 7 - 18
			160	0.42	21	3115		4161		4525		4794			7 - 13 - 25
			215	0.76	29	3601		4801		5410		5765			12 - 18 - 29
8	B1	4	25	0.15	15	2359	1.40	2882	5.40	3093	1.60	3172	2.80	5.9	0 - 1 - 4
			40	0.40	20	3015		3889		4187		4348			1 - 2 - 10
			55	0.73	22	3413		4559		4981		5193			2 - 5 - 16
	B2	5	40	0.16	15	2390		3003		3228		3333		4.8	1 - 2 - 7
			60	0.35	22	2755		3671		3974		4151			2 - 4 - 14
			80	0.62	30	3462		4632		5098		5358			3 - 7 - 19
	B3	8	80	0.17	15	2320		3097		3380		3526		4.0	2 - 5 - 16
			120	0.38	18	3423		4614		5128		5485			5 - 12 - 25
			160	0.68	25	3845		5361		6141		6650			9 - 16 - 30
	B4	10*	145	0.19	17	2664		3563		3916		4098		2.5	4 - 8 - 21
			215	0.42	27	3713		5061		5711		6145			8 - 16 - 29
			285	0.74	34	4178		5937		6808		7382			14 - 21 - 33
10	B1	5	35	0.19	15	2959	1.70	3767	6.70	4103	1.90	4243	3.40	5.9	1 - 1 - 5
			52	0.41	20	3489		4624		5087		5335			1 - 3 - 12
			69	0.73	27	3825		5275		5902		6222			2 - 5 - 18
	B2	6	55	0.22	16	2986		3961		4336		4536		4.8	1 - 2 - 9
			80	0.39	24	3238		4384		4895		5163			2 - 5 - 17
			105	0.67	31	3916		5615		6337		6765			4 - 9 - 22
	B3	8	100	0.17	15	2602		3569		3991		4208		4.0	3 - 6 - 18
			150	0.37	22	3615		5289		6028		6538			6 - 13 - 28
			200	0.66	30	4075		6023		7109		7830			10 - 18 - 33
	B4	10*	180	0.19	21	2886		4082		4585		4847		2.5	4 - 9 - 23
			240	0.36	30	3813		5572		6399		6957			7 - 15 - 30
			300	0.52	35	4124		6029		7103		7812			11 - 19 - 34

Note: Reference page U24 for operational conditions used for performance notes

CBAL-24 / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS	NC	1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)		qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	4	15	0.25	15	2962	0.16	3492	0.63	3634	1.41	3744	2.51	5.9	0 - 1 - 4
			20	0.44	15	3742		4492		4709		4882			1 - 2 - 7
			25	0.68	15	4302		5236		5515		5683			1 - 3 - 10
	B2	4	20	0.17	15	2779		3293		3443		3567		4.8	1 - 1 - 5
			30	0.39	15	3683		4476		4709		4856			1 - 3 - 10
			40	0.69	22	4499		5708		6053		6323			2 - 5 - 14
	B3	5	40	0.19	15	3093		3784		3999		4110		4	2 - 4 - 12
			60	0.43	23	4360		5596		5983		6297			4 - 8 - 18
			80	0.77	30	5648		7150		7737		8062			7 - 12 - 21
	B4	6	70	0.19	19	3430		4273		4523		4687		2.5	2 - 6 - 14
			105	0.44	29	5020		6326		6803		7124			6 - 11 - 20
			140	0.75	22	6076		7839		8514		8860			10 - 14 - 23
6	B1	4	20	0.18	15	4084	0.23	4956	0.92	5262	2.06	5278	3.67	5.9	0 - 1 - 4
			30	0.41	15	5040		6324		6715		6931			1 - 2 - 9
			40	0.72	22	6185		7909		8534		8766			2 - 4 - 13
	B2	5	30	0.16	15	3848		4761		5037		5169		4.8	1 - 2 - 6
			45	0.36	16	5095		6458		6929		7099			2 - 3 - 12
			60	0.64	24	6493		8428		9141		9501			3 - 6 - 17
	B3	6	60	0.18	16	4283		5486		5925		6090		4	2 - 5 - 14
			90	0.40	26	6361		8398		9131		9632			5 - 10 - 21
			120	0.72	33	7308		9770		10812		11497			8 - 14 - 26
	B4	10*	105	0.18	15	4791		6183		6701		6919		2.5	3 - 7 - 18
			160	0.42	21	6922		9246		10057		10654			7 - 13 - 25
			215	0.76	29	8002		10669		12022		12811			12 - 18 - 29
8	B1	4	25	0.15	15	5243	0.30	6405	1.21	6873	2.71	7049	4.83	5.9	0 - 1 - 4
			40	0.40	20	6699		8643		9303		9662			1 - 2 - 10
			55	0.73	22	7585		10130		11068		11541			2 - 5 - 16
	B2	5	40	0.16	15	5312		6673		7173		7406		4.8	1 - 2 - 7
			60	0.35	22	6122		8158		8832		9225			2 - 4 - 14
			80	0.62	30	7693		10293		11328		11907			3 - 7 - 19
	B3	8	80	0.17	15	5155		6883		7512		7835		4	2 - 5 - 16
			120	0.38	18	7606		10253		11396		12189			5 - 12 - 25
			160	0.68	25	8545		11913		13646		14779			9 - 16 - 30
	B4	10*	145	0.19	17	5920		7918		8701		9106		2.5	4 - 8 - 21
			215	0.42	27	8250		11246		12690		13656			8 - 16 - 29
			285	0.74	34	9285		13192		15129		16405			14 - 21 - 33
10	B1	5	35	0.19	15	6575	0.37	8370	1.50	9118	3.37	9429	5.98	5.9	1 - 1 - 5
			52	0.41	20	7754		10276		11305		11855			1 - 3 - 12
			69	0.73	27	8499		11721		13116		13827			2 - 5 - 18
	B2	6	55	0.22	16	6636		8802		9637		10080		4.8	1 - 2 - 9
			80	0.39	24	7195		9742		10879		11473			2 - 5 - 17
			105	0.67	31	8703		12478		14083		15034			4 - 9 - 22
	B3	8	100	0.17	15	5782		7931		8869		9351		4	3 - 6 - 18
			150	0.37	22	8032		11754		13396		14529			6 - 13 - 28
			200	0.66	30	9056		13384		15797		17399			10 - 18 - 33
	B4	10*	180	0.19	21	6414		9072		10189		10771		2.5	4 - 9 - 23
			240	0.36	30	8474		12383		14219		15461			7 - 15 - 30
			300	0.52	35	9165		13398		15783		17360			11 - 19 - 34

Note: Reference page U24 for operational conditions used for performance notes

CBAL-24 / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	4	15	0.25	15	1422	1.00	1676	3.80	1744	8.60	1797	1.90	5.9	0 - 1 - 4
			20	0.44	15	1796		2156		2260		2343			1 - 2 - 7
			25	0.68	15	2065		2513		2647		2728			1 - 3 - 10
	B2	4	20	0.17	15	1334		1581		1653		1712		4.8	1 - 1 - 5
			30	0.39	15	1768		2148		2260		2331			1 - 3 - 10
			40	0.69	22	2159		2740		2906		3035			2 - 5 - 14
	B3	5	40	0.19	15	1485		1816		1919		1973		4.0	2 - 4 - 12
			60	0.43	23	2093		2686		2872		3023			4 - 8 - 18
			80	0.77	30	2711		3432		3714		3870			7 - 12 - 21
	B4	6	70	0.19	19	1647		2051		2171		2250		2.5	2 - 6 - 14
			105	0.44	29	2409		3036		3265		3420			6 - 11 - 20
			140	0.75	22	2917		3763		4087		4253			10 - 14 - 23
6	B1	4	20	0.18	15	1960	1.40	2379	5.50	2526	1.60	2533	2.80	5.9	0 - 1 - 4
			30	0.41	15	2419		3036		3223		3327			1 - 2 - 9
			40	0.72	22	2969		3796		4096		4207			2 - 4 - 13
	B2	5	30	0.16	15	1847		2285		2418		2481		4.8	1 - 2 - 6
			45	0.36	16	2446		3100		3326		3407			2 - 3 - 12
			60	0.64	24	3117		4045		4388		4560			3 - 6 - 17
	B3	6	60	0.18	16	2056		2633		2844		2923		4.0	2 - 5 - 14
			90	0.40	26	3053		4031		4383		4623			5 - 10 - 21
			120	0.72	33	3508		4690		5190		5518			8 - 14 - 26
	B4	10*	105	0.18	15	2300		2968		3217		3321		2.5	3 - 7 - 18
			160	0.42	21	3323		4438		4827		5114			7 - 13 - 25
			215	0.76	29	3841		5121		5771		6149			12 - 18 - 29
8	B1	4	25	0.15	15	2516	1.80	3074	7.20	3299	2.10	3384	3.70	5.9	0 - 1 - 4
			40	0.40	20	3216		4148		4466		4638			1 - 2 - 10
			55	0.73	22	3641		4863		5313		5540			2 - 5 - 16
	B2	5	40	0.16	15	2550		3203		3443		3555		4.8	1 - 2 - 7
			60	0.35	22	2939		3916		4239		4428			2 - 4 - 14
			80	0.62	30	3693		4941		5437		5716			3 - 7 - 19
	B3	8	80	0.17	15	2474		3304		3606		3761		4.0	2 - 5 - 16
			120	0.38	18	3651		4922		5470		5851			5 - 12 - 25
			160	0.68	25	4102		5718		6550		7094			9 - 16 - 30
	B4	10*	145	0.19	17	2842		3801		4177		4371		2.5	4 - 8 - 21
			215	0.42	27	3960		5398		6091		6555			8 - 16 - 29
			285	0.74	34	4457		6332		7262		7874			14 - 21 - 33
10	B1	5	35	0.19	15	3156	2.20	4018	8.90	4376	2.60	4526	4.60	5.9	1 - 1 - 5
			52	0.41	20	3722		4932		5427		5691			1 - 3 - 12
			69	0.73	27	4080		5626		6296		6637			2 - 5 - 18
	B2	6	55	0.18	15	3081		4061		4432		4621		4.8	1 - 2 - 9
			80	0.39	24	3454		4676		5222		5507			2 - 5 - 17
			105	0.67	31	4178		5990		6760		7216			4 - 9 - 22
	B3	8	100	0.17	15	2776		3807		4257		4488		4.0	3 - 6 - 18
			150	0.37	22	3855		5642		6430		6974			6 - 13 - 28
			200	0.66	30	4347		6424		7582		8352			10 - 18 - 33
	B4	10*	180	0.19	21	3079		4354		4891		5170		2.5	4 - 9 - 23
			240	0.33	29	3997		5849		6666		7230			7 - 15 - 30
			300	0.52	35	4399		6431		7576		8333			11 - 19 - 34

Note: Reference page U24 for operational conditions used for performance notes

CBAL-24 / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS	NC	1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)		qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	4	15	0.25	15	3950	0.95	4657	3.80	4846	8.55	4992	1.94	5.9	0 - 1 - 4
			20	0.44	15	4990		5989		6279		6509			1 - 2 - 7
			25	0.68	15	5736		6982		7353		7577			1 - 3 - 10
	B2	4	20	0.17	15	3706		4391		4591		4756		4.8	1 - 1 - 5
			30	0.39	15	4911		5968		6279		6475			1 - 3 - 10
			40	0.69	22	5999		7611		8071		8431			2 - 5 - 14
	B3	5	40	0.19	15	4124		5045		5331		5481		4.0	2 - 4 - 12
			60	0.43	23	5813		7461		7978		8396			4 - 8 - 18
			80	0.77	30	7531		9533		10316		10750			7 - 12 - 21
	B4	6	70	0.19	19	4574		5697		6031		6249		2.5	2 - 6 - 14
			105	0.44	29	6693		8434		9071		9499			6 - 11 - 20
			140	0.75	22	8102		10453		11352		11813			10 - 14 - 23
6	B1	4	20	0.18	15	5445	1.38	6608	5.51	7016	1.58	7037	2.81	5.9	0 - 1 - 4
			30	0.41	15	6720		8433		8954		9241			1 - 2 - 9
			40	0.72	22	8246		10545		11378		11687			2 - 4 - 13
	B2	5	30	0.16	15	5130		6348		6716		6892		4.8	1 - 2 - 6
			45	0.36	16	6793		8610		9239		9465			2 - 3 - 12
			60	0.64	24	8657		11237		12188		12667			3 - 6 - 17
	B3	6	60	0.18	16	5711		7314		7901		8119		4.0	2 - 5 - 14
			90	0.40	26	8482		11198		12174		12843			5 - 10 - 21
			120	0.72	33	9744		13027		14416		15329			8 - 14 - 26
	B4	10*	105	0.18	15	6389		8245		8935		9225		2.5	3 - 7 - 18
			160	0.42	21	9230		12328		13409		14206			7 - 13 - 25
			215	0.76	29	10669		14225		16029		17081			12 - 18 - 29
8	B1	4	25	0.15	15	6990	1.80	8539	7.21	9164	2.07	9399	3.68	5.9	0 - 1 - 4
			40	0.40	20	8932		11524		12405		12883			1 - 2 - 10
			55	0.73	22	10113		13507		14758		15388			2 - 5 - 16
	B2	5	40	0.16	15	7083		8898		9564		9875		4.8	1 - 2 - 7
			60	0.35	22	8163		10877		11775		12299			2 - 4 - 14
			80	0.62	30	10257		13724		15104		15877			3 - 7 - 19
	B3	8	80	0.17	15	6873		9177		10016		10446		4.0	2 - 5 - 16
			120	0.38	18	10141		13671		15195		16251			5 - 12 - 25
			160	0.68	25	11394		15884		18194		19705			9 - 16 - 30
	B4	10*	145	0.19	17	7894		10558		11602		12141		2.5	4 - 8 - 21
			215	0.42	27	11000		14994		16920		18208			8 - 16 - 29
			285	0.74	34	12381		17590		20171		21873			14 - 21 - 33
10	B1	5	35	0.19	15	8766	2.23	11160	8.92	12157	2.56	12572	4.55	5.9	1 - 1 - 5
			52	0.41	20	10339		13701		15074		15807			1 - 3 - 12
			69	0.73	27	11332		15628		17488		18436			2 - 5 - 18
	B2	6	55	0.18	15	8558		11281		12311		12837		4.8	1 - 2 - 9
			80	0.39	24	9593		12989		14505		15298			2 - 5 - 17
			105	0.67	31	11604		16638		18777		20046			4 - 9 - 22
	B3	8	100	0.17	15	7710		10574		11825		12468		4.0	3 - 6 - 18
			150	0.37	22	10710		15672		17861		19372			6 - 13 - 28
			200	0.66	30	12074		17846		21062		23199			10 - 18 - 33
	B4	10*	180	0.19	21	8552		12096		13586		14361		2.5	4 - 9 - 23
			240	0.33	29	11103		16247		18517		20083			7 - 15 - 30
			300	0.52	35	12221		17864		21045		23147			11 - 19 - 34

Note: Reference page U24 for operational conditions used for performance notes

CBAL-12 / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	A1	5	26	0.22	15	1120	0.70	1195	2.90	1229	6.50	1246	1.40	4.6	3-4-6
			32	0.34	15	1280		1383		1429		1452			3-5-7
			38	0.47	19	1423		1554		1612		1643			4-5-8
			44	0.64	23	1551		1710		1782		1820			4-6-8
	A2	6	36	0.14	15	1181		1269		1307		1327		3.7	3-4-7
			48	0.25	17	1410		1542		1601		1631			4-6-8
			60	0.39	23	1606		1783		1863		1904			5-7-9
			72	0.56	28	1774		1996		2096		2149			6-7-10
	A3	8	55	0.15	15	1274		1384		1432		1457		2.9	3-5-8
			75	0.28	15	1529		1695		1770		1808			5-7-10
			95	0.45	18	1739		1962		2062		2116			6-8-11
			115	0.66	23	1916		2196		2323		2392			7-8-12
6	A1	6	30	0.15	15	1374	1.00	1469	4.20	1512	9.40	1533	2.10	4.6	2-4-7
			40	0.26	15	1660		1809		1874		1907			3-5-8
			50	0.41	19	1905		2109		2197		2243			4-6-9
			60	0.58	24	2118		2377		2491		2550			5-7-10
	A2	6	55	0.18	19	1740		1909		1981		2019		3.7	4-5-9
			70	0.29	25	2007		2242		2343		2396			5-7-10
			85	0.43	30	2235		2535		2668		2739			6-8-11
			100	0.60	35	2433		2801		2965		3052			7-9-12
	A3	8	85	0.21	15	1878		2090		2181		2229		2.9	4-6-10
			110	0.35	20	2168		2463		2593		2663			6-8-12
			135	0.53	25	2413		2792		2961		3051			7-9-13
			160	0.74	30	2618		3079		3288		3401			8-10-14
8	A1	8	40	0.16	15	1779	1.40	1933	5.40	1999	1.50	2032	2.70	4.6	3-4-8
			53	0.27	15	2129		2362		2462		2513			4-6-9
			66	0.42	15	2423		2737		2874		2944			5-7-10
			79	0.60	15	2676		3073		3247		3338			6-8-11
	A2	8	70	0.18	15	2168		2417		2524		2579		3.7	4-6-10
			95	0.33	17	2583		2956		3120		3205			5-8-12
			120	0.53	23	2912		3411		3633		3751			7-9-13
			145	0.77	28	3190		3811		4091		4243			8-10-14
	A3	8	110	0.23	18	2356		2672		2811		2882		2.9	5-7-12
			145	0.40	26	2730		3180		3379		3485			6-9-13
			180	0.62	31	3033		3612		3873		4015			8-10-15
			215	0.88	34	3282		3986		4310		4487			9-11-16
10	A1	8	55	0.19	15	2292	1.70	2548	6.70	2657	1.90	2713	3.40	4.6	4-5-9
			70	0.30	15	2647		3005		3160		3240			4-7-10
			85	0.44	16	2947		3410		3613		3719			5-8-11
			100	0.61	20	3207		3775		4026		4158			6-9-12
	A2	8	90	0.20	15	2650		3018		3178		3260		3.7	5-7-11
			120	0.35	22	3095		3629		3865		3988			6-9-13
			150	0.55	28	3446		4142		4456		4623			8-10-15
			180	0.79	32	3738		4592		4983		5196			9-11-16
	A3	8	130	0.22	22	2734		3152		3334		3429		2.9	5-8-13
			170	0.38	29	3138		3722		3981		4119			7-10-14
			210	0.58	34	3462		4207		4546		4728			8-11-16
			250	0.75	35	3666		4527		4924		5141			10-12-17

Note: Reference page U24 for operational conditions used for performance notes

CBAL-12 / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS	NC	1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)		qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	A1	5	26	0.22	15	2488	0.24	2656	0.96	2731	2.16	2769	3.84	4.6	3-4-6
			32	0.34	15	2844		3074		3175		3228			3-5-7
			38	0.47	19	3161		3454		3583		3651			4-5-8
			44	0.64	23	3446		3801		3961		4044			4-6-8
	A2	6	36	0.14	15	2625		2819		2905		2949		3.7	3-4-7
			48	0.25	17	3134		3427		3557		3625			4-6-8
			60	0.39	23	3568		3962		4139		4231			5-7-9
			72	0.56	28	3941		4435		4657		4775			6-7-10
	A3	8	55	0.15	15	2831		3075		3182		3237		2.9	3-5-8
			75	0.28	15	3397		3766		3932		4019			5-7-10
			95	0.45	18	3865		4360		4583		4702			6-8-11
			115	0.66	23	4259		4880		5163		5316			7-8-12
6	A1	6	30	0.15	15	3053	0.35	3265	1.38	3360	3.11	3406	5.54	4.6	2-4-7
			40	0.26	15	3690		4021		4164		4237			3-5-8
			50	0.41	19	4233		4687		4882		4984			4-6-9
			60	0.58	24	4706		5282		5534		5667			5-7-10
	A2	6	55	0.18	19	3866		4242		4403		4486		3.7	4-5-9
			70	0.29	25	4460		4981		5207		5325			5-7-10
			85	0.43	30	4966		5633		5930		6087			6-8-11
			100	0.60	35	5407		6225		6589		6783			7-9-12
	A3	8	85	0.21	15	4174		4645		4847		4953		2.9	4-6-10
			110	0.35	20	4818		5473		5763		5918			6-8-12
			135	0.53	25	5362		6204		6580		6780			7-9-13
			160	0.74	30	5818		6842		7306		7557			8-10-14
8	A1	8	40	0.16	15	3954	0.46	4296	1.83	4443	4.11	4516	7.30	4.6	3-4-8
			53	0.27	15	4731		5248		5471		5584			4-6-9
			66	0.42	15	5385		6083		6387		6543			5-7-10
			79	0.60	15	5948		6828		7215		7418			6-8-11
	A2	8	70	0.18	15	4817		5370		5609		5731		3.7	4-6-10
			95	0.33	17	5741		6569		6933		7122			5-8-12
			120	0.53	23	6472		7580		8073		8336			7-9-13
			145	0.77	28	7090		8468		9090		9429			8-10-14
	A3	8	110	0.23	18	5235		5939		6247		6405		2.9	5-7-12
			145	0.40	26	6066		7066		7508		7743			6-9-13
			180	0.62	31	6740		8027		8607		8921			8-10-15
			215	0.88	34	7293		8857		9577		9971			9-11-16
10	A1	8	55	0.19	15	5093	0.57	5661	2.26	5905	5.09	6030	9.05	4.6	4-5-9
			70	0.30	15	5882		6677		7023		7200			4-7-10
			85	0.44	16	6550		7579		8030		8264			5-8-11
			100	0.61	20	7126		8389		8946		9241			6-9-12
	A2	8	90	0.20	15	5889		6706		7062		7245		3.7	5-7-11
			120	0.35	22	6878		8065		8588		8863			6-9-13
			150	0.55	28	7658		9205		9901		10274			8-10-15
			180	0.79	32	8307		10204		11073		11546			9-11-16
	A3	8	130	0.22	22	6076		7004		7410		7620		2.9	5-8-13
			170	0.38	29	6972		8270		8846		9153			7-10-14
			210	0.58	34	7694		9349		10101		10507			8-11-16
			250	0.75	35	8147		10060		10942		11423			10-12-17

Note: Reference page U24 for operational conditions used for performance notes

CBAL-12 / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	A1	5	26	0.22	15	1194	1.00	1275	3.80	1311	8.70	1329	1.10	4.6	3-4-6
			32	0.34	15	1365		1476		1524		1549			3-5-7
			38	0.47	19	1517		1658		1720		1752			4-5-8
			44	0.64	23	1654		1825		1901		1941			4-6-8
	A2	6	36	0.14	15	1260		1353		1394		1416		3.7	3-4-7
			48	0.25	17	1504		1645		1707		1740			4-6-8
			60	0.39	23	1713		1902		1987		2031			5-7-9
			72	0.56	28	1892		2129		2235		2292			6-7-10
	A3	8	55	0.15	15	1359		1476		1527		1554		2.9	3-5-8
			75	0.28	15	1631		1808		1888		1929			5-7-10
			95	0.45	18	1855		2093		2200		2257			6-8-11
			115	0.66	23	2044		2342		2478		2552			7-8-12
6	A1	6	30	0.15	15	1465	1.40	1567	5.50	1613	1.60	1635	2.90	4.6	2-4-7
			40	0.26	15	1771		1930		1999		2034			3-5-8
			50	0.41	19	2032		2250		2343		2392			4-6-9
			60	0.58	24	2259		2535		2657		2720			5-7-10
	A2	6	55	0.18	19	1856		2036		2114		2153		3.7	4-5-9
			70	0.29	25	2141		2391		2499		2556			5-7-10
			85	0.43	30	2384		2704		2846		2922			6-8-11
			100	0.60	35	2596		2988		3163		3256			7-9-12
	A3	8	85	0.21	15	2003		2229		2327		2378		2.9	4-6-10
			110	0.35	20	2313		2627		2766		2840			6-8-12
			135	0.53	25	2574		2978		3158		3255			7-9-13
			160	0.74	30	2793		3284		3507		3627			8-10-14
8	A1	8	40	0.16	15	1898	1.80	2062	7.30	2133	3.90	2168	6.90	4.6	3-4-8
			53	0.27	15	2271		2519		2626		2680			4-6-9
			66	0.42	15	2585		2920		3066		3141			5-7-10
			79	0.60	15	2855		3278		3463		3561			6-8-11
	A2	8	70	0.18	15	2312		2578		2692		2751		3.7	4-6-10
			95	0.33	17	2756		3153		3328		3419			5-8-12
			120	0.53	23	3107		3639		3875		4001			7-9-13
			145	0.77	28	3403		4065		4363		4526			8-10-14
	A3	8	110	0.23	18	2513		2851		2998		3075		2.9	5-7-12
			145	0.40	26	2912		3391		3604		3717			6-9-13
			180	0.62	31	3235		3853		4131		4282			8-10-15
			215	0.88	34	3501		4252		4597		4786			9-11-16
10	A1	8	55	0.19	15	2445	2.20	2717	8.90	2834	5.30	2894	9.50	4.6	4-5-9
			70	0.30	15	2823		3205		3371		3456			4-7-10
			85	0.44	16	3144		3638		3854		3967			5-8-11
			100	0.61	20	3421		4027		4294		4436			6-9-12
	A2	8	90	0.20	15	2827		3219		3390		3478		3.7	5-7-11
			120	0.35	22	3302		3871		4122		4254			6-9-13
			150	0.55	28	3676		4419		4753		4932			8-10-15
			180	0.79	32	3987		4898		5315		5542			9-11-16
	A3	8	130	0.22	22	2916		3362		3557		3658		2.9	5-8-13
			170	0.38	29	3347		3970		4246		4393			7-10-14
			210	0.58	34	3693		4488		4849		5043			8-11-16
			250	0.75	35	3910		4829		5252		5483			10-12-17

Note: Reference page U24 for operational conditions used for performance notes

CBAL-12 / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	A1	5	26	0.22	15	3317	0.96	3541	3.84	3641	8.65	3693	1.06	4.6	3-4-6
			32	0.34	15	3792		4099		4233		4303			3-5-7
			38	0.47	19	4215		4605		4777		4868			4-5-8
			44	0.64	23	4595		5068		5281		5392			4-6-8
	A2	6	36	0.14	15	3500		3759		3873		3932		3.7	3-4-7
			48	0.25	17	4178		4569		4742		4833			4-6-8
			60	0.39	23	4758		5282		5519		5641			5-7-9
			72	0.56	28	5255		5913		6209		6367			6-7-10
	A3	8	55	0.15	15	3775		4100		4242		4316		2.9	3-5-8
			75	0.28	15	4530		5021		5243		5358			5-7-10
			95	0.45	18	5154		5813		6111		6270			6-8-11
			115	0.66	23	5678		6506		6884		7088			7-8-12
6	A1	6	30	0.15	15	4070	1.38	4353	5.54	4480	1.62	4541	2.87	4.6	2-4-7
			40	0.26	15	4920		5361		5552		5649			3-5-8
			50	0.41	19	5644		6250		6510		6645			4-6-9
			60	0.58	24	6275		7043		7379		7556			5-7-10
	A2	6	55	0.18	19	5155		5656		5871		5982		3.7	4-5-9
			70	0.29	25	5946		6642		6943		7101			5-7-10
			85	0.43	30	6621		7511		7906		8116			6-8-11
			100	0.60	35	7210		8299		8785		9044			7-9-12
	A3	8	85	0.21	15	5565		6193		6463		6604		2.9	4-6-10
			110	0.35	20	6424		7297		7684		7890			6-8-12
			135	0.53	25	7149		8272		8773		9040			7-9-13
			160	0.74	30	7757		9122		9741		10076			8-10-14
8	A1	8	40	0.16	15	5272	1.83	5728	7.30	5924	3.90	6022	6.93	4.6	3-4-8
			53	0.27	15	6308		6998		7295		7445			4-6-9
			66	0.42	15	7180		8110		8516		8724			5-7-10
			79	0.60	15	7930		9104		9620		9891			6-8-11
	A2	8	70	0.18	15	6423		7160		7479		7641		3.7	4-6-10
			95	0.33	17	7654		8759		9243		9496			5-8-12
			120	0.53	23	8630		10107		10764		11114			7-9-13
			145	0.77	28	9453		11291		12120		12572			8-10-14
	A3	8	110	0.23	18	6980		7918		8329		8540		2.9	5-7-12
			145	0.40	26	8089		9421		10011		10325			6-9-13
			180	0.62	31	8987		10703		11475		11895			8-10-15
			215	0.88	34	9724		11810		12769		13294			9-11-16
10	A1	8	55	0.19	15	6790	2.23	7548	8.91	7873	5.33	8040	9.47	4.6	4-5-9
			70	0.30	15	7842		8903		9364		9601			4-7-10
			85	0.44	16	8733		10105		10706		11019			5-8-11
			100	0.61	20	9501		11185		11928		12321			6-9-12
	A2	8	90	0.20	15	7852		8941		9416		9660		3.7	5-7-11
			120	0.35	22	9171		10754		11451		11818			6-9-13
			150	0.55	28	10210		12274		13202		13699			8-10-15
			180	0.79	32	11076		13605		14764		15395			9-11-16
	A3	8	130	0.22	22	8101		9338		9880		10160		2.9	5-8-13
			170	0.38	29	9296		11027		11795		12204			7-10-14
			210	0.58	34	10258		12466		13468		14009			8-11-16
			250	0.75	35	10862		13413		14589		15231			10-12-17

Note: Reference page U24 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2015
2. ΔP_s values are measured in inches of water
3. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
4. Throw values are based on isothermal supply air and represent throw distances to terminal velocities of 150, 100 and 50 fpm respectively
5. ΔP_{Coil} values are measured in feet of water. ΔP_{Coil} values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit coil.
6. Induction ratio is multiplied by the volume flow rate of primary air to estimate the volume flow rate of room air entrained through the coil

Cooling performance:

- Cooling capacity listed (qTOTAL) is the total sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air.
- Capacity is based on 18°F ΔT between the induced air and the chilled water supply. Table 1 provides correction factors for other temperature differentials.
- Primary air sensible cooling contribution can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{ROOM} - T_{PA})$$

- Primary air latent cooling can be calculated by the following equation:

$$q_{LATENT} = 0.69 \times CFM_{PA} \times (W_{ROOM} - W_{PA})$$

where W_{ROOM} and W_{PA} are the humidity ratio of the room and primary air respectively expressed in Grains of moisture per pound dry air

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	**18**	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	**1.00**	1.11	1.22	1.33

Heating performance:

- Heating capacity listed (qTOTAL) is the sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air
- Capacity is based on 50°F ΔT between the induced air and the chilled water supply. Table 2 provides correction factors for other temperature differentials.
- Primary air sensible heating offset (or contribution) can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{PA} - T_{ROOM})$$

if the primary air temperature is lower than that of the room, it will offset the coil's heating

if the primary air temperature is higher than that of the room, it will contribute to the coil's heating

TABLE 2: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	20	30	40	**50**	60	70	80	90	100	110	120
Multiply Table Value by:	0.40	0.60	0.80	**1.00**	1.20	1.40	1.60	1.80	2.00	2.20	2.40

Legend:

ΔP_S = Unit Inlet Pressure [in wg]

qCoil = Sensible Capacity, Coil [Btu/h]

ΔCoil = Water coil pressure drop [ft wg]

q_{SENSPA} = Sensible Capacity, Primary Air [Btu/h]

CFM_{PA} = Air Flowrate, Primary Air [CFM]

T_{PA} = Temperature Primary Air [°F]

T_{ROOM} = Temperature Room Air [°F]

q_{SENSPA} = Latent Capacity, Primary Air [Btu/h]

CBLE

- Exposed linear chilled beam with 1-way or 2-way air distribution patterns
- Optimized nozzle design provides high capacity and low noise levels
- Linear design matching commercial architectural styling
- Integral coanda plates for ceiling independent operation
- Optimized diffuser geometry maximizes occupant comfort

CBLE-24

CBLE-12

dual-function | open ceiling | k-12 education | universities | energy solutions

See website for Specifications

MODELS:

CBLE-24
CBLE-12

FINISHES:

Standard Finish - #26 White
Optional Finish - #84 Black

OVERVIEW

Titus active chilled beams features the aerodynamic properties of Titus ceiling diffusers and benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being discharged through a series of nozzles located along the length of the beam. The nozzles inject the primary air into the mixing chamber at velocities capable of inducing room air through its water coil where it mixes with the primary supply air. This mixture of air is then discharged into the space through the ceiling slot diffusers. This provides high cooling outputs with low amounts of primary air. The reduced volume of air results in the reduction of the air handler capacity and size, smaller duct sizes, and the overall energy consumption.

The supplied air from the air handling unit is tempered and dehumidified to handle the latent load. The remaining loads in the space are addressed with the heat exchanger which is incorporated into the chilled beam. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

The CBLE's are offered for both, cooling and heating and lengths from 2 to 10 ft. The low overall height of the CBLE is ideal for open ceiling or retrofit applications with limited floor height.

