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Titus
Redefine your comfort zone.™

# chilled beams

dual-function
energy solutions
office spaces
universities
k-12 education
healthcare
hotels/motels
laboratories

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active chilled beams

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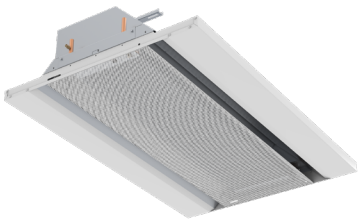
## CBAL2

### LINEAR ACTIVE CHILLED BEAM

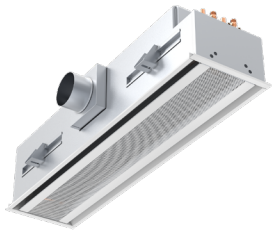
- Active linear chilled beam with 1-way or 2-way air distribution patterns
- Optimized nozzle design provides high capacity and low noise levels
- Linear design matching commercial architectural styling
- Designed to fit in standard 24-inch ceiling systems
- Optimized diffuser geometry maximizes occupant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



## CBE2

### LINEAR EXPOSED ACTIVE CHILLED BEAM

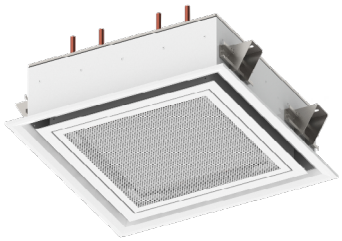
- Exposed linear chilled beam with 1-way or 2-way air distribution patterns
- Optimized nozzle design provides high capacity and low noise levels
- Linear design matching commercial architectural styling
- Integral coanda plates for ceiling independent operation
- Optimized diffuser geometry maximizes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



## CBLV-12

### LINEAR BEAM WITH VERTICAL COILS

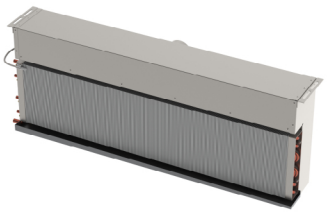
- Active linear chilled beam with 1-way or 2-way air distribution pattern
- Optimized nozzle design provides high capacity and low noise levels
- Linear design matching commercial architectural styling
- Designed to fit in standard 12-inch ceiling systems
- Vertical coil configuration
- Optimized diffuser 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

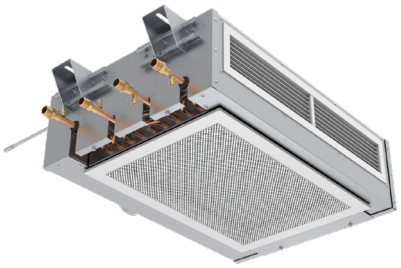
### VERTICAL RECESSED ACTIVE CHILLED BEAM

- 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

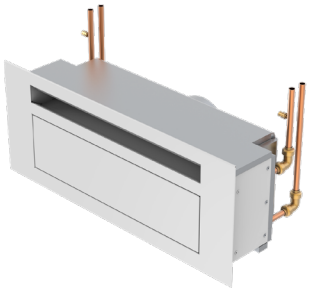
- Provides comfortable, effective sensible cooling to the space
- Optimized nozzle design provides high capacity and low noise levels
- Ideal for induction unit and unit ventilator retrofit projects
- Quick and simple installation
- Available in nominal lengths up to 6 feet
- ½" Sweat or ½" MNPT coil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



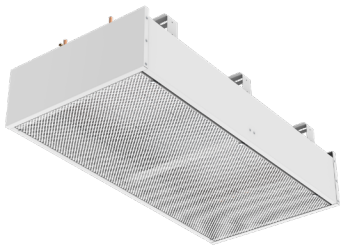
## CBAW

### 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

PAGES: U75-U77

## passive chilled beams



## CBPE

### EXPOSED PASSIVE CHILLED BEAM

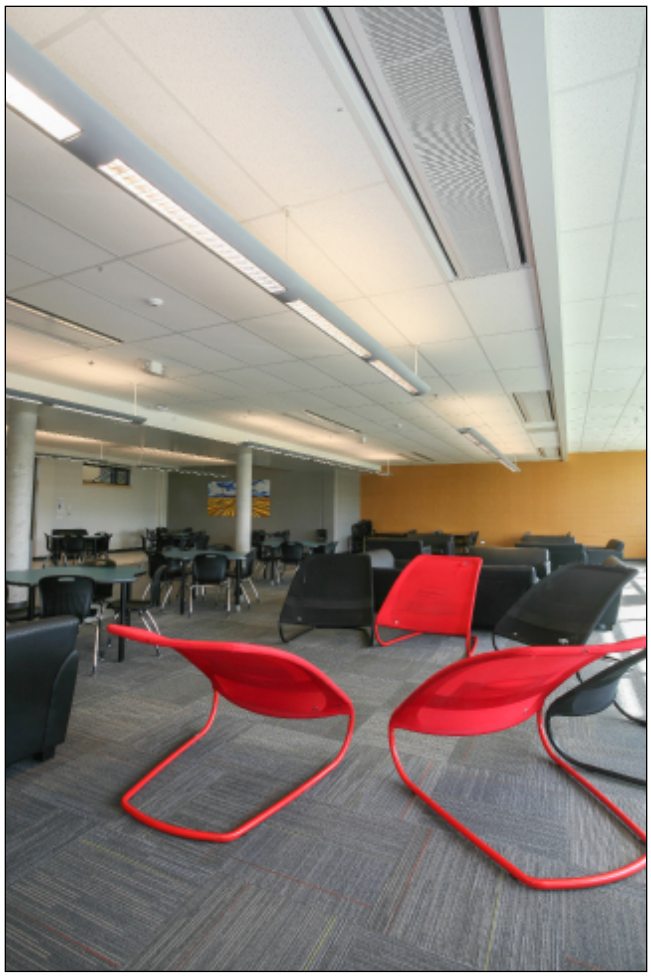
- Provides comfortable, effective sensible cooling to the space
- Ultra quiet, natural convection driven operation
- Perforated face
- Exposed or concealed installation

# 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 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



## CBAL2

- 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 24-inch ceiling systems
- Optimized diffuser geometry maximizes occupant comfort

CBAL2

dual-function | energy solutions | office spaces | universities | k-12 education | healthcare | hotels/motels | laboratories

See website for Specifications

### MODELS:

CBAL2: 24-inch

### FINISHES:

Standard Finish - #26 White
Optimized 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.

CBAL2s are offered for both cooling and heating, with a 24" width 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 CBAL2 product line is ideal for reducing the space required for false ceiling in any application.

CBAL2 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

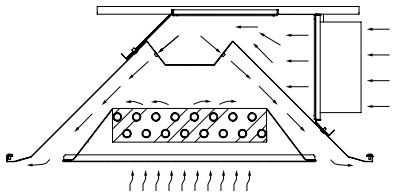
## CBAL2 STANDARD FEATURES

- 1-way or 2-way air distribution patterns
- 24-inch width
- 2 foot to 10 foot lengths, 1 foot increments
- Perforated induced air grille
- Left hand or right hand coil connections
- Side, top, or multi (both) air inlet locations
- 2-pipe and 4-pipe coil configurations
- Field-reversible coils
- 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
- Coil drain valve

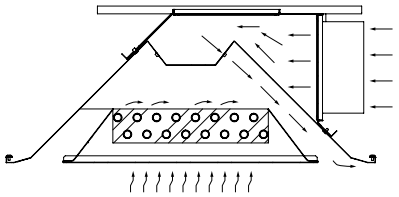
## OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- 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

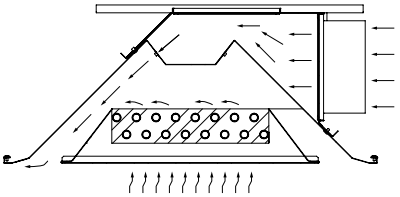
CBAL2 2-Way



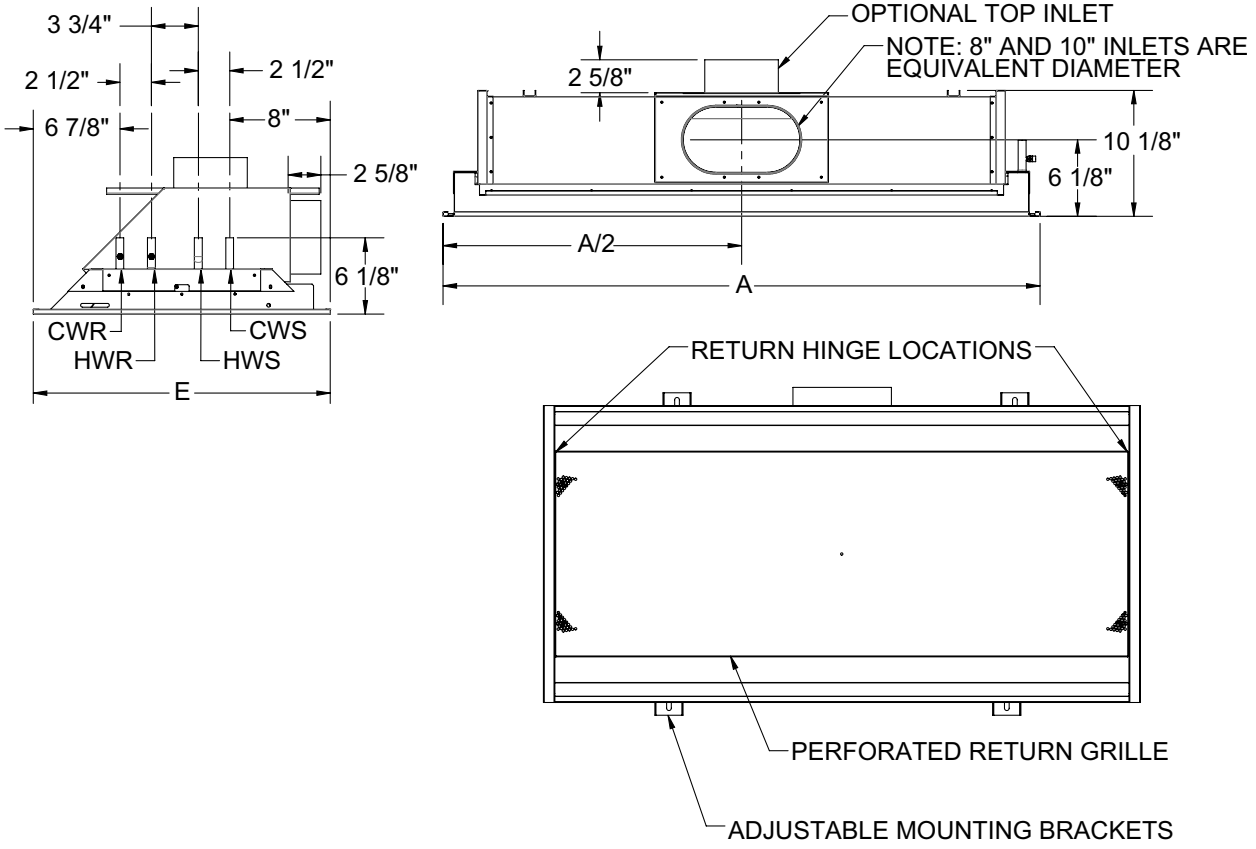
CBAL2 1-Way (front)



CBAL2 1-Way (back)



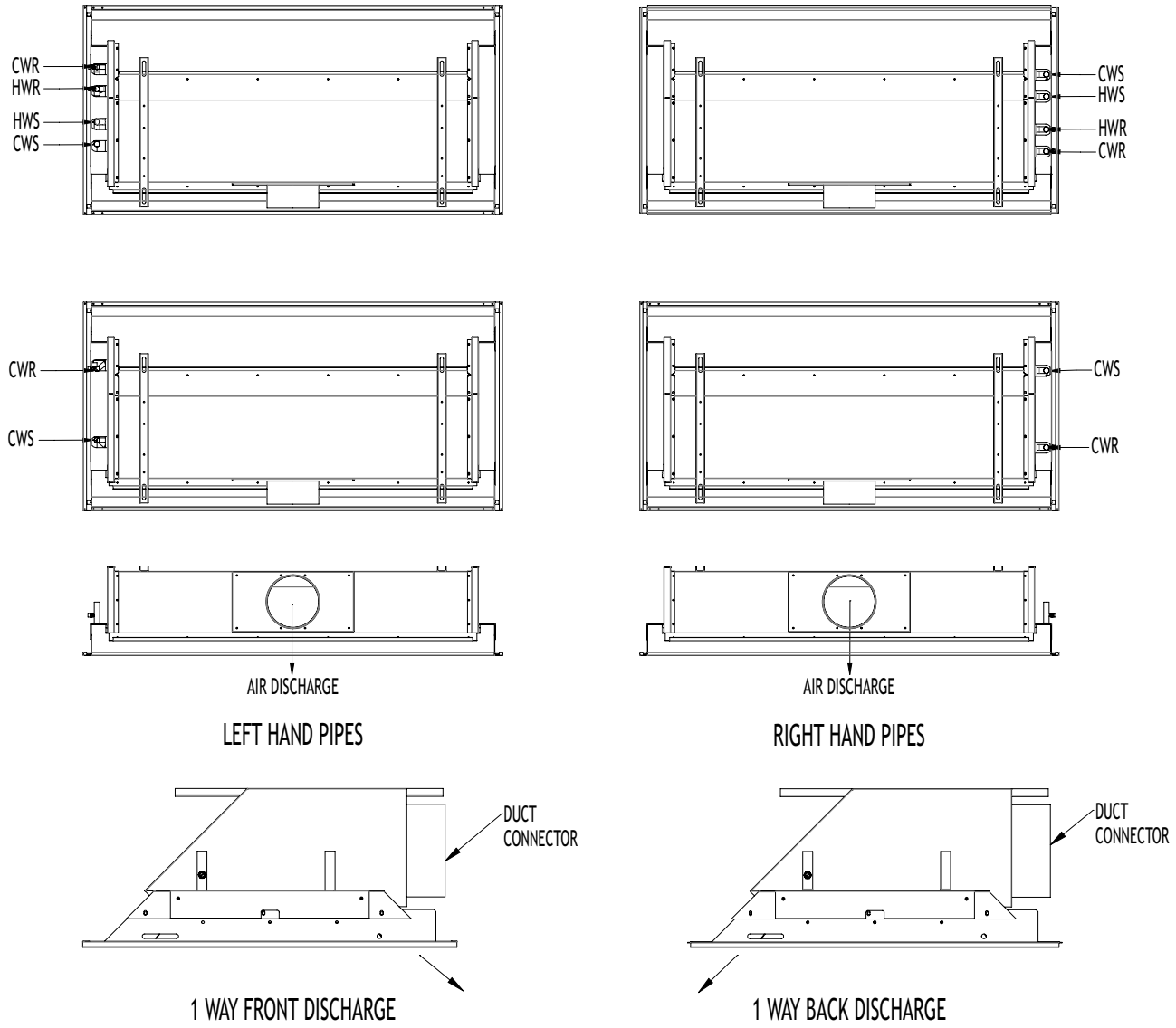
## CBAL2 UNIT DIMENSIONS



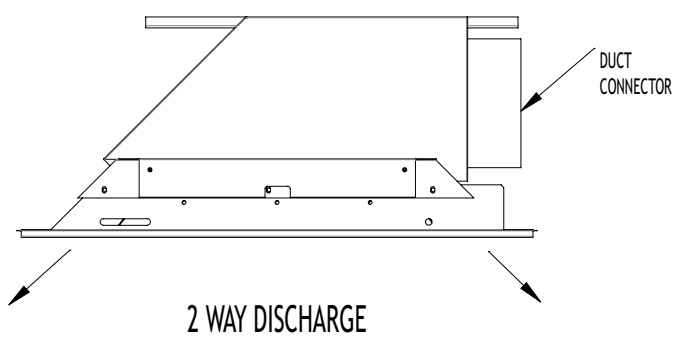

| Nominal Length (ft) | BORDER TYPE | |
|---|---|---|
| | LAY-IN | NT |
| | 'A' (IN) | 'A' (IN) |
| 2 | 23¾ | 23⅜ |
| 3 | 35¾ | 35⅜ |
| 4 | 47¾ | 47⅜ |
| 5 | 59¾ | 59⅜ |
| 6 | 71¾ | 71⅜ |
| 7 | 83¾ | 83⅜ |
| 8 | 95¾ | 95⅜ |
| 9 | 107¾ | 107⅜ |
| 10 | 119¾ | 119⅜ |