ADVANTAGES

- Removal of high thermal loads is possible in this air/water system
- The size of the air duct system is reduced to a minimum, due to the low supply of primary air
- Substantial reduction in the operating costs, due to low primary air volume
- Improvement of the thermal comfort inside the room
- Suitable for several standard ceiling grids
- Contributing sound levels below NC-30

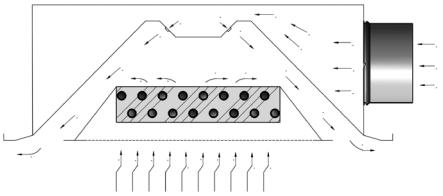
CBLE STANDARD FEATURES

- 1-way or 2-way air distribution patterns
- 2 foot to 10 foot lengths, 1 foot increments
- Perforated or linear bar induced air grille
- Left hand or Right hand coil connections
- Side or top air inlet locations
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Hinged induced air grille for roomside coil access
- Commissioning port with roomside access for balancing
- Mounting brackets with adjustments in two directions
- Durable powder coat finish
- ½" Sweat water coil connections
- Coil air vent

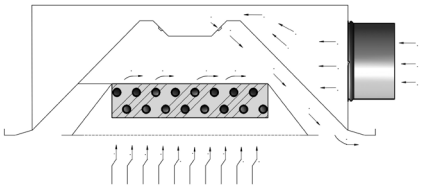
OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" or ¾ MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Coil lint screen
- Constant volume regulator

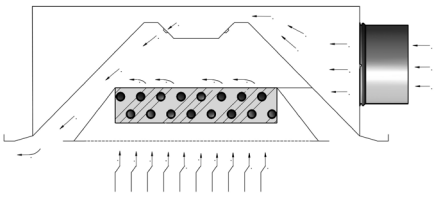
CBLE 2-Way



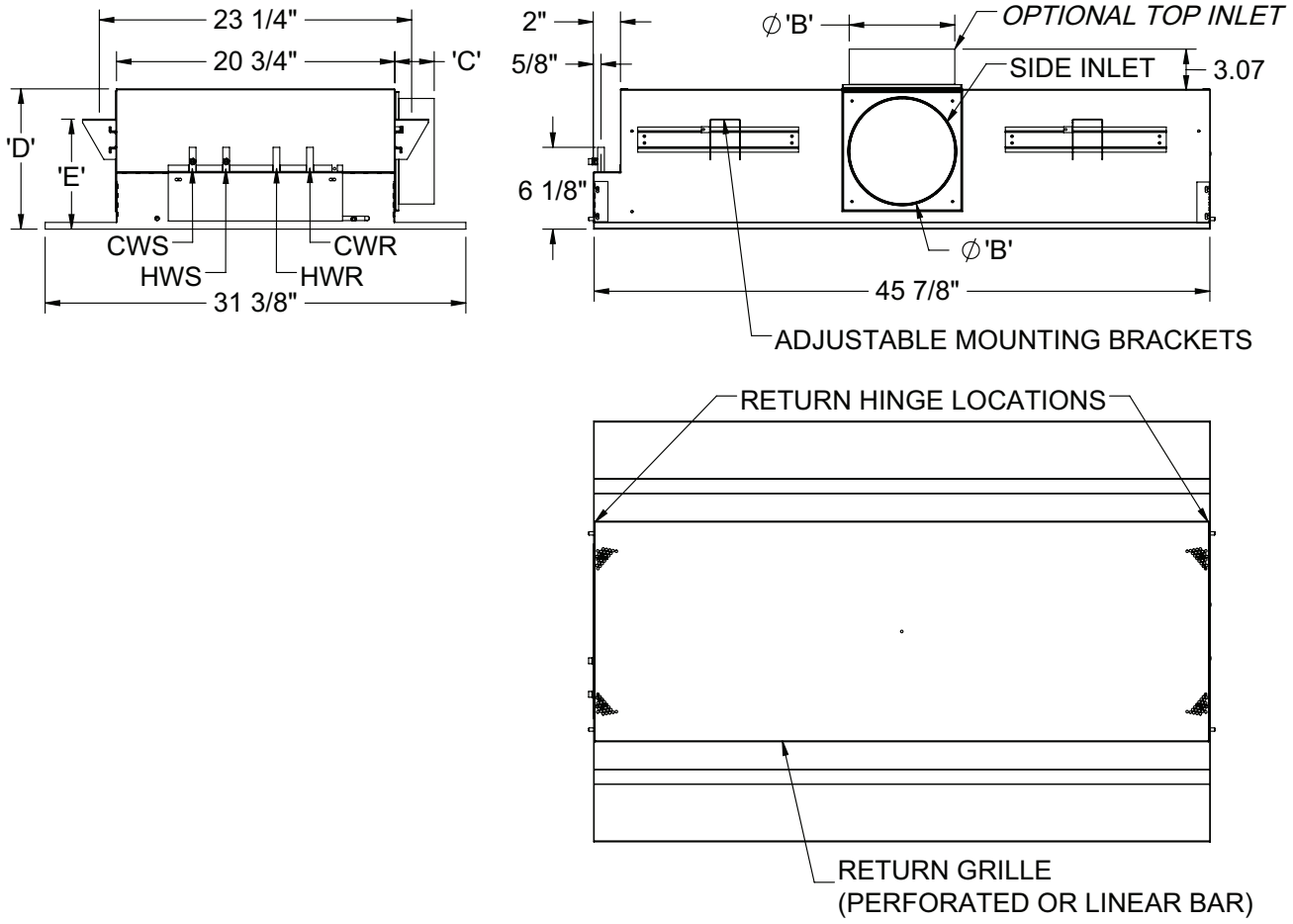
CBLE 1-Way (front)



CBLE 1-Way (back)



CBLE UNIT DIMENSIONS



Nominal Unit Length (ft)	'A' (IN)
2	21 7/8
3	33 7/8
4	45 7/8
5	57 7/8
6	69 7/8
7	81 7/8
8	93 7/8
9	105 7/8
10	117 7/8

Nominal Inlet Dia. (IN)	'B' (IN)	'C' (IN)*	'D' (IN)	'E' (IN)
5	4 7/8	3	8 3/8	6 1/4
6	5 7/8	3	8 3/8	6 1/4
8	7 7/8	3	10 3/8	8 1/4
8**	7 7/8	--	8 3/8	6 1/4

*Side Inlet Only

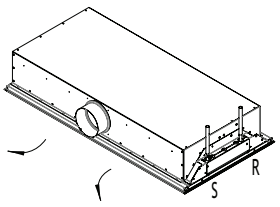
**Top Inlet Only

Integrated ¼" pressure port for balancing/commissioning accessable from roomside opposite coil connection

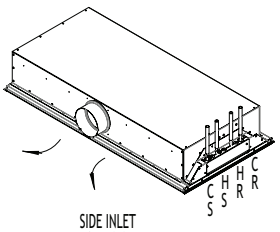
All dimensions are in inches

CBLE CASING ARRANGEMENTS / SIDE INLET 1-WAY

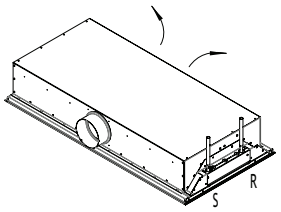
24 INCHES CASING ARRANGEMENTS



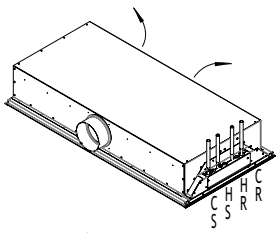
SIDE INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW FRONT



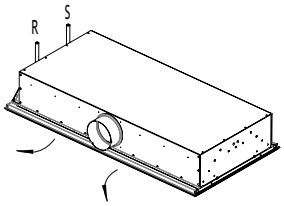
SIDE INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW FRONT



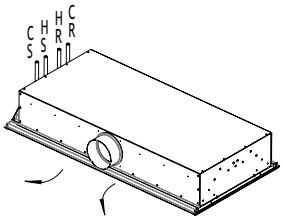
SIDE INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW BACK



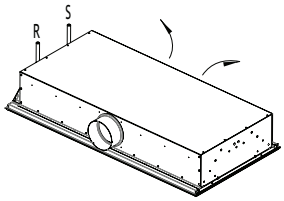
SIDE INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW BACK



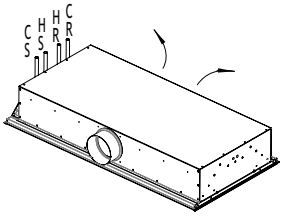
SIDE INLET
1 WAY 2 PIPE
LEFT HAND
AIR FLOW FRONT



SIDE INLET
1 WAY 4 PIPE
LEFT HAND
AIR FLOW FRONT

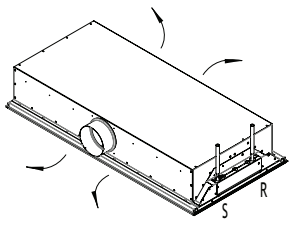


SIDE INLET
1 WAY 2 PIPE
LEFT HAND
AIR FLOW BACK

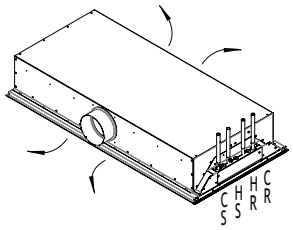


SIDE INLET
1 WAY 4 PIPE
LEFT HAND
AIR FLOW BACK

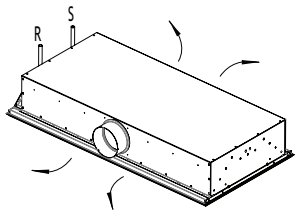
CBLE CASING ARRANGEMENTS / SIDE INLET 2-WAY



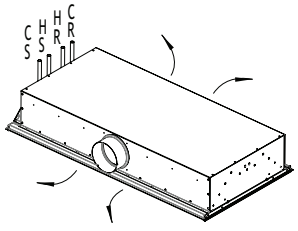
SIDE INLET
2 WAY 2 PIPE
RIGHT HAND



SIDE INLET
2 WAY 4 PIPE
RIGHT HAND

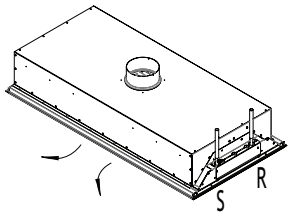


SIDE INLET
2 WAY 2 PIPE
LEFT HAND

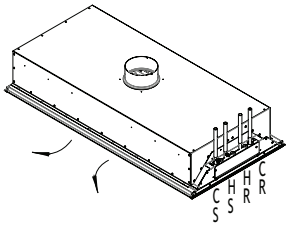


SIDE INLET
2 WAY 4 PIPE
RIGHT HAND

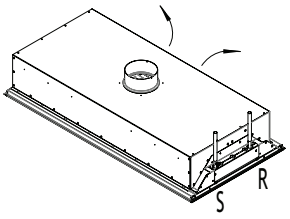
CBLE CASING ARRANGEMENTS / TOP INLET 1-WAY



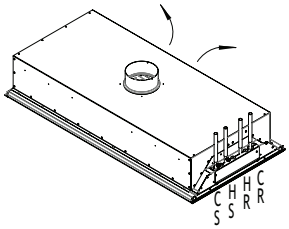
TOP INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW FRONT



TOP INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW FRONT

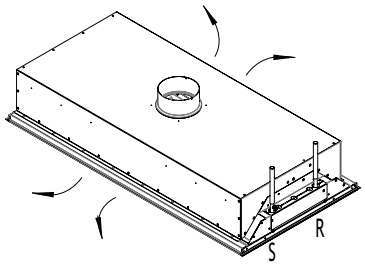


TOP INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW BACK

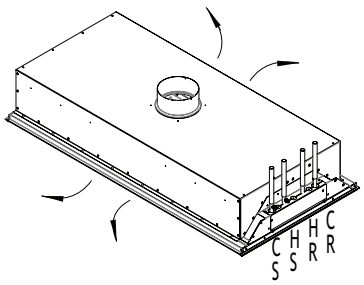


TOP INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW BACK

CBLE CASING ARRANGEMENTS / TOP INLET 2-WAY



TOP INLET
2 WAY 2 PIPE
RIGHT HAND



TOP INLET
2 WAY 4 PIPE
RIGHT HAND

R - Return S - Supply;

HR - Heating Return HS - Heating Supply;

CR - Cooling Return CS - Cooling Supply

CBLE-24 / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	4	15	0.25	15	1659	0.70	1897	2.90	1961	6.40	2010	1.50	5.9	0 - 1 - 4
			20	0.44	15	2118		2455		2553		2631			1 - 2 - 7
			25	0.68	15	2478		2899		3024		3100			1 - 3 - 10
	B2	4	20	0.17	15	1685		1916		1983		2039		4.8	1 - 1 - 5
			30	0.39	15	2308		2665		2770		2836			1 - 3 - 10
			40	0.69	22	2893		3437		3592		3713			2 - 5 - 14
	B3	5	40	0.19	15	2260		2571		2667		2718		4.0	2 - 4 - 12
			60	0.43	23	3264		3820		3995		4136			4 - 8 - 18
			80	0.77	30	4278		4953		5218		5364			7 - 12 - 21
	B4	6	70	0.19	19	3063		3442		3554		3628		2.5	2 - 6 - 14
			105	0.44	29	4537		5125		5340		5484			6 - 11 - 20
			140	0.75	22	5772		6566		6869		7025			10 - 14 - 23
6	B1	4	20	0.18	15	2272	1.00	2664	4.10	2802	9.30	2809	2.10	5.9	0 - 1 - 4
			30	0.41	15	2919		3497		3673		3770			1 - 2 - 9
			40	0.72	22	3651		4427		4708		4812			2 - 4 - 13
	B2	5	30	0.16	15	2382		2793		2918		2977		4.8	1 - 2 - 6
			45	0.36	16	3269		3882		4095		4171			2 - 3 - 12
			60	0.64	24	4224		5095		5415		5577			3 - 6 - 17
	B3	6	60	0.18	16	3229		3771		3968		4042		4.0	2 - 5 - 14
			90	0.40	26	4816		5732		6062		6287			5 - 10 - 21
			120	0.72	33	5893		7001		7469		7778			8 - 14 - 26
	B4	10*	105	0.18	15	4435		5061		5294		5392		2.5	3 - 7 - 18
			160	0.42	21	6587		7633		7997		8266			7 - 13 - 25
			215	0.76	29	8266		9466		10075		10430			12 - 18 - 29
8	B1	4	25	0.15	15	2902	1.40	3425	5.40	3635	1.60	3715	2.80	5.9	0 - 1 - 4
			40	0.40	20	3883		4757		5055		5216			1 - 2 - 10
			55	0.73	22	4607		5752		6174		6387			2 - 5 - 16
	B2	5	40	0.16	15	3258		3871		4096		4201		4.8	1 - 2 - 7
			60	0.35	22	4057		4973		5276		5453			2 - 4 - 14
			80	0.62	30	5198		6368		6834		7094			3 - 7 - 19
	B3	8	80	0.17	15	4056		4833		5116		5262		4.0	2 - 5 - 16
			120	0.38	18	6027		7218		7732		8089			5 - 12 - 25
			160	0.68	25	7317		8833		9613		10122			9 - 16 - 30
	B4	10*	145	0.19	17	5811		6710		7062		7244		2.5	4 - 8 - 21
			215	0.42	27	8378		9726		10376		10811			8 - 16 - 29
			285	0.74	34	10363		12121		12992		13567			14 - 21 - 33
10	B1	5	35	0.19	15	3718	1.70	4526	6.70	4862	1.90	5002	3.40	5.9	1 - 1 - 5
			52	0.41	20	4618		5753		6216		6463			1 - 3 - 12
			69	0.73	27	5322		6772		7399		7720			2 - 5 - 18
	B2	6	55	0.22	16	4288		5263		5638		5838		4.8	1 - 2 - 9
			80	0.39	24	4974		6120		6631		6899			2 - 5 - 17
			105	0.67	31	6195		7894		8616		9044			4 - 9 - 22
	B3	8	100	0.17	15	4772		5739		6161		6378		4.0	3 - 6 - 18
			150	0.37	22	6870		8544		9283		9793			6 - 13 - 28
			200	0.66	30	8415		10363		11449		12170			10 - 18 - 33
	B4	10*	180	0.19	21	6792		7988		8491		8753		2.5	4 - 9 - 23
			240	0.36	30	9238		10997		11824		12382			7 - 15 - 30
			300	0.52	35	10634		12539		13613		14322			11 - 19 - 34

Note: Reference page U38 for operational conditions used for performance notes

CBLE-24 / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	4	15	0.25	15	2718	0.16	3248	0.63	3390	1.41	3500	2.51	5.9	0 - 1 - 4
			20	0.44	15	3417		4166		4384		4557			1 - 2 - 7
			25	0.68	15	3895		4829		5108		5276			1 - 3 - 10
	B2	4	20	0.17	15	2454		2968		3118		3242		4.8	1 - 1 - 5
			30	0.39	15	3195		3987		4221		4368			1 - 3 - 10
			40	0.69	22	3848		5057		5402		5672			2 - 5 - 14
	B3	5	40	0.19	15	2442		3133		3348		3459		4	2 - 4 - 12
			60	0.43	23	3383		4619		5007		5320			4 - 8 - 18
			80	0.77	30	4346		5848		6435		6760			7 - 12 - 21
	B4	6	70	0.19	19	2291		3133		3384		3548		2.5	2 - 6 - 14
			105	0.44	29	3311		4617		5094		5415			6 - 11 - 20
			140	0.75	22	3798		5561		6236		6582			10 - 14 - 23
6	B1	4	20	0.18	15	3758	0.23	4631	0.92	4936	2.06	4952	3.67	5.9	0 - 1 - 4
			30	0.41	15	4551		5836		6227		6442			1 - 2 - 9
			40	0.72	22	5534		7258		7883		8115			2 - 4 - 13
	B2	5	30	0.16	15	3360		4273		4549		4681		4.8	1 - 2 - 6
			45	0.36	16	4363		5725		6197		6366			2 - 3 - 12
			60	0.64	24	5516		7451		8164		8524			3 - 6 - 17
	B3	6	60	0.18	16	3306		4509		4949		5113		4	2 - 5 - 14
			90	0.40	26	4897		6933		7666		8167			5 - 10 - 21
			120	0.72	33	5355		7817		8859		9544			8 - 14 - 26
	B4	10*	105	0.18	15	3083		4475		4992		5210		2.5	3 - 7 - 18
			160	0.42	21	4318		6642		7453		8050			7 - 13 - 25
			215	0.76	29	4502		7170		8523		9311			12 - 18 - 29
8	B1	4	25	0.15	15	4836	0.30	5998	1.21	6466	2.71	6642	4.83	5.9	0 - 1 - 4
			40	0.40	20	6048		7992		8652		9011			1 - 2 - 10
			55	0.73	22	6690		9235		10173		10646			2 - 5 - 16
	B2	5	40	0.16	15	4661		6022		6522		6755		4.8	1 - 2 - 7
			60	0.35	22	5145		7181		7855		8248			2 - 4 - 14
			80	0.62	30	6391		8991		10026		10605			3 - 7 - 19
	B3	8	80	0.17	15	3853		5581		6210		6533		4	2 - 5 - 16
			120	0.38	18	5653		8300		9443		10236			5 - 12 - 25
			160	0.68	25	5941		9309		11042		12175			9 - 16 - 30
	B4	10*	145	0.19	17	3560		5558		6342		6746		2.5	4 - 8 - 21
			215	0.42	27	4751		7747		9191		10157			8 - 16 - 29
			285	0.74	34	4647		8554		10490		11767			14 - 21 - 33
10	B1	5	35	0.19	15	6005	0.37	7801	1.50	8548	3.37	8859	5.98	5.9	1 - 1 - 5
			52	0.41	20	6908		9430		10459		11009			1 - 3 - 12
			69	0.73	27	7376		10598		11993		12704			2 - 5 - 18
	B2	6	55	0.22	16	5660		7826		8660		9103		4.8	1 - 2 - 9
			80	0.39	24	5893		8440		9577		10171			2 - 5 - 17
			105	0.67	31	6994		10769		12374		13325			4 - 9 - 22
	B3	8	100	0.17	15	4155		6303		7241		7723		4	3 - 6 - 18
			150	0.37	22	5591		9313		10955		12088			6 - 13 - 28
			200	0.66	30	5801		10129		12542		14144			10 - 18 - 33
	B4	10*	180	0.19	21	3484		6142		7260		7841		2.5	4 - 9 - 23
			240	0.36	30	4405		8314		10150		11392			7 - 15 - 30
			300	0.52	35	4283		8516		10901		12478			11 - 19 - 34

Note: Reference page U38 for operational conditions used for performance notes

CBLE-24 / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	4	15	0.25	15	1747	1.00	2002	3.80	2070	8.60	2123	1.90	5.9	0 - 1 - 4
			20	0.44	15	2230		2590		2694		2777			1 - 2 - 7
			25	0.68	15	2607		3056		3190		3270			1 - 3 - 10
	B2	4	20	0.17	15	1768		2015		2087		2146		4.8	1 - 1 - 5
			30	0.39	15	2419		2799		2911		2982			1 - 3 - 10
			40	0.69	22	3027		3608		3774		3903			2 - 5 - 14
	B3	5	40	0.19	15	2353		2684		2787		2841		4.0	2 - 4 - 12
			60	0.43	23	3395		3988		4174		4325			4 - 8 - 18
			80	0.77	30	4447		5168		5450		5606			7 - 12 - 21
	B4	6	70	0.19	19	3166		3570		3690		3769		2.5	2 - 6 - 14
			105	0.44	29	4688		5315		5544		5698			6 - 11 - 20
			140	0.75	22	5955		6801		7125		7291			10 - 14 - 23
6	B1	4	20	0.18	15	2394	1.40	2813	5.50	2960	1.60	2967	2.80	5.9	0 - 1 - 4
			30	0.41	15	3070		3687		3874		3978			1 - 2 - 9
			40	0.72	22	3837		4664		4964		5075			2 - 4 - 13
	B2	5	30	0.16	15	2498		2936		3069		3132		4.8	1 - 2 - 6
			45	0.36	16	3422		4076		4303		4384			2 - 3 - 12
			60	0.64	24	4419		5347		5690		5862			3 - 6 - 17
	B3	6	60	0.18	16	3358		3935		4146		4225		4.0	2 - 5 - 14
			90	0.40	26	5006		5984		6336		6576			5 - 10 - 21
			120	0.72	33	6112		7294		7794		8122			8 - 14 - 26
	B4	10*	105	0.18	15	4578		5247		5495		5600		2.5	3 - 7 - 18
			160	0.42	21	6795		7910		8299		8586			7 - 13 - 25
			215	0.76	29	8506		9787		10436		10815			12 - 18 - 29
8	B1	4	25	0.15	15	3059	1.80	3617	7.20	3842	2.10	3926	3.70	5.9	0 - 1 - 4
			40	0.40	20	4084		5016		5334		5506			1 - 2 - 10
			55	0.73	22	4834		6056		6506		6733			2 - 5 - 16
	B2	5	40	0.16	15	3418		4071		4311		4423		4.8	1 - 2 - 7
			60	0.35	22	4241		5218		5541		5730			2 - 4 - 14
			80	0.62	30	5429		6677		7173		7452			3 - 7 - 19
	B3	8	80	0.17	15	4210		5040		5342		5497		4.0	2 - 5 - 16
			120	0.38	18	6255		7526		8074		8455			5 - 12 - 25
			160	0.68	25	7574		9190		10022		10566			9 - 16 - 30
	B4	10*	145	0.19	17	5988		6947		7323		7517		2.5	4 - 8 - 21
			215	0.42	27	8626		10063		10757		11220			8 - 16 - 29
			285	0.74	34	10641		12517		13446		14059			14 - 21 - 33
10	B1	5	35	0.19	15	3915	2.20	4777	8.90	5136	2.60	5285	4.60	5.9	1 - 1 - 5
			52	0.41	20	4850		6061		6555		6819			1 - 3 - 12
			69	0.73	27	5577		7124		7793		8134			2 - 5 - 18
	B2	6	55	0.18	15	4274		5255		5625		5815		4.8	1 - 2 - 9
			80	0.39	24	5190		6412		6958		7243			2 - 5 - 17
			105	0.67	31	6456		8268		9038		9495			4 - 9 - 22
	B3	8	100	0.17	15	4946		5977		6427		6658		4.0	3 - 6 - 18
			150	0.37	22	7110		8897		9685		10229			6 - 13 - 28
			200	0.66	30	8687		10764		11922		12692			10 - 18 - 33
	B4	10*	180	0.19	21	6985		8260		8797		9076		2.5	4 - 9 - 23
			240	0.33	29	9205		11057		11874		12438			7 - 15 - 30
			300	0.52	35	10909		12941		14086		14843			11 - 19 - 34

Note: Reference page U38 for operational conditions used for performance notes

CBLE-24 / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS	NC	1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)		qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	4	15	0.25	15	3706	0.95	4412	3.80	4602	8.55	4748	1.94	5.9	0 - 1 - 4
			20	0.44	15	4664		5663		5953		6184			1 - 2 - 7
			25	0.68	15	5329		6575		6946		7170			1 - 3 - 10
	B2	4	20	0.17	15	3380		4066		4265		4431		4.8	1 - 1 - 5
			30	0.39	15	4422		5479		5791		5987			1 - 3 - 10
			40	0.69	22	5348		6960		7420		7780			2 - 5 - 14
	B3	5	40	0.19	15	3473		4394		4680		4830		4.0	2 - 4 - 12
			60	0.43	23	4836		6484		7001		7419			4 - 8 - 18
			80	0.77	30	6229		8231		9014		9448			7 - 12 - 21
	B4	6	70	0.19	19	3435		4558		4892		5110		2.5	2 - 6 - 14
			105	0.44	29	4984		6725		7362		7790			6 - 11 - 20
			140	0.75	22	5823		8174		9074		9535			10 - 14 - 23
6	B1	4	20	0.18	15	5120	1.38	6283	5.51	6690	1.58	6712	2.81	5.9	0 - 1 - 4
			30	0.41	15	6231		7944		8466		8753			1 - 2 - 9
			40	0.72	22	7595		9894		10727		11036			2 - 4 - 13
	B2	5	30	0.16	15	4642		5860		6228		6404		4.8	1 - 2 - 6
			45	0.36	16	6061		7878		8507		8733			2 - 3 - 12
			60	0.64	24	7681		10261		11211		11691			3 - 6 - 17
	B3	6	60	0.18	16	4734		6338		6924		7143		4.0	2 - 5 - 14
			90	0.40	26	7017		9733		10709		11378			5 - 10 - 21
			120	0.72	33	7791		11074		12463		13376			8 - 14 - 26
	B4	10*	105	0.18	15	4680		6536		7226		7516		2.5	3 - 7 - 18
			160	0.42	21	6626		9724		10805		11602			7 - 13 - 25
			215	0.76	29	7170		10726		12530		13582			12 - 18 - 29
8	B1	4	25	0.15	15	6583	1.80	8133	7.21	8757	2.07	8992	3.68	5.9	0 - 1 - 4
			40	0.40	20	8281		10873		11754		12232			1 - 2 - 10
			55	0.73	22	9218		12612		13863		14493			2 - 5 - 16
	B2	5	40	0.16	15	6432		8247		8913		9224		4.8	1 - 2 - 7
			60	0.35	22	7186		9901		10799		11323			2 - 4 - 14
			80	0.62	30	8955		12422		13802		14575			3 - 7 - 19
	B3	8	80	0.17	15	5571		7875		8714		9144		4.0	2 - 5 - 16
			120	0.38	18	8188		11718		13242		14298			5 - 12 - 25
			160	0.68	25	8790		13280		15590		17101			9 - 16 - 30
	B4	10*	145	0.19	17	5534		8198		9242		9782		2.5	4 - 8 - 21
			215	0.42	27	7501		11495		13421		14709			8 - 16 - 29
			285	0.74	34	7742		12951		15533		17235			14 - 21 - 33
10	B1	5	35	0.19	15	8197	2.23	10591	8.92	11587	2.56	12002	4.55	5.9	1 - 1 - 5
			52	0.41	20	9493		12855		14228		14961			1 - 3 - 12
			69	0.73	27	10209		14505		16365		17313			2 - 5 - 18
	B2	6	55	0.18	15	7663		10386		11415		11942		4.8	1 - 2 - 9
			80	0.39	24	8291		11687		13203		13996			2 - 5 - 17
			105	0.67	31	9895		14929		17068		18337			4 - 9 - 22
	B3	8	100	0.17	15	6082		8947		10197		10840		4.0	3 - 6 - 18
			150	0.37	22	8268		13231		15420		16931			6 - 13 - 28
			200	0.66	30	8819		14591		17807		19944			10 - 18 - 33
	B4	10*	180	0.19	21	5622		9166		10656		11431		2.5	4 - 9 - 23
			240	0.33	29	7197		12341		14611		16177			7 - 15 - 30
			300	0.52	35	7338		12982		16162		18264			11 - 19 - 34

Note: Reference page U38 for operational conditions used for performance notes

CBLE-12 / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	A1	5	26	0.22	15	1684	0.70	1759	2.90	1793	6.50	1810	1.40	4.6	3-4-6
			32	0.34	15	1974		2078		2123		2147			3-5-7
			38	0.47	19	2247		2379		2437		2468			4-5-8
			44	0.64	23	2506		2665		2737		2775			4-6-8
	A2	6	36	0.14	15	1963		2050		2088		2108		3.7	3-4-7
			48	0.25	17	2452		2584		2642		2673			4-6-8
			60	0.39	23	2908		3085		3165		3206			5-7-9
			72	0.56	28	3336		3558		3658		3711			6-7-10
	A3	8	55	0.15	15	2467		2577		2625		2650		2.9	3-5-8
			75	0.28	15	3156		3322		3397		3436			5-7-10
			95	0.45	18	3801		4023		4124		4178			6-8-11
			115	0.66	23	4412		4691		4819		4888			7-8-12
6	A1	6	30	0.15	15	2025	1.00	2120	4.20	2163	9.40	2184	2.10	4.6	2-4-7
			40	0.26	15	2528		2677		2742		2775			3-5-8
			50	0.41	19	2990		3194		3282		3328			4-6-9
			60	0.58	24	3420		3679		3793		3852			5-7-10
	A2	6	55	0.18	19	2933		3102		3175		3212		3.7	4-5-9
			70	0.29	25	3526		3761		3862		3915			5-7-10
			85	0.43	30	4079		4379		4513		4584			6-8-11
			100	0.60	35	4603		4971		5135		5222			7-9-12
	A3	8	85	0.21	15	3723		3935		4026		4073		2.9	4-6-10
			110	0.35	20	4555		4850		4980		5050			6-8-12
			135	0.53	25	5342		5721		5890		5981			7-9-13
			160	0.74	30	6090		6551		6760		6873			8-10-14
8	A1	6	40	0.16	15	2647	1.40	2801	5.40	2867	1.50	2900	2.70	4.6	3-4-8
			53	0.27	19	3279		3512		3612		3663			4-6-9
			66	0.42	25	3855		4169		4306		4377			5-7-10
			79	0.61	30	4391		4787		4961		5052			6-8-11
	A2	8	70	0.18	15	3687		3936		4043		4098		3.7	4-6-10
			95	0.33	17	4645		5018		5181		5266			5-8-12
			120	0.53	23	5516		6015		6237		6355			7-9-13
			145	0.77	28	6337		6957		7237		7390			8-10-14
	A3	8	110	0.23	18	4743		5059		5198		5269		2.9	5-7-12
			145	0.40	26	5876		6326		6525		6631			6-9-13
			180	0.62	31	6939		7518		7779		7921			8-10-15
			215	0.88	34	7948		8651		8975		9152			9-11-16
10	A1	8	55	0.19	15	3485	1.70	3741	6.70	3851	1.90	3907	3.40	4.6	4-5-9
			70	0.30	15	4166		4524		4679		4759			4-7-10
			85	0.44	16	4792		5255		5458		5563			5-8-11
			100	0.61	20	5377		5945		6196		6328			6-9-12
	A2	8	90	0.20	15	4603		4971		5131		5213		3.7	5-7-11
			120	0.35	22	5699		6233		6469		6592			6-9-13
			150	0.55	28	6701		7397		7711		7878			8-10-15
			180	0.79	32	7644		8498		8889		9102			9-11-16
	A3	8	130	0.22	22	5555		5973		6155		6250		2.9	5-8-13
			170	0.38	29	6827		7411		7670		7808			7-10-14
			210	0.58	34	8019		8764		9103		9285			8-11-16
			250	0.81	36	9153		10051		10468		10696			10-12-17

Note: Reference page U38 for operational conditions used for performance notes

CBLE-12 / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS	NC	1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)		qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	A1	5	26	0.22	15	2065	0.24	2232	0.96	2308	2.16	2346	3.84	4.6	3-4-6
			32	0.34	15	2324		2554		2654		2707			3-5-7
			38	0.47	19	2543		2835		2965		3033			4-5-8
			44	0.64	23	2730		3085		3245		3328			4-6-8
	A2	6	36	0.14	15	2039		2233		2319		2363		3.7	3-4-7
			48	0.25	17	2352		2645		2776		2844			4-6-8
			60	0.39	23	2592		2985		3162		3254			5-7-9
			72	0.56	28	2769		3263		3485		3604			6-7-10
	A3	8	55	0.15	15	1936		2180		2287		2342		2.9	3-5-8
			75	0.28	15	2177		2545		2712		2798			5-7-10
			95	0.45	18	2319		2813		3037		3156			6-8-11
			115	0.66	23	2387		3008		3291		3444			7-8-12
6	A1	6	30	0.15	15	2564	0.35	2777	1.38	2871	3.11	2918	5.54	4.6	2-4-7
			40	0.26	15	3039		3370		3513		3586			3-5-8
			50	0.41	19	3419		3873		4068		4170			4-6-9
			60	0.58	24	3730		4306		4558		4691			5-7-10
	A2	6	55	0.18	19	2971		3347		3508		3591		3.7	4-5-9
			70	0.29	25	3320		3842		4068		4186			5-7-10
			85	0.43	30	3583		4250		4546		4703			6-8-11
			100	0.60	35	3780		4597		4961		5156			7-9-12
	A3	8	85	0.21	15	2790		3261		3464		3570		2.9	4-6-10
			110	0.35	20	3028		3682		3973		4127			6-8-12
			135	0.53	25	3165		4007		4383		4583			7-9-13
			160	0.74	30	3214		4238		4702		4953			8-10-14
8	A1	6	40	0.16	15	3303	0.46	3645	1.83	3792	4.11	3865	7.30	4.6	3-4-8
			53	0.27	19	3868		4386		4608		4721			4-6-9
			66	0.42	25	4310		5008		5313		5469			5-7-10
			79	0.61	30	4662		5542		5930		6132			6-8-11
	A2	8	70	0.18	15	3678		4231		4470		4591		3.7	4-6-10
			95	0.33	17	4195		5023		5386		5576			5-8-12
			120	0.53	23	4519		5627		6120		6383			7-9-13
			145	0.77	28	4730		6108		6730		7069			8-10-14
	A3	8	110	0.23	18	3445		4149		4456		4615		2.9	5-7-12
			145	0.40	26	3707		4706		5149		5384			6-9-13
			180	0.62	31	3811		5098		5677		5992			8-10-15
			215	0.88	34	3794		5358		6078		6472			9-11-16
10	A1	8	55	0.19	15	4198	0.57	4766	2.26	5010	5.09	5135	9.05	4.6	4-5-9
			70	0.30	15	4742		5538		5884		6061			4-7-10
			85	0.44	16	5166		6195		6646		6881			5-8-11
			100	0.61	20	5499		6761		7319		7613			6-9-12
	A2	8	90	0.20	15	4424		5241		5597		5780		3.7	5-7-11
			120	0.35	22	4925		6112		6635		6910			6-9-13
			150	0.55	28	5217		6764		7460		7833			8-10-15
			180	0.79	32	5378		7274		8143		8617			9-11-16
	A3	8	130	0.22	22	3960		4888		5294		5504		2.9	5-8-13
			170	0.38	29	4206		5503		6080		6386			7-10-14
			210	0.58	34	4276		5932		6683		7089			8-11-16
			250	0.81	36	4216		6211		7138		7644			10-12-17

Note: Reference page U38 for operational conditions used for performance notes

CBLE-12 / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	A1	5	26	0.22	15	1758	1.00	1839	3.80	1875	8.70	1894	1.10	4.6	3-4-6
			32	0.34	15	2060		2170		2218		2244			3-5-7
			38	0.47	19	2342		2482		2544		2577			4-5-8
			44	0.64	23	2609		2779		2856		2896			4-6-8
	A2	6	36	0.14	15	2041		2134		2175		2197		3.7	3-4-7
			48	0.25	17	2546		2686		2749		2782			4-6-8
			60	0.39	23	3015		3204		3289		3333			5-7-9
			72	0.56	28	3454		3691		3798		3855			6-7-10
	A3	8	55	0.15	15	2552		2670		2721		2747		2.9	3-5-8
			75	0.28	15	3258		3435		3515		3556			5-7-10
			95	0.45	18	3917		4154		4261		4319			6-8-11
			115	0.66	23	4540		4838		4974		5047			7-8-12
6	A1	6	30	0.15	15	2116	1.40	2218	5.50	2264	1.60	2286	2.90	4.6	2-4-7
			40	0.26	15	2639		2798		2867		2902			3-5-8
			50	0.41	19	3117		3335		3428		3477			4-6-9
			60	0.58	24	3561		3837		3959		4022			5-7-10
	A2	6	55	0.18	19	3049		3230		3307		3347		3.7	4-5-9
			70	0.29	25	3660		3910		4018		4075			5-7-10
			85	0.43	30	4228		4548		4691		4766			6-8-11
			100	0.60	35	4766		5158		5333		5426			7-9-12
	A3	8	85	0.21	15	3848		4074		4171		4222		2.9	4-6-10
			110	0.35	20	4700		5014		5153		5227			6-8-12
			135	0.53	25	5503		5907		6088		6184			7-9-13
			160	0.74	30	6265		6756		6979		7099			8-10-14
8	A1	6	40	0.16	15	2766	1.80	2930	7.30	3001	3.90	3036	6.90	4.6	3-4-8
			53	0.27	19	3421		3669		3776		3830			4-6-9
			66	0.42	25	4017		4352		4498		4573			5-7-10
			79	0.61	30	4569		4992		5178		5275			6-8-11
	A2	8	70	0.18	15	3831		4097		4211		4270		3.7	4-6-10
			95	0.33	17	4817		5215		5389		5480			5-8-12
			120	0.53	23	5711		6243		6479		6605			7-9-13
			145	0.77	28	6550		7211		7510		7672			8-10-14
	A3	8	110	0.23	18	4900		5238		5385		5462		2.9	5-7-12
			145	0.40	26	6058		6538		6751		6863			6-9-13
			180	0.62	31	7141		7759		8037		8188			8-10-15
			215	0.88	34	8166		8917		9262		9451			9-11-16
10	A1	8	55	0.19	15	3638	2.20	3911	8.90	4028	5.30	4088	9.50	4.6	4-5-9
			70	0.30	15	4342		4724		4890		4975			4-7-10
			85	0.44	16	4988		5482		5699		5811			5-8-11
			100	0.61	20	5591		6197		6464		6606			6-9-12
	A2	8	90	0.20	15	4780		5172		5343		5431		3.7	5-7-11
			120	0.35	22	5906		6475		6726		6858			6-9-13
			150	0.55	28	6931		7674		8008		8187			8-10-15
			180	0.79	32	7893		8804		9221		9448			9-11-16
	A3	8	130	0.22	22	5737		6183		6378		6479		2.9	5-8-13
			170	0.38	29	7036		7659		7935		8082			7-10-14
			210	0.58	34	8250		9045		9406		9600			8-11-16
			250	0.81	36	9402		10359		10804		11047			10-12-17

Note: Reference page U38 for operational conditions used for performance notes

CBLE-12 / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	A1	5	26	0.22	15	2894	0.96	3118	3.84	3218	8.65	3269	1.06	4.6	3-4-6
			32	0.34	15	3272		3578		3713		3783			3-5-7
			38	0.47	19	3597		3986		4159		4249			4-5-8
			44	0.64	23	3879		4352		4565		4676			4-6-8
	A2	6	36	0.14	15	2914		3173		3287		3346		3.7	3-4-7
			48	0.25	17	3397		3788		3961		4052			4-6-8
			60	0.39	23	3781		4306		4542		4665			5-7-9
			72	0.56	28	4083		4741		5037		5195			6-7-10
	A3	8	55	0.15	15	2879		3205		3347		3421		2.9	3-5-8
			75	0.28	15	3309		3801		4023		4138			5-7-10
			95	0.45	18	3607		4267		4564		4724			6-8-11
			115	0.66	23	3807		4634		5012		5216			7-8-12
6	A1	6	30	0.15	15	3582	1.38	3865	5.54	3991	1.62	4053	2.87	4.6	2-4-7
			40	0.26	15	4269		4710		4901		4998			3-5-8
			50	0.41	19	4830		5436		5696		5831			4-6-9
			60	0.58	24	5299		6066		6403		6580			5-7-10
	A2	6	55	0.18	19	4260		4761		4976		5086		3.7	4-5-9
			70	0.29	25	4807		5503		5803		5961			5-7-10
			85	0.43	30	5238		6128		6523		6732			6-8-11
			100	0.60	35	5582		6672		7157		7417			7-9-12
	A3	8	85	0.21	15	4181		4810		5080		5221		2.9	4-6-10
			110	0.35	20	4634		5506		5894		6100			6-8-12
			135	0.53	25	4952		6075		6576		6843			7-9-13
			160	0.74	30	5153		6518		7137		7472			8-10-14
8	A1	6	40	0.16	15	4621	1.83	5077	7.30	5273	3.90	5371	6.93	4.6	3-4-8
			53	0.27	19	5445		6135		6432		6582			4-6-9
			66	0.42	25	6105		7036		7442		7650			5-7-10
			79	0.61	30	6645		7819		8335		8605			6-8-11
	A2	8	70	0.18	15	5284		6021		6340		6501		3.7	4-6-10
			95	0.33	17	6108		7213		7697		7950			5-8-12
			120	0.53	23	6677		8154		8811		9161			7-9-13
			145	0.77	28	7093		8931		9760		10212			8-10-14
	A3	8	110	0.23	18	5190		6128		6538		6750		2.9	5-7-12
			145	0.40	26	5729		7061		7651		7965			6-9-13
			180	0.62	31	6057		7773		8546		8966			8-10-15
			215	0.88	34	6225		8311		9270		9795			9-11-16
10	A1	8	55	0.19	15	5895	2.23	6653	8.91	6978	5.53	7145	9.47	4.6	4-5-9
			70	0.30	15	6703		7764		8225		8461			4-7-10
			85	0.44	16	7350		8721		9323		9635			5-8-11
			100	0.61	20	7874		9557		10301		10694			6-9-12
	A2	8	90	0.20	15	6387		7477		7951		8195		3.7	5-7-11
			120	0.35	22	7218		8801		9498		9865			6-9-13
			150	0.55	28	7769		9833		10760		11258			8-10-15
			180	0.79	32	8147		10676		11834		12466			9-11-16
	A3	8	130	0.22	22	5986		7222		7764		8044		2.9	5-8-13
			170	0.38	29	6530		8260		9028		9437			7-10-14
			210	0.58	34	6841		9048		10051		10591			8-11-16
			250	0.81	36	6978		9638		10873		11548			10-12-17

Note: Reference page U38 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2015
2. ΔP_s values are measured in inches of water
3. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
4. Throw values are based on isothermal supply air and represent throw distances to terminal velocities of 150, 100 and 50 fpm respectively
5. ΔP_{Coil} values are measured in feet of water. ΔP_{Coil} values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit coil.
6. Induction ratio is multiplied by the volume flow rate of primary air to estimate the volume flow rate of room air entrained through the coil

Cooling performance:

- Cooling capacity listed (qTOTAL) is the total sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air.
- Capacity is based on 18°F ΔT between the induced air and the chilled water supply. Table 1 provides correction factors for other temperature differentials.
- Primary air sensible cooling contribution can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{ROOM} - T_{PA})$$

- Primary air latent cooling can be calculated by the following equation:

$$q_{LATENT} = 0.69 \times CFM_{PA} \times (W_{ROOM} - W_{PA})$$

where W_{ROOM} and W_{PA} are the humidity ratio of the room and primary air respectively expressed in Grains of moisture per pound dry air

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	**18**	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	**1.00**	1.11	1.22	1.33

Heating performance:

- Heating capacity listed (qTOTAL) is the sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air
- Capacity is based on 50°F ΔT between the induced air and the chilled water supply. Table 2 provides correction factors for other temperature differentials.
- Primary air sensible heating offset (or contribution) can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{PA} - T_{ROOM})$$

if the primary air temperature is lower than that of the room, it will offset the coil's heating

if the primary air temperature is higher than that of the room, it will contribute to the coil's heating

TABLE 2: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	20	30	40	50	60	70	80	90	100	110	120
Multiply Table Value by:	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40

Legend:

ΔP_S = Unit Inlet Pressure [in wg]

qCoil = Sensible Capacity, Coil [Btu/h]

ΔCoil = Water coil pressure drop [ft wg]

q_{SENSPA} = Sensible Capacity, Primary Air [Btu/h]

CFM_{PA} = Air Flowrate, Primary Air [CFM]

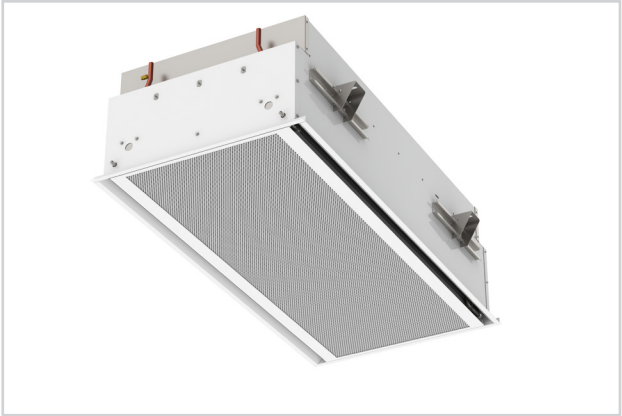
T_{PA} = Temperature Primary Air [°F]

T_{ROOM} = Temperature Room Air [°F]

q_{SENSPA} = Latent Capacity, Primary Air [Btu/h]

CBLV

- Active linear chilled beam with 2-way air distribution patterns
- Optimized nozzle design provides high capacity and low noise levels
- Linear design matching commercial architectural styling
- Designed to fit in standard 24-inch ceiling systems
- Vertical Coil configuration
- Optimized diffuser geometry maximizes occupant comfort



CBLV

dual-function | k-12 education | universities | energy solutions

See website for Specifications

MODEL:

CBLV

FINISHES:

Standard Finish - #26 White
Optional Finish - #84 Black

OVERVIEW

Titus active chilled beams features the aerodynamic properties of Titus ceiling diffusers and benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being discharged through a series of nozzles located along the length of the beam. The nozzles inject the primary air into the mixing chamber at velocities capable of inducing room air through two coils and where it mixes with the primary supply air. This mixture of air is then discharged into the space through the ceiling slot diffusers. This provides high cooling outputs with low amounts of primary air. The reduced volume of air results in the reduction of the air handler capacity and size, smaller duct sizes, and the overall energy consumption.

The supplied air from the air handling unit is tempered and dehumidified to handle the latent load. The remaining loads in the space are addressed with the heat exchanger which is incorporated into the chilled beam. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

The CBLV's are offered for both, cooling and heating, and lengths from 2 to 10 ft. They can be easily integrated into different grids styles within a suspended ceiling or even in drywall ceilings.

ADVANTAGES

- Removal of high thermal loads is possible in this air/water system
- The size of the air duct system is reduced to a minimum, due to the low supply of primary air
- Substantial reduction in the operating costs, due to low primary air volume
- Improvement of the thermal comfort inside the room
- Suitable for several standard ceiling grids
- Contributing sound levels below NC-30

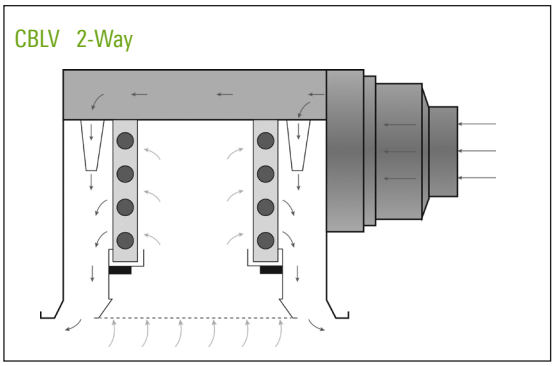
CBLV STANDARD FEATURES

- 2-way air distribution patterns
- 2 foot to 10 foot lengths, 1 foot increments
- Perforated or linear bar induced air grille
- Left hand or right hand coil connections
- Side or top air inlet locations
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Hinged induced air grille for roomside coil access
- Commissioning port with roomside access for balancing
- Mounting brackets with adjustments in two directions
- Durable powder coat finish
- ½" Sweat water coil connections
- Coil air vent
- Condensate tray with drain connection for field plumbing

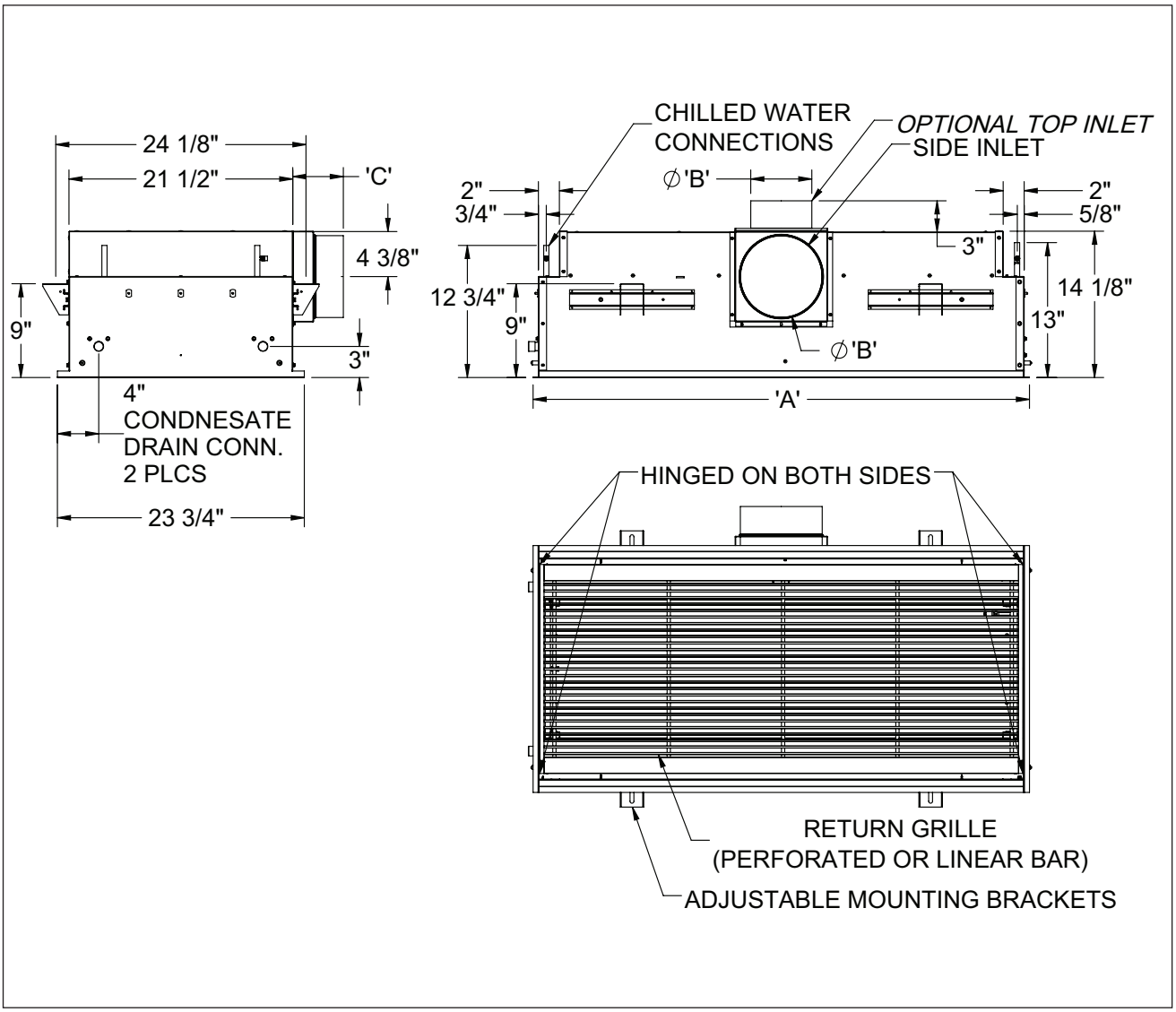
OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" or ¾ MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Lay-in, narrow tee and drop face border types
- Coil lint screen
- Constant volume regulator

CBLV 2-Way



CBLV UNIT DIMENSIONS



Nominal Unit Length (ft)	'A' (IN)
2	23¾
3	35¾
4	47¾
5	59¾
6	71¾
7	83¾
8	95¾
9	107¾
10	119¾

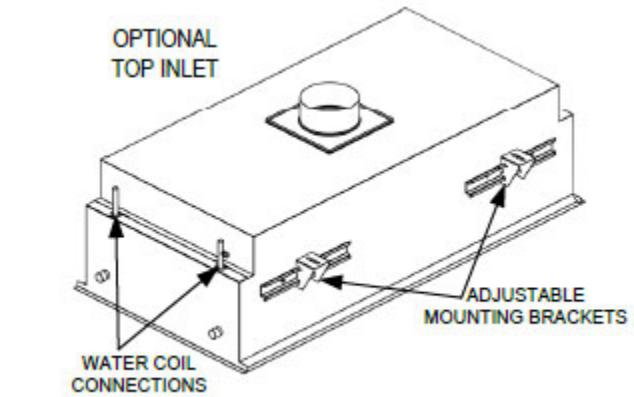
Nominal Unit Length (ft)	'B' (IN)	'C' (IN)*
4	3 7/8	7
5	4 7/8	5
6	5 7/8	5
8	7 7/8	5

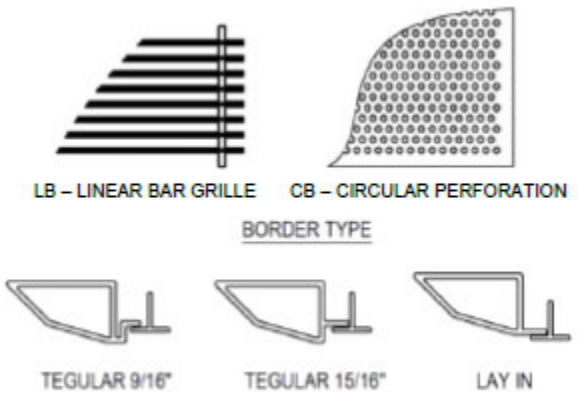
*Side Inlet Only

Integrated ¼" pressure port for balancing/commissioning accessable from roomside opposite coil connection

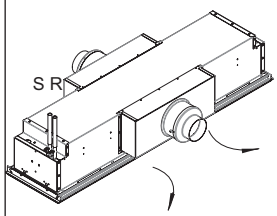
All dimensions are in inches

CBLV UNIT OPTION DETAILS

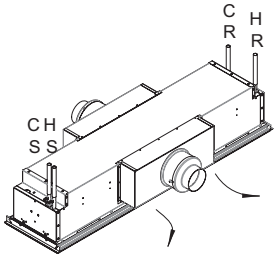




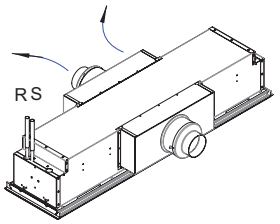
CBLV INLET, DISCHARGE AND PIPING CONFIGURATION



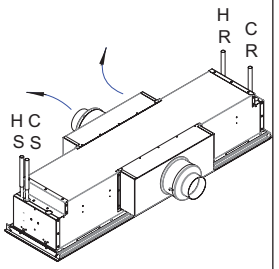
SIDE INLET
1 WAY, 2-PIPE
LEFT HAND
AIR FLOW FRONT
(RIGHT HAND
AIR FLOW BACK)



SIDE INLET
1 WAY, 4-PIPE
LEFT HAND
AIR FLOW FRONT
(RIGHT HAND
AIR FLOW BACK)



SIDE INLET
1 WAY, 2-PIPE
LEFT HAND
AIR FLOW BACK
(RIGHT HAND
AIR FLOW FRONT)



SIDE INLET
1 WAY, 4-PIPE
LEFT HAND
AIR FLOW BACK
(RIGHT HAND
AIR FLOW FRONT)

CBLV / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	5	12	0.18	15	619	0.35	674	1.39	694	3.13	704	5.56	4.2	0 - 0 - 2
			18	0.41	23	831		938		979		1000			0 - 1 - 4
			24	0.73	30	1000		1164		1230		1266			1 - 2 - 7
	B2	6	20	0.20	15	1082		1203		1248		1272		3.7	0 - 1 - 3
			30	0.44	24	1426		1650		1740		1788			1 - 2 - 7
			40	0.78	30	1687		2022		2163		2241			1 - 3 - 12
	B3	8	40	0.22	15	1456		1646		1719		1758		2.7	1 - 2 - 10
			60	0.49	15	1881		2224		2366		2444			2 - 6 - 15
			80	0.87	21	2195		2697		2915		3037			4 - 10 - 17
	B4	8	70	0.21	15	1875		2215		2356		2432		1.9	2 - 4 - 13
			105	0.48	19	2318		2893		3147		3292			4 - 8 - 17
			140	0.86	25	2626		3421		3795		4011			7 - 13 - 19
6	B1	6	20	0.20	15	942	0.51	1068	2.04	1117	4.59	1142	8.16	4.2	0 - 1 - 3
			30	0.44	23	1212		1454		1549		1601			1 - 1 - 6
			40	0.78	30	1429		1776		1925		2007			1 - 3 - 10
	B2	6	30	0.17	18	1500		1737		1827		1875		3.7	1 - 1 - 5
			45	0.39	27	1934		2351		2524		2619			1 - 3 - 11
			60	0.69	33	2238		2842		3108		3257			2 - 5 - 16
	B3	8	60	0.19	15	1993		2368		2511		2588		2.7	1 - 3 - 12
			90	0.43	17	2514		3140		3410		3559			3 - 7 - 18
			120	0.77	24	2866		3752		4157		4390			5 - 12 - 21
	B4	8	105	0.20	15	2506		3126		3394		3542		1.9	2 - 6 - 17
			160	0.46	22	3034		4034		4514		4793			6 - 13 - 22
			215	0.83	29	3300		4700		5391		5807			10 - 18 - 25
8	B1	8	25	0.16	15	1123	0.67	1305	2.68	1377	6.03	1415	1.37	4.2	0 - 1 - 3
			40	0.41	15	1483		1845		1998		2082			1 - 2 - 7
			55	0.78	16	1725		2267		2512		2652			1 - 3 - 13
	B2	8	40	0.16	15	1863		2225		2372		2451		3.7	1 - 1 - 6
			60	0.36	15	2330		2963		3238		3391			1 - 3 - 12
			80	0.65	19	2641		3538		3953		4192			2 - 6 - 18
	B3	8	80	0.18	15	2459		3015		3244		3371		2.7	2 - 3 - 14
			120	0.41	20	2989		3926		4350		4591			3 - 8 - 21
			160	0.72	26	3240		4626		5251		5616			6 - 14 - 24
	B4	8	145	0.21	16	3047		3998		4439		4691		1.9	3 - 7 - 21
			215	0.45	25	3360		4958		5696		6137			7 - 15 - 25
			285	0.79	31	3660		5641		6661		7294			12 - 20 - 29

Note: Reference page U47 for operational conditions used for performance notes

CBLV / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	5	12	0.18	15	1377	0.11	1498	0.45	1541	1.00	1565	1.79	4.2	0 - 0 - 2
			18	0.41	23	1847		2084		2175		2223			0 - 1 - 4
			24	0.73	30	2223		2586		2734		2813			1 - 2 - 7
	B2	6	20	0.20	15	2405		2673		2773		2827		3.7	0 - 1 - 3
			30	0.44	24	3170		3666		3866		3974			1 - 2 - 7
			40	0.78	30	3749		4494		4807		4979			1 - 3 - 12
	B3	8	40	0.22	15	3236		3657		3820		3907		2.7	1 - 2 - 10
			60	0.49	15	4180		4943		5259		5430			2 - 6 - 15
			80	0.87	21	4878		5994		6478		6750			4 - 10 - 17
	B4	8	70	0.21	15	4166		4922		5235		5405		1.9	2 - 4 - 13
			105	0.48	19	5151		6430		6994		7315			4 - 8 - 17
			140	0.86	25	5836		7602		8433		8913			7 - 13 - 19
6	B1	6	20	0.20	15	2094	0.15	2374	0.62	2483	1.39	2538	2.48	4.2	0 - 1 - 3
			30	0.44	23	2694		3230		3443		3559			1 - 1 - 6
			40	0.78	30	3174		3946		4278		4461			1 - 3 - 10
	B2	6	30	0.17	18	3333		3859		4060		4166		3.7	1 - 1 - 5
			45	0.39	27	4298		5224		5609		5819			1 - 3 - 11
			60	0.69	33	4972		6315		6906		7238			2 - 5 - 16
	B3	8	60	0.19	15	4428		5262		5579		5751		2.7	1 - 3 - 12
			90	0.43	17	5588		6977		7577		7909			3 - 7 - 18
			120	0.77	24	6368		8338		9238		9755			5 - 12 - 21
	B4	8	105	0.20	15	5569		6948		7542		7871		1.9	2 - 6 - 17
			160	0.46	22	6698		8965		10031		10652			6 - 13 - 22
			215	0.83	29	7407		10445		11979		12903			10 - 18 - 25
8	B1	8	25	0.16	15	2495	0.20	2900	0.80	3060	1.80	3145	3.21	4.2	0 - 1 - 3
			40	0.41	15	3296		4100		4439		4627			1 - 2 - 7
			55	0.78	16	3834		5038		5583		5893			1 - 3 - 13
	B2	8	40	0.16	15	4140		4944		5271		5447		3.7	1 - 1 - 6
			60	0.36	15	5178		6584		7195		7537			1 - 3 - 12
			80	0.65	19	5870		7862		8785		9315			2 - 6 - 18
	B3	8	80	0.18	15	5464		6699		7210		7490		2.7	2 - 3 - 14
			120	0.41	20	6641		8724		9666		10202			3 - 8 - 21
			160	0.72	26	7412		10280		11668		12481			6 - 14 - 24
	B4	8	145	0.21	16	6728		8884		9865		10425		1.9	3 - 7 - 21
			215	0.45	25	7736		11017		12659		13639			7 - 15 - 25
			285	0.79	31	8331		12535		14803		16209			12 - 20 - 29

Note: Reference page U47 for operational conditions used for performance notes

CBLV / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	5	12	0.18	15	661	0.47	719	1.88	740	4.23	751	7.52	4.2	0 - 0 - 2
			18	0.41	23	887		1000		1044		1067			0 - 1 - 4
			24	0.73	30	1067		1241		1312		1350			1 - 2 - 7
	B2	6	20	0.20	15	1154		1283		1331		1357		3.7	0 - 1 - 3
			30	0.44	24	1521		1760		1856		1907			1 - 2 - 7
			40	0.78	30	1800		2157		2307		2390			1 - 3 - 12
	B3	8	40	0.22	15	1553		1755		1834		1875		2.7	1 - 2 - 10
			60	0.49	15	2006		2372		2524		2607			2 - 6 - 15
			80	0.87	21	2342		2877		3110		3240			4 - 10 - 17
	B4	8	70	0.21	15	1999		2363		2513		2594		1.9	2 - 4 - 13
			105	0.48	19	2473		3086		3357		3511			4 - 8 - 17
			140	0.86	25	2801		3649		4048		4278			7 - 13 - 19
6	B1	6	20	0.20	15	1005	0.68	1140	2.73	1192	6.14	1218	1.39	4.2	0 - 1 - 3
			30	0.44	23	1293		1551		1653		1708			1 - 1 - 6
			40	0.78	30	1524		1894		2053		2141			1 - 3 - 10
	B2	6	30	0.17	18	1600		1852		1949		2000		3.7	1 - 1 - 5
			45	0.39	27	2063		2507		2692		2793			1 - 3 - 11
			60	0.69	33	2387		3031		3315		3474			2 - 5 - 16
	B3	8	60	0.19	15	2126		2526		2678		2761		2.7	1 - 3 - 12
			90	0.43	17	2682		3349		3637		3796			3 - 7 - 18
			120	0.77	24	3045		4002		4434		4682			5 - 12 - 21
	B4	8	105	0.20	15	2673		3335		3620		3778		1.9	2 - 6 - 17
			160	0.46	22	3224		4303		4815		5113			6 - 13 - 22
			215	0.83	29	3506		5014		5750		6194			10 - 18 - 25
8	B1	8	25	0.16	15	1198	0.90	1392	3.58	1469	8.06	1510	1.83	4.2	0 - 1 - 3
			40	0.41	15	1582		1968		2131		2221			1 - 2 - 7
			55	0.78	16	1840		2418		2680		2828			1 - 3 - 13
	B2	8	40	0.16	15	1987		2373		2530		2614		3.7	1 - 1 - 6
			60	0.36	15	2485		3160		3454		3618			1 - 3 - 12
			80	0.65	19	2817		3774		4217		4471			2 - 6 - 18
	B3	8	80	0.18	15	2623		3216		3461		3595		2.7	2 - 3 - 14
			120	0.41	20	3175		4188		4640		4897			3 - 8 - 21
			160	0.72	26	3443		4934		5601		5991			6 - 14 - 24
	B4	8	145	0.21	16	3237		4264		4735		5004		1.9	3 - 7 - 21
			215	0.45	25	3570		5288		6076		6547			7 - 15 - 25
			285	0.79	31	3889		6000		7105		7780			12 - 20 - 29

Note: Reference page U47 for operational conditions used for performance notes

CBLV / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
4	B1	5	12	0.18	15	1835	0.47	1998	1.88	2055	4.23	2087	7.52	4.2	0 - 0 - 2
			18	0.41	23	2463		2778		2900		2964			0 - 1 - 4
			24	0.73	30	2964		3448		3645		3751			1 - 2 - 7
	B2	6	20	0.20	15	3206		3564		3697		3769		3.7	0 - 1 - 3
			30	0.44	24	4226		4888		5154		5298			1 - 2 - 7
			40	0.78	30	4999		5992		6409		6639			1 - 3 - 12
	B3	8	40	0.22	15	4315		4876		5093		5209		2.7	1 - 2 - 10
			60	0.49	15	5573		6590		7012		7240			2 - 6 - 15
			80	0.87	21	6505		7992		8638		9000			4 - 10 - 17
	B4	8	70	0.21	15	5554		6563		6981		7207		1.9	2 - 4 - 13
			105	0.48	19	6868		8573		9325		9753			4 - 8 - 17
			140	0.86	25	7782		10137		11244		11884			7 - 13 - 19
6	B1	6	20	0.20	15	2791	0.68	3166	2.73	3310	6.14	3385	1.39	4.2	0 - 1 - 3
			30	0.44	23	3592		4307		4591		4745			1 - 1 - 6
			40	0.78	30	4233		5261		5704		5948			1 - 3 - 10
	B2	6	30	0.17	18	4444		5145		5413		5555		3.7	1 - 1 - 5
			45	0.39	27	5730		6965		7478		7759			1 - 3 - 11
			60	0.69	33	6630		8420		9208		9650			2 - 5 - 16
	B3	8	60	0.19	15	5904		7016		7439		7668		2.7	1 - 3 - 12
			90	0.43	17	7450		9303		10103		10546			3 - 7 - 18
			120	0.77	24	8491		11117		12318		13007			5 - 12 - 21
	B4	8	105	0.20	15	7426		9263		10056		10495		1.9	2 - 6 - 17
			160	0.46	22	8931		11953		13375		14203			6 - 13 - 22
			215	0.83	29	9876		13927		15972		17204			10 - 18 - 25
8	B1	8	25	0.16	15	3326	0.90	3867	3.58	4080	8.06	4193	1.83	4.2	0 - 1 - 3
			40	0.41	15	4395		5467		5919		6170			1 - 2 - 7
			55	0.78	16	5112		6717		7444		7857			1 - 3 - 13
	B2	8	40	0.16	15	5520		6592		7027		7262		3.7	1 - 1 - 6
			60	0.36	15	6904		8778		9594		10049			1 - 3 - 12
			80	0.65	19	7826		10483		11713		12420			2 - 6 - 18
	B3	8	80	0.18	15	7286		8932		9613		9987		2.7	2 - 3 - 14
			120	0.41	20	8855		11632		12888		13603			3 - 8 - 21
			160	0.72	26	9882		13706		15557		16641			6 - 14 - 24
	B4	8	145	0.21	16	8970		11846		13154		13900		1.9	3 - 7 - 21
			215	0.45	25	10315		14689		16878		18185			7 - 15 - 25
			285	0.79	31	11108		16713		19737		21612			12 - 20 - 29

Note: Reference page U47 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2015
2. ΔP_s values are measured in inches of water
3. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
4. Throw values are based on isothermal supply air and represent throw distances to terminal velocities of 150, 100 and 50 fpm respectively
5. ΔP_{Coil} values are measured in feet of water. ΔP_{Coil} values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit coil.
6. Induction ratio is multiplied by the volume flow rate of primary air to estimate the volume flow rate of room air entrained through the coil

Cooling performance:

- Cooling capacity listed (qTOTAL) is the total sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air.

- Capacity is based on 18°F ΔT between the induced air and the chilled water supply. Table 1 provides correction factors for other temperature differentials.

- Primary air sensible cooling contribution can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{ROOM} - T_{PA})$$

- Primary air latent cooling can be calculated by the following equation:

$$q_{LATENT} = 0.69 \times CFM_{PA} \times (W_{ROOM} - W_{PA})$$

where W_{ROOM} and W_{PA} are the humidity ratio of the room and primary air respectively expressed in Grains of moisture per pound dry air

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	**18**	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	**1.00**	1.11	1.22	1.33

Heating performance:

- Heating capacity listed (qTOTAL) is the sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air

- Capacity is based on 50°F ΔT between the induced air and the chilled water supply. Table 2 provides correction factors for other temperature differentials.

- Primary air sensible heating offset (or contribution) can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{PA} - T_{ROOM})$$

if the primary air temperature is lower than that of the room, it will offset the coil's heating

if the primary air temperature is higher than that of the room, it will contribute to the coil's heating

TABLE 2: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	20	30	40	**50**	60	70	80	90	100	110	120
Multiply Table Value by:	0.40	0.60	0.80	**1.00**	1.20	1.40	1.60	1.80	2.00	2.20	2.40

Legend:

ΔP_S = Unit Inlet Pressure [in wg]

qCoil = Sensible Capacity, Coil [Btu/h]

ΔCoil = Water coil pressure drop [ft wg]

q_{SENSPA} = Sensible Capacity, Primary Air [Btu/h]

CFM_{PA} = Air Flowrate, Primary Air [CFM]

T_{PA} = Temperature Primary Air [°F]

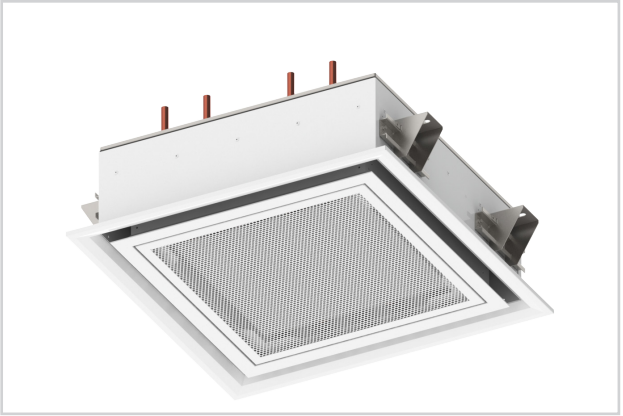
T_{ROOM} = Temperature Room Air [°F]

q_{SENSPA} = Latent Capacity, Primary Air [Btu/h]

Modular Active Chilled Beams

CBAM

- Active modular chilled beam with 4-way air distribution pattern
- Optimized nozzle design provides high capacity and low noise levels
- Modular design matching commercial architectural styling
- Designed to fit in standard 24 inch ceiling systems
- Optimized diffuser geometry maximizes occupant comfort



CBAM

dual-function | healthcare | k-12 education | universities | wood grains | energy solutions

See website for Specifications

MODEL:

CBAM: 24" x 24" / 48" x 24" module sizes

FINISHES:

Standard Finish - #26 White
Optional Finish - #84 Black

OVERVIEW

Titus active chilled beams features the aerodynamic properties of Titus ceiling diffusers and benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being discharged through a series of nozzles located along the perimeter of the beam. The nozzles inject the primary air into the mixing chamber at velocities capable of inducing room air through the water coil and where it mixes with the primary supply air. This mixture of air is then discharged into the space through the ceiling slot diffusers. This provides high cooling outputs with low amounts of primary air. The reduced volume of air results in the reduction of the air handler capacity and size, smaller duct sizes, and the overall energy consumption.

The supplied air from the air handling unit is tempered and dehumidified to handle the latent load. The remaining loads in the space are addressed with the heat exchanger which is incorporated into the chilled beam. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

The CBAM's are offered for both, cooling and heating, and in 24" x 24" and 48" x 24" module sizes. They can be easily integrated into different grids styles within a suspended ceiling or even in drywall ceilings. The low overall height of the CBAM product line is ideal for reducing the space required for false ceiling in any application.