All dimensions are in inches

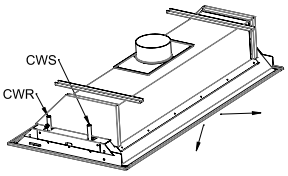
## CBAL2 CASING ARRANGEMENTS / SIDE INLET 1-WAY



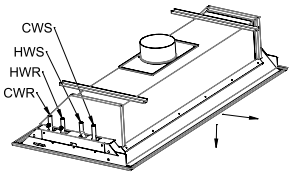

## CBAL2 CASING ARRANGEMENTS / SIDE INLET 2-WAY



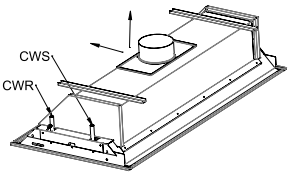
## CBAL2 CASING ARRANGEMENTS / TOP INLET 1-WAY



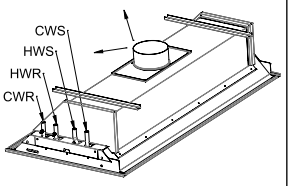

TOP INLET
1 WAY FRONT THROW
2 PIPE LEFT HAND COIL
OR
1 WAY BACK THROW
2 PIPE RIGHT HAND COIL




TOP INLET
1 WAY FRONT THROW
4 PIPE LEFT HAND COIL
OR
1 WAY BACK THROW
4 PIPE RIGHT HAND COIL

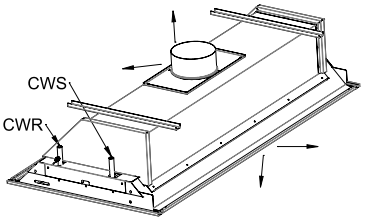



TOP INLET
1 WAY BACK THROW
2 PIPE LEFT HAND COIL
OR
1 WAY FRONT THROW
2 PIPE RIGHT HAND COIL

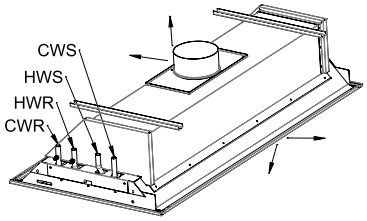



TOP INLET
1 WAY BACK THROW
4 PIPE LEFT HAND COIL
OR
1 WAY FRONT THROW
4 PIPE RIGHT HAND COIL

## CBAL2 CASING ARRANGEMENTS / TOP INLET 2-WAY




TOP INLET
2 WAY THROW
2 PIPE LEFT HAND COIL
OR
2 WAY THROW
2 PIPE RIGHT HAND COIL




TOP INLET
2 WAY THROW
4 PIPE LEFT HAND COIL
OR
2 WAY THROW
4 PIPE RIGHT HAND COIL

R - Return S - Supply;

HR - Heating Return HS - Heating Supply;

CR - Cooling Return CS - Cooling Supply

## CBAL2 / 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 | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 4 | 15 | 0.20 | 15 | 1357 | 2.90 | 1412 | 6.40 | 1455 | 1.50 | 1471 | 2.30 | 6.1 | 0 - 1 - 4 |
| | | | 20 | 0.35 | 17 | 1745 | | 1830 | | 1897 | | 1925 | | | 1 - 2 - 7 |
| | | | 25 | 0.55 | 20 | 2035 | | 2143 | | 2208 | | 2248 | | | 1 - 3 - 10 |
| | M17 | 4 | 20 | 0.18 | 16 | 1419 | | 1484 | | 1537 | | 1556 | | 4.8 | 1 - 1 - 5 |
| | | | 30 | 0.40 | 21 | 1929 | | 2029 | | 2093 | | 2129 | | | 1 - 3 - 10 |
| | | | 40 | 0.71 | 25 | 2460 | | 2608 | | 2725 | | 2785 | | | 2 - 5 - 14 |
| | M23 | 5 | 40 | 0.21 | 20 | 1703 | | 1799 | | 1850 | | 1885 | | 2.9 | 2 - 4 - 12 |
| | | | 60 | 0.48 | 26 | 2518 | | 2693 | | 2834 | | 2910 | | | 4 - 8 - 18 |
| | | | 75 | 0.75 | 29 | 3069 | | 3317 | | 3459 | | 3570 | | | 7 - 12 - 21 |
| | M31 | 6 | 70 | 0.18 | 20 | 1923 | | 2035 | | 2109 | | 2153 | | 2.6 | 2 - 6 - 14 |
| | | | 105 | 0.41 | 25 | 2847 | | 3061 | | 3206 | | 3299 | | | 6 - 11 - 20 |
| | | | 140 | 0.74 | 31 | 3528 | | 3831 | | 3987 | | 4131 | | | 10 - 14 - 23 |
| 6 | M13 | 4 | 20 | 0.15 | 15 | 1926 | 4.10 | 2044 | 9.30 | 2051 | 2.10 | 2080 | 3.30 | 6.1 | 0 - 1 - 4 |
| | | | 30 | 0.34 | 18 | 2457 | | 2609 | | 2693 | | 2748 | | | 1 - 2 - 9 |
| | | | 40 | 0.61 | 22 | 3073 | | 3316 | | 3406 | | 3495 | | | 2 - 4 - 13 |
| | M17 | 5 | 30 | 0.17 | 17 | 2051 | | 2171 | | 2227 | | 2265 | | 4.8 | 1 - 2 - 6 |
| | | | 45 | 0.39 | 23 | 2783 | | 2986 | | 3059 | | 3132 | | | 2 - 3 - 12 |
| | | | 60 | 0.69 | 26 | 3632 | | 3939 | | 4094 | | 4221 | | | 3 - 6 - 17 |
| | M23 | 6 | 60 | 0.21 | 22 | 2469 | | 2666 | | 2740 | | 2813 | | 3.9 | 2 - 5 - 14 |
| | | | 90 | 0.48 | 27 | 3779 | | 4109 | | 4334 | | 4497 | | | 5 - 10 - 21 |
| | | | 110 | 0.71 | 30 | 4223 | | 4602 | | 4895 | | 5108 | | | 8 - 13 - 24 |
| | M31 | 8 | 105 | 0.19 | 21 | 2783 | | 3016 | | 3113 | | 3203 | | 2.6 | 3 - 7 - 18 |
| | | | 160 | 0.43 | 27 | 4161 | | 4525 | | 4794 | | 4988 | | | 7 - 13 - 25 |
| | | | 210 | 0.74 | 31 | 4744 | | 5338 | | 5676 | | 5958 | | | 12 - 18 - 29 |
| 8 | M13 | 4 | 25 | 0.14 | 15 | 2543 | 5.40 | 2729 | 1.60 | 2799 | 2.80 | 2847 | 4.30 | 6.1 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 20 | 3432 | | 3694 | | 3836 | | 3937 | | | 1 - 2 - 10 |
| | | | 55 | 0.67 | 25 | 4022 | | 4395 | | 4582 | | 4741 | | | 2 - 5 - 16 |
| | M17 | 5 | 40 | 0.18 | 19 | 3003 | | 3228 | | 3333 | | 3406 | | 4.8 | 1 - 2 - 7 |
| | | | 60 | 0.40 | 24 | 3671 | | 3974 | | 4151 | | 4281 | | | 2 - 4 - 14 |
| | | | 80 | 0.70 | 28 | 4632 | | 5098 | | 5358 | | 5571 | | | 3 - 7 - 19 |
| | M23 | 8 | 80 | 0.22 | 24 | 3097 | | 3380 | | 3526 | | 3646 | | 3.9 | 2 - 5 - 16 |
| | | | 120 | 0.49 | 29 | 4614 | | 5128 | | 5485 | | 5746 | | | 5 - 12 - 25 |
| | | | 140 | 0.67 | 31 | 4976 | | 5648 | | 6092 | | 6417 | | | 8- 15 - 28 |
| | M31 | 10* | 145 | 0.20 | 24 | 3563 | | 3916 | | 4098 | | 4253 | | 2.6 | 4 - 8 - 21 |
| | | | 215 | 0.45 | 29 | 5061 | | 5711 | | 6145 | | 6462 | | | 8 - 16 - 29 |
| | | | 260 | 0.66 | 34 | 5612 | | 6429 | | 6964 | | 7379 | | | 14 - 20 - 32 |
| 10 | M13 | 5 | 35 | 0.17 | 16 | 3394 | 6.70 | 3697 | 1.90 | 3823 | 3.40 | 3913 | 5.30 | 6.1 | 1 - 1 - 5 |
| | | | 50 | 0.35 | 21 | 4133 | | 4533 | | 4746 | | 4897 | | | 1 - 3 - 12 |
| | | | 70 | 0.69 | 25 | 4804 | | 5379 | | 5670 | | 5911 | | | 2 - 5 - 18 |
| | M17 | 6 | 55 | 0.22 | 21 | 3807 | | 4155 | | 4333 | | 4458 | | 4.8 | 1 - 2 - 9 |
| | | | 80 | 0.46 | 26 | 4384 | | 4895 | | 5163 | | 5370 | | | 2 - 5 - 17 |
| | | | 100 | 0.71 | 29 | 5335 | | 6009 | | 6389 | | 6696 | | | 4 - 9 - 22 |
| | M23 | 8 | 100 | 0.23 | 25 | 3569 | | 3991 | | 4208 | | 4382 | | 3.9 | 3 - 6 - 18 |
| | | | 150 | 0.51 | 31 | 5289 | | 6028 | | 6538 | | 6912 | | | 6 - 13 - 28 |
| | | | 180 | 0.73 | 33 | 5708 | | 6694 | | 7344 | | 7825 | | | 9 - 17- 32 |
| | M31 | 10* | 180 | 0.22 | 26 | 4082 | | 4585 | | 4847 | | 5068 | | 2.6 | 4 - 9 - 23 |
| | | | 240 | 0.39 | 31 | 5483 | | 6249 | | 6778 | | 7165 | | | 7 - 15 - 30 |
| | | | 300 | 0.61 | 40 | 6000 | | 7103 | | 7812 | | 8339 | | | 11 - 19 - 34 |

Note: Reference page U15 for operational conditions used for performance notes

## CBAL2 / 4-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Heating (Btu/h) | | | | | | | | Induction ratio | Throw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 4 | 15 | 0.2 | 15 | 2108 | 0.20 | 2485 | 0.60 | 2586 | 1.40 | 2664 | 2.50 | 6.1 | 0 - 1 - 4 |
| | | | 20 | 0.35 | 17 | 2663 | | 3196 | | 3350 | | 3473 | | | 1 - 2 - 7 |
| | | | 25 | 0.55 | 20 | 3061 | | 3725 | | 3923 | | 4043 | | | 1 - 3 - 10 |
| | M17 | 4 | 20 | 0.18 | 16 | 2193 | | 2598 | | 2716 | | 2814 | | 4.8 | 1 - 1 - 5 |
| | | | 30 | 0.4 | 21 | 2906 | | 3531 | | 3715 | | 3831 | | | 1 - 3 - 10 |
| | | | 40 | 0.71 | 25 | 3549 | | 4503 | | 4776 | | 4999 | | | 2 - 5 - 14 |
| | M23 | 5 | 40 | 0.21 | 20 | 2548 | | 3118 | | 3295 | | 3387 | | 3.9 | 2 - 4 - 12 |
| | | | 60 | 0.48 | 26 | 3592 | | 4611 | | 4930 | | 5188 | | | 4 - 8 - 18 |
| | | | 75 | 0.75 | 29 | 4500 | | 5618 | | 6073 | | 6334 | | | 7 - 12 - 21 |
| | M31 | 6 | 70 | 0.18 | 20 | 2826 | | 3520 | | 3727 | | 3862 | | 2.6 | 2 - 6 - 14 |
| | | | 105 | 0.41 | 25 | 4136 | | 5212 | | 5605 | | 5870 | | | 6 - 11 - 20 |
| | | | 140 | 0.74 | 31 | 5007 | | 6459 | | 7015 | | 7300 | | | 10 - 14 - 23 |
| 6 | M13 | 4 | 20 | 0.15 | 15 | 2905 | 0.20 | 3526 | 0.90 | 3743 | 2.10 | 3755 | 3.70 | 6.1 | 0 - 1 - 4 |
| | | | 30 | 0.34 | 18 | 3585 | | 4500 | | 4778 | | 4931 | | | 1 - 2 - 9 |
| | | | 40 | 0.61 | 22 | 4400 | | 5627 | | 6071 | | 6236 | | | 2 - 4 - 13 |
| | M17 | 5 | 30 | 0.17 | 17 | 3036 | | 3756 | | 3974 | | 4078 | | 4.8 | 1 - 2 - 6 |
| | | | 45 | 0.39 | 23 | 4020 | | 5095 | | 5467 | | 5601 | | | 2 - 3 - 12 |
| | | | 60 | 0.69 | 26 | 5123 | | 6649 | | 7212 | | 7496 | | | 3 - 6 - 17 |
| | M23 | 6 | 60 | 0.21 | 22 | 3529 | | 4520 | | 4882 | | 5017 | | 3.9 | 2 - 5 - 14 |
| | | | 90 | 0.48 | 27 | 5241 | | 6920 | | 7523 | | 7936 | | | 5 - 10 - 21 |
| | | | 110 | 0.71 | 30 | 5744 | | 7733 | | 8427 | | 8962 | | | 8 - 13 - 24 |
| | M31 | 8 | 105 | 0.19 | 21 | 3948 | | 5095 | | 5521 | | 5701 | | 2.6 | 3 - 7 - 18 |
| | | | 160 | 0.43 | 27 | 5703 | | 7618 | | 8266 | | 8778 | | | 7 - 13 - 25 |
| | | | 210 | 0.74 | 31 | 6552 | | 8686 | | 9774 | | 10393 | | | 12 - 18 - 29 |
| 8 | M13 | 4 | 25 | 0.14 | 15 | 3811 | 0.30 | 4656 | 1.20 | 4997 | 2.70 | 5125 | 4.80 | 6.1 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 20 | 4870 | | 6283 | | 6764 | | 7025 | | | 1 - 2 - 10 |
| | | | 55 | 0.67 | 25 | 5514 | | 7365 | | 8047 | | 8390 | | | 2 - 5 - 16 |
| | M17 | 5 | 40 | 0.18 | 19 | 4377 | | 5499 | | 5910 | | 6102 | | 4.8 | 1 - 2 - 7 |
| | | | 60 | 0.4 | 24 | 5044 | | 6722 | | 7277 | | 7600 | | | 2 - 4 - 14 |
| | | | 80 | 0.7 | 28 | 6339 | | 8481 | | 9333 | | 9811 | | | 3 - 7 - 19 |
| | M23 | 8 | 80 | 0.22 | 24 | 4247 | | 5671 | | 6190 | | 6455 | | 3.9 | 2 - 5 - 16 |
| | | | 120 | 0.49 | 29 | 6267 | | 8448 | | 9390 | | 10043 | | | 5 - 12 - 25 |
| | | | 140 | 0.67 | 31 | 6659 | | 9111 | | 10341 | | 11154 | | | 8 - 15- 28 |
| | M31 | 10* | 145 | 0.2 | 24 | 4878 | | 6524 | | 7170 | | 7503 | | 2.6 | 4 - 8 - 21 |
| | | | 215 | 0.45 | 29 | 6798 | | 9266 | | 10456 | | 11252 | | | 8 - 16 - 29 |
| | | | 260 | 0.66 | 34 | 7350 | | 10275 | | 11772 | | 12752 | | | 14 - 20 - 32 |
| 10 | M13 | 5 | 35 | 0.17 | 16 | 4882 | 0.40 | 6215 | 1.50 | 6769 | 3.40 | 7000 | 6.00 | 6.1 | 1 - 1 - 5 |
| | | | 50 | 0.35 | 21 | 5707 | | 7567 | | 8299 | | 8689 | | | 1 - 3 - 12 |
| | | | 70 | 0.69 | 25 | 6350 | | 8797 | | 9848 | | 10381 | | | 2 - 5 - 18 |
| | M17 | 6 | 55 | 0.22 | 21 | 5289 | | 6971 | | 7607 | | 7933 | | 4.8 | 1 - 2 - 9 |
| | | | 80 | 0.46 | 26 | 5928 | | 8027 | | 8963 | | 9453 | | | 2 - 5 - 17 |
| | | | 100 | 0.71 | 29 | 6852 | | 9769 | | 11003 | | 11699 | | | 4 - 9 - 22 |
| | M23 | 8 | 100 | 0.23 | 25 | 4764 | | 6534 | | 7307 | | 7705 | | 3.9 | 3 - 6 - 18 |
| | | | 150 | 0.51 | 31 | 6618 | | 9685 | | 11037 | | 11971 | | | 6 - 13 - 28 |
| | | | 180 | 0.73 | 33 | 7158 | | 10452 | | 12257 | | 13446 | | | 10 - 17 - 32 |
| | M31 | 10* | 180 | 0.22 | 26 | 5285 | | 7475 | | 8395 | | 8874 | | 2.6 | 4 - 9 - 23 |
| | | | 240 | 0.39 | 31 | 6861 | | 10040 | | 11443 | | 12410 | | | 7 - 15 - 30 |
| | | | 300 | 0.61 | 40 | 7552 | | 11039 | | 13005 | | 14304 | | | 11 - 19 - 34 |