ADVANTAGES

- Removal of high thermal loads is possible in this air/water system
- The size of the air duct system is reduced to a minimum, due to the low supply of primary air
- Substantial reduction in the operating costs, due to low primary air volume
- Improvement of the thermal comfort inside the room
- Suitable for several standard ceiling grids
- Contributing sound levels below NC-30

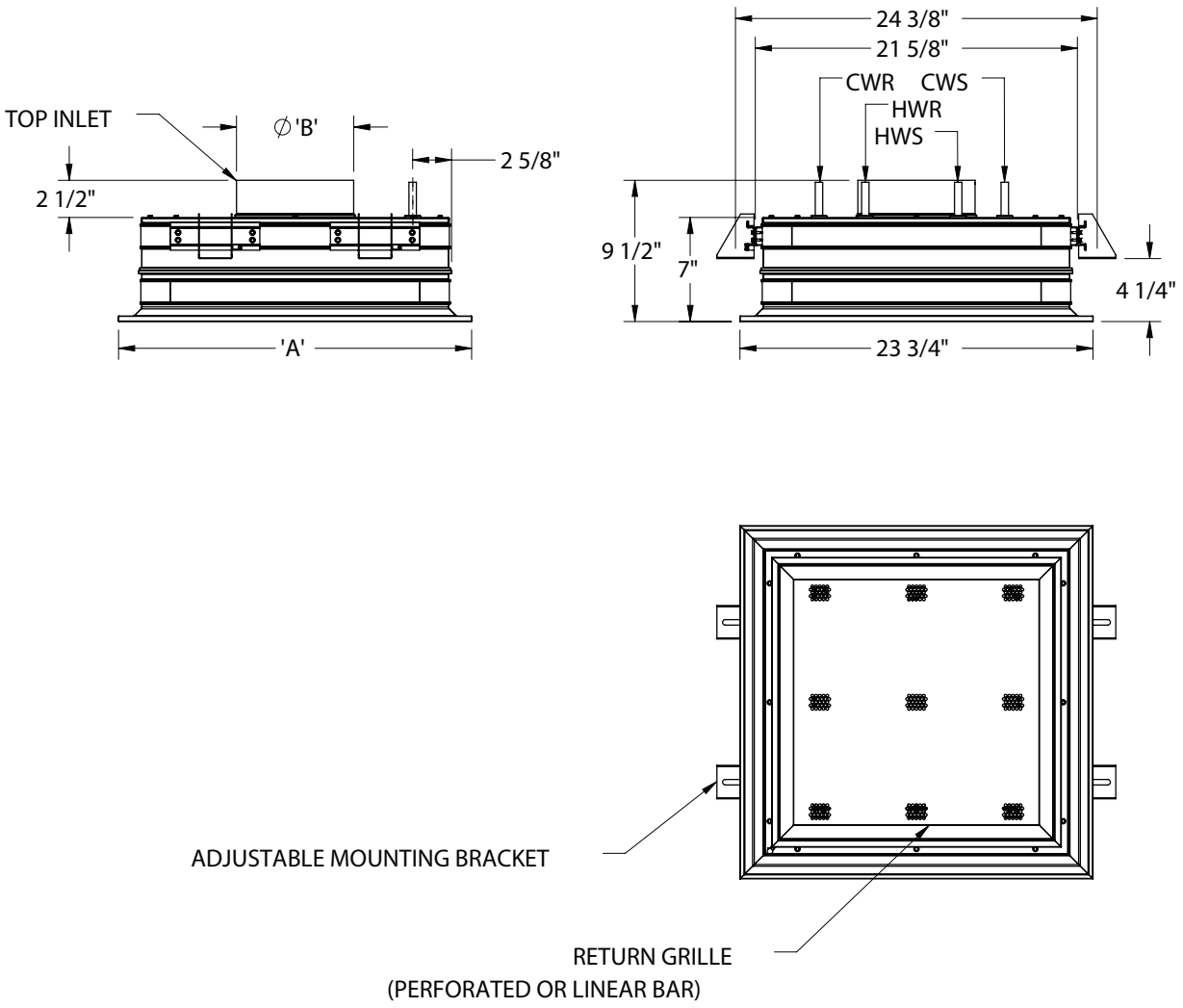
CBAM STANDARD FEATURES

- 4-way way air distribution pattern
- 24-inch and 48 inch lengths
- 24-inch width
- Perforated or linear bar induced air grille
- Top or side coil connections
- Top or side air inlet locations
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Removable induced air grille for roomside coil access
- Commissioning port with roomside access for balancing
- Mounting brackets with adjustments in two directions
- Durable powder coat finish
- ½" Sweat water coil connections
- Coil air vent

OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" or ¾ MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Lay-in, narrow tee and drop face border types
- Coil lint screen
- Constant volume regulator

CBAM UNIT DIMENSIONS / TOP INLET



Module Size (IN)	'A' Dimension
24 x 24	23¾
24 x 48	47¾

Nominal Inlet Diameter (IN)	'B' Dimension
5	4 7/8
6	5 7/8
8	7 7/8

All dimensions are in inches

CBAM / 4-PIPE COOLING

Nominal Size, L x W (ft)	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		
2 x 2	B1	4	11	0.21	15	545	0.50	617	2.00	634	4.40	648	5.70	5.9	0 - 0 - 2
			16	0.45	16	718		822		846		854			0 - 1 - 3
			21	0.77	25	910		1091		1122		1154			1 - 1 - 6
	B2	4	18	0.22	15	710		806		829		837		3.5	0 - 1 - 3
			24	0.39	22	899		1059		1090		1113			1 - 1 - 5
			30	0.61	28	1061		1242		1290		1315			1 - 2 - 8
	B3	5	30	0.17	15	828		957		986		999		2.2	1 - 1 - 5
			45	0.39	24	1126		1296		1353		1372			1 - 3 - 9
			60	0.69	32	1338		1532		1617		1610			2 - 5 - 12
	B4	6	55	0.18	15	1065		1261		1304		1335		1.5	1 - 3 - 9
			85	0.44	28	1383		1583		1670		1667			3 - 6 - 13
			115	0.78	24	1538		1720		1820		1824			5 - 9 - 16
4 x 2	B1	4	18	0.19	15	825	1.00	966	3.90	995	8.70	1001	11.20	6.9	0 - 1 - 3
			27	0.44	23	1190		1432		1514		1556			1 - 2 - 6
			36	0.78	32	1451		1788		1889		1930			1 - 3 - 11
	B2	5	25	0.15	15	962		1132		1170		1177		3.9	0 - 1 - 4
			40	0.38	23	1434		1749		1851		1899			1 - 2 - 10
			55	0.71	32	1727		2162		2305		2336			2 - 5 - 14
	B3	6	50	0.17	15	1357		1638		1737		1788		2.6	1 - 2 - 9
			75	0.37	26	1731		2162		2303		2336			2 - 5 - 15
			100	0.66	34	2108		2805		3012		3112			4 - 9 - 19
	B4	8	90	0.18	15	1642		2027		2143		2188		1.8	2 - 5 - 14
			135	0.39	20	2119		2799		3003		3096			5 - 11 - 20
			180	0.70	28	2462		3224		3545		3627			9 - 14 - 23

CBAM / 4-PIPE HEATING

Nominal Size, L x W (ft)	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		
2 x 2	B1	4	11	0.21	15	1050	0.08	1189	0.33	1222	0.74	1247	0.96	5.9	0 - 0 - 2
			16	0.45	16	1384		1583		1630		1644			0 - 1 - 3
			21	0.77	25	1753		2100		2162		2222			1 - 1 - 6
	B2	4	18	0.22	15	1367		1553		1597		1612		3.3	0 - 1 - 3
			24	0.39	22	1731		2040		2100		2144			1 - 1 - 5
			30	0.61	28	2044		2393		2485		2533			1 - 2 - 8
	B3	5	30	0.17	15	1595		1844		1899		1923		2.2	1 - 1 - 5
			45	0.39	24	2169		2496		2607		2642			1 - 3 - 9
			60	0.69	32	2577		2951		3114		3102			2 - 5 - 12
	B4	6	55	0.18	15	2051		2429		2512		2572		1.5	1 - 3 - 9
			85	0.44	28	2664		3049		3215		3211			3 - 6 - 13
			115	0.78	24	2963		3313		3505		3512			5 - 9 - 16
4 x 2	B1	4	18	0.19	15	1589	0.17	1860	0.68	1917	1.52	1928	1.96	6.9	0 - 1 - 3
			27	0.44	23	2292		2758		2916		2998			1 - 2 - 6
			36	0.78	32	2794		3444		3638		3718			1 - 3 - 11
	B2	5	25	0.15	15	1852		2181		2253		2267		3.9	0 - 1 - 4
			40	0.38	23	2761		3368		3564		3657			1 - 2 - 10
			55	0.71	32	3326		4164		4440		4499			2 - 5 - 14
	B3	6	50	0.17	15	2613		3155		3344		3444		2.6	1 - 2 - 9
			75	0.37	26	3334		4165		4435		4499			2 - 5 - 15
			100	0.66	34	4060		5402		5800		5994			4 - 9 - 19
	B4	8	90	0.18	15	3162		3904		4128		4215		1.8	2 - 5 - 14
			135	0.39	20	4080		5391		5784		5963			5 - 11 - 20
			180	0.70	28	4741		6209		6827		6986			9 - 14 - 23

Note: Reference page U53 for operational conditions used for performance notes

CBAM / 2-PIPE COOLING

Nominal Size, L x W (ft)	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H20)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		
2 x 2	B1	4	11	0.21	15	582	0.60	658	2.40	677	5.40	691	6.90	5.9	0 - 0 - 2
			16	0.45	16	766		877		903		910			0 - 1 - 3
			21	0.77	25	971		1163		1197		1231			1 - 1 - 6
	B2	4	18	0.22	15	757		860		884		893		3.3	0 - 1 - 3
			24	0.39	22	959		1130		1163		1187			1 - 1 - 5
			30	0.61	28	1132		1325		1376		1403			1 - 2 - 8
	B3	5	30	0.17	15	883		1021		1052		1065		2.2	1 - 1 - 5
			45	0.39	24	1201		1382		1444		1463			1 - 3 - 9
			60	0.69	32	1427		1635		1725		1718			2 - 5 - 12
	B4	6	55	0.18	15	1136		1345		1391		1424		1.5	1 - 3 - 9
			85	0.44	28	1475		1688		1781		1779			3 - 6 - 13
			115	0.78	24	1641		1835		1941		1945			5 - 9 - 16
4 x 2	B1	4	18	0.19	15	880	1.20	1030	4.80	1062	10.70	1068	13.70	6.9	0 - 1 - 3
			27	0.44	23	1269		1527		1615		1660			1 - 2 - 6
			36	0.78	32	1547		1907		2015		2059			1 - 3 - 11
	B2	5	25	0.15	15	1026		1208		1248		1255		3.9	0 - 1 - 4
			40	0.38	23	1529		1865		1974		2025			1 - 2 - 10
			55	0.71	32	1842		2306		2459		2492			2 - 5 - 14
	B3	6	50	0.17	15	1447		1747		1852		1907		2.6	1 - 2 - 9
			75	0.37	26	1846		2306		2456		2492			2 - 5 - 15
			100	0.66	34	2249		2992		3212		3320			4 - 9 - 19
	B4	8	90	0.18	15	1751		2162		2286		2334		1.8	2 - 5 - 14
			135	0.39	20	2260		2986		3203		3303			5 - 11 - 20
			180	0.70	28	2626		3439		3781		3869			9 - 14 - 23

CBAM / 2-PIPE HEATING

Nominal Size, L x W (ft)	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H20)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		
2 x 2	B1	4	11	0.21	15	1616	0.60	1829	2.40	1880	5.40	1919	6.94	5.9	0 - 0 - 2
			16	0.45	16	2129		2435		2508		2529			0 - 1 - 3
			21	0.77	25	2696		3231		3326		3419			1 - 1 - 6
	B2	4	18	0.22	15	2103		2389		2456		2481		3.3	0 - 1 - 3
			24	0.39	22	2664		3138		3231		3298			1 - 1 - 5
			30	0.61	28	3144		3681		3823		3898			1 - 2 - 8
	B3	5	30	0.17	15	2454		2836		2921		2959		2.2	1 - 1 - 5
			45	0.39	24	3336		3840		4010		4065			1 - 3 - 9
			60	0.69	32	3965		4540		4791		4772			2 - 5 - 12
	B4	6	55	0.18	15	3155		3737		3864		3957		1.5	1 - 3 - 9
			85	0.44	28	4098		4690		4947		4941			3 - 6 - 13
			115	0.78	24	4558		5097		5393		5403			5 - 9 - 16
4 x 2	B1	4	18	0.19	15	2445	1.19	2862	4.75	2950	10.69	2967	13.73	6.9	0 - 1 - 3
			27	0.44	23	3526		4243		4487		4612			1 - 2 - 6
			36	0.78	32	4298		5298		5597		5719			1 - 3 - 11
	B2	5	25	0.15	15	2849		3355		3465		3487		3.9	0 - 1 - 4
			40	0.38	23	4248		5182		5484		5626			1 - 2 - 10
			55	0.71	32	5117		6406		6830		6922			2 - 5 - 14
	B3	6	50	0.17	15	4019		4854		5145		5298		2.6	1 - 2 - 9
			75	0.37	26	5129		6407		6823		6922			2 - 5 - 15
			100	0.66	34	6246		8311		8924		9221			4 - 9 - 19
	B4	8	90	0.18	15	4864		6006		6351		6484		1.8	2 - 5 - 14
			135	0.39	20	6277		8294		8899		9174			5 - 11 - 20
			180	0.70	28	7294		9552		10502		10748			9 - 14 - 23

Note: Reference page U53 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2015
2. ΔP_s values are measured in inches of water
3. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
4. Throw values are based on isothermal supply air and represent throw distances to terminal velocities of 150, 100 and 50 fpm respectively
5. ΔP_{Coil} values are measured in feet of water. ΔP_{Coil} values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit coil.
6. Induction ratio is multiplied by the volume flow rate of primary air to estimate the volume flow rate of room air entrained through the coil

Cooling performance:

- Cooling capacity listed (qTOTAL) is the total sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air.

- Capacity is based on 18°F ΔT between the induced air and the chilled water supply. Table 1 provides correction factors for other temperature differentials.

- Primary air sensible cooling contribution can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{ROOM} - T_{PA})$$

- Primary air latent cooling can be calculated by the following equation:

$$q_{LATENT} = 0.69 \times CFM_{PA} \times (W_{ROOM} - W_{PA})$$

where W_{ROOM} and W_{PA} are the humidity ratio of the room and primary air respectively expressed in Grains of moisture per pound dry air

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	**18**	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	**1.00**	1.11	1.22	1.33

Heating performance:

- Heating capacity listed (qTOTAL) is the sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air

- Capacity is based on 50°F ΔT between the induced air and the chilled water supply. Table 2 provides correction factors for other temperature differentials.

- Primary air sensible heating offset (or contribution) can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{PA} - T_{ROOM})$$

if the primary air temperature is lower than that of the room, it will offset the coil's heating

if the primary air temperature is higher than that of the room, it will contribute to the coil's heating

TABLE 2: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	20	30	40	**50**	60	70	80	90	100	110	120
Multiply Table Value by:	0.40	0.60	0.80	**1.00**	1.20	1.40	1.60	1.80	2.00	2.20	2.40

Legend:

ΔP_S = Unit Inlet Pressure [in wg]

qCoil = Sensible Capacity, Coil [Btu/h]

ΔCoil = Water coil pressure drop [ft wg]

q_{SENSPA} = Sensible Capacity, Primary Air [Btu/h]

CFM_{PA} = Air Flowrate, Primary Air [CFM]

T_{PA} = Temperature Primary Air [°F]

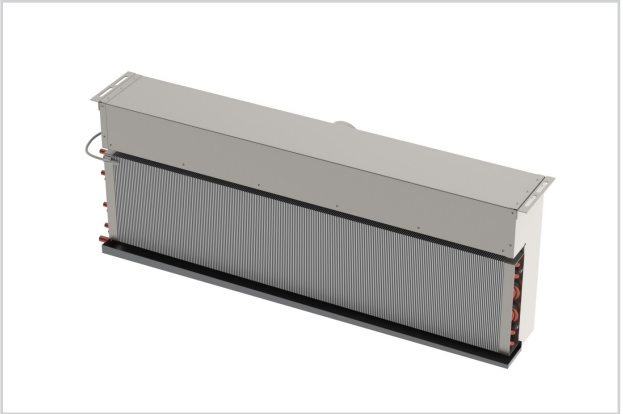
T_{ROOM} = Temperature Room Air [°F]

q_{SENSPA} = Latent Capacity, Primary Air [Btu/h]

Vertical Recessed Active Chilled Beams

CBAV

- Active chilled beam for use in recessed applications
- Optimized nozzle design provides high capacity and low noise levels
- Vertical coil with condensate pan
- Designed to integrate with Titus slot diffusers
- Optimized diffuser geometry maximizes occupant comfort



CBAV

dual-function | k-12 education | universities | energy solutions

See website for Specifications

MODEL:

CBAV: Vertical Recessed Chilled Beam

OVERVIEW

Titus active chilled beams benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being discharged through a series of nozzles located along the length of the beam. The nozzles inject the primary air into the mixing chamber at velocities capable of inducing plenum or soffit air through the water coil and where it mixes with the primary supply air. This mixture of air is then discharged into the space through ceiling slot diffusers. This provides high cooling outputs with low amounts of primary air. The reduced volume of air results in the reduction of the air handler capacity and size, smaller duct sizes, and the overall energy consumption.

The supplied air from the air handling unit is tempered and dehumidified to handle the latent load. The remaining loads in the space are addressed with the heat exchanger which is incorporated into the chilled beam. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

The CBAV's are offered for both, cooling and heating, lengths from 2 to 8 ft. They can be easily integrated with many of Titus' slot diffusers. Units can have single slot diffusers installed directly to the discharge of the chilled beam, or CBAV beams can be located in specific locations above a long run of slot differs creating active and inactive sections.

ADVANTAGES

- Removal of high thermal loads is possible in this air/water system
- The size of the air duct system is reduced to a minimum, due to the low supply of primary air
- Substantial reduction in the operating costs, due to low primary air volume
- Improvement of the thermal comfort inside the room
- Contributing sound levels below NC-30

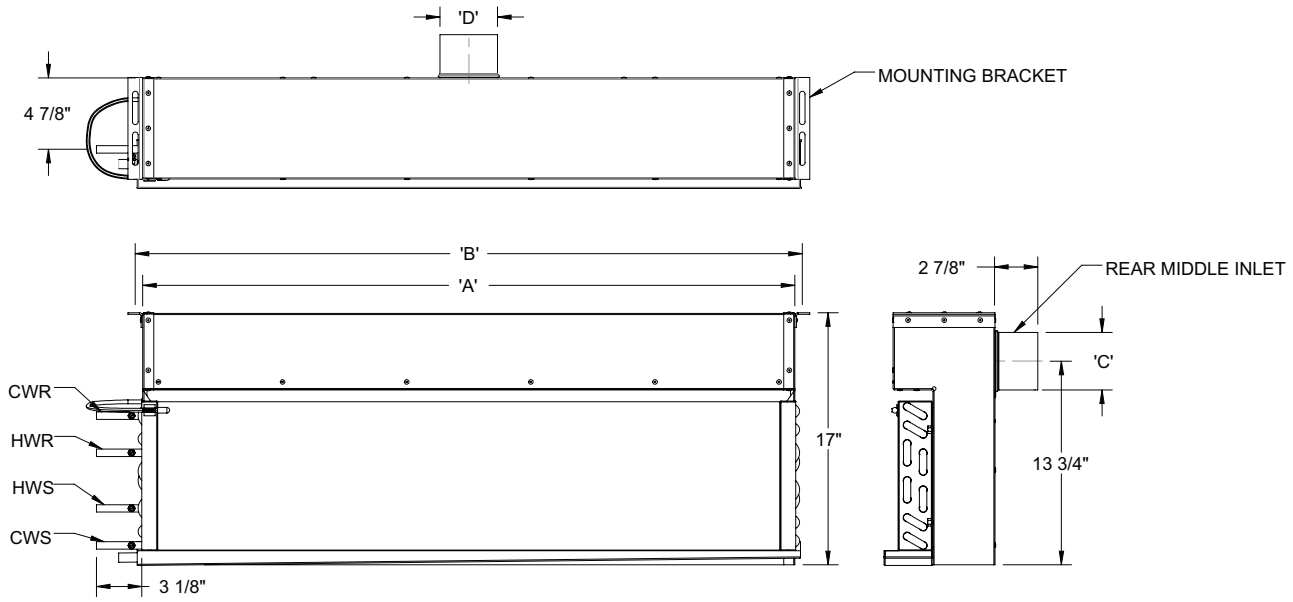
CBAV STANDARD FEATURES

- 2 foot to 8 foot lengths
- Left hand or right hand coil connections
- Rear air inlet locations
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Commissioning port with roomside access for balancing
- Mounting brackets with adjustments in two directions
- ½" Sweat water coil connections
- Coil air vent
- Condensate tray with drain connection for field plumbing

OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses

CBAV UNIT DIMENSIONS



CBAV VERTICAL RECESSED BEAM

Nominal Unit Length (ft)	'A' (IN)	'B' (IN)
2	20	21
3	32	33
4	44	45
6	68	69
8	92	93

Nominal Inlet (IN)	'C' (IN)	'D' (IN)
4 IN Round	3 7/8	-
5 IN Round	4 7/8	-
6 IN Oval	5 1/4	6 1/4
8 IN Oval	5 1/4	9 3/8

All dimensions are in inches

CBAV / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw ft
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		
2	B1	4	3	0.36	15	278	0.40	303	1.60	309	3.50	311	6.20	7.2	0 - 0 - 1
			4	0.64	15	357		392		402		404			0 - 0 - 1
			5	1.00	15	433		479		492		496			0 - 0 - 2
	B2	4	4	0.22	15	312		341		348		350		5.7	0 - 0 - 1
			6	0.49	15	445		491		504		508			0 - 1 - 2
			8	0.87	15	567		632		653		659			0 - 1 - 4
	B3	4	9	0.30	15	554		615		634		639		4.8	0 - 1 - 3
			12	0.54	15	687		780		809		819			1 - 1 - 5
			15	0.84	15	812		936		976		991			1 - 2 - 7
	B4	4	15	0.18	15	642		723		747		756		3.4	0 - 1 - 4
			21	0.35	15	827		953		994		1010			1 - 2 - 7
			27	0.58	21	983		1155		1214		1237			2 - 4 - 9
3	B1	4	5	0.29	15	452	0.60	499	2.20	512	5.00	515	8.80	7.2	0 - 0 - 1
			7	0.57	15	602		675		697		704			0 - 0 - 2
			9	0.94	15	735		837		869		880			0 - 1 - 3
	B2	4	7	0.21	15	528		586		603		607		5.7	0 - 0 - 2
			10	0.42	15	712		805		833		842			0 - 1 - 3
			13	0.72	15	877		1007		1048		1063			1 - 1 - 5
	B3	4	13	0.20	15	778		884		917		928		4.8	0 - 1 - 3
			19	0.43	15	1038		1212		1269		1292			1 - 2 - 7
			25	0.74	21	1250		1497		1583		1618			1 - 3 - 9
	B4	4	25	0.20	15	1010		1173		1226		1246		3.4	1 - 2 - 7
			35	0.39	21	1274		1526		1612		1648			1 - 3 - 10
			45	0.64	28	1487		1828		1952		2006			2 - 5 - 13
4	B1	4	6	0.20	15	542	0.70	601	2.90	617	6.40	622	1.50	7.2	0 - 0 - 1
			9	0.44	15	754		857		888		899			0 - 0 - 2
			12	0.78	15	943		1094		1142		1161			0 - 1 - 3
	B2	4	10	0.20	15	726		820		848		857		5.7	0 - 1 - 2
			14	0.40	15	954		1100		1146		1163			0 - 1 - 4
			18	0.66	16	1152		1355		1421		1448			1 - 2 - 7
	B3	4	18	0.19	15	1028		1194		1246		1266		4.8	0 - 1 - 4
			27	0.42	18	1372		1654		1751		1791			1 - 2 - 9
			36	0.74	26	1640		2044		2191		2257			2 - 4 - 12
	B4	6	30	0.15	15	1196		1406		1474		1502		3.4	1 - 2 - 6
			50	0.41	16	1665		2071		2219		2284			2 - 4 - 12
			70	0.81	26	2003		2604		2841		2951			4 - 9 - 16
6	B1	4	10	0.20	15	732	1.00	832	4.10	854	9.30	865	2.10	7.2	0 - 0 - 1
			14	0.40	15	947		1110		1151		1172			0 - 1 - 3
			18	0.66	16	1136		1363		1427		1459			0 - 1 - 4
	B2	4	16	0.20	15	939		1091		1129		1148		5.7	0 - 1 - 3
			22	0.38	15	1193		1426		1490		1523			1 - 1 - 5
			28	0.62	22	1401		1721		1817		1866			1 - 2 - 9
	B3	6	30	0.20	15	1328		1613		1696		1739		4.8	1 - 2 - 6
			45	0.44	15	1875		2281		2448		2535			2 - 3 - 12
			60	0.79	24	2255		2873		3141		3285			3 - 6 - 16
	B4	6	55	0.21	15	1693		2056		2189		2259		3.4	1 - 3 - 11
			80	0.45	22	2247		2835		3088		3221			3 - 6 - 16
			105	0.77	30	2538		3357		3728		3931			5 - 10 - 20

Note: Reference page U60 for operational conditions used for performance notes

CBAV / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw ft
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		
2	B1	4	3	0.36	15	618	0.08	672	0.34	687	0.76	690	1.36	7.2	0 - 0 - 1
			4	0.64	15	794		872		893		898			0 - 0 - 1
			5	1.00	15	963		1064		1094		1102			0 - 0 - 2
	B2	4	4	0.22	15	694		757		773		778		5.7	0 - 0 - 1
			6	0.49	15	988		1091		1120		1128			0 - 1 - 2
			8	0.87	15	1261		1405		1450		1464			0 - 1 - 4
	B3	4	9	0.30	15	1231		1366		1409		1421		4.8	0 - 1 - 3
			12	0.54	15	1527		1734		1797		1820			1 - 1 - 5
			15	0.84	15	1803		2080		2169		2203			1 - 2 - 7
	B4	4	15	0.18	15	1427		1606		1661		1679		3.4	0 - 1 - 4
			21	0.35	15	1838		2119		2209		2244			1 - 2 - 7
			27	0.58	21	2184		2567		2697		2750			2 - 4 - 9
3	B1	4	5	0.29	15	1003	0.12	1108	0.49	1137	1.10	1145	1.95	7.2	0 - 0 - 1
			7	0.57	15	1337		1501		1548		1563			0 - 0 - 2
			9	0.94	15	1633		1861		1930		1955			0 - 1 - 3
	B2	4	7	0.21	15	1174		1303		1339		1350		5.7	0 - 0 - 2
			10	0.42	15	1583		1789		1851		1872			0 - 1 - 3
			13	0.72	15	1949		2239		2330		2363			1 - 1 - 5
	B3	4	13	0.20	15	1728		1965		2037		2062		4.8	0 - 1 - 3
			19	0.43	15	2307		2694		2821		2870			1 - 2 - 7
			25	0.74	21	2777		3327		3517		3595			1 - 3 - 9
	B4	4	25	0.20	15	2244		2606		2723		2768		3.4	1 - 2 - 7
			35	0.39	21	2832		3390		3582		3662			1 - 3 - 10
			45	0.64	28	3304		4063		4337		4457			2 - 5 - 13
4	B1	4	6	0.20	15	1203	0.16	1335	0.63	1371	1.41	1382	2.51	7.2	0 - 0 - 1
			9	0.44	15	1675		1905		1974		1998			0 - 0 - 2
			12	0.78	15	2095		2432		2539		2580			0 - 1 - 3
	B2	4	10	0.20	15	1614		1822		1883		1905		5.7	0 - 1 - 2
			14	0.40	15	2120		2444		2546		2584			0 - 1 - 4
			18	0.66	16	2559		3010		3158		3217			1 - 2 - 7
	B3	4	18	0.19	15	2286		2653		2769		2814		4.8	0 - 1 - 4
			27	0.42	18	3049		3675		3891		3980			1 - 2 - 9
			36	0.74	26	3645		4541		4870		5015			2 - 4 - 12
	B4	6	30	0.15	15	2657		3123		3276		3337		3.4	1 - 2 - 6
			50	0.41	16	3700		4602		4930		5075			2 - 4 - 12
			70	0.81	26	4451		5786		6312		6558			4 - 9 - 16
6	B1	4	10	0.20	15	1626	0.23	1850	0.92	1899	2.06	1923	3.67	7.2	0 - 0 - 1
			14	0.40	15	2105		2466		2558		2605			0 - 1 - 3
			18	0.66	16	2524		3029		3171		3243			0 - 1 - 4
	B2	4	16	0.20	15	2087		2425		2508		2551		5.7	0 - 1 - 3
			22	0.38	15	2650		3168		3312		3385			1 - 1 - 5
			28	0.62	22	3114		3824		4038		4147			1 - 2 - 9
	B3	6	30	0.20	15	2952		3585		3770		3864		4.8	1 - 2 - 6
			45	0.44	15	4168		5070		5440		5634			2 - 3 - 12
			60	0.79	24	5011		6385		6981		7299			3 - 6 - 16
	B4	6	55	0.21	15	3761		4569		4866		5019		3.4	1 - 3 - 11
			80	0.45	22	4993		6300		6861		7159			3 - 6 - 16
			105	0.77	30	5640		7459		8284		8736			5 - 10 - 20

Note: Reference page U60 for operational conditions used for performance notes

CBAV / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw ft
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		
2	B1	4	3	0.36	15	297	0.50	323	2.10	330	4.70	331	8.40	7.2	0 - 0 - 1
			4	0.64	15	381		418		429		431			0 - 0 - 1
			5	1.00	15	462		511		525		529			0 - 0 - 2
	B2	4	4	0.22	15	333		363		371		373		5.7	0 - 0 - 1
			6	0.49	15	474		524		538		541			0 - 1 - 2
			8	0.87	15	605		675		696		703			0 - 1 - 4
	B3	4	9	0.30	15	591		656		676		682		4.8	0 - 1 - 3
			12	0.54	15	733		832		863		874			1 - 1 - 5
			15	0.84	15	866		998		1041		1058			1 - 2 - 7
	B4	4	15	0.18	15	685		771		797		806		3.4	0 - 1 - 4
			21	0.35	15	882		1017		1060		1077			1 - 2 - 7
			27	0.58	21	1048		1232		1294		1320			2 - 4 - 9
3	B1	4	5	0.29	15	482	0.70	532	2.90	546	6.60	550	1.50	7.2	0 - 0 - 1
			7	0.57	15	642		721		743		750			0 - 0 - 2
			9	0.94	15	784		893		927		938			0 - 1 - 3
	B2	4	7	0.21	15	563		625		643		648		5.7	0 - 0 - 2
			10	0.42	15	760		859		888		898			0 - 1 - 3
			13	0.72	15	935		1075		1118		1134			1 - 1 - 5
	B3	4	13	0.20	15	830		943		978		990		4.8	0 - 1 - 3
			19	0.43	15	1108		1293		1354		1378			1 - 2 - 7
			25	0.74	21	1333		1597		1688		1726			1 - 3 - 9
	B4	4	25	0.20	15	1077		1251		1307		1329		3.4	1 - 2 - 7
			35	0.39	21	1359		1627		1720		1758			1 - 3 - 10
			45	0.64	28	1586		1950		2082		2139			2 - 5 - 13
4	B1	4	6	0.20	15	578	1.00	641	3.80	658	8.60	663	1.90	7.2	0 - 0 - 1
			9	0.44	15	804		914		947		959			0 - 0 - 2
			12	0.78	15	1006		1167		1218		1238			0 - 1 - 3
	B2	4	10	0.20	15	775		875		904		914		5.7	0 - 1 - 2
			14	0.40	15	1018		1173		1222		1240			0 - 1 - 4
			18	0.66	16	1228		1445		1516		1544			1 - 2 - 7
	B3	4	18	0.19	15	1097		1273		1329		1351		4.8	0 - 1 - 4
			27	0.42	18	1463		1764		1868		1911			1 - 2 - 9
			36	0.74	26	1749		2180		2337		2407			2 - 4 - 12
	B4	6	30	0.15	15	1275		1499		1573		1602		3.4	1 - 2 - 6
			50	0.41	16	1776		2209		2367		2436			2 - 4 - 12
			70	0.81	26	2136		2777		3030		3148			4 - 9 - 16
6	B1	4	10	0.20	15	781	1.40	888	5.50	911	1.60	923	2.80	7.2	0 - 0 - 1
			14	0.40	15	1010		1184		1228		1250			0 - 1 - 3
			18	0.66	16	1211		1454		1522		1557			0 - 1 - 4
	B2	4	16	0.20	15	1002		1164		1204		1224		5.7	0 - 1 - 3
			22	0.38	15	1272		1521		1590		1625			1 - 1 - 5
			28	0.62	22	1495		1835		1938		1991			1 - 2 - 9
	B3	6	30	0.20	15	1417		1721		1809		1855		4.8	1 - 2 - 6
			45	0.44	15	2000		2433		2611		2705			2 - 3 - 12
			60	0.79	24	2405		3065		3351		3504			3 - 6 - 16
	B4	6	55	0.21	15	1805		2193		2335		2409		3.4	1 - 3 - 11
			80	0.45	22	2396		3024		3293		3436			3 - 6 - 16
			105	0.77	30	2707		3581		3976		4193			5 - 10 - 20

Note: Reference page U60 for operational conditions used for performance notes

CBAV / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw ft
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		
2	B1	4	3	0.36	15	824	0.52	896	2.09	915	4.70	920	8.36	7.2	0 - 0 - 1
			4	0.64	15	1058		1162		1191		1198			0 - 0 - 1
			5	1.00	15	1283		1418		1458		1469			0 - 0 - 2
	B2	4	4	0.22	15	926		1009		1031		1037		5.7	0 - 0 - 1
			6	0.49	15	1318		1454		1494		1504			0 - 1 - 2
			8	0.87	15	1681		1874		1934		1952			0 - 1 - 4
	B3	4	9	0.30	15	1641		1822		1878		1894		4.8	0 - 1 - 3
			12	0.54	15	2035		2311		2397		2427			1 - 1 - 5
			15	0.84	15	2405		2773		2892		2938			1 - 2 - 7
	B4	4	15	0.18	15	1903		2141		2214		2239		3.4	0 - 1 - 4
			21	0.35	15	2451		2825		2946		2992			1 - 2 - 7
			27	0.58	21	2912		3422		3596		3666			2 - 4 - 9
3	B1	4	5	0.29	15	1338	0.74	1477	2.94	1516	6.62	1526	1.50	7.2	0 - 0 - 1
			7	0.57	15	1783		2001		2064		2084			0 - 0 - 2
			9	0.94	15	2177		2481		2574		2607			0 - 1 - 3
	B2	4	7	0.21	15	1565		1737		1785		1800		5.7	0 - 0 - 2
			10	0.42	15	2110		2386		2468		2495			0 - 1 - 3
			13	0.72	15	2598		2985		3106		3151			1 - 1 - 5
	B3	4	13	0.20	15	2304		2620		2716		2749		4.8	0 - 1 - 3
			19	0.43	15	3077		3592		3761		3827			1 - 2 - 7
			25	0.74	21	3702		4436		4689		4794			1 - 3 - 9
	B4	4	25	0.20	15	2992		3475		3631		3691		3.4	1 - 2 - 7
			35	0.39	21	3776		4520		4777		4882			1 - 3 - 10
			45	0.64	28	4406		5417		5782		5942			2 - 5 - 13
4	B1	4	6	0.20	15	1604	0.95	1779	3.80	1827	8.55	1842	1.94	7.2	0 - 0 - 1
			9	0.44	15	2233		2539		2631		2665			0 - 0 - 2
			12	0.78	15	2793		3242		3385		3440			0 - 1 - 3
	B2	4	10	0.20	15	2152		2430		2511		2540		5.7	0 - 1 - 2
			14	0.40	15	2827		3259		3394		3445			0 - 1 - 4
			18	0.66	16	3412		4014		4211		4290			1 - 2 - 7
	B3	4	18	0.19	15	3047		3537		3692		3753		4.8	0 - 1 - 4
			27	0.42	18	4065		4900		5189		5307			1 - 2 - 9
			36	0.74	26	4860		6055		6493		6687			2 - 4 - 12
	B4	6	30	0.15	15	3542		4165		4368		4449		3.4	1 - 2 - 6
			50	0.41	16	4933		6136		6574		6767			2 - 4 - 12
			70	0.81	26	5934		7714		8416		8745			4 - 9 - 16
6	B1	4	10	0.20	15	2169	1.38	2466	5.51	2532	1.58	2564	2.81	7.2	0 - 0 - 1
			14	0.40	15	2807		3288		3411		3473			0 - 1 - 3
			18	0.66	16	3365		4038		4227		4324			0 - 1 - 4
	B2	4	16	0.20	15	2783		3233		3344		3401		5.7	0 - 1 - 3
			22	0.38	15	3533		4225		4416		4514			1 - 1 - 5
			28	0.62	22	4152		5099		5384		5530			1 - 2 - 9
	B3	6	30	0.20	15	3936		4780		5026		5152		4.8	1 - 2 - 6
			45	0.44	15	5557		6760		7254		7513			2 - 3 - 12
			60	0.79	24	6682		8514		9308		9732			3 - 6 - 16
	B4	6	55	0.21	15	5015		6093		6487		6692		3.4	1 - 3 - 11
			80	0.45	22	6657		8400		9149		9545			3 - 6 - 16
			105	0.77	30	7520		9946		11045		11648			5 - 10 - 20

Note: Reference page U60 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2015
2. ΔP_s values are measured in inches of water
3. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
4. Throw values are based on isothermal supply air and represent throw distances to terminal velocities of 150, 100 and 50 fpm respectively
5. ΔP_{Coil} values are measured in feet of water. ΔP_{Coil} values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit coil.
6. Induction ratio is multiplied by the volume flow rate of primary air to estimate the volume flow rate of room air entrained through the coil

Cooling performance:

- Cooling capacity listed (qTOTAL) is the total sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air.
- Capacity is based on 18°F ΔT between the induced air and the chilled water supply. Table 1 provides correction factors for other temperature differentials.
- Primary air sensible cooling contribution can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{ROOM} - T_{PA})$$

- Primary air latent cooling can be calculated by the following equation:

$$q_{LATENT} = 0.69 \times CFM_{PA} \times (W_{ROOM} - W_{PA})$$

where W_{ROOM} and W_{PA} are the humidity ratio of the room and primary air respectively expressed in Grains of moisture per pound dry air

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	**18**	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	**1.00**	1.11	1.22	1.33

Heating performance:

- Heating capacity listed (qTOTAL) is the sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air
- Capacity is based on 50°F ΔT between the induced air and the chilled water supply. Table 2 provides correction factors for other temperature differentials.
- Primary air sensible heating offset (or contribution) can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{PA} - T_{ROOM})$$

if the primary air temperature is lower than that of the room, it will offset the coil's heating

if the primary air temperature is higher than that of the room, it will contribute to the coil's heating

TABLE 2: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	20	30	40	**50**	60	70	80	90	100	110	120
Multiply Table Value by:	0.40	0.60	0.80	**1.00**	1.20	1.40	1.60	1.80	2.00	2.20	2.40

Legend:

ΔP_S = Unit Inlet Pressure [in wg]

qCoil = Sensible Capacity, Coil [Btu/h]

ΔCoil = Water coil pressure drop [ft wg]

q_{SENSPA} = Sensible Capacity, Primary Air [Btu/h]

CFM_{PA} = Air Flowrate, Primary Air [CFM]

T_{PA} = Temperature Primary Air [°F]

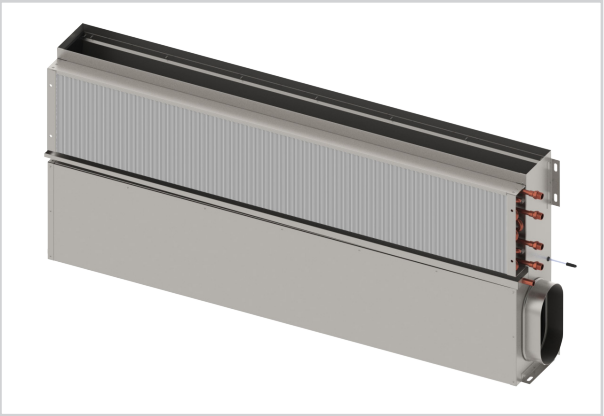
T_{ROOM} = Temperature Room Air [°F]

q_{SENSPA} = Latent Capacity, Primary Air [Btu/h]

Under Sill Active Chilled Beams

CBAS

- Provides comfortable, effective sensible cooling to the space
- Optimized nozzle design provides high capacity and low noise levels
- Ideal for induction unit and unit ventilator retrofit projects
- Quick and simple installation
- Available in nominal lengths up to 6 feet



CBAS

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See website for Specifications

MODEL:

CBAS / Under sill active chilled beam

OVERVIEW

Titus active chilled beams benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being discharged through a series of nozzles located along the length of the beam. The nozzles inject the primary air into the mixing chamber at velocities capable of inducing plenum or soffit air through the water coil and where it mixes with the primary supply air. This mixture of air is then discharged into the space through ceiling slot diffusers. This provides high cooling outputs with low amounts of primary air. The reduced volume of air results in the reduction of the air handler capacity and size, smaller duct sizes, and the overall energy consumption.