Note: Reference page U15 for operational conditions used for performance notes

## CBAL2 / 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 | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 4 | 15 | 0.20 | 15 | 1447 | 3.80 | 1506 | 8.60 | 1552 | 1.90 | 1569 | 3.00 | 6.1 | 0 - 1 - 4 |
| | | | 20 | 0.35 | 17 | 1862 | | 1952 | | 2023 | | 2053 | | | 1 - 2 - 7 |
| | | | 25 | 0.55 | 20 | 2170 | | 2286 | | 2355 | | 2398 | | | 1 - 3 - 10 |
| | M17 | 4 | 20 | 0.18 | 16 | 1514 | | 1583 | | 1640 | | 1660 | | 4.8 | 1 - 1 - 5 |
| | | | 30 | 0.40 | 21 | 2057 | | 2164 | | 2232 | | 2271 | | | 1 - 3 - 10 |
| | | | 40 | 0.71 | 25 | 2624 | | 2782 | | 2906 | | 2971 | | | 2 - 5 - 14 |
| | M23 | 5 | 40 | 0.21 | 20 | 1816 | | 8.6 | | 1973 | | 2011 | | 3.9 | 2 - 4 - 12 |
| | | | 60 | 0.48 | 26 | 2686 | | 2872 | | 3023 | | 3104 | | | 4 - 8 - 18 |
| | | | 75 | 0.75 | 29 | 3273 | | 3538 | | 3690 | | 3808 | | | 7 - 12 - 21 |
| | M31 | 6 | 70 | 0.18 | 20 | 2051 | | 2171 | | 2250 | | 2296 | | 2.6 | 2 - 6 - 14 |
| | | | 105 | 0.41 | 25 | 3036 | | 3265 | | 3420 | | 3518 | | | 6 - 11 - 20 |
| | | | 140 | 0.74 | 31 | 3763 | | 4087 | | 4253 | | 4406 | | | 10 - 14 - 23 |
| 6 | M13 | 4 | 20 | 0.15 | 15 | 2054 | 5.50 | 2181 | 1.60 | 2188 | 2.80 | 2219 | 4.40 | 6.1 | 0 - 1 - 4 |
| | | | 30 | 0.34 | 18 | 2621 | | 2783 | | 2872 | | 2931 | | | 1 - 2 - 9 |
| | | | 40 | 0.61 | 22 | 3278 | | 3537 | | 3633 | | 3728 | | | 2 - 4 - 13 |
| | M17 | 5 | 30 | 0.17 | 17 | 2188 | | 2315 | | 2376 | | 2417 | | 4.8 | 1 - 2 - 6 |
| | | | 45 | 0.39 | 23 | 2968 | | 3185 | | 3263 | | 3341 | | | 2 - 3 - 12 |
| | | | 60 | 0.69 | 26 | 3874 | | 4201 | | 4367 | | 4502 | | | 3 - 6 - 17 |
| | M23 | 6 | 60 | 0.21 | 22 | 2633 | | 2844 | | 2923 | | 3000 | | 3.9 | 2 - 5 - 14 |
| | | | 90 | 0.48 | 27 | 4031 | | 4383 | | 4623 | | 4797 | | | 5 - 10 - 21 |
| | | | 110 | 0.71 | 30 | 4505 | | 4909 | | 5221 | | 5448 | | | 8 - 14 - 26 |
| | M31 | 8 | 105 | 0.19 | 21 | 2968 | | 3217 | | 3321 | | 3416 | | 2.6 | 3 - 7 - 18 |
| | | | 160 | 0.43 | 27 | 4438 | | 4827 | | 5114 | | 5321 | | | 7 - 13 - 25 |
| | | | 210 | 0.74 | 31 | 5060 | | 5694 | | 6055 | | 6356 | | | 12 - 18 - 29 |
| 8 | M13 | 4 | 25 | 0.14 | 15 | 2713 | 7.20 | 2911 | 2.10 | 2986 | 3.70 | 3037 | 5.70 | 6.1 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 20 | 3660 | | 3940 | | 4092 | | 4200 | | | 1 - 2 - 10 |
| | | | 55 | 0.67 | 25 | 4290 | | 4688 | | 4888 | | 5057 | | | 2 - 5 - 16 |
| | M17 | 5 | 40 | 0.18 | 19 | 3203 | | 3443 | | 3555 | | 3633 | | 4.8 | 1 - 2 - 7 |
| | | | 60 | 0.40 | 24 | 3916 | | 4239 | | 4428 | | 4566 | | | 2 - 4 - 14 |
| | | | 80 | 0.70 | 28 | 4941 | | 5437 | | 5716 | | 5943 | | | 3 - 7 - 19 |
| | M23 | 8 | 80 | 0.22 | 24 | 3304 | | 3606 | | 3761 | | 3889 | | 3.9 | 2 - 5 - 16 |
| | | | 120 | 0.49 | 29 | 4922 | | 5470 | | 5851 | | 6130 | | | 5 - 12 - 25 |
| | | | 140 | 0.67 | 31 | 5308 | | 6024 | | 6496 | | 6844 | | | 9 - 16 - 30 |
| | M31 | 10* | 145 | 0.20 | 24 | 3801 | | 4177 | | 4371 | | 4537 | | 2.6 | 4 - 8 - 21 |
| | | | 215 | 0.45 | 29 | 5398 | | 6091 | | 6555 | | 6893 | | | 8 - 16 - 29 |
| | | | 260 | 0.66 | 34 | 5986 | | 6858 | | 7429 | | 7871 | | | 14 - 21 - 33 |
| 10 | M13 | 5 | 35 | 0.17 | 16 | 3620 | 8.90 | 3944 | 2.60 | 4078 | 4.60 | 4173 | 7.10 | 6.1 | 1 - 1 - 5 |
| | | | 50 | 0.35 | 21 | 4408 | | 4835 | | 5062 | | 5223 | | | 1 - 3 - 12 |
| | | | 70 | 0.69 | 25 | 5125 | | 5737 | | 6048 | | 6305 | | | 2 - 5 - 18 |
| | M17 | 6 | 55 | 0.22 | 21 | 4061 | | 4432 | | 4621 | | 4755 | | 4.8 | 1 - 2 - 9 |
| | | | 80 | 0.46 | 26 | 4676 | | 5222 | | 5507 | | 5728 | | | 2 - 5 - 17 |
| | | | 100 | 0.71 | 29 | 5691 | | 6410 | | 6815 | | 7143 | | | 4 - 9 - 22 |
| | M23 | 8 | 100 | 0.23 | 25 | 3807 | | 4257 | | 4488 | | 4674 | | 3.9 | 3 - 6 - 18 |
| | | | 150 | 0.51 | 31 | 5642 | | 6430 | | 6974 | | 7372 | | | 6 - 13 - 28 |
| | | | 180 | 0.73 | 33 | 6000 | | 7141 | | 7833 | | 8346 | | | 10 - 18 - 33 |
| | M31 | 10* | 180 | 0.22 | 26 | 4354 | | 4891 | | 5170 | | 5405 | | 2.6 | 4 - 9 - 23 |
| | | | 240 | 0.39 | 31 | 5849 | | 6666 | | 7230 | | 7643 | | | 7 - 15 - 30 |
| | | | 300 | 0.61 | 40 | 6000 | | 7576 | | 8333 | | 8894 | | | 11 - 19 - 34 |

Note: Reference page U15 for operational conditions used for performance notes

## CBAL2 / 2-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Heating (Btu/h) | | | | | | | | Induction ratio | Throw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 4 | 15 | 0.2 | 15 | 3308 | 1.00 | 3900 | 3.80 | 4059 | 8.60 | 4181 | 1.90 | 6.1 | 0-1-4 |
| | | | 20 | 0.35 | 17 | 4179 | | 5016 | | 5259 | | 5452 | | | 1-2-7 |
| | | | 25 | 0.55 | 20 | 4804 | | 5848 | | 6159 | | 6347 | | | 1-3-10 |
| | M17 | 4 | 20 | 0.18 | 16 | 3442 | | 4079 | | 4264 | | 4418 | | 4.8 | 1-1-5 |
| | | | 30 | 0.4 | 21 | 4561 | | 5543 | | 5832 | | 6014 | | | 1-3-10 |
| | | | 40 | 0.71 | 25 | 5572 | | 7069 | | 7497 | | 7831 | | | 2-5-14 |
| | M23 | 5 | 40 | 0.21 | 20 | 4000 | | 4894 | | 5172 | | 5316 | | 3.9 | 2-4-12 |
| | | | 60 | 0.48 | 26 | 5639 | | 7237 | | 7739 | | 8144 | | | 4-8-18 |
| | | | 75 | 0.75 | 29 | 7064 | | 8819 | | 9533 | | 9942 | | | 7-12-21 |
| | M31 | 6 | 70 | 0.18 | 20 | 4437 | | 5526 | | 5850 | | 6062 | | 2.6 | 2-6-14 |
| | | | 105 | 0.41 | 25 | 6492 | | 8181 | | 8799 | | 9214 | | | 6-11-20 |
| | | | 140 | 0.74 | 31 | 7859 | | 10139 | | 11012 | | 11459 | | | 10-14-23 |
| 6 | M13 | 4 | 20 | 0.15 | 15 | 4561 | 1.40 | 5535 | 5.50 | 5876 | 1.60 | 5894 | 2.80 | 6.1 | 0-1-4 |
| | | | 30 | 0.34 | 18 | 5628 | | 7063 | | 7500 | | 7740 | | | 1-2-9 |
| | | | 40 | 0.61 | 22 | 6907 | | 8832 | | 9530 | | 9789 | | | 2-4-13 |
| | M17 | 5 | 30 | 0.17 | 17 | 4765 | | 5896 | | 6238 | | 6402 | | 4.8 | 1-2-6 |
| | | | 45 | 0.39 | 23 | 6310 | | 7998 | | 8582 | | 8791 | | | 2-3-12 |
| | | | 60 | 0.69 | 26 | 8041 | | 10438 | | 11321 | | 11766 | | | 3-6-17 |
| | M23 | 6 | 60 | 0.21 | 22 | 5539 | | 7095 | | 7664 | | 7876 | | 3.9 | 2-5-14 |
| | | | 90 | 0.48 | 27 | 8227 | | 10862 | | 11809 | | 12458 | | | 5-10-21 |
| | | | 110 | 0.71 | 30 | 9016 | | 12139 | | 13228 | | 14068 | | | 8-13-24 |
| | M31 | 10* | 105 | 0.19 | 21 | 6197 | | 7997 | | 8667 | | 8948 | | 2.6 | 3-7-18 |
| | | | 160 | 0.43 | 27 | 8953 | | 11958 | | 13007 | | 13780 | | | 7-13-25 |
| | | | 210 | 0.74 | 31 | 10284 | | 13635 | | 15343 | | 16314 | | | 12-18-29 |
| 8 | M13 | 4 | 25 | 0.14 | 15 | 5983 | 1.80 | 7309 | 7.20 | 7843 | 2.10 | 8045 | 3.70 | 6.1 | 0-1-4 |
| | | | 40 | 0.36 | 20 | 7645 | | 9863 | | 10617 | | 11027 | | | 1-2-10 |
| | | | 55 | 0.67 | 25 | 8656 | | 11561 | | 12631 | | 13171 | | | 2-5-16 |
| | M17 | 5 | 40 | 0.18 | 19 | 6870 | | 8631 | | 9278 | | 9579 | | 4.8 | 1-2-7 |
| | | | 60 | 0.4 | 24 | 7918 | | 10551 | | 11422 | | 11931 | | | 2-4-14 |
| | | | 80 | 0.7 | 28 | 9950 | | 13312 | | 14651 | | 15401 | | | 3-7-19 |
| | M23 | 8 | 80 | 0.22 | 24 | 6667 | | 8902 | | 9716 | | 10133 | | 3.9 | 2-5-16 |
| | | | 120 | 0.49 | 29 | 9637 | | 13261 | | 14739 | | 15764 | | | 5-12-25 |
| | | | 140 | 0.67 | 31 | 10453 | | 14302 | | 16233 | | 17509 | | | 8-15-28 |
| | M31 | 10* | 145 | 0.2 | 24 | 7657 | | 10241 | | 11254 | | 11777 | | 2.6 | 4-8-21 |
| | | | 215 | 0.45 | 29 | 10671 | | 14545 | | 16413 | | 17662 | | | 8-16-29 |
| | | | 260 | 0.66 | 34 | 11538 | | 16129 | | 18479 | | 20017 | | | 14-20-32 |
| 10 | M13 | 5 | 35 | 0.17 | 16 | 7663 | 2.20 | 9755 | 8.90 | 10626 | 2.60 | 10989 | 4.60 | 6.1 | 1-1-5 |
| | | | 50 | 0.35 | 21 | 8958 | | 11878 | | 13028 | | 13640 | | | 1-3-12 |
| | | | 70 | 0.69 | 25 | 9968 | | 13809 | | 15459 | | 16296 | | | 2-5-18 |
| | M17 | 6 | 55 | 0.22 | 21 | 8302 | | 10943 | | 11941 | | 12452 | | 4.8 | 1-2-9 |
| | | | 80 | 0.46 | 26 | 9306 | | 12599 | | 14070 | | 14839 | | | 2-5-17 |
| | | | 100 | 0.71 | 29 | 10756 | | 15334 | | 17272 | | 18363 | | | 4-9-22 |
| | M23 | 8 | 100 | 0.23 | 25 | 7479 | | 10257 | | 11470 | | 12094 | | 3.9 | 3-6-18 |
| | | | 150 | 0.51 | 31 | 10389 | | 15202 | | 17326 | | 18791 | | | 6-13-28 |
| | | | 180 | 0.73 | 33 | 11235 | | 16406 | | 19240 | | 21107 | | | 9-17-32 |
| | M31 | 10* | 180 | 0.22 | 26 | 8295 | | 11733 | | 13178 | | 13930 | | 2.6 | 4-9-23 |
| | | | 240 | 0.39 | 31 | 10770 | | 15760 | | 17962 | | 19481 | | | 7-15-30 |
| | | | 300 | 0.61 | 40 | 11854 | | 17329 | | 20414 | | 22453 | | | 11-19-34 |

Note: Reference page U15 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2018.
2. $\Delta P_s$ 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. $\Delta P_{Coil}$ values are measured in feet of water. $\Delta P_{Coil}$ 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
7. * denotes oval inlet air connection.

## 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 heating 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 HEATING 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:

$\Delta P_S$ = 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]

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

# CBE2

- 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

CBE2-24

CBE2-12

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

See website for Specifications

## MODELS:

CBE2-24
CBE2-12

## FINISHES:

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

## OVERVIEW

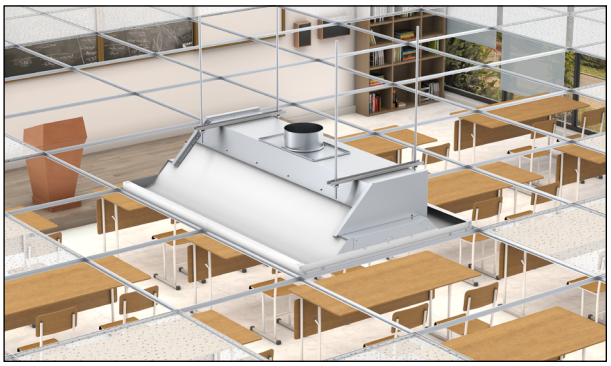
Titus active chilled beams features the aerodynamic properties of Titus ceiling diffusers and benefit from the use of using hydronic coils and induced air to reduce energy consumption associated with removal of sensible thermal loads. The primary air is supplied to the chilled beam subsequent to it being 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 CBE2s are offered for both cooling and heating and lengths from 2 to 10 ft. The low overall height of the CBE2 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



CBE2 installed in an open ceiling of a college classroom

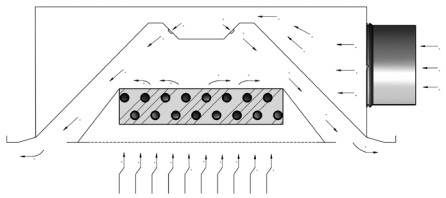
## CBE2 STANDARD FEATURES

- 1-way or 2-way air distribution patterns
- 12-inch or 24-inch width
- 2 foot to 10 foot lengths, 1 foot increments
- Perforated induced air grille
- Left hand or Right hand coil connections
- Side, top, or multi (CBE2-24 only) air inlet locations
- 2-pipe and 4-pipe coil configurations
- Field-reversible coils (CBE2-24 only)
- 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
- Coil drain valve

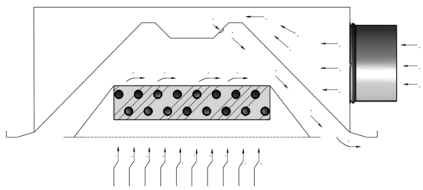
## OPTIONS AND ACCESSORIES

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

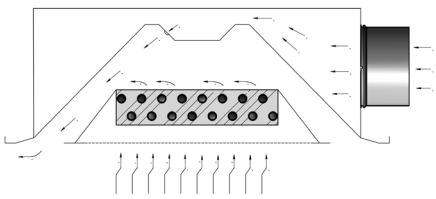
CBE2 2-Way



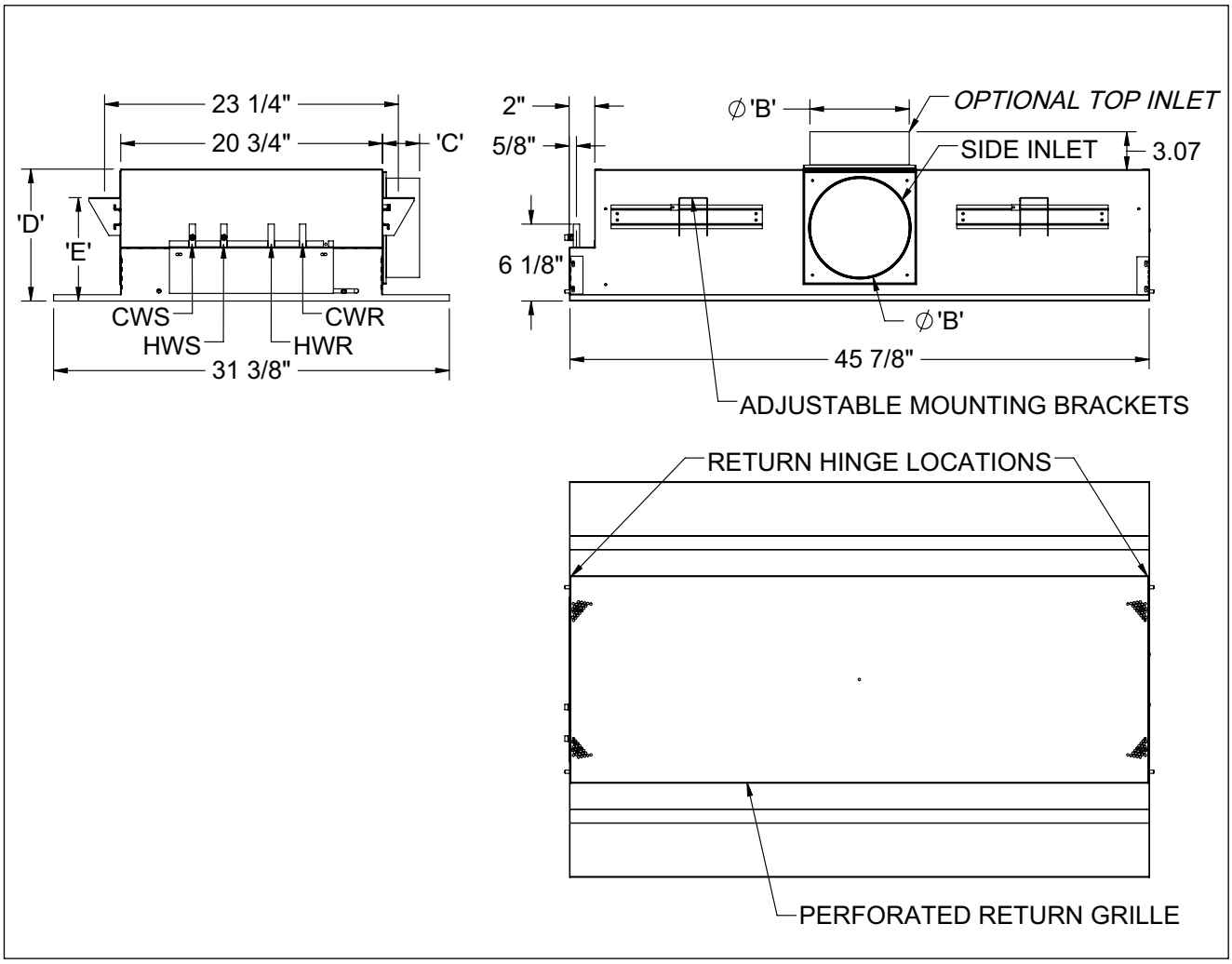
CBE2 1-Way (front)



CBE2 1-Way (back)



## CBE2 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 |

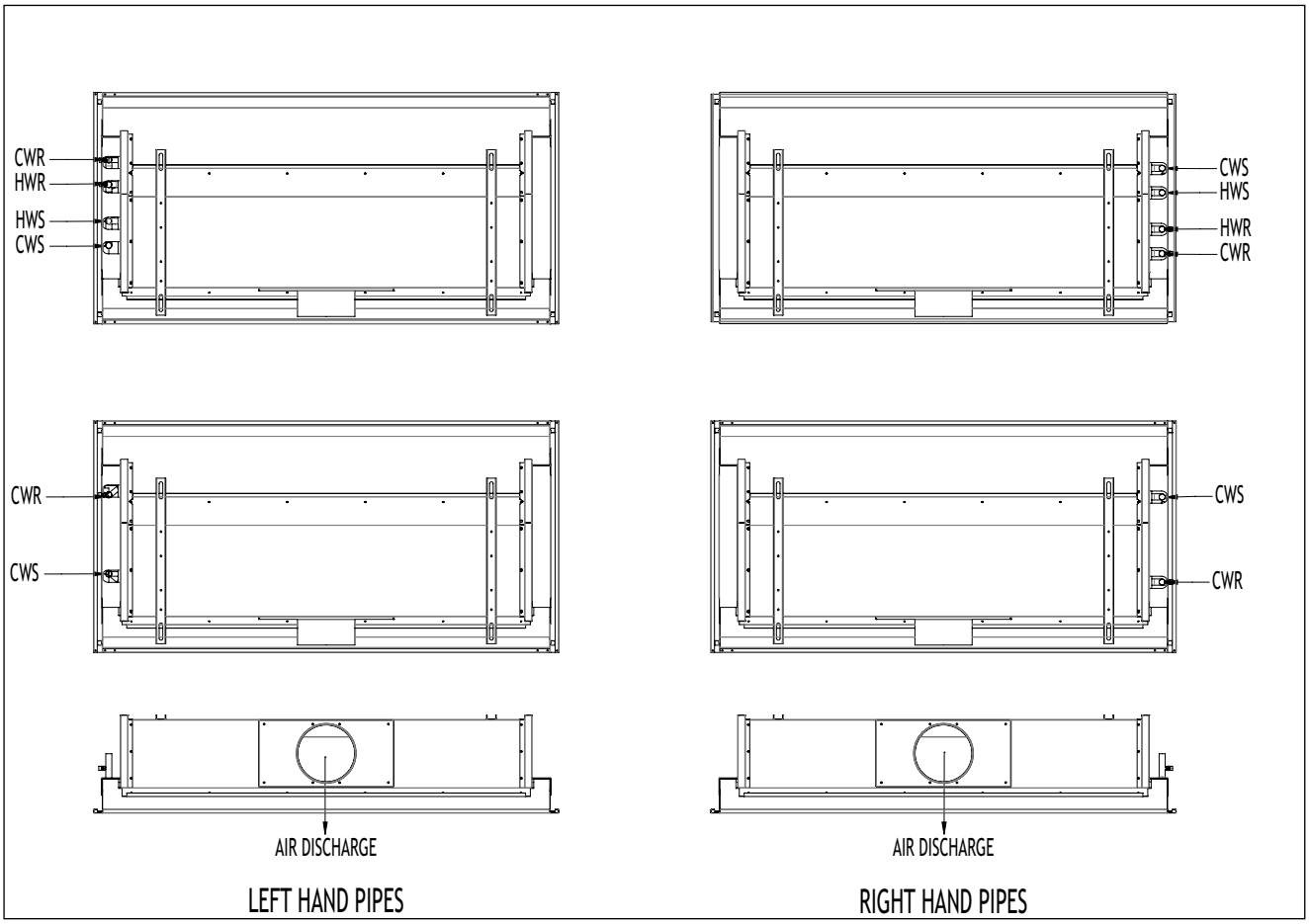
*Side Inlet Only

**Top Inlet Only

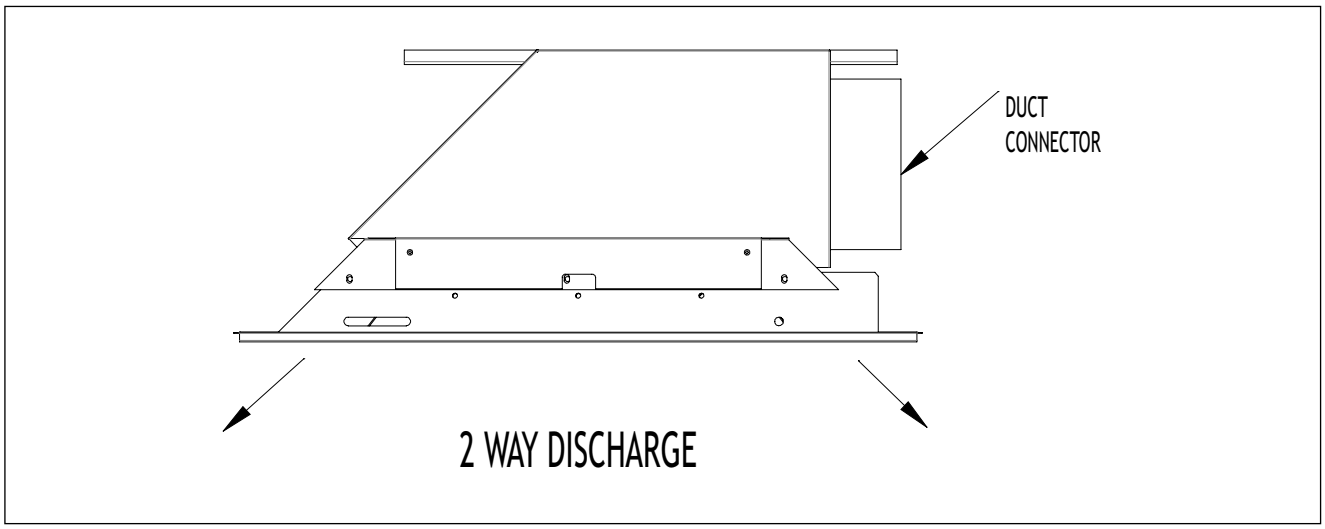
Integrated ¼" pressure port for balancing/commissioning accessable from roomside opposite coil connection