The supplied air from the air handling unit is tempered and dehumidified to handle the latent load. The remaining loads in the space are addressed with the heat exchanger which is incorporated into the chilled beam. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

The CBAS's are offered for both, cooling and heating, lengths from 2 to 6 ft. They can be easily integrated in retrofit projects where induction units, unit ventilator, or other under sill units are being replaced. Under sill active beams save significant energy and reduce sounds levels compared to other under sill mounted products. Additionally, the utilization of most or all of the existing piping and duct work minimizes project costs.

ADVANTAGES

- Removal of high thermal loads is possible in this air/water system
- The height of the air duct system is reduced to a minimum, due to the low supply of primary air
- Substantial reduction in the operating costs, due to low primary air volume
- Improvement of the thermal comfort inside the room
- Contributing sound levels below NC-30
- Coil lint screen
- Constant volume regulator

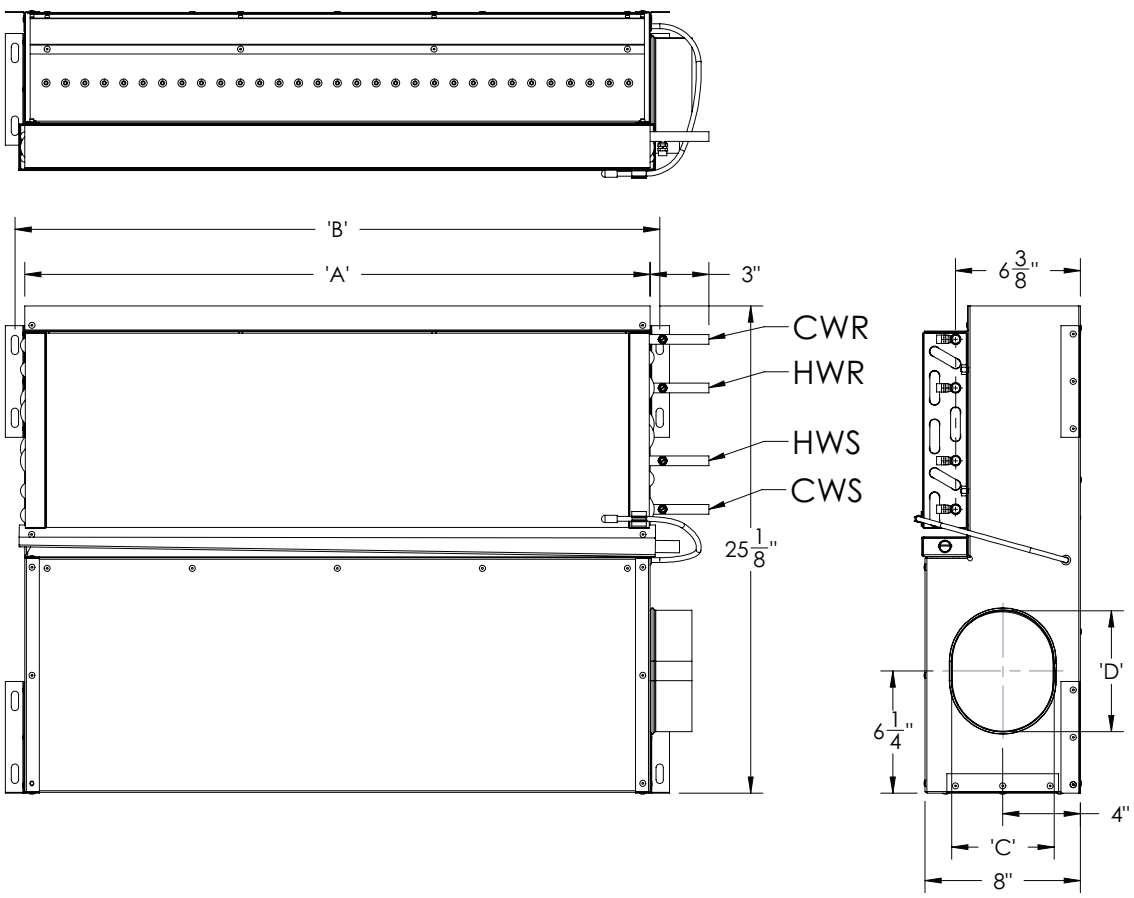
CBAS STANDARD FEATURES

- 2 foot to 6 foot lengths
- Left hand or right hand coil connections
- Left hand, right hand, or rear air inlet locations
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Commissioning port with roomside access for balancing
- Mounting brackets with adjustments in two directions
- ½" Sweat water coil connections
- Coil air vent
- Condensate tray with drain connection for field plumbing

OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" or ¾ MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Coil lint screen
- Constant volume regulator

CBAS UNIT DIMENSIONS



Nominal Length	A	B
3ft	32	33
4ft	44	45
5ft	56	57
6ft	68	69

Nominal Inlet (in)	C	D
4	3⅞"	-
5	4⅞"	-
6	5¼"	6¼"
8	5¼"	9⅜"

6 and 8 inlets are equalivalent oval

All dimensions are in inches

CBAS / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM		
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	
3	B1	6" oval	6	0.42	15	527	0.60	587	2.20	604	5.00	609	8.80	7.2
			8	0.74	15	669		757		784		792		
			10	1.16	15	800		917		954		967		
	B2	6" oval	10	0.42	15	712		805		833		842		5.7
			13	0.72	15	877		1007		1048		1063		
			17	1.23	15	1065		1251		1312		1336		
	B3	6" oval	17	0.34	15	956		1107		1155		1174		4.2
			23	0.62	15	1184		1408		1484		1514		
			30	1.06	16	1398		1706		1816		1864		
	B4	6" oval	30	0.28	15	1150		1356		1425		1453		3.4
			40	0.50	15	1384		1678		1782		1827		
			55	0.94	24	1667		2098		2261		2335		
4	B1	6" oval	8	0.35	15	683	0.70	772	2.90	798	6.40	807	1.50	7.2
			10	0.54	15	824		943		979		992		
			14	1.06	15	1060		1244		1305		1329		
	B2	6" oval	12	0.29	15	846		965		1001		1014		5.7
			16	0.52	15	1053		1228		1284		1305		
			22	0.99	15	1318		1584		1675		1713		
	B3	6" oval	22	0.27	15	1193		1408		1479		1508		4.8
			30	0.51	15	1466		1789		1902		1950		
			42	1.00	20	1792		2275		2459		2543		
	B4	6" oval	42	0.29	15	1494		1822		1937		1986		3.4
			55	0.50	19	1763		2216		2386		2462		
			75	0.93	28	2072		2721		2981		3104		
5	B1	6" oval	10	0.31	15	718	0.90	819	3.50	842	7.90	853	1.80	7.2
			13	0.53	15	890		1031		1067		1085		
			18	1.02	15	1118		1340		1402		1434		
	B2	6" oval	16	0.31	15	935		1081		1118		1136		5.7
			20	0.48	15	1093		1294		1348		1376		
			28	0.94	15	1471		1735		1834		1885		
	B3	6" oval	28	0.26	15	1260		1509		1582		1619		4.8
			40	0.53	15	1753		2096		2236		2309		
			58	1.12	26	2168		2740		2987		3119		
	B4	6" oval	58	0.34	16	1836		2203		2354		2432		3.4
			70	0.50	22	2055		2534		2736		2842		
			97	0.96	31	2392		3107		3427		3601		
6	B1	6" oval	13	0.35	15	893	1.00	1040	4.10	1077	9.30	1096	2.10	7.2
			16	0.52	15	1054		1247		1299		1325		
			23	1.08	15	1351		1655		1751		1801		
	B2	6" oval	18	0.25	15	1031		1209		1255		1278		5.7
			25	0.49	15	1297		1573		1654		1695		
			34	0.91	18	1679		2035		2171		2242		
	B3	6" oval	30	0.20	15	1328		1613		1696		1739		4.8
			45	0.44	15	1875		2281		2448		2535		
			66	0.96	26	2354		3049		3356		3522		
	B4	6" oval	66	0.30	17	1979		2422		2606		2702		3.4
			85	0.50	24	2316		2952		3228		3376		
			120	1.00	34	2670		3620		4064		4310		

Note: Reference page U68 for operational conditions used for performance notes

CBAS / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM		
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	
3	B1	6" oval	6	0.42	15	1170	0.12	1305	0.49	1343	1.10	1256	1.95	7.2
			8	0.74	15	1487		1683		1741		1631		
			10	1.16	15	1778		2038		2119		1986		
	B2	6" oval	10	0.42	15	1583		1789		1851		1709		5.7
			13	0.72	15	1949		2239		2330		2152		
			17	1.23	15	2368		2779		2916		2693		
	B3	6" oval	17	0.34	15	2125		2460		2567		2331		4.8
			23	0.62	15	2632		3128		3297		2991		
			30	1.06	16	3106		3792		4037		3654		
	B4	6" oval	30	0.28	15	2555		3014		3168		2741		3.4
			40	0.50	15	3076		3730		3960		3408		
			55	0.94	24	3704		4662		5025		4295		
4	B1	6" oval	8	0.35	15	1518	0.16	1715	0.63	1773	1.41	1663	2.51	7.2
			10	0.54	15	1832		2095		2175		2041		
			14	1.06	15	2354		2765		2900		2725		
	B2	6" oval	12	0.29	15	1881		2145		2225		2059		5.7
			16	0.52	15	2340		2728		2852		2641		
			22	0.99	15	2929		3520		3723		3448		
	B3	6" oval	22	0.27	15	2652		3130		3287		2992		4.8
			30	0.51	15	3257		3975		4227		3846		
			42	1.00	20	3982		5056		5465		4967		
	B4	6" oval	42	0.29	15	3321		4049		4304		3729		3.4
			55	0.50	19	3918		4925		5302		4576		
			75	0.93	28	4605		6047		6624		5677		
5	B1	6" oval	10	0.31	15	1597	0.19	1819	0.78	1870	1.75	1733	3.11	7.2
			13	0.53	15	1979		2292		2371		2198		
			18	1.02	15	2483		2977		3116		2894		
	B2	6" oval	16	0.31	15	2077		2402		2484		2264		5.7
			20	0.48	15	2430		2875		2997		2732		
			28	0.94	15	3269		3856		4076		3733		
	B3	6" oval	28	0.26	15	2800		3353		3516		3142		4.8
			40	0.53	15	3895		4658		4970		4480		
			58	1.12	26	4818		6089		6638		5988		
	B4	6" oval	58	0.34	16	4080		4896		5231		4460		3.4
			70	0.50	22	4567		5632		6080		5177		
			97	0.96	31	5315		6905		7615		6423		
6	B1	6" oval	13	0.35	15	1985	0.23	2312	0.92	2393	2.06	2223	3.67	7.2
			16	0.52	15	2341		2771		2886		2683		
			23	1.08	15	3002		3678		3892		3627		
	B2	6" oval	18	0.25	15	2290		2686		2788		2547		5.7
			25	0.49	15	2882		3496		3675		3359		
			34	0.91	18	3732		4523		4824		4428		
	B3	6" oval	30	0.20	15	2952		3585		3770		3376		4.8
			45	0.44	15	4168		5070		5440		4902		
			66	0.96	26	5232		6776		7458		6753		
	B4	6" oval	66	0.30	17	4398		5383		5791		4930		3.4
			85	0.50	24	5146		6560		7174		6118		
			120	1.00	34	5934		8045		9032		7624		

Note: Reference page U68 for operational conditions used for performance notes

CBAS / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM		
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	
3	B1	6" oval	6	0.42	15	562	0.70	626	2.90	644	6.60	650	1.50	7.2
			8	0.74	15	714		808		836		845		
			10	1.16	15	853		978		1017		1032		
	B2	6" oval	10	0.42	15	760		859		888		898		5.7
			13	0.72	15	935		1075		1118		1134		
			17	1.23	15	1137		1334		1400		1425		
	B3	6" oval	17	0.34	15	1020		1181		1232		1252		4.8
			23	0.62	15	1263		1502		1583		1615		
			30	1.06	16	1491		1820		1938		1989		
	B4	6" oval	30	0.28	15	1226		1447		1520		1550		3.4
			40	0.50	15	1476		1790		1901		1948		
			55	0.94	24	1778		2238		2412		2491		
4	B1	6" oval	8	0.35	15	728	1.00	823	3.80	851	8.60	861	1.90	7.2
			10	0.54	15	879		1005		1044		1058		
			14	1.06	15	1130		1327		1392		1417		
	B2	6" oval	12	0.29	15	903		1030		1068		1082		5.7
			16	0.52	15	1123		1309		1369		1392		
			22	0.99	15	1406		1690		1787		1827		
	B3	6" oval	22	0.27	15	1273		1502		1578		1608		4.8
			30	0.51	15	1563		1908		2029		2080		
			42	1.00	20	1912		2427		2623		2712		
	B4	6" oval	42	0.29	15	1594		1943		2066		2118		3.4
			55	0.50	19	1881		2364		2545		2626		
			75	0.93	28	2210		2902		3180		3311		
5	B1	6" oval	10	0.31	15	766	1.20	873	4.70	898	1.30	910	2.40	7.2
			13	0.53	15	950		1100		1138		1157		
			18	1.02	15	1192		1429		1496		1530		
	B2	6" oval	16	0.31	15	997		1153		1192		1212		5.7
			20	0.48	15	1166		1380		1438		1468		
			28	0.94	15	1569		1851		1957		2011		
	B3	6" oval	28	0.26	15	1344		1609		1687		1727		4.8
			40	0.53	15	1870		2236		2385		2463		
			58	1.12	26	2312		2923		3186		3327		
	B4	6" oval	58	0.34	16	1958		2350		2511		2594		3.4
			70	0.50	22	2192		2703		2918		3032		
			97	0.96	31	2551		3314		3655		3841		
6	B1	6" oval	13	0.35	15	953	1.40	1110	5.50	1149	1.60	1169	2.80	7.2
			16	0.52	15	1124		1330		1385		1413		
			23	1.08	15	1441		1766		1868		1921		
	B2	6" oval	18	0.25	15	1099		1289		1338		1363		5.7
			25	0.49	15	1383		1678		1764		1808		
			34	0.91	18	1791		2171		2316		2391		
	B3	6" oval	30	0.20	15	1417		1721		1809		1855		4.8
			45	0.44	15	2000		2433		2611		2705		
			66	0.96	26	2511		3253		3580		3757		
	B4	6" oval	66	0.30	17	2111		2584		2780		2882		3.4
			85	0.50	24	2470		3149		3443		3601		
			120	1.00	34	2848		3862		4335		4597		

Note: Reference page U68 for operational conditions used for performance notes

CBAS / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM		
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	
3	B1	6" oval	6	0.42	15	1561	0.74	1739	2.94	1790	6.62	1805	1.50	7.2
			8	0.74	15	1983		2244		2322		2348		
			10	1.16	15	2371		2718		2826		2865		
	B2	6" oval	10	0.42	15	2110		2386		2468		2495		5.7
			13	0.72	15	2598		2985		3106		3151		
			17	1.23	15	3157		3706		3888		3960		
	B3	6" oval	17	0.34	15	2833		3280		3423		3477		4.8
			23	0.62	15	3509		4171		4396		4487		
			30	1.06	16	4141		5056		5382		5524		
	B4	6" oval	30	0.28	15	3406		4019		4224		4305		3.4
			40	0.50	15	4101		4973		5280		5412		
			55	0.94	24	4939		6216		6700		6920		
4	B1	6" oval	8	0.35	15	2024	0.95	2286	3.80	2363	8.55	2390	1.94	7.2
			10	0.54	15	2443		2793		2899		2939		
			14	1.06	15	3139		3687		3866		3937		
	B2	6" oval	12	0.29	15	2508		2860		2966		3005		5.7
			16	0.52	15	3120		3637		3803		3868		
			22	0.99	15	3906		4694		4963		5074		
	B3	6" oval	22	0.27	15	3536		4173		4383		4467		4.8
			30	0.51	15	4342		5300		5636		5779		
			42	1.00	20	5310		6741		7286		7534		
	B4	6" oval	42	0.29	15	4428		5398		5739		5884		3.4
			55	0.50	19	5225		6566		7069		7295		
			75	0.93	28	6139		8062		8833		9197		
5	B1	6" oval	10	0.31	15	2129	1.16	2425	4.65	2493	1.33	2528	2.37	7.2
			13	0.53	15	2638		3056		3161		3213		
			18	1.02	15	3311		3969		4155		4249		
	B2	6" oval	16	0.31	15	2769		3203		3312		3365		5.7
			20	0.48	15	3240		3834		3996		4077		
			28	0.94	15	4358		5142		5435		5585		
	B3	6" oval	28	0.26	15	3733		4470		4687		4798		4.8
			40	0.53	15	5194		6211		6626		6841		
			58	1.12	26	6423		8118		8850		9242		
	B4	6" oval	58	0.34	16	5440		6529		6974		7205		3.4
			70	0.50	22	6090		7509		8106		8421		
			97	0.96	31	7087		9207		10154		10669		
6	B1	6" oval	13	0.35	15	2647	1.38	3082	5.51	3191	1.58	3246	2.81	7.2
			16	0.52	15	3122		3695		3847		3925		
			23	1.08	15	4002		4904		5189		5335		
	B2	6" oval	18	0.25	15	3053		3582		3718		3787		5.7
			25	0.49	15	3843		4662		4900		5022		
			34	0.91	18	4976		6031		6432		6642		
	B3	6" oval	30	0.20	15	3936		4780		5026		5152		4.8
			45	0.44	15	5557		6760		7254		7513		
			66	0.96	26	6976		9035		9944		10437		
	B4	6" oval	66	0.30	17	5864		7177		7721		8006		3.4
			85	0.50	24	6861		8747		9565		10002		
			120	1.00	34	7912		10727		12042		12770		

Note: Reference page U68 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2015
2. ΔP_s values are measured in inches of water
3. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
4. Throw values are based on isothermal supply air and represent throw distances to terminal velocities of 150, 100 and 50 fpm respectively
5. ΔP_{Coil} values are measured in feet of water. ΔP_{Coil} values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit coil.
6. Induction ratio is multiplied by the volume flow rate of primary air to estimate the volume flow rate of room air entrained through the coil

Cooling performance:

- Cooling capacity listed (qTOTAL) is the total sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air.
- Capacity is based on 18°F ΔT between the induced air and the chilled water supply. Table 1 provides correction factors for other temperature differentials.
- Primary air sensible cooling contribution can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{ROOM} - T_{PA})$$

- Primary air latent cooling can be calculated by the following equation:

$$q_{LATENT} = 0.69 \times CFM_{PA} \times (W_{ROOM} - W_{PA})$$

where W_{ROOM} and W_{PA} are the humidity ratio of the room and primary air respectively expressed in Grains of moisture per pound dry air

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	**18**	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	**1.00**	1.11	1.22	1.33

Heating performance:

- Heating capacity listed (qTOTAL) is the sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air
- Capacity is based on 50°F ΔT between the induced air and the chilled water supply. Table 2 provides correction factors for other temperature differentials.
- Primary air sensible heating offset (or contribution) can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{PA} - T_{ROOM})$$

if the primary air temperature is lower than that of the room, it will offset the coil's heating

if the primary air temperature is higher than that of the room, it will contribute to the coil's heating

TABLE 2: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	20	30	40	**50**	60	70	80	90	100	110	120
Multiply Table Value by:	0.40	0.60	0.80	**1.00**	1.20	1.40	1.60	1.80	2.00	2.20	2.40

Legend:

ΔP_S = Unit Inlet Pressure [in wg]

qCoil = Sensible Capacity, Coil [Btu/h]

ΔCoil = Water coil pressure drop [ft wg]

q_{SENSPA} = Sensible Capacity, Primary Air [Btu/h]

CFM_{PA} = Air Flowrate, Primary Air [CFM]

T_{PA} = Temperature Primary Air [°F]

T_{ROOM} = Temperature Room Air [°F]

q_{SENSPA} = Latent Capacity, Primary Air [Btu/h]

Bulkhead Mounted Recessed Active Chilled Beams

CBAB

- Provides comfortable, effective sensible cooling to the space
- Optimized nozzle design provides high capacity and low noise levels
- Ideal for single room hospitality spaces
- Quick and simple installation
- Available in nominal lengths up to 6 feet
- ½" Sweat or ½" MNPT coil connections

CBAB

healthcare | dual-function | hotels / motels | retrofit | universities | energy solutions

See website for Specifications

MODEL:

CBAB / Bulkhead Mounted Recessed Active Chilled Beam

OVERVIEW

Titus active chilled beams benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being discharged through a series of nozzles located along the length of the beam. The nozzles inject the primary air into the mixing chamber at velocities capable of inducing plenum or soffit air through the water coil and where it mixes with the primary supply air. This mixture of air is then discharged into the space through ceiling slot diffusers. This provides high cooling outputs with low amounts of primary air. The reduced volume of air results in the reduction of the air handler capacity and size, smaller duct sizes, and the overall energy consumption.

The supplied air from the air handling unit is tempered and dehumidified to handle the latent load. The remaining loads in the space are addressed with the heat exchanger which is incorporated into the chilled beam. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

The CBAB bulkhead beams are the ideal solution for single room hospitality spaces, such as hotel, dorm, and hospital rooms. With their shallow height, ceiling heights can be maximized creating an open and inviting space. Bulkhead chilled beams are great for use in retrofit of buildings which were not originally built with HVAC systems originally installed.

ADVANTAGES

- Removal of high thermal loads is possible in this air/water system
- The height of the air duct system is reduced to a minimum, due to the low supply of primary air
- Substantial reduction in the operating costs, due to low primary air volume
- Improvement of the thermal comfort inside the room
- Contributing sound levels below NC-30

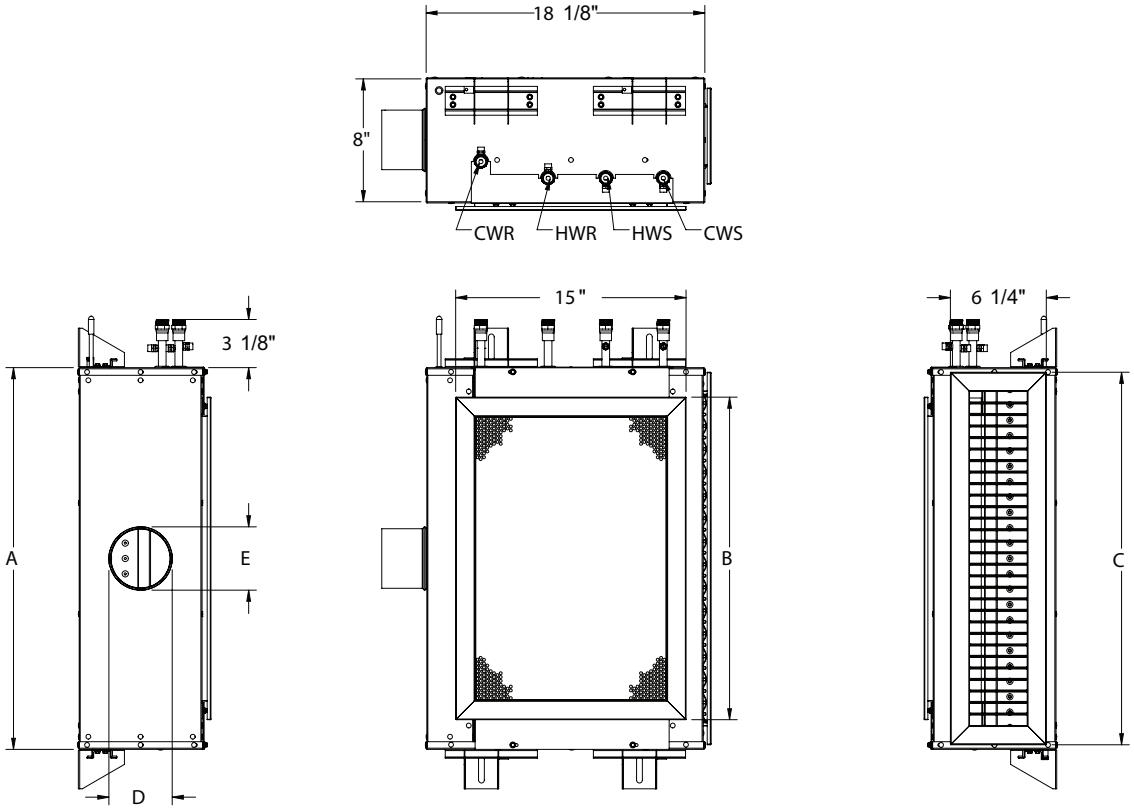
CBAB STANDARD FEATURES

- 2 foot to 6 foot lengths
- Left hand or right hand coil connections
- Rear air inlet location
- Louvered supply grille
- Perforated return grille
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Commissioning port with roomside access for balancing
- Mounting brackets with adjustments in two directions
- ½" Sweat water coil connections
- Coil air vent

OPTIONS AND ACCESSORIES

- Linear Bar supply grille
- Linear Bar return grille
- Louvered Bar return grille
- Eggcrate Bar return grille
- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" or ¾ MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Coil lint screen
- Constant volume regulator

CBAB UNIT DIMENSIONS



NOTE:
- SCREW HOLES ON GRILLES NOT SHOWN.
- 271RS SUPPLY AND 8R RETURN SHOWN, OTHER OPTIONS AVAILABLE.

Nominal	A	B	C
2ft	24 7/8	21	24 1/4
3ft	36 7/8	33	36 1/4
4ft	48 7/8	45	48 1/4
5ft	60 7/8	57	60 1/4
6ft	72 7/8	69	72 1/4

Inlet	D	E
4 IN Round	3 7/8	3 7/8
5 IN Round	4 7/8	4 7/8
6 IN Oval	5 1/4	6 1/4
8 IN Oval	5 1/4	9 3/8

All dimensions are in inches

CBAB / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.21	15	560	0.70	609	2.90	621	6.60	627	1.50	6.0	1 - 2 - 8
			11	0.39	15	733		837		858		869			2 - 4 - 12
			14	0.63	20	889		1023		1057		1073			3 - 6 - 16
			17	0.93	26	1090		1244		1293		1317			4 - 9 - 18
	B3	4	15	0.20	15	965		1102		1131		1146		4.5	2 - 4 - 13
			20	0.36	15	1217		1403		1452		1475			4 - 8 - 17
			25	0.56	19	1584		1792		1868		1906			6 - 11 - 19
			30	0.81	25	1860		2131		2237		2292			8 - 13 - 21
	B4	4	30	0.23	15	1324		1522		1571		1594		2.7	4 - 8 - 17
			40	0.40	17	1791		2033		2117		2159			6 - 12 - 20
			50	0.63	24	2207		2529		2655		2720			10 - 15 - 22
			60	0.91	29	2492		2916		3085		3173			12 - 17 - 24
4	B2	4	11	0.20	15	741	1.00	819	3.80	840	8.60	851	1.90	6.0	1 - 2 - 10
			15	0.38	15	954		1113		1150		1169			2 - 5 - 15
			19	0.61	21	1176		1349		1405		1434			3 - 7 - 19
			23	0.89	27	1403		1611		1691		1732			5 - 11 - 21
	B3	4	21	0.21	15	1287		1500		1552		1579		4.5	2 - 6 - 16
			28	0.37	15	1665		1894		1981		2024			4 - 10 - 20
			35	0.58	21	2060		2401		2535		2604			7 - 13 - 23
			42	0.84	27	2379		2838		3024		3121			10 - 16 - 25
	B4	4	35	0.18	15	1528		1780		1842		1873		2.7	3 - 7 - 18
			50	0.36	15	2109		2414		2532		2592			6 - 13 - 22
			65	0.59	18	2671		3156		3350		3450			11 - 17 - 25
			80	0.90	25	3070		3730		4004		4147			14 - 20 - 28
5	B2	4	15	0.23	15	960	1.20	1093	4.70	1131	1.30	1150	2.40	6.0	1 - 3 - 13
			20	0.41	16	1205		1440		1502		1533			3 - 6 - 17
			25	0.65	23	1455		1713		1805		1852			4 - 9 - 22
			30	0.93	28	1709		2029		2157		2223			6 - 13 - 24
	B3	4	25	0.18	15	1252		1487		1548		1579		4.5	2 - 6 - 17
			35	0.36	15	1661		1950		2059		2115			5 - 11 - 23
			45	0.59	23	2082		2512		2686		2777			8 - 15 - 26
			55	0.87	24	2349		2996		3243		3374			12 - 19 - 28
	B4	6" oval	40	0.14	15	1413		1666		1732		1766		2.7	3 - 6 - 18
			60	0.32	15	1984		2325		2457		2525			6 - 14 - 24
			80	0.57	15	2549		3115		3343		3462			11 - 18 - 28
			100	0.89	21	2850		3700		4027		4226			15 - 22 - 31
6	B2	4	20	0.28	15	1204	1.40	1423	5.50	1486	1.60	1518	2.80	6.0	2 - 4 - 16
			25	0.44	18	1429		1744		1837		1884			3 - 7 - 20
			30	0.63	23	1654		2001		2127		2193			4 - 10 - 24
			35	0.86	28	1879		2281		2446		2531			6 - 13 - 26
	B3	4	35	0.25	15	1921		2338		2469		2536		4.5	4 - 8 - 22
			45	0.41	17	2356		2843		3040		3143			6 - 14 - 26
			55	0.61	23	2797		3485		3774		3926			9 - 17 - 28
			65	0.83	23	3071		4019		4402		4607			13 - 20 - 31
	B4	6" oval	60	0.22	15	2331		2834		2997		3080		2.7	5 - 11 - 24
			80	0.40	15	2953		3602		3869		4008			9 - 17 - 28
			100	0.62	15	3511		4471		4870		5081			13 - 21 - 31
			120	0.90	21	3814		5132		5664		5971			17 - 24 - 34

Note: Reference page U76 for operational conditions used for performance notes

CBAB / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS	NC	1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)		qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.21	15	1245	0.12	1354	0.49	1381	1.10	1394	1.95	6.0	1 - 2 - 8
			11	0.39	15	1629		1860		1908		1932			2 - 4 - 12
			14	0.63	20	1975		2273		2348		2384			3 - 6 - 16
			17	0.93	26	2423		2764		2873		2926			4 - 9 - 18
	B3	4	15	0.20	15	2144		2450		2514		2547		4.5	2 - 4 - 13
			20	0.36	15	2704		3117		3226		3278			4 - 8 - 17
			25	0.56	19	3519		3981		4151		4236			6 - 11 - 19
			30	0.81	25	4133		4737		4972		5093			8 - 13 - 21
	B4	4	30	0.23	15	2943		3383		3490		3543		2.7	4 - 8 - 17
			40	0.40	17	3980		4517		4704		4797			6 - 12 - 20
			50	0.63	24	4904		5621		5900		6044			10 - 15 - 22
			60	0.91	29	5538		6479		6856		7052			12 - 17 - 24
4	B2	4	11	0.20	15	1648	0.16	1820	0.63	1868	1.41	1891	2.51	6.0	1 - 2 - 10
			15	0.38	15	2121		2474		2556		2597			2 - 5 - 15
			19	0.61	21	2614		2997		3123		3187			3 - 7 - 19
			23	0.89	27	3119		3580		3759		3850			5 - 11 - 21
	B3	4	21	0.21	15	2861		3333		3449		3508		4.5	2 - 6 - 16
			28	0.37	15	3700		4210		4401		4498			4 - 10 - 20
			35	0.58	21	4577		5335		5634		5787			7 - 13 - 23
			42	0.84	27	5286		6307		6720		6935			10 - 16 - 25
	B4	4	35	0.18	15	3395		3955		4093		4163		2.7	3 - 7 - 18
			50	0.36	15	4686		5365		5627		5760			6 - 13 - 22
			65	0.59	18	5936		7014		7445		7668			11 - 17 - 25
			80	0.90	25	6822		8290		8897		9216			14 - 20 - 28
5	B2	4	15	0.23	15	2134	0.19	2430	0.78	2514	1.75	2556	3.11	6.0	1 - 3 - 13
			20	0.41	16	2679		3199		3337		3407			3 - 6 - 17
			25	0.65	23	3234		3807		4011		4115			4 - 9 - 22
			30	0.93	28	3797		4509		4793		4940			6 - 13 - 24
	B3	4	25	0.18	15	2783		3306		3440		3509		4.5	2 - 6 - 17
			35	0.36	15	3692		4334		4575		4699			5 - 11 - 23
			45	0.59	23	4626		5581		5969		6171			8 - 15 - 26
			55	0.87	24	5220		6659		7208		7497			12 - 19 - 28
	B4	4	40	0.14	15	3139		3702		3849		3924		2.7	3 - 6 - 18
			60	0.32	15	4409		5167		5461		5612			6 - 14 - 24
			80	0.57	15	5664		6922		7428		7693			11 - 18 - 28
			100	0.89	21	6334		8222		8949		9391			15 - 22 - 31
6	B2	4	20	0.28	15	2676	0.23	3162	0.92	3303	2.06	3374	3.67	6.0	2 - 4 - 16
			25	0.44	18	3176		3875		4081		4186			3 - 7 - 20
			30	0.63	23	3675		4447		4727		4872			4 - 10 - 24
			35	0.86	28	4175		5070		5435		5625			6 - 13 - 26
	B3	4	35	0.25	15	4268		5196		5486		5635		4.5	4 - 8 - 22
			45	0.41	17	5236		6318		6756		6984			6 - 14 - 26
			55	0.61	23	6215		7745		8388		8725			9 - 17 - 28
			65	0.83	23	6825		8930		9783		10238			13 - 20 - 31
	B4	4	60	0.22	15	5180		6297		6659		6845		2.7	5 - 11 - 24
			80	0.40	15	6562		8005		8598		8907			9 - 17 - 28
			100	0.62	15	7802		9937		10823		11291			13 - 21 - 31
			120	0.90	21	8476		11405		12586		13269			17 - 24 - 34