All dimensions are in inches

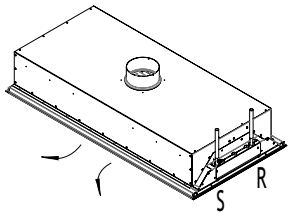
CBE2 CASING ARRANGEMENTS / SIDE INLET 1-WAY



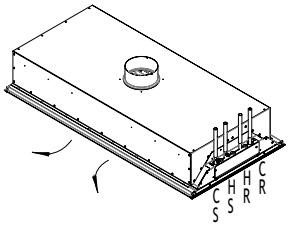

CBE2 CASING ARRANGEMENTS / SIDE INLET 2-WAY



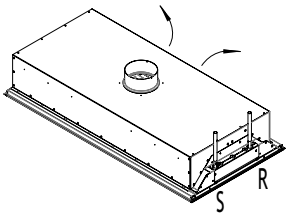
## CBE2 CASING ARRANGEMENTS / TOP INLET 1-WAY



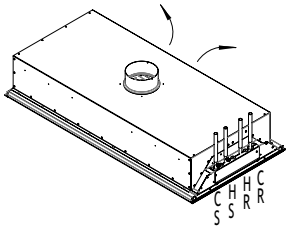

TOP INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW FRONT




TOP INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW FRONT

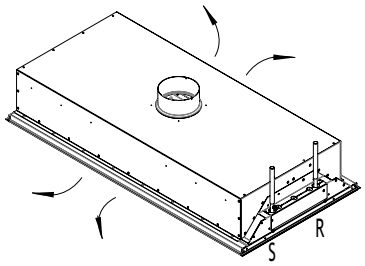



TOP INLET
1 WAY 2 PIPE
RIGHT HAND
AIR FLOW BACK

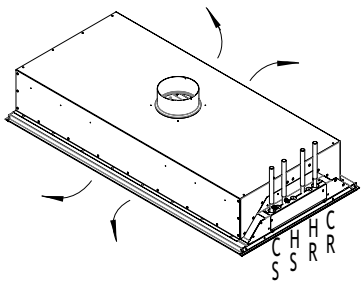



TOP INLET
1 WAY 4 PIPE
RIGHT HAND
AIR FLOW BACK

## CBE2 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

## CBE2-24 / 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 | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 4 | 15 | 0.20 | 15 | 1357 | 2.90 | 1412 | 6.40 | 1455 | 1.50 | 1471 | 2.30 | 6.1 | 0 - 1 - 4 |
| | | | 20 | 0.35 | 17 | 1745 | | 1830 | | 1897 | | 1925 | | | 1 - 2 - 7 |
| | | | 25 | 0.55 | 20 | 2035 | | 2143 | | 2208 | | 2248 | | | 1 - 3 - 10 |
| | M17 | 4 | 20 | 0.18 | 16 | 1419 | | 1484 | | 1537 | | 1556 | | 4.8 | 1 - 1 - 5 |
| | | | 30 | 0.40 | 21 | 1929 | | 2029 | | 2093 | | 2129 | | | 1 - 3 - 10 |
| | | | 40 | 0.71 | 25 | 2460 | | 2608 | | 2725 | | 2785 | | | 2 - 5 - 14 |
| | M23 | 5 | 40 | 0.21 | 20 | 1703 | | 1799 | | 1850 | | 1885 | | 2.9 | 2 - 4 - 12 |
| | | | 60 | 0.48 | 26 | 2518 | | 2693 | | 2834 | | 2910 | | | 4 - 8 - 18 |
| | | | 75 | 0.75 | 29 | 3069 | | 3317 | | 3459 | | 3570 | | | 7 - 12 - 21 |
| | M31 | 6 | 70 | 0.18 | 20 | 1923 | | 2035 | | 2109 | | 2153 | | 2.6 | 2 - 6 - 14 |
| | | | 105 | 0.41 | 25 | 2847 | | 3061 | | 3206 | | 3299 | | | 6 - 11 - 20 |
| | | | 140 | 0.74 | 31 | 3528 | | 3831 | | 3987 | | 4131 | | | 10 - 14 - 23 |
| 6 | M13 | 4 | 20 | 0.15 | 15 | 1926 | 4.10 | 2044 | 9.30 | 2051 | 2.10 | 2080 | 3.30 | 6.1 | 0 - 1 - 4 |
| | | | 30 | 0.34 | 18 | 2457 | | 2609 | | 2693 | | 2748 | | | 1 - 2 - 9 |
| | | | 40 | 0.61 | 22 | 3073 | | 3316 | | 3406 | | 3495 | | | 2 - 4 - 13 |
| | M17 | 5 | 30 | 0.17 | 17 | 2051 | | 2171 | | 2227 | | 2265 | | 4.8 | 1 - 2 - 6 |
| | | | 45 | 0.39 | 23 | 2783 | | 2986 | | 3059 | | 3132 | | | 2 - 3 - 12 |
| | | | 60 | 0.69 | 26 | 3632 | | 3939 | | 4094 | | 4221 | | | 3 - 6 - 17 |
| | M23 | 6 | 60 | 0.21 | 22 | 2469 | | 2666 | | 2740 | | 2813 | | 3.9 | 2 - 5 - 14 |
| | | | 90 | 0.48 | 27 | 3779 | | 4109 | | 4334 | | 4497 | | | 5 - 10 - 21 |
| | | | 110 | 0.71 | 30 | 4223 | | 4602 | | 4895 | | 5108 | | | 8 - 13 - 24 |
| | M31 | 8 | 105 | 0.19 | 21 | 2783 | | 3016 | | 3113 | | 3203 | | 2.6 | 3 - 7 - 18 |
| | | | 160 | 0.43 | 27 | 4161 | | 4525 | | 4794 | | 4988 | | | 7 - 13 - 25 |
| | | | 210 | 0.74 | 31 | 4744 | | 5338 | | 5676 | | 5958 | | | 12 - 18 - 29 |
| 8 | M13 | 4 | 25 | 0.14 | 15 | 2882 | 5.40 | 3093 | 1.60 | 3172 | 2.80 | 3227 | 4.30 | 6.1 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 20 | 3889 | | 4187 | | 4348 | | 4462 | | | 1 - 2 - 10 |
| | | | 55 | 0.67 | 25 | 4559 | | 4981 | | 5193 | | 5373 | | | 2 - 5 - 16 |
| | M17 | 5 | 40 | 0.18 | 19 | 3003 | | 3228 | | 3333 | | 3406 | | 4.8 | 1 - 2 - 7 |
| | | | 60 | 0.40 | 24 | 3671 | | 3974 | | 4151 | | 4281 | | | 2 - 4 - 14 |
| | | | 80 | 0.70 | 28 | 4632 | | 5098 | | 5358 | | 5571 | | | 3 - 7 - 19 |
| | M23 | 8 | 80 | 0.22 | 24 | 3097 | | 3380 | | 3526 | | 3646 | | 3.9 | 2 - 5 - 16 |
| | | | 120 | 0.49 | 29 | 4614 | | 5128 | | 5485 | | 5746 | | | 5 - 12 - 25 |
| | | | 140 | 0.67 | 31 | 4976 | | 5648 | | 6092 | | 6417 | | | 8- 15 - 28 |
| | M31 | 10* | 145 | 0.20 | 24 | 3563 | | 3916 | | 4098 | | 4253 | | 2.6 | 4 - 8 - 21 |
| | | | 215 | 0.45 | 29 | 5061 | | 5711 | | 6145 | | 6462 | | | 8 - 16 - 29 |
| | | | 260 | 0.66 | 34 | 5612 | | 6429 | | 6964 | | 7379 | | | 14 - 20 - 32 |
| 10 | M13 | 5 | 35 | 0.17 | 16 | 3767 | 6.70 | 4103 | 1.90 | 4243 | 3.40 | 4342 | 5.30 | 6.1 | 1 - 1 - 5 |
| | | | 50 | 0.35 | 21 | 4586 | | 5030 | | 5267 | | 5434 | | | 1 - 3 - 12 |
| | | | 70 | 0.69 | 25 | 5332 | | 5969 | | 6292 | | 6559 | | | 2 - 5 - 18 |
| | M17 | 6 | 55 | 0.22 | 21 | 3807 | | 4155 | | 4333 | | 4458 | | 4.8 | 1 - 2 - 9 |
| | | | 80 | 0.46 | 26 | 4384 | | 4895 | | 5163 | | 5370 | | | 2 - 5 - 17 |
| | | | 100 | 0.71 | 29 | 5335 | | 6009 | | 6389 | | 6696 | | | 4 - 9 - 22 |
| | M23 | 8 | 100 | 0.23 | 25 | 3569 | | 3991 | | 4208 | | 4382 | | 3.9 | 3 - 6 - 18 |
| | | | 150 | 0.51 | 31 | 5289 | | 6028 | | 6538 | | 6912 | | | 6 - 13 - 28 |
| | | | 180 | 0.73 | 33 | 5708 | | 6694 | | 7344 | | 7825 | | | 9 - 17- 32 |
| | M31 | 10* | 180 | 0.22 | 26 | 4082 | | 4585 | | 4847 | | 5068 | | 2.6 | 4 - 9 - 23 |
| | | | 240 | 0.39 | 31 | 5483 | | 6249 | | 6778 | | 7165 | | | 7 - 15 - 30 |
| | | | 300 | 0.61 | 40 | 6000 | | 7103 | | 7812 | | 8339 | | | 11 - 19 - 34 |

Note: Reference page U29 for operational conditions used for performance notes

## CBE2-24 / 4-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Heating (Btu/h) | | | | | | | | Induction ratio | Throw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 4 | 15 | 0.2 | 15 | 2108 | 0.20 | 2485 | 0.60 | 2586 | 1.40 | 2664 | 2.50 | 6.1 | 0 - 1 - 4 |
| | | | 20 | 0.35 | 17 | 2663 | | 3196 | | 3350 | | 3473 | | | 1 - 2 - 7 |
| | | | 25 | 0.55 | 20 | 3061 | | 3725 | | 3923 | | 4043 | | | 1 - 3 - 10 |
| | M17 | 4 | 20 | 0.18 | 16 | 2193 | | 2598 | | 2716 | | 2814 | | 4.8 | 1 - 1 - 5 |
| | | | 30 | 0.4 | 21 | 2906 | | 3531 | | 3715 | | 3831 | | | 1 - 3 - 10 |
| | | | 40 | 0.71 | 25 | 3549 | | 4503 | | 4776 | | 4999 | | | 2 - 5 - 14 |
| | M23 | 5 | 40 | 0.21 | 20 | 2548 | | 3118 | | 3295 | | 3387 | | 3.9 | 2 - 4 - 12 |
| | | | 60 | 0.48 | 26 | 3592 | | 4611 | | 4930 | | 5188 | | | 4 - 8 - 18 |
| | | | 75 | 0.75 | 29 | 4500 | | 5618 | | 6073 | | 6334 | | | 7 - 12 - 21 |
| | M31 | 6 | 70 | 0.18 | 20 | 2826 | | 3520 | | 3727 | | 3862 | | 2.6 | 2 - 6 - 14 |
| | | | 105 | 0.41 | 25 | 4136 | | 5212 | | 5605 | | 5870 | | | 6 - 11 - 20 |
| | | | 140 | 0.74 | 31 | 5007 | | 6459 | | 7015 | | 7300 | | | 10 - 14 - 23 |
| 6 | M13 | 4 | 20 | 0.15 | 15 | 2905 | 0.20 | 3526 | 0.90 | 3743 | 2.10 | 3755 | 3.70 | 6.1 | 0 - 1 - 4 |
| | | | 30 | 0.34 | 18 | 3585 | | 4500 | | 4778 | | 4931 | | | 1 - 2 - 9 |
| | | | 40 | 0.61 | 22 | 4400 | | 5627 | | 6071 | | 6236 | | | 2 - 4 - 13 |
| | M17 | 5 | 30 | 0.17 | 17 | 3036 | | 3756 | | 3974 | | 4078 | | 4.8 | 1 - 2 - 6 |
| | | | 45 | 0.39 | 23 | 4020 | | 5095 | | 5467 | | 5601 | | | 2 - 3 - 12 |
| | | | 60 | 0.69 | 26 | 5123 | | 6649 | | 7212 | | 7496 | | | 3 - 6 - 17 |
| | M23 | 6 | 60 | 0.21 | 22 | 3529 | | 4520 | | 4882 | | 5017 | | 3.9 | 2 - 5 - 14 |
| | | | 90 | 0.48 | 27 | 5241 | | 6920 | | 7523 | | 7936 | | | 5 - 10 - 21 |
| | | | 110 | 0.71 | 30 | 5744 | | 7733 | | 8427 | | 8962 | | | 8 - 13 - 24 |
| | M31 | 8 | 105 | 0.19 | 21 | 3948 | | 5095 | | 5521 | | 5701 | | 2.6 | 3 - 7 - 18 |
| | | | 160 | 0.43 | 27 | 5703 | | 7618 | | 8266 | | 8778 | | | 7 - 13 - 25 |
| | | | 210 | 0.74 | 31 | 6552 | | 8686 | | 9774 | | 10393 | | | 12 - 18 - 29 |
| 8 | M13 | 4 | 25 | 0.14 | 15 | 4320 | 0.30 | 5277 | 1.20 | 5663 | 2.70 | 5808 | 4.80 | 6.1 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 20 | 5520 | | 7121 | | 7665 | | 7961 | | | 1 - 2 - 10 |
| | | | 55 | 0.67 | 25 | 6249 | | 8347 | | 9120 | | 9509 | | | 2 - 5 - 16 |
| | M17 | 5 | 40 | 0.18 | 19 | 4377 | | 5499 | | 5910 | | 6102 | | 4.8 | 1 - 2 - 7 |
| | | | 60 | 0.4 | 24 | 5044 | | 6722 | | 7277 | | 7600 | | | 2 - 4 - 14 |
| | | | 80 | 0.7 | 28 | 6339 | | 8481 | | 9333 | | 9811 | | | 3 - 7 - 19 |
| | M23 | 8 | 80 | 0.22 | 24 | 4247 | | 5671 | | 6190 | | 6455 | | 3.9 | 2 - 5 - 16 |
| | | | 120 | 0.49 | 29 | 6267 | | 8448 | | 9390 | | 10043 | | | 5 - 12 - 25 |
| | | | 140 | 0.67 | 31 | 6659 | | 9111 | | 10341 | | 11154 | | | 8 - 15- 28 |
| | M31 | 10* | 145 | 0.2 | 24 | 4878 | | 6524 | | 7170 | | 7503 | | 2.6 | 4 - 8 - 21 |
| | | | 215 | 0.45 | 29 | 6798 | | 9266 | | 10456 | | 11252 | | | 8 - 16 - 29 |
| | | | 260 | 0.66 | 34 | 7350 | | 10275 | | 11772 | | 12752 | | | 14 - 20 - 32 |
| 10 | M13 | 5 | 35 | 0.17 | 16 | 5417 | 0.40 | 6897 | 1.50 | 7512 | 3.40 | 7769 | 6.00 | 6.1 | 1 - 1 - 5 |
| | | | 50 | 0.35 | 21 | 6333 | | 8397 | | 9210 | | 9643 | | | 1 - 3 - 12 |
| | | | 70 | 0.69 | 25 | 7047 | | 9762 | | 10929 | | 11521 | | | 2 - 5 - 18 |
| | M17 | 6 | 55 | 0.22 | 21 | 5289 | | 6971 | | 7607 | | 7933 | | 4.8 | 1 - 2 - 9 |
| | | | 80 | 0.46 | 26 | 5928 | | 8027 | | 8963 | | 9453 | | | 2 - 5 - 17 |
| | | | 100 | 0.71 | 29 | 6852 | | 9769 | | 11003 | | 11699 | | | 4 - 9 - 22 |
| | M23 | 8 | 100 | 0.23 | 25 | 4764 | | 6534 | | 7307 | | 7705 | | 3.9 | 3 - 6 - 18 |
| | | | 150 | 0.51 | 31 | 6618 | | 9685 | | 11037 | | 11971 | | | 6 - 13 - 28 |
| | | | 180 | 0.73 | 33 | 7158 | | 10452 | | 12257 | | 13446 | | | 10 - 17 - 32 |
| | M31 | 10* | 180 | 0.22 | 26 | 5285 | | 7475 | | 8395 | | 8874 | | 2.6 | 4 - 9 - 23 |
| | | | 240 | 0.39 | 31 | 6861 | | 10040 | | 11443 | | 12410 | | | 7 - 15 - 30 |
| | | | 300 | 0.61 | 40 | 7552 | | 11039 | | 13005 | | 14304 | | | 11 - 19 - 34 |

Note: Reference page U29 for operational conditions used for performance notes

## CBE2-24 / 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 | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 4 | 15 | 0.20 | 15 | 1447 | 3.80 | 1506 | 8.60 | 1552 | 1.90 | 1569 | 3.00 | 6.1 | 0 - 1 - 4 |
| | | | 20 | 0.35 | 17 | 1862 | | 1952 | | 2023 | | 2053 | | | 1 - 2 - 7 |
| | | | 25 | 0.55 | 20 | 2170 | | 2286 | | 2355 | | 2398 | | | 1 - 3 - 10 |
| | M17 | 4 | 20 | 0.18 | 16 | 1514 | | 1583 | | 1640 | | 1660 | | 4.8 | 1 - 1 - 5 |
| | | | 30 | 0.40 | 21 | 2057 | | 2164 | | 2232 | | 2271 | | | 1 - 3 - 10 |
| | | | 40 | 0.71 | 25 | 2624 | | 2782 | | 2906 | | 2971 | | | 2 - 5 - 14 |
| | M23 | 5 | 40 | 0.21 | 20 | 1816 | | 8.6 | | 1973 | | 2011 | | 3.9 | 2 - 4 - 12 |
| | | | 60 | 0.48 | 26 | 2686 | | 2872 | | 3023 | | 3104 | | | 4 - 8 - 18 |
| | | | 75 | 0.75 | 29 | 3273 | | 3538 | | 3690 | | 3808 | | | 7 - 12 - 21 |
| | M31 | 6 | 70 | 0.18 | 20 | 2051 | | 2171 | | 2250 | | 2296 | | 2.6 | 2 - 6 - 14 |
| | | | 105 | 0.41 | 25 | 3036 | | 3265 | | 3420 | | 3518 | | | 6 - 11 - 20 |
| | | | 140 | 0.74 | 31 | 3763 | | 4087 | | 4253 | | 4406 | | | 10 - 14 - 23 |
| 6 | M13 | 4 | 20 | 0.15 | 15 | 2054 | 5.50 | 2181 | 1.60 | 2188 | 2.80 | 2219 | 4.40 | 6.1 | 0 - 1 - 4 |
| | | | 30 | 0.34 | 18 | 2621 | | 2783 | | 2872 | | 2931 | | | 1 - 2 - 9 |
| | | | 40 | 0.61 | 22 | 3278 | | 3537 | | 3633 | | 3728 | | | 2 - 4 - 13 |
| | M17 | 5 | 30 | 0.17 | 17 | 2188 | | 2315 | | 2376 | | 2417 | | 4.8 | 1 - 2 - 6 |
| | | | 45 | 0.39 | 23 | 2968 | | 3185 | | 3263 | | 3341 | | | 2 - 3 - 12 |
| | | | 60 | 0.69 | 26 | 3874 | | 4201 | | 4367 | | 4502 | | | 3 - 6 - 17 |
| | M23 | 6 | 60 | 0.21 | 22 | 2633 | | 2844 | | 2923 | | 3000 | | 3.9 | 2 - 5 - 14 |
| | | | 90 | 0.48 | 27 | 4031 | | 4383 | | 4623 | | 4797 | | | 5 - 10 - 21 |
| | | | 110 | 0.71 | 30 | 4505 | | 4909 | | 5221 | | 5448 | | | 8 - 14 - 26 |
| | M31 | 8 | 105 | 0.19 | 21 | 2968 | | 3217 | | 3321 | | 3416 | | 2.6 | 3 - 7 - 18 |
| | | | 160 | 0.43 | 27 | 4438 | | 4827 | | 5114 | | 5321 | | | 7 - 13 - 25 |
| | | | 210 | 0.74 | 31 | 5060 | | 5694 | | 6055 | | 6356 | | | 12 - 18 - 29 |
| 8 | M13 | 4 | 25 | 0.14 | 15 | 3074 | 7.20 | 3299 | 2.10 | 3384 | 3.70 | 3442 | 5.70 | 6.1 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 20 | 4148 | | 4466 | | 4638 | | 4760 | | | 1 - 2 - 10 |
| | | | 55 | 0.67 | 25 | 4863 | | 5313 | | 5540 | | 5731 | | | 2 - 5 - 16 |
| | M17 | 5 | 40 | 0.18 | 19 | 3203 | | 3443 | | 3555 | | 3633 | | 4.8 | 1 - 2 - 7 |
| | | | 60 | 0.40 | 24 | 3916 | | 4239 | | 4428 | | 4566 | | | 2 - 4 - 14 |
| | | | 80 | 0.70 | 28 | 4941 | | 5437 | | 5716 | | 5943 | | | 3 - 7 - 19 |
| | M23 | 8 | 80 | 0.22 | 24 | 3304 | | 3606 | | 3761 | | 3889 | | 3.9 | 2 - 5 - 16 |
| | | | 120 | 0.49 | 29 | 4922 | | 5470 | | 5851 | | 6130 | | | 5 - 12 - 25 |
| | | | 140 | 0.67 | 31 | 5308 | | 6024 | | 6496 | | 6844 | | | 9 - 16 - 30 |
| | M31 | 10* | 145 | 0.20 | 24 | 3801 | | 4177 | | 4371 | | 4537 | | 2.6 | 4 - 8 - 21 |
| | | | 215 | 0.45 | 29 | 5398 | | 6091 | | 6555 | | 6893 | | | 8 - 16 - 29 |
| | | | 260 | 0.66 | 34 | 5986 | | 6858 | | 7429 | | 7871 | | | 14 - 21 - 33 |
| 10 | M13 | 5 | 35 | 0.17 | 16 | 4018 | 8.90 | 4376 | 2.60 | 4526 | 4.60 | 4632 | 7.10 | 6.1 | 1 - 1 - 5 |
| | | | 50 | 0.35 | 21 | 4892 | | 5366 | | 5618 | | 5796 | | | 1 - 3 - 12 |
| | | | 70 | 0.69 | 25 | 5687 | | 6367 | | 6712 | | 6997 | | | 2 - 5 - 18 |
| | M17 | 6 | 55 | 0.22 | 21 | 4061 | | 4432 | | 4621 | | 4755 | | 4.8 | 1 - 2 - 9 |
| | | | 80 | 0.46 | 26 | 4676 | | 5222 | | 5507 | | 5728 | | | 2 - 5 - 17 |
| | | | 100 | 0.71 | 29 | 5691 | | 6410 | | 6815 | | 7143 | | | 4 - 9 - 22 |
| | M23 | 8 | 100 | 0.23 | 25 | 3807 | | 4257 | | 4488 | | 4674 | | 3.9 | 3 - 6 - 18 |
| | | | 150 | 0.51 | 31 | 5642 | | 6430 | | 6974 | | 7372 | | | 6 - 13 - 28 |
| | | | 180 | 0.73 | 33 | 6000 | | 7141 | | 7833 | | 8346 | | | 10 - 18 - 33 |
| | M31 | 10* | 180 | 0.22 | 26 | 4354 | | 4891 | | 5170 | | 5405 | | 2.6 | 4 - 9 - 23 |
| | | | 240 | 0.39 | 31 | 5849 | | 6666 | | 7230 | | 7643 | | | 7 - 15 - 30 |
| | | | 300 | 0.61 | 40 | 6000 | | 7576 | | 8333 | | 8894 | | | 11 - 19 - 34 |

Note: Reference page U29 for operational conditions used for performance notes

## CBE2-24 / 2-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Heating (Btu/h) | | | | | | | | Induction ratio | Throw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 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 | | |
| 4 | M13 | 4 | 15 | 0.2 | 15 | 3308 | 1.00 | 3900 | 3.80 | 4059 | 8.60 | 4181 | 1.90 | 6.1 | 0-1-4 |
| | | | 20 | 0.35 | 17 | 4179 | | 5016 | | 5259 | | 5452 | | | 1-2-7 |
| | | | 25 | 0.55 | 20 | 4804 | | 5848 | | 6159 | | 6347 | | | 1-3-10 |
| | M17 | 4 | 20 | 0.18 | 16 | 3442 | | 4079 | | 4264 | | 4418 | | 4.8 | 1-1-5 |
| | | | 30 | 0.4 | 21 | 4561 | | 5543 | | 5832 | | 6014 | | | 1-3-10 |
| | | | 40 | 0.71 | 25 | 5572 | | 7069 | | 7497 | | 7831 | | | 2-5-14 |
| | M23 | 5 | 40 | 0.21 | 20 | 4000 | | 4894 | | 5172 | | 5316 | | 3.9 | 2-4-12 |
| | | | 60 | 0.48 | 26 | 5639 | | 7237 | | 7739 | | 8144 | | | 4-8-18 |
| | | | 75 | 0.75 | 29 | 7064 | | 8819 | | 9533 | | 9942 | | | 7-12-21 |
| | M31 | 6 | 70 | 0.18 | 20 | 4437 | | 5526 | | 5850 | | 6062 | | 2.6 | 2-6-14 |
| | | | 105 | 0.41 | 25 | 6492 | | 8181 | | 8799 | | 9214 | | | 6-11-20 |
| | | | 140 | 0.74 | 31 | 7859 | | 10139 | | 11012 | | 11459 | | | 10-14-23 |
| 6 | M13 | 4 | 20 | 0.15 | 15 | 4561 | 1.40 | 5535 | 5.50 | 5876 | 1.60 | 5894 | 2.80 | 6.1 | 0-1-4 |
| | | | 30 | 0.34 | 18 | 5628 | | 7063 | | 7500 | | 7740 | | | 1-2-9 |
| | | | 40 | 0.61 | 22 | 6907 | | 8832 | | 9530 | | 9789 | | | 2-4-13 |
| | M17 | 5 | 30 | 0.17 | 17 | 4765 | | 5896 | | 6238 | | 6402 | | 4.8 | 1-2-6 |
| | | | 45 | 0.39 | 23 | 6310 | | 7998 | | 8582 | | 8791 | | | 2-3-12 |
| | | | 60 | 0.69 | 26 | 8041 | | 10438 | | 11321 | | 11766 | | | 3-6-17 |
| | M23 | 6 | 60 | 0.21 | 22 | 5539 | | 7095 | | 7664 | | 7876 | | 3.9 | 2-5-14 |
| | | | 90 | 0.48 | 27 | 8227 | | 10862 | | 11809 | | 12458 | | | 5-10-21 |
| | | | 110 | 0.71 | 30 | 9016 | | 12139 | | 13228 | | 14068 | | | 8-13-24 |
| | M31 | 10* | 105 | 0.19 | 21 | 6197 | | 7997 | | 8667 | | 8948 | | 2.6 | 3-7-18 |
| | | | 160 | 0.43 | 27 | 8953 | | 11958 | | 13007 | | 13780 | | | 7-13-25 |
| | | | 210 | 0.74 | 31 | 10284 | | 13635 | | 15343 | | 16314 | | | 12-18-29 |
| 8 | M13 | 4 | 25 | 0.14 | 15 | 6781 | 1.80 | 8283 | 7.20 | 8889 | 2.10 | 9117 | 3.70 | 6.1 | 0-1-4 |
| | | | 40 | 0.36 | 20 | 8665 | | 11178 | | 12033 | | 12497 | | | 1-2-10 |
| | | | 55 | 0.67 | 25 | 9810 | | 13102 | | 14315 | | 14927 | | | 2-5-16 |
| | M17 | 5 | 40 | 0.18 | 19 | 6870 | | 8631 | | 9278 | | 9579 | | 4.8 | 1-2-7 |
| | | | 60 | 0.4 | 24 | 7918 | | 10551 | | 11422 | | 11931 | | | 2-4-14 |
| | | | 80 | 0.7 | 28 | 9950 | | 13312 | | 14651 | | 15401 | | | 3-7-19 |
| | M23 | 8 | 80 | 0.22 | 24 | 6667 | | 8902 | | 9716 | | 10133 | | 3.9 | 2-5-16 |
| | | | 120 | 0.49 | 29 | 9637 | | 13261 | | 14739 | | 15764 | | | 5-12-25 |
| | | | 140 | 0.67 | 31 | 10453 | | 14302 | | 16233 | | 17509 | | | 8-15-28 |
| | M31 | 10* | 145 | 0.2 | 24 | 7657 | | 10241 | | 11254 | | 11777 | | 2.6 | 4-8-21 |
| | | | 215 | 0.45 | 29 | 10671 | | 14545 | | 16413 | | 17662 | | | 8-16-29 |
| | | | 260 | 0.66 | 34 | 11538 | | 16129 | | 18479 | | 20017 | | | 14-20-32 |
| 10 | M13 | 5 | 35 | 0.17 | 16 | 8504 | 2.20 | 10826 | 8.90 | 11792 | 2.60 | 12195 | 4.60 | 6.1 | 1-1-5 |
| | | | 50 | 0.35 | 21 | 9941 | | 13182 | | 14458 | | 15137 | | | 1-3-12 |
| | | | 70 | 0.69 | 25 | 11062 | | 15324 | | 17155 | | 18084 | | | 2-5-18 |
| | M17 | 6 | 55 | 0.22 | 21 | 8302 | | 10943 | | 11941 | | 12452 | | 4.8 | 1-2-9 |
| | | | 80 | 0.46 | 26 | 9306 | | 12599 | | 14070 | | 14839 | | | 2-5-17 |
| | | | 100 | 0.71 | 29 | 10756 | | 15334 | | 17272 | | 18363 | | | 4-9-22 |
| | M23 | 8 | 100 | 0.23 | 25 | 7479 | | 10257 | | 11470 | | 12094 | | 3.9 | 3-6-18 |
| | | | 150 | 0.51 | 31 | 10389 | | 15202 | | 17326 | | 18791 | | | 6-13-28 |
| | | | 180 | 0.73 | 33 | 11235 | | 16406 | | 19240 | | 21107 | | | 9-17-32 |
| | M31 | 10* | 180 | 0.22 | 26 | 8295 | | 11733 | | 13178 | | 13930 | | 2.6 | 4-9-23 |
| | | | 240 | 0.39 | 31 | 10770 | | 15760 | | 17962 | | 19481 | | | 7-15-30 |
| | | | 300 | 0.61 | 40 | 11854 | | 17329 | | 20414 | | 22453 | | | 11-19-34 |