Note: Reference page U76 for operational conditions used for performance notes

CBAB / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.21	15	598	0.90	650	3.70	663	8.30	669	1.90	6.0	1 - 2 - 8
			11	0.39	15	782		893		916		927			2 - 4 - 12
			14	0.63	20	948		1091		1127		1144			3 - 6 - 16
			17	0.93	26	1163		1327		1379		1405			4 - 9 - 18
	B3	4	15	0.20	15	1029		1176		1207		1222		4.5	2 - 4 - 13
			20	0.36	15	1298		1496		1548		1574			4 - 8 - 17
			25	0.56	19	1689		1911		1992		2033			6 - 11 - 19
			30	0.81	25	1984		2274		2386		2445			8 - 13 - 21
	B4	4	30	0.23	15	1413		1624		1675		1701		2.7	4 - 8 - 17
			40	0.40	17	1910		2168		2258		2303			6 - 12 - 20
			50	0.63	24	2354		2698		2832		2901			10 - 15 - 22
			60	0.91	29	2658		3110		3291		3385			12 - 17 - 24
4	B2	4	11	0.20	15	791	1.20	874	4.80	896	1.40	907	2.40	6.0	1 - 2 - 10
			15	0.38	15	1018		1187		1227		1247			2 - 5 - 15
			19	0.61	21	1255		1439		1499		1530			3 - 7 - 19
			23	0.89	27	1497		1718		1804		1848			5 - 11 - 21
	B3	4	21	0.21	15	1373		1600		1656		1684		4.5	2 - 6 - 16
			28	0.37	15	1776		2021		2113		2159			4 - 10 - 20
			35	0.58	21	2197		2561		2704		2778			7 - 13 - 23
			42	0.84	27	2538		3027		3226		3329			10 - 16 - 25
	B4	4	35	0.18	15	1629		1899		1965		1998		2.7	3 - 7 - 18
			50	0.36	15	2249		2575		2701		2765			6 - 13 - 22
			65	0.59	18	2849		3367		3573		3680			11 - 17 - 25
			80	0.90	25	3275		3979		4270		4424			14 - 20 - 28
5	B2	4	15	0.23	15	1025	1.50	1166	5.80	1206	1.70	1227	3.00	6.0	1 - 3 - 13
			20	0.41	16	1286		1536		1602		1635			3 - 6 - 17
			25	0.65	23	1552		1827		1925		1975			4 - 9 - 22
			30	0.93	28	1823		2164		2301		2371			6 - 13 - 24
	B3	4	25	0.18	15	1336		1587		1651		1684		4.5	2 - 6 - 17
			35	0.36	15	1772		2080		2196		2256			5 - 11 - 23
			45	0.59	23	2220		2679		2865		2962			8 - 15 - 26
			55	0.87	24	2506		3196		3460		3599			12 - 19 - 28
	B4	6" oval	40	0.14	15	1507		1777		1847		1883		2.7	3 - 6 - 18
			60	0.32	15	2116		2480		2621		2694			6 - 14 - 24
			80	0.57	15	2719		3322		3566		3693			11 - 18 - 28
			100	0.89	21	3040		3946		4296		4508			15 - 22 - 31
6	B2	4	20	0.28	15	1285	1.70	1518	6.90	1585	2.00	1620	3.50	6.0	2 - 4 - 16
			25	0.44	18	1525		1860		1959		2009			3 - 7 - 20
			30	0.63	23	1764		2134		2269		2339			4 - 10 - 24
			35	0.86	28	2004		2433		2609		2700			6 - 13 - 26
	B3	4	35	0.25	15	2049		2494		2633		2705		4.5	4 - 8 - 22
			45	0.41	17	2513		3033		3243		3352			6 - 14 - 26
			55	0.61	23	2983		3718		4026		4188			9 - 17 - 28
			65	0.83	23	3276		4286		4696		4914			13 - 20 - 31
	B4	6" oval	60	0.22	15	2486		3023		3196		3285		2.7	5 - 11 - 24
			80	0.40	15	3150		3842		4127		4275			9 - 17 - 28
			100	0.62	15	3745		4770		5195		5420			13 - 21 - 31
			120	0.90	21	4069		5475		6041		6369			17 - 24 - 34

Note: Reference page U76 for operational conditions used for performance notes

CBAB / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.21	15	1660	0.92	1805	3.69	1841	8.30	1859	1.88	6.0	1 - 2 - 8
			11	0.39	15	2172		2480		2544		2576			2 - 4 - 12
			14	0.63	20	2634		3031		3131		3179			3 - 6 - 16
			17	0.93	26	3230		3685		3830		3902			4 - 9 - 18
	B3	4	15	0.20	15	2859		3267		3352		3396		4.5	2 - 4 - 13
			20	0.36	15	3605		4157		4301		4371			4 - 8 - 17
			25	0.56	19	4692		5309		5534		5648			6 - 11 - 19
			30	0.81	25	5510		6315		6629		6791			8 - 13 - 21
	B4	4	30	0.23	15	3924		4510		4654		4724		2.7	4 - 8 - 17
			40	0.40	17	5306		6023		6272		6396			6 - 12 - 20
			50	0.63	24	6539		7494		7866		8059			10 - 15 - 22
			60	0.91	29	7384		8639		9142		9403			12 - 17 - 24
4	B2	4	11	0.20	15	2197	1.19	2427	4.76	2490	1.37	2521	2.43	6.0	1 - 2 - 10
			15	0.38	15	2827		3298		3408		3463			2 - 5 - 15
			19	0.61	21	3485		3996		4164		4249			3 - 7 - 19
			23	0.89	27	4158		4774		5012		5133			5 - 11 - 21
	B3	4	21	0.21	15	3814		4444		4599		4678		4.5	2 - 6 - 16
			28	0.37	15	4933		5613		5868		5998			4 - 10 - 20
			35	0.58	21	6103		7114		7512		7716			7 - 13 - 23
			42	0.84	27	7049		8409		8960		9247			10 - 16 - 25
	B4	4	35	0.18	15	4526		5274		5458		5551		2.7	3 - 7 - 18
			50	0.36	15	6248		7153		7502		7680			6 - 13 - 22
			65	0.59	18	7915		9352		9926		10224			11 - 17 - 25
			80	0.90	25	9096		11053		11862		12288			14 - 20 - 28
5	B2	4	15	0.23	15	2846	1.46	3240	5.83	3351	1.67	3408	2.97	6.0	1 - 3 - 13
			20	0.41	16	3572		4266		4449		4543			3 - 6 - 17
			25	0.65	23	4311		5076		5348		5487			4 - 9 - 22
			30	0.93	28	5063		6012		6390		6586			6 - 13 - 24
	B3	4	25	0.18	15	3710		4407		4587		4679		4.5	2 - 6 - 17
			35	0.36	15	4923		5779		6101		6266			5 - 11 - 23
			45	0.59	23	6168		7442		7959		8228			8 - 15 - 26
			55	0.87	24	6960		8878		9610		9996			12 - 19 - 28
	B4	4	40	0.14	15	4185		4936		5132		5232		2.7	3 - 6 - 18
			60	0.32	15	5878		6890		7281		7482			6 - 14 - 24
			80	0.57	15	7552		9229		9904		10257			11 - 18 - 28
			100	0.89	21	8446		10962		11932		12522			15 - 22 - 31
6	B2	4	20	0.28	15	3568	1.72	4215	6.89	4404	1.98	4499	3.52	6.0	2 - 4 - 16
			25	0.44	18	4235		5167		5442		5581			3 - 7 - 20
			30	0.63	23	4900		5929		6303		6496			4 - 10 - 24
			35	0.86	28	5567		6760		7247		7500			6 - 13 - 26
	B3	4	35	0.25	15	5691		6928		7315		7513		4.5	4 - 8 - 22
			45	0.41	17	6981		8424		9008		9312			6 - 14 - 26
			55	0.61	23	8286		10326		11184		11633			9 - 17 - 28
			65	0.83	23	9100		11907		13044		13650			13 - 20 - 31
	B4	4	60	0.22	15	6906		8396		8879		9126		2.7	5 - 11 - 24
			80	0.40	15	8749		10674		11464		11876			9 - 17 - 28
			100	0.62	15	10403		13249		14431		15055			13 - 21 - 31
			120	0.90	21	11302		15207		16781		17692			17 - 24 - 34

Note: Reference page U76 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2015
2. ΔP_s values are measured in inches of water
3. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
4. Throw values are based on isothermal supply air and represent throw distances to terminal velocities of 150, 100 and 50 fpm respectively
5. ΔP_{Coil} values are measured in feet of water. ΔP_{Coil} values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit coil.
6. Induction ratio is multiplied by the volume flow rate of primary air to estimate the volume flow rate of room air entrained through the coil

Cooling performance:

- Cooling capacity listed (qTOTAL) is the total sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air.
- Capacity is based on 18°F ΔT between the induced air and the chilled water supply. Table 1 provides correction factors for other temperature differentials.
- Primary air sensible cooling contribution can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{ROOM} - T_{PA})$$

- Primary air latent cooling can be calculated by the following equation:

$$q_{LATENT} = 0.69 \times CFM_{PA} \times (W_{ROOM} - W_{PA})$$

where W_{ROOM} and W_{PA} are the humidity ratio of the room and primary air respectively expressed in Grains of moisture per pound dry air

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	**18**	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	**1.00**	1.11	1.22	1.33

Heating performance:

- Heating capacity listed (qTOTAL) is the sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air
- Capacity is based on 50°F ΔT between the induced air and the chilled water supply. Table 2 provides correction factors for other temperature differentials.
- Primary air sensible heating offset (or contribution) can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{PA} - T_{ROOM})$$

if the primary air temperature is lower than that of the room, it will offset the coil's heating

if the primary air temperature is higher than that of the room, it will contribute to the coil's heating

TABLE 2: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	20	30	40	**50**	60	70	80	90	100	110	120
Multiply Table Value by:	0.40	0.60	0.80	**1.00**	1.20	1.40	1.60	1.80	2.00	2.20	2.40

Legend:

ΔP_S = Unit Inlet Pressure [in wg]

qCoil = Sensible Capacity, Coil [Btu/h]

ΔCoil = Water coil pressure drop [ft wg]

q_{SENSPA} = Sensible Capacity, Primary Air [Btu/h]

CFM_{PA} = Air Flowrate, Primary Air [CFM]

T_{PA} = Temperature Primary Air [°F]

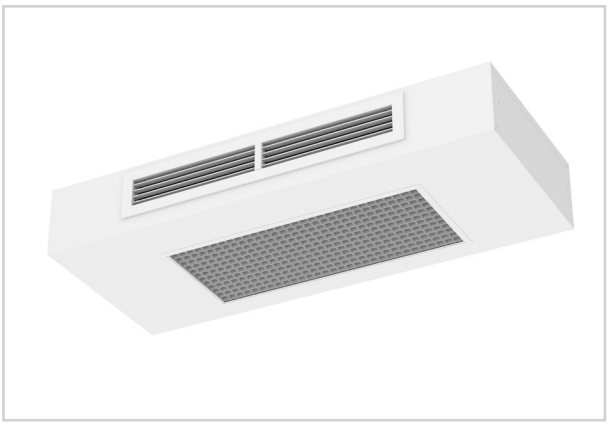
T_{ROOM} = Temperature Room Air [°F]

q_{SENSPA} = Latent Capacity, Primary Air [Btu/h]

Bulkhead Mounted Exposed Active Chilled Beams

CBAC

- Provides comfortable, effective sensible cooling to the space
- Optimized nozzle design provides high capacity and low noise levels
- Durable powder coated steel cabinet with tool-less access panels
- Quick and simple installation
- Available in nominal lengths up to 6 feet



CBAC

See website for Specifications

MODEL:

CBAC / Bulkhead Mounted Exposed Active Chilled Beam

FINISHES:

Standard Finish - #26 White
Optional Finish - #84 Black

OVERVIEW

Titus active chilled beams benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being discharged through a series of nozzles located along the length of the beam. The nozzles inject the primary air into the mixing chamber at velocities capable of inducing plenum or soffit air through the water coil and where it mixes with the primary supply air. This mixture of air is then discharged into the space through ceiling slot diffusers. This provides high cooling outputs with low amounts of primary air. The reduced volume of air results in the reduction of the air handler capacity and size, smaller duct sizes, and the overall energy consumption.

The supplied air from the air handling unit is tempered and dehumidified to handle the latent load. The remaining loads in the space are addressed with the heat exchanger which is incorporated into the chilled beam. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

The CBAC bulkhead beams are the ideal solution for single room hospitality spaces, such as hotel, dorm, and hospital rooms. With their shallow height, ceiling heights can be maximized creating an open and inviting space. Exposed bulkhead chilled beams are great for use in retrofit of buildings which were not originally built with HVAC systems originally installed.

ADVANTAGES

- Removal of high thermal loads is possible in this air/water system
- The height of the air duct system is reduced to a minimum, due to the low supply of primary air
- Substantial reduction in the operating costs, due to low primary air volume
- Improvement of the thermal comfort inside the room
- Contributing sound levels below NC-30

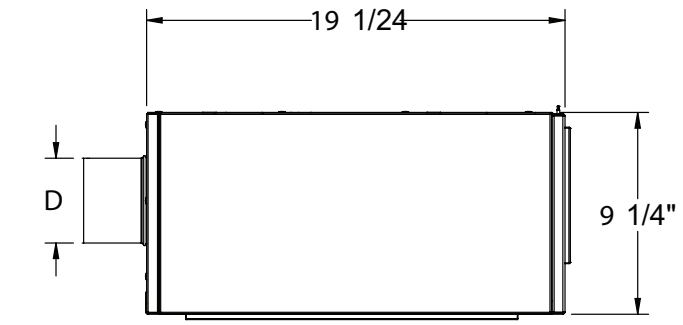
CBAC STANDARD FEATURES

- 2 foot to 6 foot nominal lengths
- Left hand or right hand coil connections
- Rear air inlet location
- Durable powder coated steel cabinet
- Louvered supply grille
- Perforated return grille
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Commissioning port with roomside access for balancing
- Mounting brackets with adjustments in two directions
- ½" Sweat water coil connections
- Coil air vent

OPTIONS AND ACCESSORIES

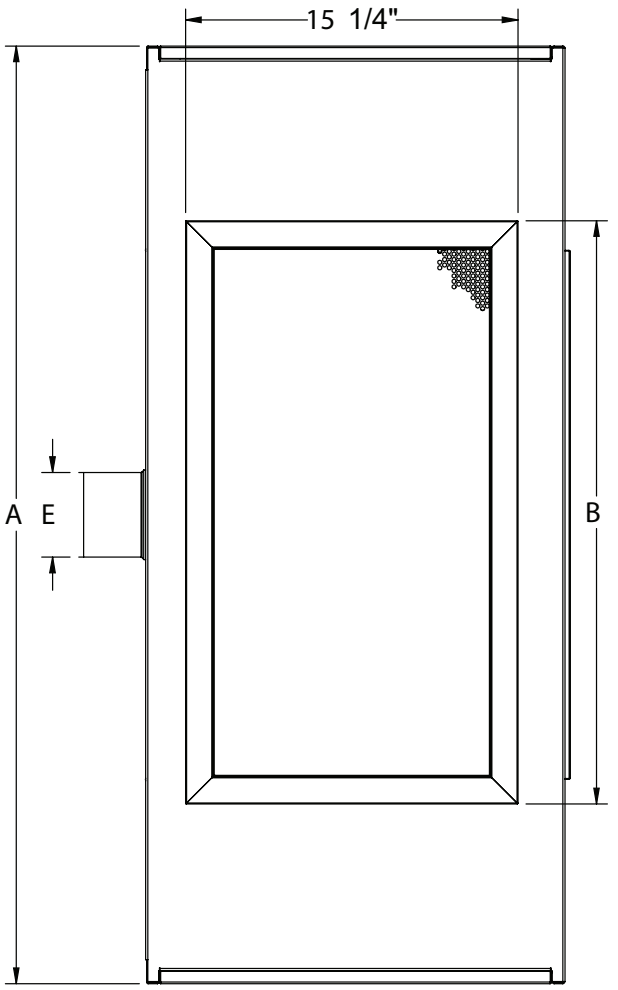
- Linear Bar supply grille
- Linear Bar return grille
- Louvered return grille
- Eggcrate return grille
- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" or ¾ MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Coil lint screen
- Constant volume regulator

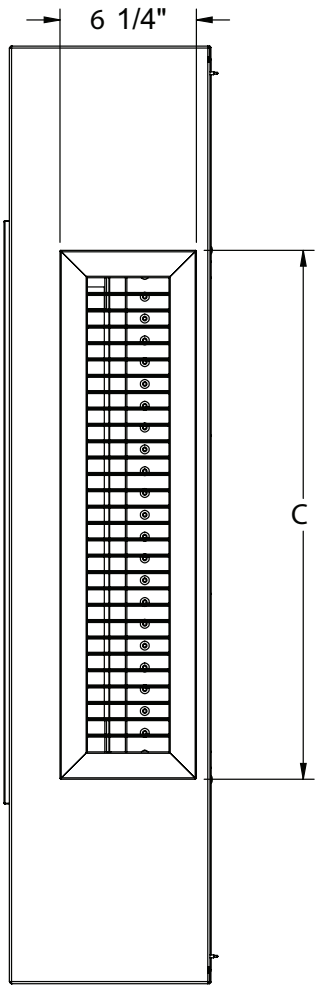
CBAC UNIT DIMENSIONS



Nominal	A	B	C
2ft	43	26¾	24¼
3ft	55	38¾	36¼
4ft	67	50¾	48¼
5ft	79	62¾	60¼
6ft	91	74¾	72¼

Inlet	D	E
4 IN Round	3 7/8	3 7/8
5 IN Round	4 7/8	4 7/8
6 IN Oval	5¼	6¼
8 IN Oval	5¼	9 3/8





All dimensions are in inches

CBAC / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.21	15	560	0.70	609	2.90	621	6.60	627	1.50	6.0	1 - 2 - 8
			11	0.39	15	733		837		858		869			2 - 4 - 12
			14	0.63	20	889		1023		1057		1073			3 - 6 - 16
			17	0.93	26	1090		1244		1293		1317			4 - 9 - 18
	B3	4	15	0.20	15	965		1102		1131		1146		4.5	2 - 4 - 13
			20	0.36	15	1217		1403		1452		1475			4 - 8 - 17
			25	0.56	19	1584		1792		1868		1906			6 - 11 - 19
			30	0.81	25	1860		2131		2237		2292			8 - 13 - 21
	B4	4	30	0.23	15	1324		1522		1571		1594		2.7	4 - 8 - 17
			40	0.40	17	1791		2033		2117		2159			6 - 12 - 20
			50	0.63	24	2207		2529		2655		2720			10 - 15 - 22
			60	0.91	29	2492		2916		3085		3173			12 - 17 - 24
4	B2	4	11	0.20	15	741	1.00	819	3.80	840	8.60	851	1.90	6.0	1 - 2 - 10
			15	0.38	15	954		1113		1150		1169			2 - 5 - 15
			19	0.61	21	1176		1349		1405		1434			3 - 7 - 19
			23	0.89	27	1403		1611		1691		1732			5 - 11 - 21
	B3	4	21	0.21	15	1287		1500		1552		1579		4.5	2 - 6 - 16
			28	0.37	15	1665		1894		1981		2024			4 - 10 - 20
			35	0.58	21	2060		2401		2535		2604			7 - 13 - 23
			42	0.84	27	2379		2838		3024		3121			10 - 16 - 25
	B4	4	35	0.18	15	1528		1780		1842		1873		2.7	3 - 7 - 18
			50	0.36	15	2109		2414		2532		2592			6 - 13 - 22
			65	0.59	18	2671		3156		3350		3450			11 - 17 - 25
			80	0.90	25	3070		3730		4004		4147			14 - 20 - 28
5	B2	4	15	0.23	15	960	1.20	1093	4.70	1131	1.30	1150	2.40	6.0	1 - 3 - 13
			20	0.41	16	1205		1440		1502		1533			3 - 6 - 17
			25	0.65	23	1455		1713		1805		1852			4 - 9 - 22
			30	0.93	28	1709		2029		2157		2223			6 - 13 - 24
	B3	4	25	0.18	15	1252		1487		1548		1579		4.5	2 - 6 - 17
			35	0.36	15	1661		1950		2059		2115			5 - 11 - 23
			45	0.59	23	2082		2512		2686		2777			8 - 15 - 26
			55	0.87	24	2349		2996		3243		3374			12 - 19 - 28
	B4	6" oval	40	0.14	15	1413		1666		1732		1766		2.7	3 - 6 - 18
			60	0.32	15	1984		2325		2457		2525			6 - 14 - 24
			80	0.57	15	2549		3115		3343		3462			11 - 18 - 28
			100	0.89	21	2850		3700		4027		4226			15 - 22 - 31
6	B2	4	20	0.28	15	1204	1.40	1423	5.50	1486	1.60	1518	2.80	6.0	2 - 4 - 16
			25	0.44	18	1429		1744		1837		1884			3 - 7 - 20
			30	0.63	23	1654		2001		2127		2193			4 - 10 - 24
			35	0.86	28	1879		2281		2446		2531			6 - 13 - 26
	B3	4	35	0.25	15	1921		2338		2469		2536		4.5	4 - 8 - 22
			45	0.41	17	2356		2843		3040		3143			6 - 14 - 26
			55	0.61	23	2797		3485		3774		3926			9 - 17 - 28
			65	0.83	23	3071		4019		4402		4607			13 - 20 - 31
	B4	6" oval	60	0.22	15	2331		2834		2997		3080		2.7	5 - 11 - 24
			80	0.40	15	2953		3602		3869		4008			9 - 17 - 28
			100	0.62	15	3511		4471		4870		5081			13 - 21 - 31
			120	0.90	21	3814		5132		5664		5971			17 - 24 - 34

Note: Reference page U84 for operational conditions used for performance notes

CBAC / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS	NC	1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)		qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.21	15	1245	0.12	1354	0.49	1381	1.10	1394	1.95	6.0	1 - 2 - 8
			11	0.39	15	1629		1860		1908		1932			2 - 4 - 12
			14	0.63	20	1975		2273		2348		2384			3 - 6 - 16
			17	0.93	26	2423		2764		2873		2926			4 - 9 - 18
	B3	4	15	0.20	15	2144		2450		2514		2547		4.5	2 - 4 - 13
			20	0.36	15	2704		3117		3226		3278			4 - 8 - 17
			25	0.56	19	3519		3981		4151		4236			6 - 11 - 19
			30	0.81	25	4133		4737		4972		5093			8 - 13 - 21
	B4	4	30	0.23	15	2943		3383		3490		3543		2.7	4 - 8 - 17
			40	0.40	17	3980		4517		4704		4797			6 - 12 - 20
			50	0.63	24	4904		5621		5900		6044			10 - 15 - 22
			60	0.91	29	5538		6479		6856		7052			12 - 17 - 24
4	B2	4	11	0.20	15	1648	0.16	1820	0.63	1868	1.41	1891	2.51	6.0	1 - 2 - 10
			15	0.38	15	2121		2474		2556		2597			2 - 5 - 15
			19	0.61	21	2614		2997		3123		3187			3 - 7 - 19
			23	0.89	27	3119		3580		3759		3850			5 - 11 - 21
	B3	4	21	0.21	15	2861		3333		3449		3508		4.5	2 - 6 - 16
			28	0.37	15	3700		4210		4401		4498			4 - 10 - 20
			35	0.58	21	4577		5335		5634		5787			7 - 13 - 23
			42	0.84	27	5286		6307		6720		6935			10 - 16 - 25
	B4	4	35	0.18	15	3395		3955		4093		4163		2.7	3 - 7 - 18
			50	0.36	15	4686		5365		5627		5760			6 - 13 - 22
			65	0.59	18	5936		7014		7445		7668			11 - 17 - 25
			80	0.90	25	6822		8290		8897		9216			14 - 20 - 28
5	B2	4	15	0.23	15	2134	0.19	2430	0.78	2514	1.75	2556	3.11	6.0	1 - 3 - 13
			20	0.41	16	2679		3199		3337		3407			3 - 6 - 17
			25	0.65	23	3234		3807		4011		4115			4 - 9 - 22
			30	0.93	28	3797		4509		4793		4940			6 - 13 - 24
	B3	4	25	0.18	15	2783		3306		3440		3509		4.5	2 - 6 - 17
			35	0.36	15	3692		4334		4575		4699			5 - 11 - 23
			45	0.59	23	4626		5581		5969		6171			8 - 15 - 26
			55	0.87	24	5220		6659		7208		7497			12 - 19 - 28
	B4	4	40	0.14	15	3139		3702		3849		3924		2.7	3 - 6 - 18
			60	0.32	15	4409		5167		5461		5612			6 - 14 - 24
			80	0.57	15	5664		6922		7428		7693			11 - 18 - 28
			100	0.89	21	6334		8222		8949		9391			15 - 22 - 31
6	B2	4	20	0.28	15	2676	0.23	3162	0.92	3303	2.06	3374	3.67	6.0	2 - 4 - 16
			25	0.44	18	3176		3875		4081		4186			3 - 7 - 20
			30	0.63	23	3675		4447		4727		4872			4 - 10 - 24
			35	0.86	28	4175		5070		5435		5625			6 - 13 - 26
	B3	4	35	0.25	15	4268		5196		5486		5635		4.5	4 - 8 - 22
			45	0.41	17	5236		6318		6756		6984			6 - 14 - 26
			55	0.61	23	6215		7745		8388		8725			9 - 17 - 28
			65	0.83	23	6825		8930		9783		10238			13 - 20 - 31
	B4	4	60	0.22	15	5180		6297		6659		6845		2.7	5 - 11 - 24
			80	0.40	15	6562		8005		8598		8907			9 - 17 - 28
			100	0.62	15	7802		9937		10823		11291			13 - 21 - 31
			120	0.90	21	8476		11405		12586		13269			17 - 24 - 34

Note: Reference page U84 for operational conditions used for performance notes

CBAC / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.21	15	598	0.90	650	3.70	663	8.30	669	1.90	6.0	1 - 2 - 8
			11	0.39	15	782		893		916		927			2 - 4 - 12
			14	0.63	20	948		1091		1127		1144			3 - 6 - 16
			17	0.93	26	1163		1327		1379		1405			4 - 9 - 18
	B3	4	15	0.20	15	1029		1176		1207		1222		4.5	2 - 4 - 13
			20	0.36	15	1298		1496		1548		1574			4 - 8 - 17
			25	0.56	19	1689		1911		1992		2033			6 - 11 - 19
			30	0.81	25	1984		2274		2386		2445			8 - 13 - 21
	B4	4	30	0.23	15	1413		1624		1675		1701		2.7	4 - 8 - 17
			40	0.40	17	1910		2168		2258		2303			6 - 12 - 20
			50	0.63	24	2354		2698		2832		2901			10 - 15 - 22
			60	0.91	29	2658		3110		3291		3385			12 - 17 - 24
4	B2	4	11	0.20	15	791	1.20	874	4.80	896	1.40	907	2.40	6.0	1 - 2 - 10
			15	0.38	15	1018		1187		1227		1247			2 - 5 - 15
			19	0.61	21	1255		1439		1499		1530			3 - 7 - 19
			23	0.89	27	1497		1718		1804		1848			5 - 11 - 21
	B3	4	21	0.21	15	1373		1600		1656		1684		4.5	2 - 6 - 16
			28	0.37	15	1776		2021		2113		2159			4 - 10 - 20
			35	0.58	21	2197		2561		2704		2778			7 - 13 - 23
			42	0.84	27	2538		3027		3226		3329			10 - 16 - 25
	B4	4	35	0.18	15	1629		1899		1965		1998		2.7	3 - 7 - 18
			50	0.36	15	2249		2575		2701		2765			6 - 13 - 22
			65	0.59	18	2849		3367		3573		3680			11 - 17 - 25
			80	0.90	25	3275		3979		4270		4424			14 - 20 - 28
5	B2	4	15	0.23	15	1025	1.50	1166	5.80	1206	1.70	1227	3.00	6.0	1 - 3 - 13
			20	0.41	16	1286		1536		1602		1635			3 - 6 - 17
			25	0.65	23	1552		1827		1925		1975			4 - 9 - 22
			30	0.93	28	1823		2164		2301		2371			6 - 13 - 24
	B3	4	25	0.18	15	1336		1587		1651		1684		4.5	2 - 6 - 17
			35	0.36	15	1772		2080		2196		2256			5 - 11 - 23
			45	0.59	23	2220		2679		2865		2962			8 - 15 - 26
			55	0.87	24	2506		3196		3460		3599			12 - 19 - 28
	B4	6" oval	40	0.14	15	1507		1777		1847		1883		2.7	3 - 6 - 18
			60	0.32	15	2116		2480		2621		2694			6 - 14 - 24
			80	0.57	15	2719		3322		3566		3693			11 - 18 - 28
			100	0.89	21	3040		3946		4296		4508			15 - 22 - 31
6	B2	4	20	0.28	15	1285	1.70	1518	6.90	1585	2.00	1620	3.50	6.0	2 - 4 - 16
			25	0.44	18	1525		1860		1959		2009			3 - 7 - 20
			30	0.63	23	1764		2134		2269		2339			4 - 10 - 24
			35	0.86	28	2004		2433		2609		2700			6 - 13 - 26
	B3	4	35	0.25	15	2049		2494		2633		2705		4.5	4 - 8 - 22
			45	0.41	17	2513		3033		3243		3352			6 - 14 - 26
			55	0.61	23	2983		3718		4026		4188			9 - 17 - 28
			65	0.83	23	3276		4286		4696		4914			13 - 20 - 31
	B4	6" oval	60	0.22	15	2486		3023		3196		3285		2.7	5 - 11 - 24
			80	0.40	15	3150		3842		4127		4275			9 - 17 - 28
			100	0.62	15	3745		4770		5195		5420			13 - 21 - 31
			120	0.90	21	4069		5475		6041		6369			17 - 24 - 34

Note: Reference page U84 for operational conditions used for performance notes

CBAC / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS	NC	1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)		qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.21	15	1660	0.92	1805	3.69	1841	8.30	1859	1.88	6.0	1 - 2 - 8
			11	0.39	15	2172		2480		2544		2576			2 - 4 - 12
			14	0.63	20	2634		3031		3131		3179			3 - 6 - 16
			17	0.93	26	3230		3685		3830		3902			4 - 9 - 18
	B3	4	15	0.20	15	2859		3267		3352		3396		4.5	2 - 4 - 13
			20	0.36	15	3605		4157		4301		4371			4 - 8 - 17
			25	0.56	19	4692		5309		5534		5648			6 - 11 - 19
			30	0.81	25	5510		6315		6629		6791			8 - 13 - 21
	B4	4	30	0.23	15	3924		4510		4654		4724		2.7	4 - 8 - 17
			40	0.40	17	5306		6023		6272		6396			6 - 12 - 20
			50	0.63	24	6539		7494		7866		8059			10 - 15 - 22
			60	0.91	29	7384		8639		9142		9403			12 - 17 - 24
4	B2	4	11	0.20	15	2197	1.19	2427	4.76	2490	1.37	2521	2.43	6.0	1 - 2 - 10
			15	0.38	15	2827		3298		3408		3463			2 - 5 - 15
			19	0.61	21	3485		3996		4164		4249			3 - 7 - 19
			23	0.89	27	4158		4774		5012		5133			5 - 11 - 21
	B3	4	21	0.21	15	3814		4444		4599		4678		4.5	2 - 6 - 16
			28	0.37	15	4933		5613		5868		5998			4 - 10 - 20
			35	0.58	21	6103		7114		7512		7716			7 - 13 - 23
			42	0.84	27	7049		8409		8960		9247			10 - 16 - 25
	B4	4	35	0.18	15	4526		5274		5458		5551		2.7	3 - 7 - 18
			50	0.36	15	6248		7153		7502		7680			6 - 13 - 22
			65	0.59	18	7915		9352		9926		10224			11 - 17 - 25
			80	0.90	25	9096		11053		11862		12288			14 - 20 - 28
5	B2	4	15	0.23	15	2846	1.46	3240	5.83	3351	1.67	3408	2.97	6.0	1 - 3 - 13
			20	0.41	16	3572		4266		4449		4543			3 - 6 - 17
			25	0.65	23	4311		5076		5348		5487			4 - 9 - 22
			30	0.93	28	5063		6012		6390		6586			6 - 13 - 24
	B3	4	25	0.18	15	3710		4407		4587		4679		4.5	2 - 6 - 17
			35	0.36	15	4923		5779		6101		6266			5 - 11 - 23
			45	0.59	23	6168		7442		7959		8228			8 - 15 - 26
			55	0.87	24	6960		8878		9610		9996			12 - 19 - 28
	B4	4	40	0.14	15	4185		4936		5132		5232		2.7	3 - 6 - 18
			60	0.32	15	5878		6890		7281		7482			6 - 14 - 24
			80	0.57	15	7552		9229		9904		10257			11 - 18 - 28
			100	0.89	21	8446		10962		11932		12522			15 - 22 - 31
6	B2	4	20	0.28	15	3568	1.72	4215	6.89	4404	1.98	4499	3.52	6.0	2 - 4 - 16
			25	0.44	18	4235		5167		5442		5581			3 - 7 - 20
			30	0.63	23	4900		5929		6303		6496			4 - 10 - 24
			35	0.86	28	5567		6760		7247		7500			6 - 13 - 26
	B3	4	35	0.25	15	5691		6928		7315		7513		4.5	4 - 8 - 22
			45	0.41	17	6981		8424		9008		9312			6 - 14 - 26
			55	0.61	23	8286		10326		11184		11633			9 - 17 - 28
			65	0.83	23	9100		11907		13044		13650			13 - 20 - 31
	B4	4	60	0.22	15	6906		8396		8879		9126		2.7	5 - 11 - 24
			80	0.40	15	8749		10674		11464		11876			9 - 17 - 28
			100	0.62	15	10403		13249		14431		15055			13 - 21 - 31
			120	0.90	21	11302		15207		16781		17692			17 - 24 - 34

Note: Reference page U84 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2015
2. ΔP_s values are measured in inches of water
3. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
4. Throw values are based on isothermal supply air and represent throw distances to terminal velocities of 150, 100 and 50 fpm respectively
5. ΔP_{Coil} values are measured in feet of water. ΔP_{Coil} values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit coil.
6. Induction ratio is multiplied by the volume flow rate of primary air to estimate the volume flow rate of room air entrained through the coil

Cooling performance:

- Cooling capacity listed (qTOTAL) is the total sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air.
- Capacity is based on 18°F ΔT between the induced air and the chilled water supply. Table 1 provides correction factors for other temperature differentials.
- Primary air sensible cooling contribution can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{ROOM} - T_{PA})$$

- Primary air latent cooling can be calculated by the following equation:

$$q_{LATENT} = 0.69 \times CFM_{PA} \times (W_{ROOM} - W_{PA})$$

where W_{ROOM} and W_{PA} are the humidity ratio of the room and primary air respectively expressed in Grains of moisture per pound dry air

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	**18**	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	**1.00**	1.11	1.22	1.33

Heating performance:

- Heating capacity listed (qTOTAL) is the sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air
- Capacity is based on 50°F ΔT between the induced air and the chilled water supply. Table 2 provides correction factors for other temperature differentials.
- Primary air sensible heating offset (or contribution) can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{PA} - T_{ROOM})$$

if the primary air temperature is lower than that of the room, it will offset the coil's heating

if the primary air temperature is higher than that of the room, it will contribute to the coil's heating

TABLE 2: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	20	30	40	**50**	60	70	80	90	100	110	120
Multiply Table Value by:	0.40	0.60	0.80	**1.00**	1.20	1.40	1.60	1.80	2.00	2.20	2.40

Legend:

ΔP_S = Unit Inlet Pressure [in wg]

qCoil = Sensible Capacity, Coil [Btu/h]

ΔCoil = Water coil pressure drop [ft wg]

q_{SENSPA} = Sensible Capacity, Primary Air [Btu/h]

CFM_{PA} = Air Flowrate, Primary Air [CFM]

T_{PA} = Temperature Primary Air [°F]

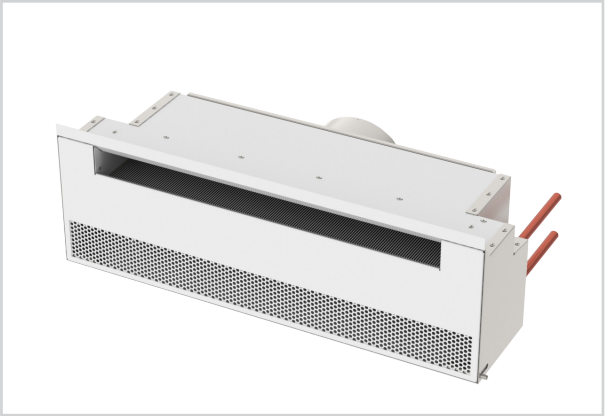
T_{ROOM} = Temperature Room Air [°F]

q_{SENSPA} = Latent Capacity, Primary Air [Btu/h]

Sidewall Active Chilled Beams

CBAW

- Provides comfortable, effective sensible cooling to the space
- Optimized nozzle design provides high capacity and low noise levels
- Ideal for multi-story residential and hospitality spaces
- Quick and simple installation
- Available in nominal lengths up to 10 feet



CBAW

hotels / motels | dual-function | universities | energy solutions

See website for Specifications

MODEL:

CBAW / Sidewall Active Chilled Beam

OVERVIEW

Titus active chilled beams benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being discharged through a series of nozzles located along the length of the beam. The nozzles inject the primary air into the mixing chamber at velocities capable of inducing plenum or soffit air through the water coil and where it mixes with the primary supply air. This mixture of air is then discharged into the space through ceiling slot diffusers. This provides high cooling outputs with low amounts of primary air. The reduced volume of air results in the reduction of the air handler capacity and size, smaller duct sizes, and the overall energy consumption.