Note: Reference page U29 for operational conditions used for performance notes

## CBE2-12 / 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 | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 5 | 15 | 0.24 | 15 | 842 | 0.70 | 853 | 1.60 | 864 | 2.90 | 870 | 4.50 | 3.4 | 2-3-5 |
| | | | 20 | 0.42 | 18 | 1048 | | 1070 | | 1087 | | 1096 | | | 2-3-5 |
| | | | 25 | 0.65 | 21 | 1238 | | 1271 | | 1296 | | 1309 | | | 3-4-6 |
| | M17 | 5 | 25 | 0.27 | 15 | 1143 | | 1171 | | 1191 | | 1203 | | 2.3 | 3-3-6 |
| | | | 35 | 0.53 | 20 | 1450 | | 1499 | | 1534 | | 1553 | | | 3-4-7 |
| | | | 40 | 0.7 | 21 | 1582 | | 1644 | | 1686 | | 1709 | | | 4-6-8 |
| | M23 | 5 | 40 | 0.21 | 16 | 1195 | | 1226 | | 1248 | | 1260 | | 1.9 | 4-5-7 |
| | | | 60 | 0.47 | 22 | 1583 | | 1643 | | 1685 | | 1708 | | | 5-7-9 |
| | | | 75 | 0.73 | 25 | 1830 | | 1916 | | 1974 | | 2006 | | | 6-7-10 |
| | M31 | 6 | 75 | 0.24 | 20 | 1394 | | 1428 | | 1454 | | 1469 | | 1.3 | 5-6-8 |
| | | | 100 | 0.42 | 23 | 1708 | | 1765 | | 1805 | | 1827 | | | 6-8-11 |
| | | | 130 | 0.71 | 28 | 2034 | | 2121 | | 2181 | | 2213 | | | 7-8-11 |
| 6 | M13 | 5 | 20 | 0.19 | 16 | 1156 | 1.00 | 1174 | 2.30 | 1191 | 4.20 | 1199 | 6.50 | 3.4 | 2-3-5 |
| | | | 30 | 0.42 | 21 | 1546 | | 1591 | | 1623 | | 1641 | | | 3-5-8 |
| | | | 40 | 0.75 | 25 | 1906 | | 1979 | | 2029 | | 2057 | | | 4-5-7 |
| | M17 | 5 | 40 | 0.31 | 19 | 1766 | | 1826 | | 1868 | | 1892 | | 2.3 | 3-5-8 |
| | | | 50 | 0.49 | 22 | 2050 | | 2139 | | 2199 | | 2232 | | | 4-6-9 |
| | | | 60 | 0.71 | 25 | 2312 | | 2431 | | 2510 | | 2552 | | | 5-7-10 |
| | M23 | 6 | 60 | 0.21 | 20 | 1766 | | 1825 | | 1866 | | 1890 | | 1.9 | 4-6-10 |
| | | | 85 | 0.42 | 24 | 2235 | | 2342 | | 2413 | | 2452 | | | 6-8-11 |
| | | | 110 | 0.7 | 27 | 2628 | | 2785 | | 2890 | | 2946 | | | 7-10-12 |
| | M31 | 8 | 110 | 0.22 | 22 | 2020 | | 2085 | | 2132 | | 2158 | | 1.3 | 6-8-12 |
| | | | 150 | 0.42 | 26 | 2498 | | 2610 | | 2685 | | 2726 | | | 7-10-13 |
| | | | 190 | 0.67 | 29 | 2910 | | 3070 | | 3178 | | 3235 | | | 9-11-14 |
| 8 | M13 | 5 | 30 | 0.24 | 19 | 1800 | 1.40 | 1848 | 3.00 | 1883 | 5.40 | 1901 | 8.50 | 3.4 | 3-4-8 |
| | | | 40 | 0.43 | 23 | 2204 | | 2288 | | 2343 | | 2374 | | | 3-5-9 |
| | | | 50 | 0.67 | 26 | 2599 | | 2718 | | 2795 | | 2838 | | | 4-6-9 |
| | M17 | 6 | 50 | 0.28 | 21 | 2419 | | 2521 | | 2588 | | 2625 | | 2.3 | 4-6-8 |
| | | | 65 | 0.48 | 24 | 2886 | | 3041 | | 3141 | | 3196 | | | 5-7-10 |
| | | | 80 | 0.72 | 27 | 3301 | | 3511 | | 3647 | | 3722 | | | 6-8-11 |
| | M23 | 8 | 80 | 0.22 | 22 | 2507 | | 2617 | | 2689 | | 2728 | | 1.9 | 5-7-10 |
| | | | 110 | 0.42 | 26 | 3093 | | 3273 | | 3390 | | 3454 | | | 7-9-13 |
| | | | 140 | 0.67 | 30 | 3584 | | 3839 | | 4003 | | 4094 | | | 8-10-14 |
| | M31 | 10 | 140 | 0.22 | 25 | 2533 | | 2637 | | 2705 | | 2743 | | 1.3 | 7-9-13 |
| | | | 195 | 0.42 | 29 | 3174 | | 3349 | | 3463 | | 3525 | | | 8-10-15 |
| | | | 250 | 0.69 | 34 | 3710 | | 3962 | | 4125 | | 4214 | | | 10-12-17 |
| 10 | M13 | 5 | 35 | 0.22 | 21 | 2815 | 1.70 | 2941 | 3.80 | 3022 | 6.70 | 3067 | 10.50 | 3.4 | 4-5-9 |
| | | | 50 | 0.45 | 25 | 3603 | | 3821 | | 3960 | | 4037 | | | 4-6-10 |
| | | | 60 | 0.64 | 27 | 4045 | | 4329 | | 4512 | | 4612 | | | 5-7-11 |
| | M17 | 6 | 60 | 0.27 | 22 | 3804 | | 4052 | | 4211 | | 4298 | | 2.3 | 4-6-9 |
| | | | 80 | 0.49 | 26 | 4528 | | 4899 | | 5137 | | 5270 | | | 5-8-11 |
| | | | 95 | 0.69 | 28 | 4986 | | 5452 | | 5751 | | 5919 | | | 6-9-12 |
| | M23 | 8 | 95 | 0.22 | 25 | 3970 | | 4243 | | 4418 | | 4514 | | 1.9 | 5-8-11 |
| | | | 135 | 0.44 | 29 | 4880 | | 5322 | | 5605 | | 5764 | | | 7-9-12 |
| | | | 170 | 0.69 | 32 | 5500 | | 6091 | | 6473 | | 6687 | | | 8-10-15 |
| | M31 | 10 | 170 | 0.23 | 28 | 3784 | | 4029 | | 4186 | | 4272 | | 1.3 | 7-9-13 |
| | | | 230 | 0.41 | 32 | 4544 | | 4919 | | 5159 | | 5292 | | | 8-11-16 |
| | | | 290 | 0.66 | 40 | 5162 | | 5670 | | 5997 | | 6180 | | | 11-13-18 |

Note: Reference page U29 for operational conditions used for performance notes

## CBE2-12 / 4-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Sensible Heating (Btu/h) | | | | | | | | Induction ratio | Throw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 5 | 15 | 0.24 | 15 | 1500 | 0.10 | 1599 | 0.20 | 1620 | 0.50 | 1639 | 1.00 | 3.4 | 2-3-5 |
| | | | 20 | 0.42 | 18 | 1844 | | 1997 | | 2037 | | 2068 | | | 2-3-5 |
| | | | 25 | 0.65 | 21 | 2158 | | 2367 | | 2427 | | 2471 | | | 3-4-6 |
| | M17 | 5 | 25 | 0.27 | 15 | 2018 | | 2197 | | 2246 | | 2283 | | 2.3 | 3-3-6 |
| | | | 35 | 0.53 | 20 | 2517 | | 2804 | | 2893 | | 2955 | | | 3-4-7 |
| | | | 40 | 0.70 | 21 | 2727 | | 3069 | | 3180 | | 3256 | | | 4-6-8 |
| | M23 | 5 | 40 | 0.21 | 16 | 2178 | | 2372 | | 2426 | | 2467 | | 1.9 | 4-5-7 |
| | | | 60 | 0.47 | 22 | 2840 | | 3178 | | 3288 | | 3363 | | | 5-7-9 |
| | | | 75 | 0.73 | 25 | 3259 | | 3706 | | 3860 | | 3966 | | | 6-7-10 |
| | M31 | 6 | 75 | 0.24 | 20 | 2695 | | 2919 | | 2982 | | 3028 | | 1.3 | 5-6-8 |
| | | | 100 | 0.42 | 23 | 3285 | | 3621 | | 3724 | | 3796 | | | 6-8-11 |
| | | | 130 | 0.71 | 28 | 3902 | | 4372 | | 4529 | | 4637 | | | 7-8-11 |
| 6 | M13 | 5 | 20 | 0.19 | 16 | 2041 | 0.10 | 2192 | 0.30 | 2226 | 0.80 | 2255 | 1.40 | 3.4 | 2-3-5 |
| | | | 30 | 0.42 | 21 | 2666 | | 2950 | | 3030 | | 3089 | | | 3-5-8 |
| | | | 40 | 0.75 | 25 | 3232 | | 3652 | | 3784 | | 3874 | | | 4-5-7 |
| | M17 | 5 | 40 | 0.31 | 19 | 3037 | | 3401 | | 3508 | | 3585 | | 2.3 | 3-5-8 |
| | | | 50 | 0.49 | 22 | 3477 | | 3966 | | 4127 | | 4235 | | | 4-6-9 |
| | | | 60 | 0.71 | 25 | 3878 | | 4494 | | 4707 | | 4849 | | | 5-7-10 |
| | M23 | 6 | 60 | 0.21 | 20 | 3150 | | 3509 | | 3615 | | 3690 | | 1.9 | 4-6-10 |
| | | | 85 | 0.42 | 24 | 3924 | | 4491 | | 4684 | | 4811 | | | 6-8-11 |
| | | | 110 | 0.70 | 27 | 4557 | | 5335 | | 5617 | | 5806 | | | 7-10-12 |
| | M31 | 8 | 110 | 0.22 | 22 | 3835 | | 4239 | | 4356 | | 4441 | | 1.3 | 6-8-12 |
| | | | 150 | 0.42 | 26 | 4709 | | 5317 | | 5519 | | 5654 | | | 7-10-13 |
| | | | 190 | 0.67 | 29 | 5460 | | 6276 | | 6566 | | 6759 | | | 9-11-14 |
| 8 | M13 | 5 | 30 | 0.24 | 19 | 3093 | 0.10 | 3407 | 0.50 | 3494 | 1.00 | 3557 | 1.80 | 3.4 | 3-4-8 |
| | | | 40 | 0.43 | 23 | 3709 | | 4190 | | 4341 | | 4441 | | | 3-5-9 |
| | | | 50 | 0.67 | 26 | 4308 | | 4957 | | 5171 | | 5310 | | | 4-6-9 |
| | M17 | 6 | 50 | 0.28 | 21 | 4062 | | 4632 | | 4816 | | 4936 | | 2.3 | 4-6-8 |
| | | | 65 | 0.48 | 24 | 4752 | | 5556 | | 5834 | | 6016 | | | 5-7-10 |
| | | | 80 | 0.72 | 27 | 5348 | | 6385 | | 6764 | | 7009 | | | 6-8-11 |
| | M23 | 8 | 80 | 0.22 | 22 | 4348 | | 4954 | | 5152 | | 5281 | | 1.9 | 5-7-10 |
| | | | 110 | 0.42 | 26 | 5257 | | 6172 | | 6497 | | 6709 | | | 7-9-13 |
| | | | 140 | 0.67 | 30 | 6005 | | 7220 | | 7681 | | 7976 | | | 8-10-14 |
| | M31 | 10 | 140 | 0.22 | 25 | 4741 | | 5326 | | 5513 | | 5636 | | 1.3 | 7-9-13 |
| | | | 195 | 0.42 | 29 | 5877 | | 6780 | | 7095 | | 7300 | | | 8-10-15 |
| | | | 250 | 0.69 | 34 | 6829 | | 8045 | | 8499 | | 8792 | | | 10-12-17 |
| 10 | M13 | 5 | 35 | 0.22 | 21 | 4572 | 0.10 | 5265 | 0.60 | 5491 | 1.30 | 5638 | 2.30 | 3.4 | 4-5-9 |
| | | | 50 | 0.45 | 25 | 5662 | | 6766 | | 7159 | | 7411 | | | 4-6-10 |
| | | | 60 | 0.64 | 27 | 6239 | | 7618 | | 8130 | | 8459 | | | 5-7-11 |
| | M17 | 6 | 60 | 0.27 | 22 | 5954 | | 7183 | | 7630 | | 7917 | | 2.3 | 4-6-9 |
| | | | 80 | 0.49 | 26 | 6883 | | 8596 | | 9266 | | 9695 | | | 5-8-11 |
| | | | 95 | 0.69 | 28 | 7448 | | 9503 | | 10344 | | 10884 | | | 6-9-12 |
| | M23 | 8 | 95 | 0.22 | 25 | 6340 | | 7672 | | 8164 | | 8479 | | 1.9 | 5-8-11 |
| | | | 135 | 0.44 | 29 | 7559 | | 9530 | | 10326 | | 10837 | | | 7-9-12 |
| | | | 170 | 0.69 | 32 | 8361 | | 10837 | | 11903 | | 12591 | | | 8-10-15 |
| | M31 | 10 | 170 | 0.23 | 28 | 6527 | | 7743 | | 8185 | | 8468 | | 1.3 | 7-9-13 |
| | | | 230 | 0.41 | 32 | 7715 | | 9439 | | 10114 | | 10547 | | | 8-11-16 |
| | | | 290 | 0.66 | 40 | 8683 | | 10879 | | 11795 | | 12384 | | | 11-13-18 |