The supplied air from the air handling unit is tempered and dehumidified to handle the latent load. The remaining loads in the space are addressed with the heat exchanger which is incorporated into the chilled beam. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

In multi-story residential and hospitality spaces, the CBAW sidewall beams complement modern architectural styling and minimize installed space, as well as minimizing energy consumption. Superior comfort and near maintenance free operation of the CBAW product family, combined with energy efficiency are an ideal solution in such demanding applications.

ADVANTAGES

- Removal of high thermal loads is possible in this air/water system
- The height of the air duct system is reduced to a minimum, due to the low supply of primary air
- Substantial reduction in the operating costs, due to low primary air volume
- Improvement of the thermal comfort inside the room
- Contributing sound levels below NC-30

CBAW STANDARD FEATURES

- 2 foot to 10 foot lengths, 1 foot increments
- 2-pipe and 4-pipe coil configurations
- Configured nozzle geometry for capacity optimization
- Commissioning port with roomside access for balancing
- ½" Sweat water coil connections
- Coil air vent
- Perforated grille

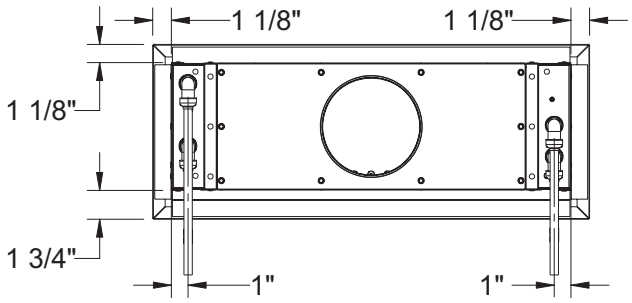
OPTIONS AND ACCESSORIES

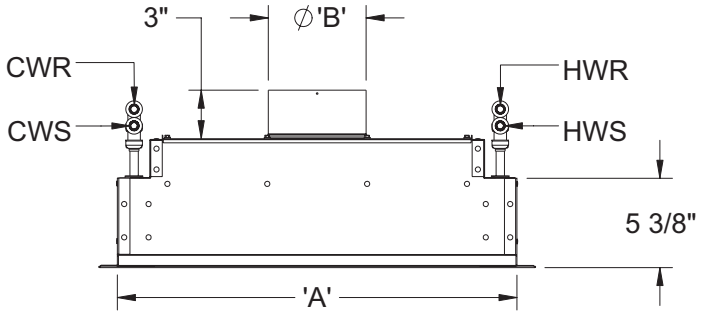
- Linear bar grille
- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" or ¾ MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Coil lint screen
- Constant volume regulator

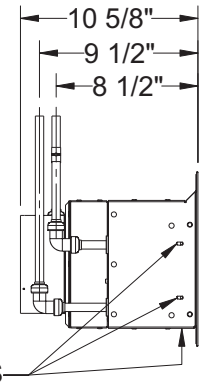
CBAW UNIT DIMENSIONS

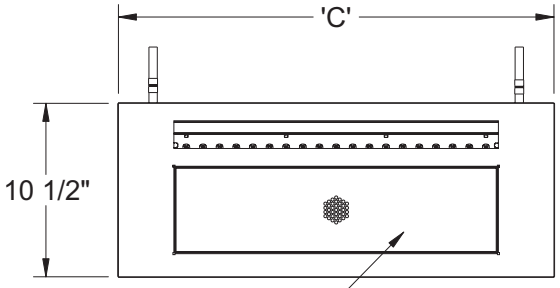
Nominal Length	A	C
2ft	24	26⅛
3ft	36	38⅛
4ft	48	50⅛
5ft	60	62⅛
6ft	72	74⅛
7ft	84	86⅛
8ft	96	98⅛
9ft	108	110⅛
10ft	120	122⅛

Nominal Inlet	B
4 IN	3⅞
5 IN	4⅞
6 IN	5¼
8 IN	5¼









MOUNTING SLOTS

RETURN GRILLE
(PERFORATED OR LINEAR BAR)

All dimensions are in inches

CBAW / 4-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.27	15	405	0.30	425	1.10	432	2.50	435	4.00	4.4	1 - 2 - 6
			10	0.42	19	484		513		524		528			1 - 2 - 8
			12	0.61	23	556		597		611		617			2 - 4 - 9
			14	0.83	27	623		675		694		702			2 - 5 - 11
	B3	4	14	0.23	16	579		619		633		639		3.6	2 - 5 - 11
			18	0.38	22	696		757		779		788			4 - 7 - 12
			22	0.57	27	800		882		914		927			5 - 8 - 13
			26	0.80	31	892		997		1038		1056			7 - 10 - 15
	B4	4	24	0.18	19	770		842		870		882		3.0	6 - 9 - 14
			32	0.32	26	930		1043		1087		1105			8 - 12 - 16
			40	0.51	31	1066		1219		1281		1307			10 - 13 - 18
			48	0.71	25	1181		1375		1455		1490			12 - 14 - 20
4	B2	4	10	0.20	15	502	0.40	531	1.40	541	3.20	545	5.10	4.4	1 - 2 - 6
			13	0.35	20	619		663		680		687			1 - 3 - 9
			16	0.52	24	723		786		810		820			2 - 4 - 11
			19	0.74	28	818		901		933		945			3 - 6 - 13
	B3	4	18	0.19	17	734		793		815		824		3.6	2 - 5 - 12
			24	0.33	24	901		995		1031		1045			4 - 8 - 14
			30	0.52	29	1046		1178		1229		1250			6 - 10 - 16
			36	0.74	33	1171		1341		1410		1438			8 - 12 - 17
	B4	4	35	0.21	23	1054		1184		1234		1255		3.0	8 - 12 - 17
			45	0.35	29	1232		1417		1492		1523			10 - 14 - 19
			55	0.52	34	1381		1623		1723		1766			12 - 15 - 21
			65	0.69	27	1508		1806		1933		1987			13 - 16 - 23
5	B2	4	12	0.17	15	596	0.40	634	1.70	648	3.90	654	6.30	4.4	1 - 2 - 7
			16	0.31	20	747		809		833		842			1 - 3 - 10
			20	0.48	26	880		970		1004		1018			2 - 5 - 12
			24	0.69	30	998		1118		1164		1183			3 - 7 - 14
	B3	4	24	0.20	20	936		1030		1066		1080		3.6	3 - 7 - 14
			30	0.31	25	1091		1224		1276		1297			5 - 9 - 16
			36	0.44	29	1226		1401		1471		1499			7 - 11 - 17
			42	0.60	33	1346		1564		1652		1688			8 - 13 - 19
	B4	6" oval	40	0.16	15	1200		1360		1424		1449		3.0	8 - 12 - 18
			55	0.31	19	1454		1706		1809		1852			11 - 15 - 21
			70	0.50	25	1655		1999		2145		2207			14 - 17 - 24
			85	0.74	30	1819		2253		2442		2525			15 - 19 - 27
6	B2	4	15	0.18	16	726	0.50	783	2.00	804	4.60	812	7.40	4.4	1 - 2 - 8
			20	0.32	23	904		995		1029		1043			2 - 4 - 11
			25	0.50	28	1058		1188		1238		1258			2 - 5 - 14
			30	0.71	32	1193		1364		1431		1459			4 - 8 - 16
	B3	4	28	0.18	20	1074		1196		1242		1261		3.6	3 - 7 - 15
			36	0.29	26	1270		1449		1520		1548			5 - 10 - 17
			44	0.44	31	1436		1676		1772		1812			8 - 12 - 19
			52	0.61	35	1580		1881		2005		2058			9 - 14 - 21
	B4	6" oval	50	0.17	15	1429		1657		1748		1785		3.0	9 - 14 - 20
			70	0.34	22	1725		2085		2235		2299			13 - 17 - 24
			90	0.56	28	1950		2439		2653		2745			16 - 19 - 27
			110	0.84	32	2128		2739		3016		3138			17 - 21 - 30

Note: Reference page U91 for operational conditions used for performance notes

CBAW / 4-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.27	15	938	0.09	984	0.36	1001	0.82	1007	1.31	4.4	1 - 2 - 6
			10	0.42	19	1121		1189		1214		1223			1 - 2 - 8
			12	0.61	23	1288		1381		1416		1428			2 - 4 - 9
			14	0.83	27	1443		1563		1607		1625			2 - 5 - 11
	B3	4	14	0.23	16	1340		1432		1466		1479		3.6	2 - 5 - 11
			18	0.38	22	1612		1751		1804		1825			4 - 7 - 12
			22	0.57	27	1852		2042		2116		2146			5 - 8 - 13
			26	0.80	31	2064		2308		2404		2444			7 - 10 - 15
	B4	4	24	0.18	19	1782		1950		2015		2041		3.0	6 - 9 - 14
			32	0.32	26	2154		2414		2516		2559			8 - 12 - 16
			40	0.51	31	2468		2822		2965		3025			10 - 13 - 18
			48	0.71	25	2734		3183		3369		3448			12 - 14 - 20
4	B2	4	10	0.20	15	1163	0.12	1228	0.47	1252	1.06	1262	1.70	4.4	1 - 2 - 6
			13	0.35	20	1432		1536		1574		1589			1 - 3 - 9
			16	0.52	24	1674		1820		1875		1897			2 - 4 - 11
			19	0.74	28	1893		2086		2159		2188			3 - 6 - 13
	B3	4	18	0.19	17	1698		1835		1887		1907		3.6	2 - 5 - 12
			24	0.33	24	2085		2303		2386		2420			4 - 8 - 14
			30	0.52	29	2421		2726		2844		2893			6 - 10 - 16
			36	0.74	33	2710		3105		3264		3329			8 - 12 - 17
	B4	4	35	0.21	23	2440		2740		2856		2905		3.0	8 - 12 - 17
			45	0.35	29	2851		3281		3454		3526			10 - 14 - 19
			55	0.52	34	3196		3756		3989		4087			12 - 15 - 21
			65	0.69	27	3490		4181		4475		4601			13 - 16 - 23
5	B2	4	12	0.17	15	1380	0.14	1468	0.58	1501	1.29	1513	2.08	4.4	1 - 2 - 7
			16	0.31	20	1729		1874		1928		1949			1 - 3 - 10
			20	0.48	26	2038		2246		2325		2356			2 - 5 - 12
			24	0.69	30	2311		2588		2696		2738			3 - 7 - 14
	B3	4	24	0.20	20	2167		2385		2467		2499		3.6	3 - 7 - 14
			30	0.31	25	2525		2833		2954		3002			5 - 9 - 16
			36	0.44	29	2839		3243		3404		3470			7 - 11 - 17
			42	0.60	33	3117		3620		3823		3908			8 - 13 - 19
	B4	6" oval	40	0.16	15	2778		3149		3296		3355		3.0	8 - 12 - 18
			55	0.31	19	3367		3949		4186		4287			11 - 15 - 21
			70	0.50	25	3832		4628		4966		5109			14 - 17 - 24
			85	0.74	30	4212		5216		5654		5844			15 - 19 - 27
6	B2	4	15	0.18	16	1682	0.17	1813	0.69	1861	1.54	1880	2.47	4.4	1 - 2 - 8
			20	0.32	23	2092		2304		2383		2415			2 - 4 - 11
			25	0.50	28	2449		2750		2865		2912			2 - 5 - 14
			30	0.71	32	2761		3157		3313		3377			4 - 8 - 16
	B3	4	28	0.18	20	2486		2769		2875		2919		3.6	3 - 7 - 15
			36	0.29	26	2940		3355		3518		3584			5 - 10 - 17
			44	0.44	31	3325		3879		4103		4195			8 - 12 - 19
			52	0.61	35	3657		4355		4642		4763			9 - 14 - 21
	B4	6" oval	50	0.17	15	3308		3835		4046		4132		3.0	9 - 14 - 20
			70	0.34	22	3993		4825		5174		5322			13 - 17 - 24
			90	0.56	28	4515		5647		6142		6355			16 - 19 - 27
			110	0.84	32	4925		6340		6982		7265			17 - 21 - 30

Note: Reference page U91 for operational conditions used for performance notes

CBAW / 2-PIPE COOLING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Sensible Cooling (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.27	15	432	0.40	454	1.50	461	3.30	464	5.40	4.4	1 - 2 - 6
			10	0.42	19	516		548		559		564			1 - 2 - 8
			12	0.61	23	593		637		652		658			2 - 4 - 9
			14	0.83	27	665		720		741		749			2 - 5 - 11
	B3	4	14	0.23	16	617		660		676		682		3.6	2 - 5 - 11
			18	0.38	22	743		807		831		841			4 - 7 - 12
			22	0.57	27	853		941		975		989			5 - 8 - 13
			26	0.80	31	951		1064		1108		1126			7 - 10 - 15
	B4	4	24	0.18	19	821		899		928		941		3.0	6 - 9 - 14
			32	0.32	26	992		1112		1159		1179			8 - 12 - 16
			40	0.51	31	1137		1300		1366		1394			10 - 13 - 18
			48	0.71	25	1260		1467		1552		1589			12 - 14 - 20
4	B2	4	10	0.20	15	536	0.50	566	1.90	577	4.30	581	7.00	4.4	1 - 2 - 6
			13	0.35	20	660		708		725		732			1 - 3 - 9
			16	0.52	24	771		839		864		874			2 - 4 - 11
			19	0.74	28	872		961		995		1008			3 - 6 - 13
	B3	4	18	0.19	17	783		846		869		879		3.6	2 - 5 - 12
			24	0.33	24	961		1061		1099		1115			4 - 8 - 14
			30	0.52	29	1115		1256		1311		1333			6 - 10 - 16
			36	0.74	33	1249		1431		1504		1534			8 - 12 - 17
	B4	4	35	0.21	23	1124		1263		1316		1338		3.0	8 - 12 - 17
			45	0.35	29	1314		1512		1591		1625			10 - 14 - 19
			55	0.52	34	1473		1731		1838		1883			12 - 15 - 21
			65	0.69	27	1608		1927		2062		2120			13 - 16 - 23
5	B2	4	12	0.17	15	636	0.60	676	2.40	692	5.30	697	8.50	4.4	1 - 2 - 7
			16	0.31	20	797		863		889		898			1 - 3 - 10
			20	0.48	26	939		1035		1071		1086			2 - 5 - 12
			24	0.69	30	1065		1192		1242		1262			3 - 7 - 14
	B3	4	24	0.20	20	999		1099		1137		1152		3.6	3 - 7 - 14
			30	0.31	25	1163		1306		1361		1383			5 - 9 - 16
			36	0.44	29	1308		1495		1569		1599			7 - 11 - 17
			42	0.60	33	1436		1668		1762		1801			8 - 13 - 19
	B4	6" oval	40	0.16	15	1280		1451		1519		1546		3.0	8 - 12 - 18
			55	0.31	19	1551		1820		1929		1975			11 - 15 - 21
			70	0.50	25	1766		2133		2288		2354			14 - 17 - 24
			85	0.74	30	1941		2404		2605		2693			15 - 19 - 27
6	B2	4	15	0.18	16	775	0.70	835	2.80	858	6.30	866	10.00	4.4	1 - 2 - 8
			20	0.32	23	964		1062		1098		1113			2 - 4 - 11
			25	0.50	28	1128		1267		1320		1342			2 - 5 - 14
			30	0.71	32	1272		1455		1527		1556			4 - 8 - 16
	B3	4	28	0.18	20	1146		1276		1325		1345		3.6	3 - 7 - 15
			36	0.29	26	1355		1546		1621		1652			5 - 10 - 17
			44	0.44	31	1532		1788		1891		1933			8 - 12 - 19
			52	0.61	35	1685		2007		2139		2195			9 - 14 - 21
	B4	6" oval	50	0.17	15	1524		1767		1864		1904		3.0	9 - 14 - 20
			70	0.34	22	1840		2223		2384		2452			13 - 17 - 24
			90	0.56	28	2080		2602		2830		2928			16 - 19 - 27
			110	0.84	32	2269		2922		3217		3348			17 - 21 - 30

Note: Reference page U91 for operational conditions used for performance notes

CBAW / 2-PIPE HEATING

Nominal Length ft	Nozzle Size	Primary Air			Sound	Coil Heating (Btu/h)								Induction ratio	Throw
		Inlet Dia.	Flow Rate	Inlet ΔPS		1.0 GPM		2.0 GPM		3.0 GPM		4.0 GPM			
		Inches	CFM	(in. H2O)	NC	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL	qTOTAL	ΔCOIL		ft.
3	B2	4	8	0.27	15	1201	0.37	1260	1.49	1281	3.35	1289	5.37	4.4	1 - 2 - 6
			10	0.42	19	1435		1521		1553		1566			1 - 2 - 8
			12	0.61	23	1648		1768		1812		1828			2 - 4 - 9
			14	0.83	27	1846		2000		2057		2079			2 - 5 - 11
	B3	4	14	0.23	16	1715		1833		1877		1893		3.6	2 - 5 - 11
			18	0.38	22	2063		2242		2309		2336			4 - 7 - 12
			22	0.57	27	2371		2614		2708		2746			5 - 8 - 13
			26	0.80	31	2642		2955		3077		3128			7 - 10 - 15
	B4	4	24	0.18	19	2280		2496		2579		2613		3.0	6 - 9 - 14
			32	0.32	26	2757		3090		3220		3275			8 - 12 - 16
			40	0.51	31	3159		3612		3795		3872			10 - 13 - 18
			48	0.71	25	3499		4074		4312		4414			12 - 14 - 20
4	B2	4	10	0.20	15	1489	0.48	1572	1.93	1603	4.34	1615	6.96	4.4	1 - 2 - 6
			13	0.35	20	1833		1966		2015		2034			1 - 3 - 9
			16	0.52	24	2143		2330		2401		2429			2 - 4 - 11
			19	0.74	28	2424		2670		2763		2800			3 - 6 - 13
	B3	4	18	0.19	17	2174		2349		2415		2441		3.6	2 - 5 - 12
			24	0.33	24	2669		2948		3054		3097			4 - 8 - 14
			30	0.52	29	3099		3489		3641		3703			6 - 10 - 16
			36	0.74	33	3469		3975		4178		4261			8 - 12 - 17
	B4	4	35	0.21	23	3123		3507		3656		3718		3.0	8 - 12 - 17
			45	0.35	29	3650		4199		4421		4513			10 - 14 - 19
			55	0.52	34	4091		4808		5106		5232			12 - 15 - 21
			65	0.69	27	4467		5352		5728		5889			13 - 16 - 23
5	B2	4	12	0.17	15	1766	0.59	1879	2.37	1921	5.33	1937	8.54	4.4	1 - 2 - 7
			16	0.31	20	2213		2398		2468		2495			1 - 3 - 10
			20	0.48	26	2608		2875		2975		3016			2 - 5 - 12
			24	0.69	30	2958		3312		3450		3505			3 - 7 - 14
	B3	4	24	0.20	20	2774		3053		3157		3199		3.6	3 - 7 - 14
			30	0.31	25	3232		3627		3781		3843			5 - 9 - 16
			36	0.44	29	3633		4152		4357		4442			7 - 11 - 17
			42	0.60	33	3990		4634		4893		5003			8 - 13 - 19
	B4	6" oval	40	0.16	15	3556		4031		4219		4295		3.0	8 - 12 - 18
			55	0.31	19	4309		5054		5359		5487			11 - 15 - 21
			70	0.50	25	4905		5924		6356		6540			14 - 17 - 24
			85	0.74	30	5391		6677		7237		7481			15 - 19 - 27
6	B2	4	15	0.18	16	2152	0.69	2320	2.78	2383	6.25	2407	10.03	4.4	1 - 2 - 8
			20	0.32	23	2678		2949		3050		3091			2 - 4 - 11
			25	0.50	28	3134		3519		3667		3727			2 - 5 - 14
			30	0.71	32	3534		4041		4241		4322			4 - 8 - 16
	B3	4	28	0.18	20	3182		3544		3680		3736		3.6	3 - 7 - 15
			36	0.29	26	3763		4294		4503		4588			5 - 10 - 17
			44	0.44	31	4255		4966		5252		5370			8 - 12 - 19
			52	0.61	35	4680		5574		5942		6096			9 - 14 - 21
	B4	6" oval	50	0.17	15	4234		4909		5179		5289		3.0	9 - 14 - 20
			70	0.34	22	5112		6176		6623		6812			13 - 17 - 24
			90	0.56	28	5779		7228		7861		8134			16 - 19 - 27
			110	0.84	32	6304		8116		8937		9299			17 - 21 - 30

Note: Reference page U91 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2015
2. ΔP_s values are measured in inches of water
3. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
4. Throw values are based on isothermal supply air and represent throw distances to terminal velocities of 150, 100 and 50 fpm respectively
5. ΔP_{Coil} values are measured in feet of water. ΔP_{Coil} values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit coil.
6. Induction ratio is multiplied by the volume flow rate of primary air to estimate the volume flow rate of room air entrained through the coil

Cooling performance:

- Cooling capacity listed (qTOTAL) is the total sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air.
- Capacity is based on 18°F ΔT between the induced air and the chilled water supply. Table 1 provides correction factors for other temperature differentials.
- Primary air sensible cooling contribution can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{ROOM} - T_{PA})$$

- Primary air latent cooling can be calculated by the following equation:

$$q_{LATENT} = 0.69 \times CFM_{PA} \times (W_{ROOM} - W_{PA})$$

where W_{ROOM} and W_{PA} are the humidity ratio of the room and primary air respectively expressed in Grains of moisture per pound dry air

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	**18**	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	**1.00**	1.11	1.22	1.33

Heating performance:

- Heating capacity listed (qTOTAL) is the sensible heat removal by the beam's integral coil. It does not include any contribution or offset by the primary air
- Capacity is based on 50°F ΔT between the induced air and the chilled water supply. Table 2 provides correction factors for other temperature differentials.
- Primary air sensible heating offset (or contribution) can be calculated by the following equation:

$$q_{SENSPA} = 1.085 \times CFM_{PA} \times (T_{PA} - T_{ROOM})$$

if the primary air temperature is lower than that of the room, it will offset the coil's heating

if the primary air temperature is higher than that of the room, it will contribute to the coil's heating

TABLE 2: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR AND ENTERING CHILLED WATER

Actual ΔT	20	30	40	**50**	60	70	80	90	100	110	120
Multiply Table Value by:	0.40	0.60	0.80	**1.00**	1.20	1.40	1.60	1.80	2.00	2.20	2.40

Legend:

ΔP_S = Unit Inlet Pressure [in wg]

qCoil = Sensible Capacity, Coil [Btu/h]

ΔCoil = Water coil pressure drop [ft wg]

q_{SENSPA} = Sensible Capacity, Primary Air [Btu/h]

CFM_{PA} = Air Flowrate, Primary Air [CFM]

T_{PA} = Temperature Primary Air [°F]

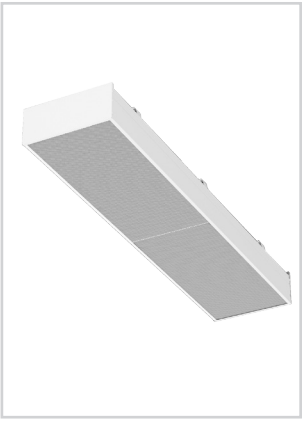
T_{ROOM} = Temperature Room Air [°F]

q_{SENSPA} = Latent Capacity, Primary Air [Btu/h]

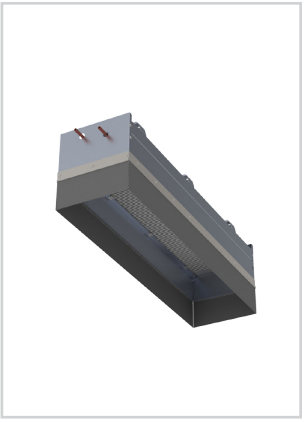
Linear Passive Chilled Beams

CBPE / CBPR

- Provides comfortable, effective sensible cooling to the space
- Ultra quiet, natural convection driven operation
- Perforated or Linear Bar Grille options for exposed models
- Exposed, recessed or concealed installation
- Quick and simple installation
- Available in nominal lengths up to 10 feet
- ½" Sweat or ½" MNPT coil connections



CBPE



CBPR

k-12 education universities energy solutions

See website for Specifications

MODELS:

CBPE / Exposed linear passive chilled beam
CBPR / Recessed linear passive chilled beam

FINISHES:

Standard Finish - #26 White
Optional Finish - #84 Black

OVERVIEW

Comfortable, effective, ultra-quiet sensible cooling technology

Passive chilled beams are primarily used to provide sensible cooling in perimeter zones and comfortable sensible cooling within interior zones. The primary mode of heat transfer is by natural convection, with a percentage of heat transfer transmitted through radiation. During cooling, warm room air rises to the ceiling area; cool air around the coil sinks down to the occupied area as a result of the higher density. As the cool air descends in to the space, more warm air is drawn over the coil creating a convective current that drives the system.

The airflow pattern generated from a passive beam is unidirectional with direct downward projection from the bottom of the beam. As the thermal buoyancy of the cool air drives the airflow down into space it will begin to mix with ambient room air and diffuse throughout the space. To maximize occupant comfort with passive beam systems, stationary or seated occupants should not be positioned directly under a beam. Passive beams should be installed in aisles, walkways or corridors, or at least 15 feet above the occupied space to prevent instances of occupant discomfort.

When using passive chilled beams, ventilation and latent cooling loads are addressed by a separate primary air system. Primary air systems could be traditional mixed air distribution, underfloor air distribution or displacement ventilation systems. As the primary air system is not used to address the entire cooling load the total system fan energy is reduced improving overall energy efficiency of the building. Applications with low latent cooling loads could use 100 percent outdoor air allowing for use of a dedicated outdoor air system with energy recovery further reducing total system energy consumption.

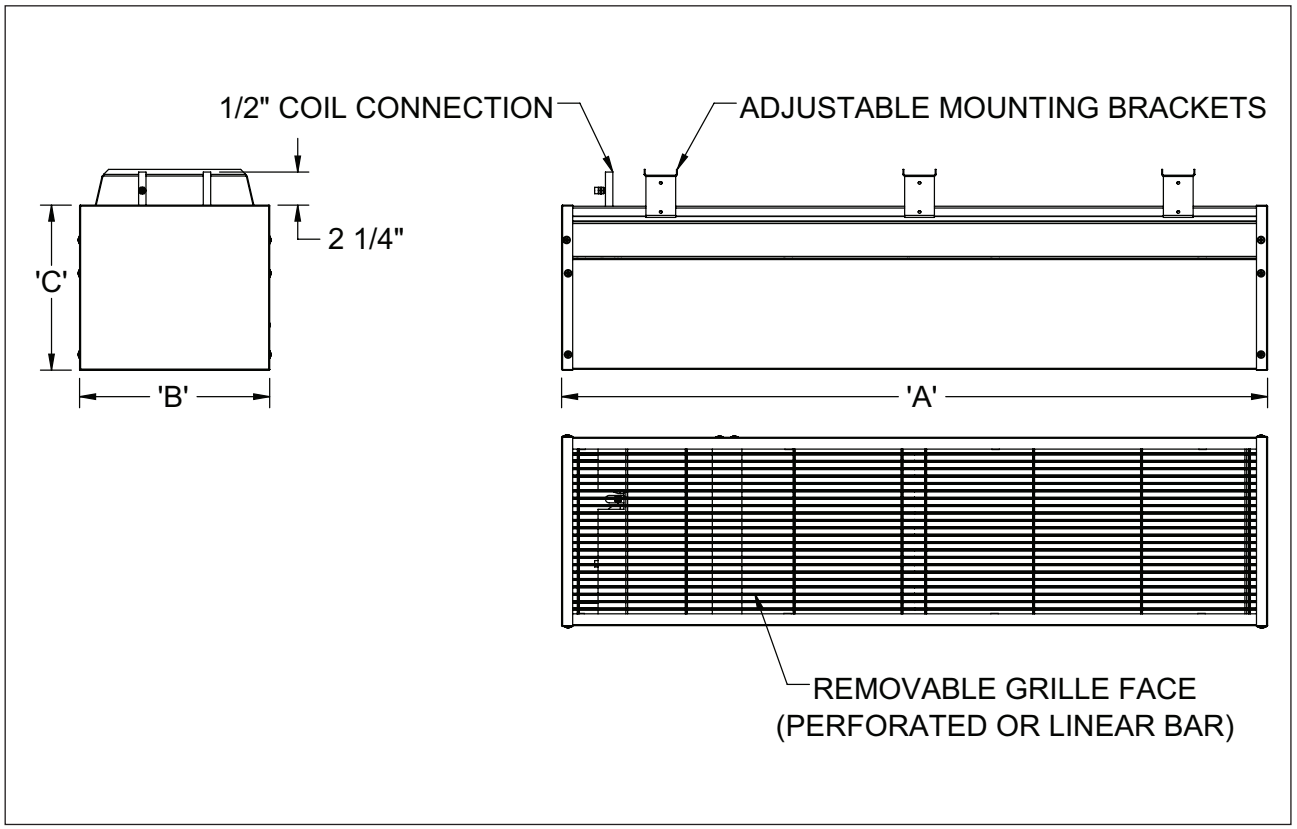
CBPE

The CBPE is ideal for exposed installations or can be integrated into lay-in ceiling systems for concealed installations. For applications with low ceilings or limited ceiling plenum height the low profile design excels at satisfying sensible cooling.

CBPR

CBPR passive beams are designed for recessed installation above a false ceiling. The false ceiling could be an architectural cloud type or even a perforated panel in a conventional lay-in ceiling grid. The CBPR beams are supplied with an additional skirt below the unit's coil that is designed to further enhance the convective current through beam augmenting performance. Beams should be installed with the skirt in contact with the top side of the false ceiling.

CBPE UNIT DIMENSIONS



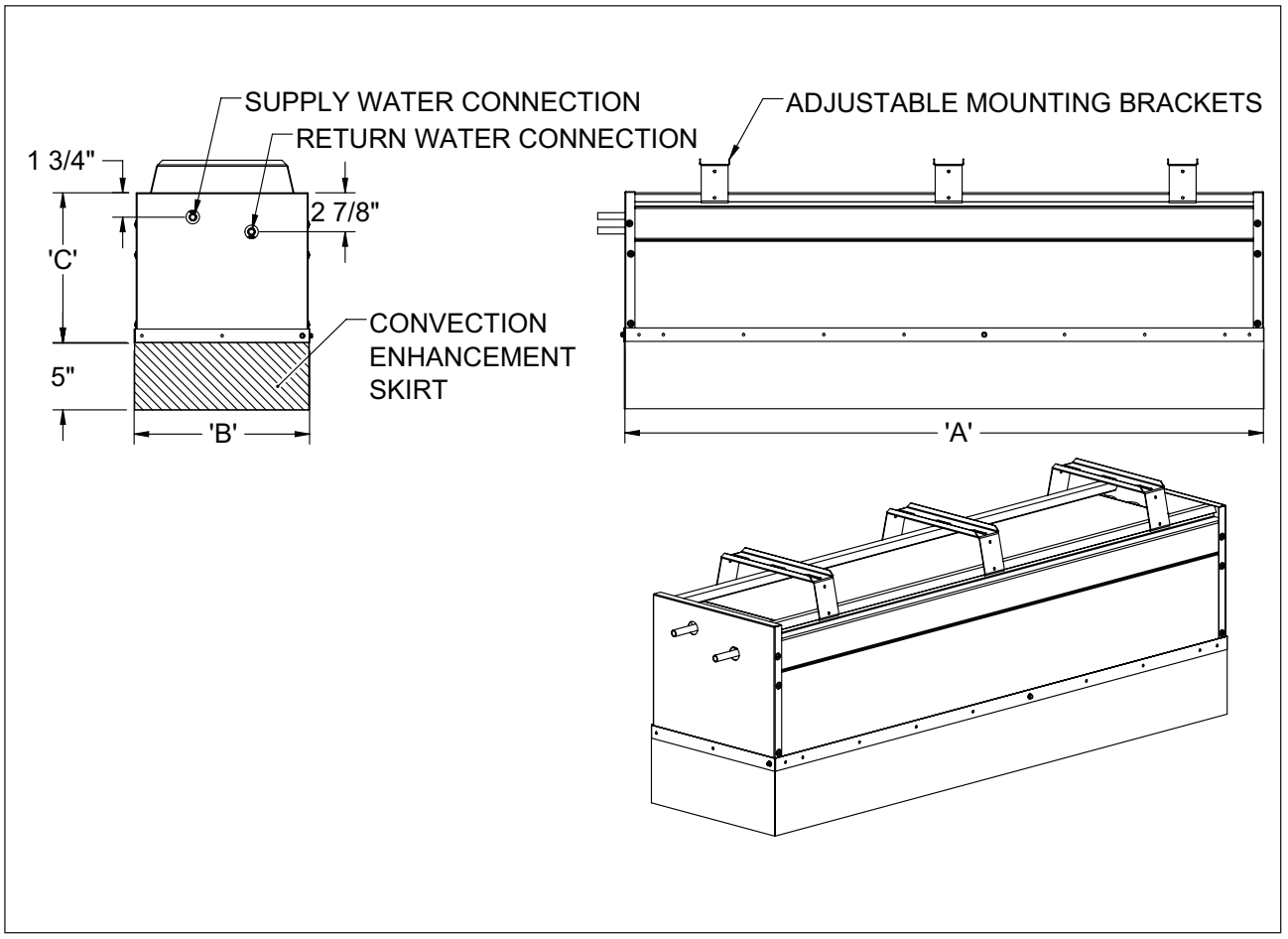
Nominal Unit Length (ft)	'A' (IN)
2	23¾
3	35¾
4	47¾
5	59¾
6	71¾
7	83¾
8	95¾
9	107¾
10	119¾

Nominal Unit Width (IN)	'B' (IN)
13	12¾
17	16¾
18	17¾
22	21¾
24	23¾

Nominal Unit Height (IN)	'C' (IN)
8	8 7/8
10	10 7/8
12	12 7/8

All dimensions are in inches

CBPR UNIT DIMENSIONS



Nominal Unit Length (ft)	'A' (IN)
2	23¾
3	35¾
4	47¾
5	59¾
6	71¾
7	83¾
8	95¾
9	107¾
10	119¾

Nominal Unit Width (IN)	'B' (IN)
13	12¾
17	16¾
18	17¾
22	21¾
24	23¾

Nominal Unit Height (IN)	'C' (IN)
8	8 7/8
10	10 7/8
12	12 7/8

All dimensions are in inches

CBPE / CBPR SENSIBLE COOLING CAPACITY

Chilled Water Flow Rate, GPM												
Nominal Length	Nominal Width	0.75 GPM		1.0 GPM		1.25 GPM		1.5 GPM		2.0 GPM		2.5 GPM	
		Q_{SENS}	ΔP_W	Q_{SENS}	ΔP_W	Q_{SENS}	ΔP_W	Q_{SENS}	ΔP_W	Q_{SENS}	ΔP_W	Q_{SENS}	ΔP_W
ft	in	Btu/h	ft wg	Btu/h	ft wg	Btu/h	ft wg	Btu/h	ft wg	Btu/h	ft wg	Btu/h	ft wg
4	13	963	0.33	1,000	0.75	1,029	1.17	1,054	1.62	1,094	2.69	1,127	4.01
	17	1,045	0.40	1,085	0.90	1,117	1.41	1,144	1.94	1,188	3.23	1,223	4.81
	18	1,121	0.46	1,164	1.06	1,198	1.64	1,227	2.26	1,274	3.77	1,312	5.61
	22	1,190	0.53	1,236	1.21	1,272	1.88	1,303	2.59	1,353	4.31	1,393	6.41
	24	1,255	0.60	1,303	1.36	1,342	2.11	1,374	2.91	1,427	4.84	1,469	7.21
6	13	1,444	0.45	1,499	1.05	1,544	1.63	1,581	2.24	1,642	3.70	1,690	5.48
	17	1,568	0.54	1,628	1.26	1,676	1.95	1,717	2.68	1,782	4.44	1,835	6.58
	18	1,681	0.63	1,745	1.46	1,797	2.28	1,840	3.13	1,911	5.18	1,967	7.67
	22	1,785	0.72	1,854	1.67	1,909	2.60	1,955	3.58	2,029	5.92	2,089	8.77
	24	1,883	0.81	1,955	1.88	2,013	2.93	2,061	4.02	2,140	6.66	2,204	9.86
8	13	1,925	0.57	1,999	1.34	2,058	2.08	2,108	2.85	2,189	4.71	2,254	6.95
	17	2,091	0.68	2,171	1.61	2,235	2.50	2,289	3.42	2,376	5.65	2,447	8.35
	18	2,241	0.79	2,327	1.87	2,396	2.91	2,454	4.00	2,548	6.59	2,623	9.74
	22	2,380	0.91	2,472	2.14	2,545	3.33	2,606	4.57	2,706	7.53	2,786	11.13
	24	2,510	1.02	2,606	2.41	2,684	3.75	2,748	5.14	2,854	8.47	2,938	12.52
10	13	2,407	0.68	2,499	1.63	2,573	2.54	2,635	3.47	2,736	5.71	2,817	8.43
	17	2,613	0.82	2,713	1.96	2,794	3.04	2,861	4.17	2,971	6.86	3,059	10.11
	18	2,801	0.96	2,909	2.28	2,995	3.55	3,067	4.86	3,185	8.00	3,279	11.80
	22	2,975	1.09	3,089	2.61	3,181	4.06	3,258	5.56	3,382	9.14	3,482	13.49
	24	3,138	1.23	3,258	2.94	3,354	4.56	3,435	6.25	3,567	10.28	3,673	15.17

Performance based on:

1. Unit height of 10 inches. Correction factors for other unit heights are shown in table 1 below.
2. Distance (Y) between top of beam and horizontal surface equal to 30% of coil width (W). For other values of Y/W see table 2 below.
3. Discharge through a minimum 50% free area face. Correction factors for other free areas are shown in table 3 below.
4. Free area for room air to enter ceiling cavity equal to free area of beam discharge into space.
5. Based on an 18°F ΔT between entering air and entering chilled water. Correction factors for other ΔT values are shown in table 4 below.

Legend:

Q_{SENS} - Sensible Capacity, Coil [Btu/h]

ΔP_w - Water coil pressure drop [ft wg]

TABLE 1: CORRECTION FOR UNIT HEIGHT

Unit height	Multiply Table Value by:
8	0.95
10	1.00
12	1.05

TABLE 2: CORRECTION FOR DISTANCE BELOW STRUCTURE VERSUS UNIT WIDTH (Y/W)

Y/W	Multiply Table Value by:
0.10	0.66
0.20	0.92
0.30	1.00
0.40	1.03
0.50	1.04

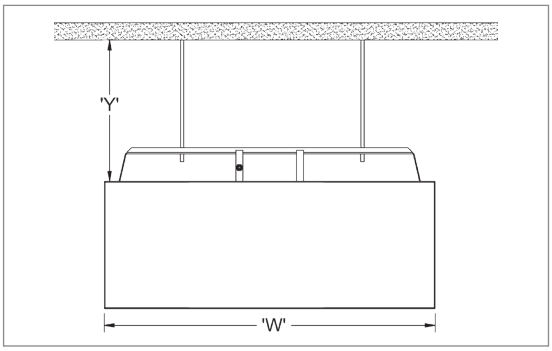


TABLE 3: CORRECTION FOR FALSE CEILING FREE AREA

Face free area	Multiply Table Value by:
30%	0.94
40%	0.98
50% or more	1.00

TABLE 4: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR* AND ENTERING CHILLED WATER

Actual ΔT	10	12	14	16	18	20	22	24
Multiply Table Value by:	0.56	0.67	0.78	0.89	1.00	1.11	1.22	1.33

*Note: Entering air temperature is typically 2-3°F above room temperature for exposed and standard recessed installations. When beams are installed above a adjacent to the perimeter glazing, entering air temperature is typically 5 to 7°F above that of the room.

Floor Mounted Displacement Chilled Beams

TAO

- Floor mounted, under the sill or fully exposed active chilled beam perfectly suited for educational and healthcare facilities
- Suited for climate zones with heat loads greater than 250 Btuh/ft
- Designed to meet the highest ventilation effectiveness required in schools and healthcare facilities while maximizing the hydronic system to handle the sensible load
- Circular perforated front face for return air
- Pencil proof grille
- Ultra quiet operation
- Available in 5 and 6 ft length to match different classrooms spaces and loads
- Heavy gauge painted cabinet
- Pressure port for air-side balancing and flow verification

TAO

dual-function | k-12 education | wood grains | energy solutions

* The Titus AR mobile app is available for download in Google Play and iOS

See website for Specifications

MODEL:

TAO

FINISHES:

Standard Finish - #26 White
Optional Finish - Wood grains (See Wood grains Brochure for Finishes)

OVERVIEW

Installed along building perimeters to best handle extreme temperatures where they start – from the outside in - the TAO (Temperature Ambient Optimizer) provides superior thermal comfort in areas where high ventilation loads are needed, such as educational facilities and theaters. It combines the benefits of both chilled beam and displacement units, rolled into one system perfect for extreme climates.

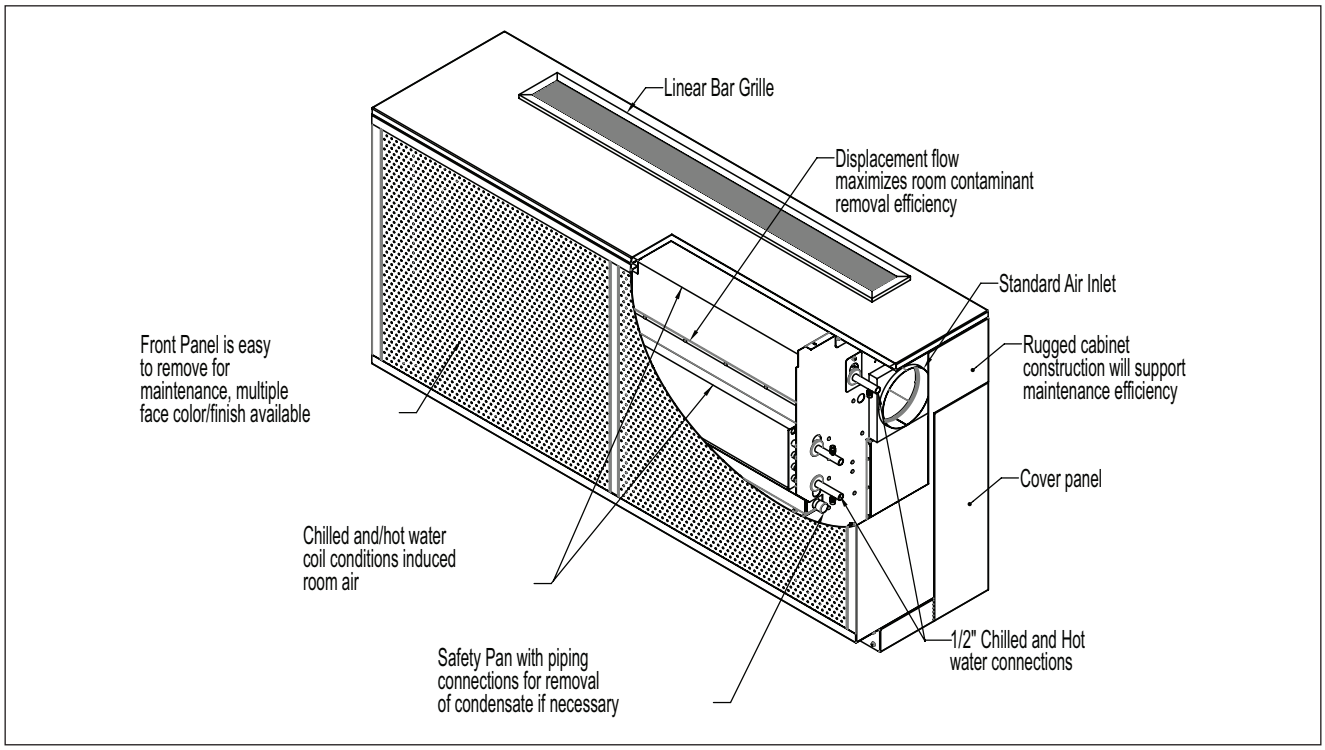
Ideal for use in classrooms and theaters where air quality and sound are critical, the TAO supplies 100% outside air while meeting ANSI Standard S12.60 for acoustics in educational facilities.

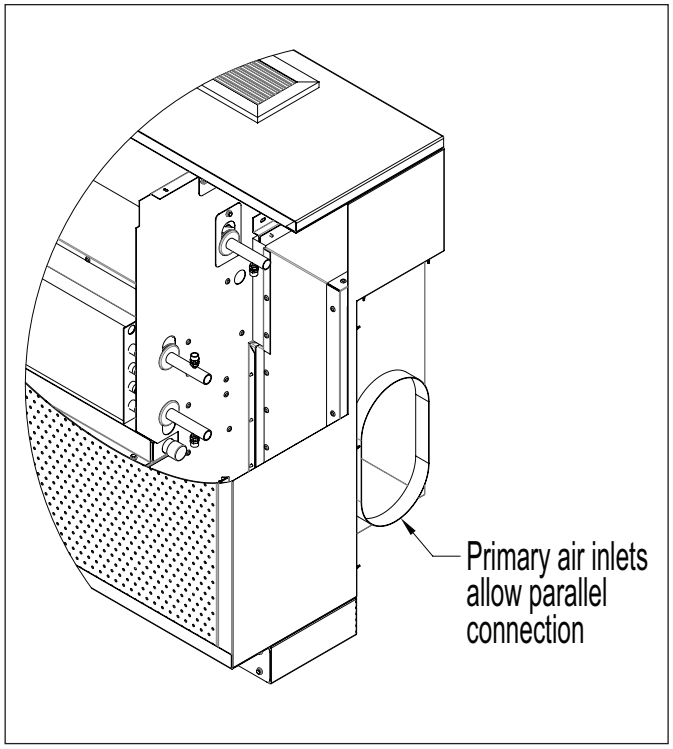
Multiple TAO units installed in an elementary school

ADVANTAGES

- Maximizes the displacement ventilation benefits and enhances the removal of space respiratory contaminants
- Dedicated heating coil to neutralize the thermal load of the window or perimeter wall
- 2 x 2 pipe vertical mounted coil with removable condensate tray for cooling during the Summer and to provide supplemental heating for the Winter
- Optional integral primary air parallel duct connection to minimize air pressure drop, noise and ease of installation

TAO UNIT DIMENSIONS

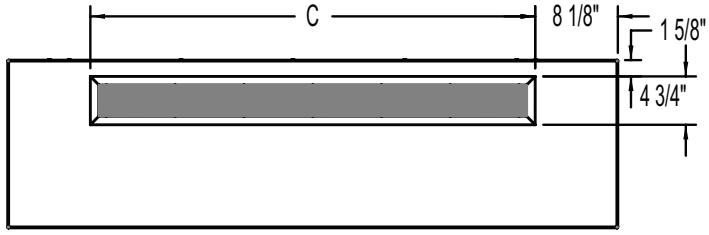




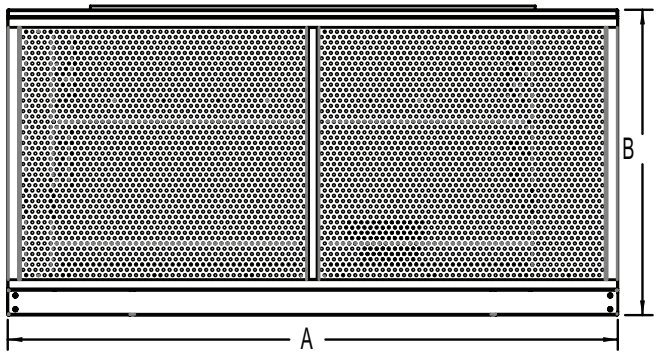
All units are shipped as right air inlet connecting. To modify the unit to allow a left side air connection, simply remove the cover panel and cap from the left side and replace them on the right. For center units in series, remove the cover panel and cap from the left side and discard.

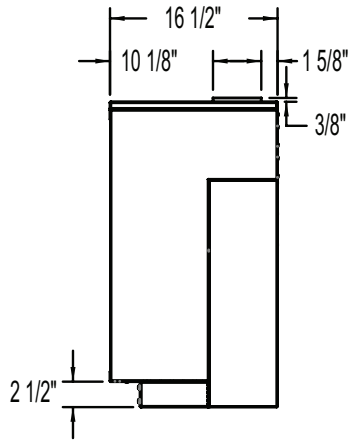
All dimensions are in inches

TAO UNIT DIMENSIONS



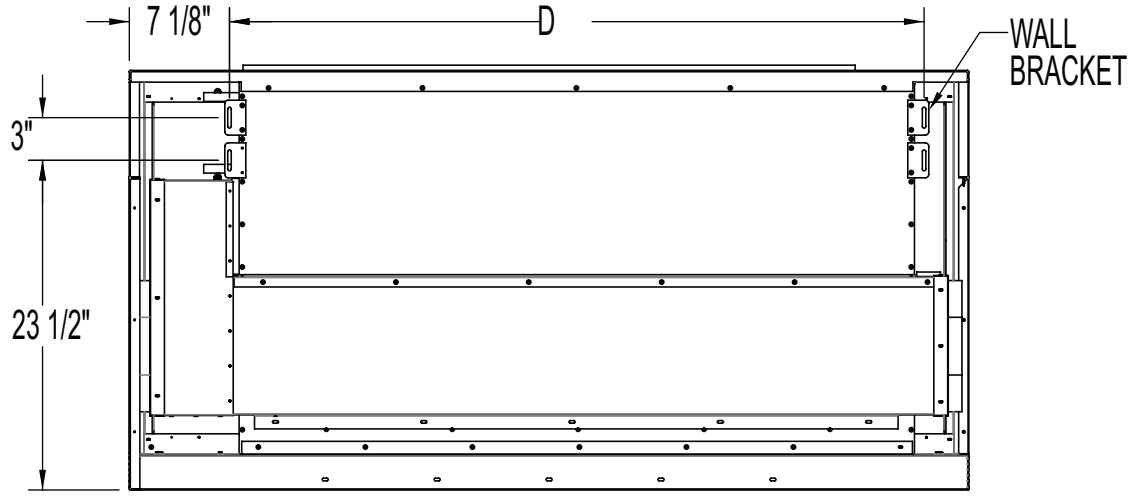
Unit	Dimensions		
	A	B	C
5 ft	60	30	43 3/4
6 ft	72	30	55 3/4





TAO UNIT DIMENSIONS

Wall Mounting

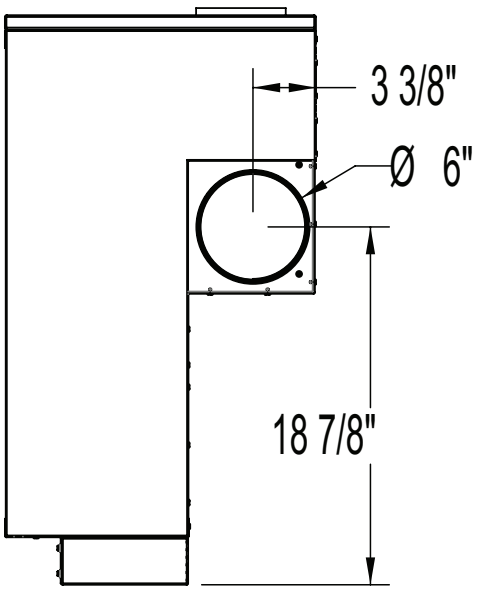


Unit	D
5 ft	49 1/8
6 ft	61 1/8

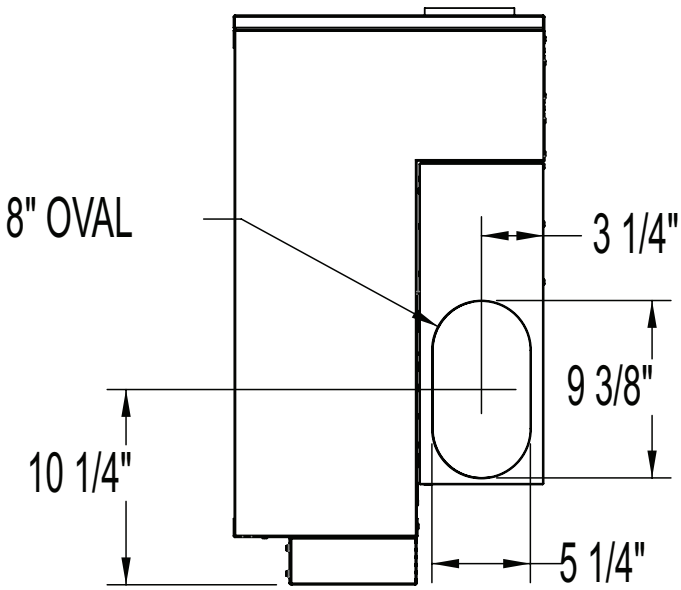
All dimensions are in inches

DUCT CONNECTION LOCATION

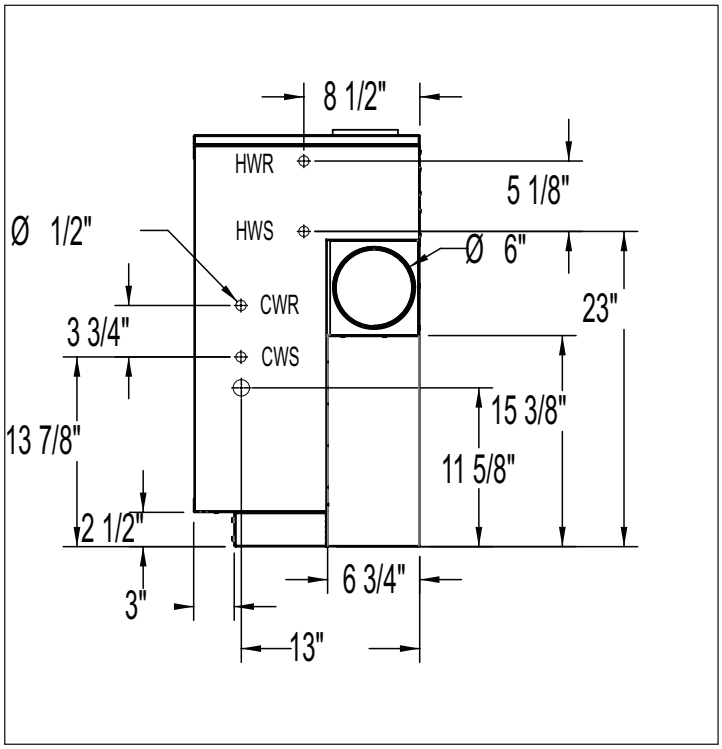
6 inch round (For individually ducted installations)



8 inch oval (For multi-unit installations)



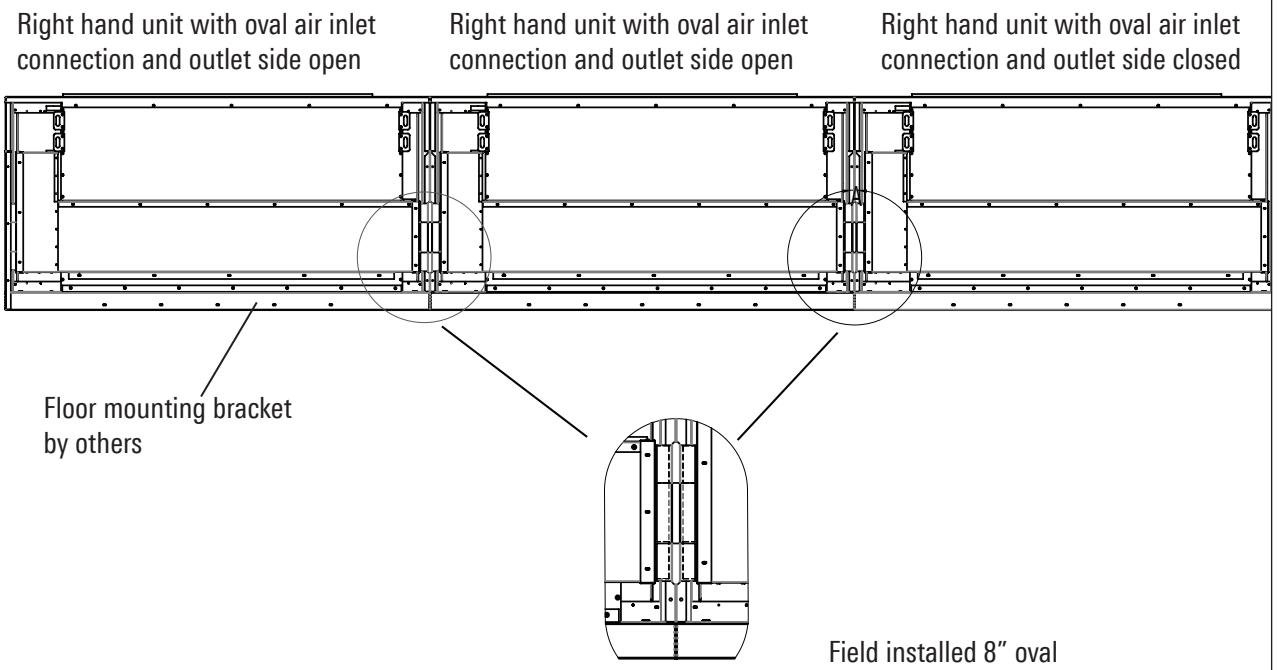
WATER COIL AND CONDENSATE CONNECTION LOCATIONS



All dimensions are in inches

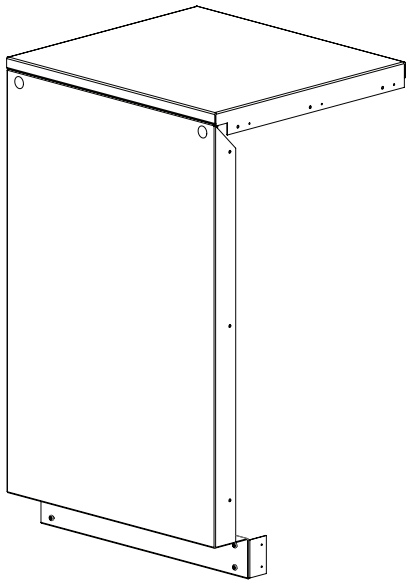
TAO

Multiple Units Connected in Parallel

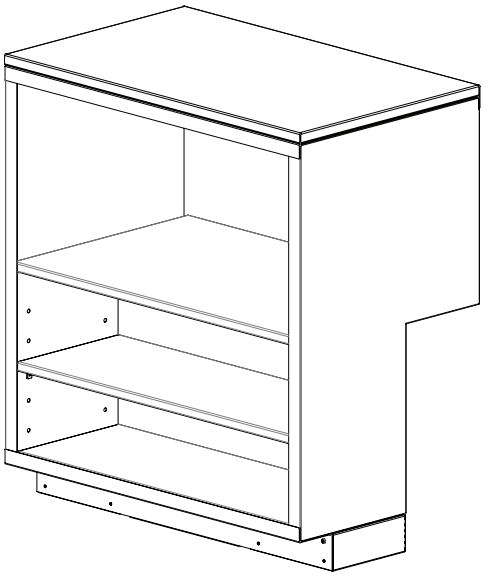


Units viewed from the back showing interconnection between units

Filler Panel with Bookshelf Details / Utility Cabinet & Duct Cover



Filler panel (optional)



Bookshelf (optional)

TAO WATER

COIL ROWS	WATER FLOW (GPM)	ΔPW (FT WG)	TAO - 5 FT										
			SECONDARY COOLING [BTU/H] AT PRIME AIRFLOWS [CFM]										
			80	90	100	110	120	130	140	150	160	170	180
AIR INLET P [W.G."]			0.25"	0.33"	0.40"	0.48"	0.56"	0.64"	0.75"	0.82"	0.92"	1.00"	1.12"
SUPPLY AIRFLOW			210	247	278	309	339	370	403	432	459	480	518
2	0.5	0.08	1278	1414	1535	1644	1738	1823	1907	1966	2025	2056	2129
	0.75	0.18	1380	1542	1689	1825	1943	2053	2163	2240	2319	2360	2461
	1	0.32	1437	1615	1779	1932	2066	2192	2318	2408	2501	2549	2668
	1.25	0.49	1474	1662	1838	2002	2147	2284	2422	2521	2624	2677	2810
	1.5	0.7	1500	1695	1879	2052	2205	2350	2498	2603	2714	2771	2914
ROOM AIR TEMPERATURE: 75°F, WATER ENTERING TEMPERATURE: 57°F													
			SECONDARY HEATING [BTU/H] AT PRIME AIRFLOWS [CFM]										
2	0.5	0.08	2639	3018	3277	3525	3763	4038	4343	4552	4793	4948	5318
	0.75	0.17	2725	3133	3413	3685	3949	4255	4599	4836	5112	5291	5722
	1	0.3	2769	3193	3486	3771	4048	4372	4737	4991	5286	5479	5945
	1.25	0.47	2796	3230	3531	3824	4110	4445	4824	5087	5396	5597	6086
	1.5	0.66	2815	3255	3561	3860	4152	4495	4883	5154	5472	5679	6184
ROOM AIR TEMPERATURE: 70°F, WATER ENTERING TEMPERATURE: 140°F													

Correction factors for other entering conditions:							
ΔT (°F)		8	13	18	23	28	33
Cooling Factor		0.71	0.82	1.00	1.23	1.51	1.85
ΔT (°F)	60	65	70	75	80	85	90
Heating Factor	0.85	0.93	1.00	1.07	1.14	1.22	1.30

COIL ROWS	WATER FLOW (GPM)	ΔPW (FT WG)	TAO - 6 FT										
			SECONDARY COOLING [BTU/H] AT PRIME AIRFLOWS [CFM]										
			120	130	140	150	160	170	180	190	200	210	220
AIR INLET P [W.G."]			0.23"	0.33"	0.43"	0.50"	0.61"	0.70"	0.75"	0.88"	0.96"	1.00"	1.12"
SUPPLY AIRFLOW			291	331	369	405	442	477	513	547	579	612	644
2	0.5	0.1	1564	1682	1809	1918	2018	2109	2192	2265	2329	2392	2448
	0.75	0.22	1711	1854	2014	2153	2282	2402	2514	2614	2701	2790	2869
	1	0.39	1794	1954	2133	2292	2440	2580	2711	2828	2933	3039	3134
	1.25	0.6	1848	2019	2212	2383	2545	2699	2844	2974	3091	3210	3317
	1.5	0.85	1885	2064	2268	2449	2621	2785	2940	3080	3206	3335	3452
ROOM AIR TEMPERATURE: 75°F, WATER ENTERING TEMPERATURE: 57°F													
			SECONDARY HEATING [BTU/H] AT PRIME AIRFLOWS [CFM]										
2	0.5	0.1	3503	4050	4513	4903	5311	5619	5947	6224	6455	6678	6891
	0.75	0.21	3653	4257	4775	5219	5689	6048	6435	6766	7045	7316	7578
	1	0.37	3731	4366	4916	5390	5895	6283	6705	7068	7375	7675	7966
	1.25	0.57	3780	4434	5004	5497	6024	6432	6877	7260	7586	7904	8215
	1.5	0.81	3813	4481	5064	5570	6114	6535	6996	7393	7733	8065	8389
ROOM AIR TEMPERATURE: 70°F, WATER ENTERING TEMPERATURE: 140°F													

Correction factors for other entering conditions:							
ΔT (°F)		8	13	18	23	28	33
Cooling Factor		0.71	0.82	1.00	1.23	1.51	1.85
ΔT (°F)	60	65	70	75	80	85	90
Heating Factor	0.85	0.93	1.00	1.07	1.14	1.22	1.30

TAO (ETHYLENE/GLYCOL)

COIL ROWS	ETHYLENE GLYCOL/ WATER FLOW (GPM)	ΔPW (FT WG)	TAO - 5 FT										
			SECONDARY COOLING [BTU/H] AT PRIME AIRFLOWS [CFM]										
			80	90	100	110	120	130	140	150	160	170	180
AIR INLET P [W.G."]			0.25"	0.33"	0.40"	0.48"	0.56"	0.64"	0.75"	0.82"	0.92"	1.00"	1.12"
SUPPLY AIRFLOW			210	247	278	309	339	370	403	432	459	480	518
2	0.5	0.33	1173	1239	1329	1408	1473	1533	1590	1635	1669	1689	1737
	0.75	0.54	1250	1377	1491	1592	1679	1757	1835	1897	1943	1971	2039
	1	0.76	1319	1462	1592	1709	1810	1904	1996	2070	2126	2160	2242
	1.25	0.99	1365	1520	1662	1791	1903	2007	2111	2195	2258	2297	2391
	1.5	1.23	1398	1563	1741	1852	1973	2086	2198	2290	2359	2401	2505
ROOM AIR TEMPERATURE: 75°F, FLUID ENTERING TEMPERATURE: 57°F, ETHYLENE GLYCOL 35%													
			SECONDARY HEATING [BTU/H] AT PRIME AIRFLOWS [CFM]										
2	0.5	0.1	3273	3714	4010	4291	4559	4863	5197	5423	5681	5845	6233
	0.75	0.23	3391	3870	4195	4507	4805	5148	5527	5786	6083	6275	6729
	1	0.39	3455	3956	4297	4626	4942	5307	5714	5992	6314	6521	7017
	1.25	0.6	3550	4088	4459	4820	5170	5577	6034	6351	6720	6904	7538
	1.5	0.86	3582	4133	4513	4884	5245	5666	6141	6470	6856	7106	7713
ROOM AIR TEMPERATURE: 70°F, FLUID ENTERING TEMPERATURE: 160°F, ETHYLENE GLYCOL 50%													

Correction factors for other entering conditions:							
ΔT (°F)		8	13	18	23	28	33
Cooling Factor		0.64	0.72	1.00	1.28	1.55	1.83
ΔT (°F)			70	75	80	85	90
Heating Factor			0.77	0.83	0.88	0.94	1.00

COIL ROWS	ETHYLENE GLYCOL/ WATER FLOW (GPM)	ΔPW (FT WG)	TAO - 6 FT										
			SECONDARY COOLING [BTU/H] AT PRIME AIRFLOWS [CFM]										
			120	130	140	150	160	170	180	190	200	210	220
AIR INLET P [W.G."]			0.23"	0.33"	0.43"	0.50"	0.61"	0.70"	0.75"	0.88"	0.96"	1.00"	1.12"
SUPPLY AIRFLOW			291	331	369	405	442	477	513	547	579	612	644
2	0.5	0.4	1394	1483	1578	1657	1729	1793	1852	1902	1946	1989	2027
	0.75	0.66	1550	1664	1787	1892	1988	2077	2158	2229	2291	2352	2406
	1	0.93	1646	1776	1918	2042	2155	2260	2358	2444	2519	2595	2663
	1.25	1.21	1710	1852	2009	2146	2273	2391	2501	2599	2685	2772	2805
	1.5	1.51	1757	1908	2076	2223	2361	2489	2610	2717	2812	2908	2994
ROOM AIR TEMPERATURE: 75°F, FLUID ENTERING TEMPERATURE: 57°F, ETHYLENE GLYCOL 35%													
			SECONDARY HEATING [BTU/H] AT PRIME AIRFLOWS [CFM]										
2	0.5	0.13	4302	4923	5437	5862	6299	6624	6966	7251	7487	7712	7926
	0.75	0.28	4508	5201	5784	6274	6784	7167	7576	7920	8207	8483	8747
	1	0.48	4621	5355	5979	6507	7060	7479	7928	8309	8628	8936	9232
	1.25	0.74	4787	5594	6291	6889	7525	8013	8541	8993	9376	9748	10110
	1.5	1.05	4843	5673	6393	7015	7678	8189	8745	9222	9628	10023	10403
ROOM AIR TEMPERATURE: 70°F, FLUID ENTERING TEMPERATURE: 160°F, ETHYLENE GLYCOL 50%													

Correction factors for other entering conditions:							
ΔT (°F)		8	13	18	23	28	33
Cooling Factor		0.64	0.72	1.00	1.28	1.55	1.83
ΔT (°F)			70	75	80	85	90
Heating Factor			0.77	0.83	0.88	0.94	1.00

Notes

Icons

contributes toward energy savings by reducing operating costs of air distribution devices

energy solutions

finish options that resemble wood grains, perfect for high-profile architectural applications

wood grains

ideally suited for occupant spaces on university and college campuses

universities

excellent air distribution device for schools and other educational facilities

k-12 education

for use in retrofitting older products into modern designs & systems

retrofit

excellent air distribution device for hotels, motels or any similar commercial building application

hotels / motels

can be used in open ceiling environments

open ceiling

supplies both heating and cooling from one air device

dual-function

can be used in healthcare facility common areas such as: nurse's stations, patient rooms and waiting rooms

healthcare