Note: Reference page U29 for operational conditions used for performance notes

## CBE2-12 / 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 | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 5 | 15 | 0.24 | 15 | 884 | 1.00 | 896 | 2.20 | 907 | 3.80 | 913 | 6.00 | 3.4 | 2-3-5 |
| | | | 20 | 0.42 | 18 | 1100 | | 1123 | | 1141 | | 1151 | | | 2-3-5 |
| | | | 25 | 0.65 | 21 | 1300 | | 1335 | | 1360 | | 1375 | | | 3-4-6 |
| | M17 | 5 | 25 | 0.27 | 15 | 1200 | | 1229 | | 1251 | | 1263 | | 2.3 | 3-3-6 |
| | | | 35 | 0.53 | 20 | 1522 | | 1574 | | 1610 | | 1631 | | | 3-4-7 |
| | | | 40 | 0.70 | 21 | 1661 | | 1726 | | 1770 | | 1795 | | | 4-6-8 |
| | M23 | 5 | 40 | 0.21 | 16 | 1255 | | 1287 | | 1310 | | 1323 | | 1.9 | 4-5-7 |
| | | | 60 | 0.47 | 22 | 1662 | | 1725 | | 1769 | | 1793 | | | 5-7-9 |
| | | | 75 | 0.73 | 25 | 1922 | | 2011 | | 2073 | | 2106 | | | 6-7-10 |
| | M31 | 6 | 75 | 0.24 | 20 | 1463 | | 1500 | | 1527 | | 1542 | | 1.3 | 5-6-8 |
| | | | 100 | 0.42 | 23 | 1793 | | 1853 | | 1895 | | 1919 | | | 6-8-11 |
| | | | 130 | 0.71 | 28 | 2135 | | 2227 | | 2290 | | 2324 | | | 7-8-11 |
| 6 | M13 | 5 | 20 | 0.19 | 16 | 1213 | 1.40 | 1233 | 3.10 | 1250 | 5.50 | 1258 | 8.70 | 3.4 | 2-3-5 |
| | | | 30 | 0.42 | 21 | 1623 | | 1670 | | 1704 | | 1723 | | | 3-5-8 |
| | | | 40 | 0.75 | 25 | 2001 | | 2077 | | 2130 | | 2159 | | | 4-5-7 |
| | M17 | 5 | 40 | 0.31 | 19 | 1854 | | 1917 | | 1961 | | 1986 | | 2.3 | 3-5-8 |
| | | | 50 | 0.49 | 22 | 2152 | | 2245 | | 2308 | | 2343 | | | 4-6-9 |
| | | | 60 | 0.71 | 25 | 2427 | | 2562 | | 2635 | | 2680 | | | 5-7-10 |
| | M23 | 6 | 60 | 0.21 | 20 | 1854 | | 1916 | | 1960 | | 1984 | | 1.9 | 4-6-10 |
| | | | 85 | 0.42 | 24 | 2347 | | 2459 | | 2534 | | 2575 | | | 6-8-11 |
| | | | 110 | 0.70 | 27 | 2760 | | 2924 | | 3034 | | 3093 | | | 7-10-12 |
| | M31 | 8 | 110 | 0.22 | 22 | 2121 | | 2190 | | 2239 | | 2266 | | 1.3 | 6-8-12 |
| | | | 150 | 0.42 | 26 | 2623 | | 2740 | | 2819 | | 2863 | | | 7-10-13 |
| | | | 190 | 0.67 | 29 | 3055 | | 3223 | | 3336 | | 3397 | | | 9-11-14 |
| 8 | M13 | 5 | 30 | 0.24 | 19 | 1889 | 1.80 | 1940 | 4.10 | 1977 | 7.30 | 1996 | 2.70 | 3.4 | 3-4-8 |
| | | | 40 | 0.43 | 23 | 2314 | | 2402 | | 2460 | | 2492 | | | 3-5-9 |
| | | | 50 | 0.67 | 26 | 2729 | | 2854 | | 2935 | | 2979 | | | 4-6-9 |
| | M17 | 6 | 50 | 0.28 | 21 | 2540 | | 2647 | | 2717 | | 2756 | | 2.3 | 4-6-8 |
| | | | 65 | 0.48 | 24 | 3030 | | 3193 | | 3298 | | 3356 | | | 5-7-10 |
| | | | 80 | 0.72 | 27 | 3466 | | 3687 | | 3829 | | 3907 | | | 6-8-11 |
| | M23 | 8 | 80 | 0.22 | 22 | 2633 | | 2748 | | 2823 | | 2864 | | 1.9 | 5-7-10 |
| | | | 110 | 0.42 | 26 | 3247 | | 3436 | | 3559 | | 3626 | | | 7-9-13 |
| | | | 140 | 0.67 | 30 | 3762 | | 4031 | | 4203 | | 4298 | | | 8-10-14 |
| | M31 | 10 | 140 | 0.22 | 25 | 2659 | | 2769 | | 2840 | | 2880 | | 1.3 | 7-9-13 |
| | | | 195 | 0.42 | 29 | 3332 | | 3516 | | 3635 | | 3700 | | | 8-10-15 |
| | | | 250 | 0.69 | 34 | 3896 | | 4160 | | 4330 | | 4424 | | | 10-12-17 |
| 10 | M13 | 5 | 35 | 0.22 | 21 | 2956 | 2.20 | 3088 | 5.00 | 3173 | 8.90 | 3220 | 3.70 | 3.4 | 4-5-9 |
| | | | 50 | 0.45 | 25 | 3782 | | 4012 | | 4158 | | 4238 | | | 4-6-10 |
| | | | 60 | 0.64 | 27 | 4247 | | 4545 | | 4737 | | 4842 | | | 5-7-11 |
| | M17 | 6 | 60 | 0.27 | 22 | 3994 | | 4254 | | 4421 | | 4513 | | 2.3 | 4-6-9 |
| | | | 80 | 0.49 | 26 | 4754 | | 5143 | | 5394 | | 5533 | | | 5-8-11 |
| | | | 95 | 0.69 | 28 | 5234 | | 5724 | | 6038 | | 6215 | | | 6-9-12 |
| | M23 | 8 | 95 | 0.22 | 25 | 4168 | | 4454 | | 4638 | | 4739 | | 1.9 | 5-8-11 |
| | | | 135 | 0.44 | 29 | 5124 | | 5587 | | 5885 | | 6051 | | | 7-9-12 |
| | | | 170 | 0.69 | 32 | 5774 | | 6395 | | 6796 | | 7021 | | | 8-10-15 |
| | M31 | 10 | 170 | 0.23 | 28 | 3973 | | 4230 | | 4395 | | 4485 | | 1.3 | 7-9-13 |
| | | | 230 | 0.41 | 32 | 4771 | | 5164 | | 5416 | | 5556 | | | 8-11-16 |
| | | | 290 | 0.66 | 40 | 5420 | | 5953 | | 6296 | | 6488 | | | 11-13-18 |

Note: Reference page U29 for operational conditions used for performance notes

## CBE2-12 / 2-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Sensible Heating (Btu/h) | | | | | | | | Induction ratio | Throw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 5 | 15 | 0.24 | 15 | 2417 | 0.20 | 2580 | 1.00 | 2613 | 2.20 | 2646 | 3.80 | 3.4 | 2-3-5 |
| | | | 20 | 0.42 | 18 | 2966 | | 3218 | | 3282 | | 3334 | | | 2-3-5 |
| | | | 25 | 0.65 | 21 | 3465 | | 3810 | | 3908 | | 3981 | | | 3-4-6 |
| | M17 | 5 | 25 | 0.27 | 15 | 3234 | | 3629 | | 3609 | | 3670 | | 2.3 | 3-3-6 |
| | | | 35 | 0.53 | 20 | 4020 | | 4493 | | 4639 | | 4741 | | | 3-4-7 |
| | | | 40 | 0.70 | 21 | 4349 | | 4912 | | 5096 | | 5220 | | | 4-6-8 |
| | M23 | 5 | 40 | 0.21 | 16 | 3445 | | 3764 | | 3854 | | 3921 | | 1.9 | 4-5-7 |
| | | | 60 | 0.47 | 22 | 4466 | | 5022 | | 5202 | | 5325 | | | 5-7-9 |
| | | | 75 | 0.73 | 25 | 5101 | | 5839 | | 6092 | | 6266 | | | 6-7-10 |
| | M31 | 6 | 75 | 0.24 | 20 | 4174 | | 4543 | | 4646 | | 4722 | | 1.3 | 5-6-8 |
| | | | 100 | 0.42 | 23 | 5057 | | 5610 | | 5780 | | 5898 | | | 6-8-11 |
| | | | 130 | 0.71 | 28 | 5968 | | 6741 | | 7001 | | 7177 | | | 7-8-11 |
| 6 | M13 | 5 | 20 | 0.19 | 16 | 3290 | 0.30 | 3638 | 1.40 | 3594 | 3.10 | 3642 | 5.50 | 3.4 | 2-3-5 |
| | | | 30 | 0.42 | 21 | 4284 | | 4751 | | 4883 | | 4980 | | | 3-5-8 |
| | | | 40 | 0.75 | 25 | 5180 | | 5872 | | 6088 | | 6238 | | | 4-5-7 |
| | M17 | 5 | 40 | 0.31 | 19 | 4859 | | 5458 | | 5635 | | 5761 | | 2.3 | 3-5-8 |
| | | | 50 | 0.49 | 22 | 5549 | | 6353 | | 6618 | | 6796 | | | 4-6-9 |
| | | | 60 | 0.71 | 25 | 6174 | | 7187 | | 7539 | | 7773 | | | 5-7-10 |
| | M23 | 6 | 60 | 0.21 | 20 | 4975 | | 5567 | | 5740 | | 5864 | | 1.9 | 4-6-10 |
| | | | 85 | 0.42 | 24 | 6161 | | 7095 | | 7412 | | 7623 | | | 6-8-11 |
| | | | 110 | 0.70 | 27 | 7116 | | 8397 | | 8861 | | 9172 | | | 7-10-12 |
| | M31 | 8 | 110 | 0.22 | 22 | 5928 | | 6592 | | 6786 | | 6924 | | 1.3 | 6-8-12 |
| | | | 150 | 0.42 | 26 | 7227 | | 8227 | | 8560 | | 8782 | | | 7-10-13 |
| | | | 190 | 0.57 | 29 | 8321 | | 9665 | | 10142 | | 10461 | | | 9-11-14 |
| 8 | M13 | 5 | 30 | 0.24 | 19 | 4986 | 0.50 | 5503 | 1.80 | 5647 | 4.10 | 5749 | 7.30 | 3.4 | 3-4-8 |
| | | | 40 | 0.43 | 23 | 5966 | | 6758 | | 7005 | | 7171 | | | 3-5-9 |
| | | | 50 | 0.67 | 26 | 6916 | | 7984 | | 8337 | | 8567 | | | 4-6-9 |
| | M17 | 6 | 50 | 0.28 | 21 | 6512 | | 7450 | | 7753 | | 7951 | | 2.3 | 4-6-8 |
| | | | 65 | 0.48 | 24 | 7595 | | 8918 | | 9377 | | 9675 | | | 5-7-10 |
| | | | 80 | 0.72 | 27 | 8523 | | 10231 | | 10854 | | 11258 | | | 6-8-11 |
| | M23 | 8 | 80 | 0.22 | 22 | 6877 | | 7875 | | 8201 | | 8413 | | 1.9 | 5-7-10 |
| | | | 110 | 0.42 | 26 | 8269 | | 9775 | | 10310 | | 10658 | | | 7-9-13 |
| | | | 140 | 0.67 | 30 | 9395 | | 11394 | | 12153 | | 12640 | | | 8-10-14 |
| | M31 | 10 | 140 | 0.22 | 25 | 7315 | | 8277 | | 8585 | | 8788 | | 1.3 | 7-9-13 |
| | | | 196 | 0.42 | 29 | 8992 | | 10477 | | 10996 | | 11334 | | | 8-10-15 |
| | | | 250 | 0.69 | 34 | 10365 | | 12367 | | 13115 | | 13596 | | | 10-12-17 |
| 10 | M13 | 5 | 35 | 0.22 | 21 | 7403 | 0.60 | 8545 | 2.20 | 8917 | 5.00 | 9159 | 8.90 | 3.4 | 4-5-9 |
| | | | 50 | 0.45 | 25 | 9146 | | 10963 | | 11610 | | 12024 | | | 4-6-10 |
| | | | 60 | 0.64 | 27 | 10061 | | 12331 | | 13173 | | 13714 | | | 5-7-11 |
| | M17 | 6 | 60 | 0.27 | 22 | 9591 | | 11614 | | 12350 | | 12822 | | 2.3 | 4-6-9 |
| | | | 80 | 0.49 | 26 | 11051 | | 13871 | | 14972 | | 15679 | | | 5-8-11 |
| | | | 95 | 0.69 | 28 | 11927 | | 15310 | | 16695 | | 17583 | | | 6-9-12 |
| | M23 | 8 | 95 | 0.22 | 25 | 10104 | | 12297 | | 13106 | | 13625 | | 1.9 | 5-8-11 |
| | | | 135 | 0.44 | 29 | 11970 | | 15215 | | 16526 | | 17366 | | | 7-9-12 |
| | | | 170 | 0.69 | 32 | 13168 | | 17243 | | 18998 | | 20130 | | | 8-10-15 |
| | M31 | 10 | 170 | 0.23 | 28 | 10149 | | 12151 | | 12878 | | 13344 | | 1.3 | 7-9-13 |
| | | | 230 | 0.41 | 32 | 11894 | | 14733 | | 15844 | | 16557 | | | 8-11-16 |
| | | | 290 | 0.66 | 40 | 13277 | | 16893 | | 18401 | | 19369 | | | 11-13-18 |

Note: Reference page U29 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2018.
2. $\Delta P_s$ 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. $\Delta P_{Coil}$ values are measured in feet of water. $\Delta P_{Coil}$ 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
7. * denotes oval inlet air connection.

## 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:

$\Delta P_S$ = 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–12

- 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 ceiling systems
- Vertical Coil configuration
- Optimized diffuser geometry maximizes occupant comfort

CBLV-12


See website for Specifications

## MODEL:

CBLV-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 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-12s 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.

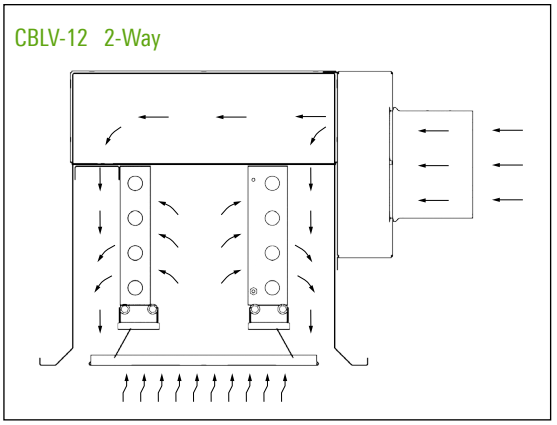
## ADVANTAGES

- 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-12 STANDARD FEATURES

- 1-way or 2-way air distribution patterns
- 2 foot to 10 foot lengths, 1 foot increments
- Perforated 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
- Coil drain valve
- Condensate tray with drain connection for field plumbing

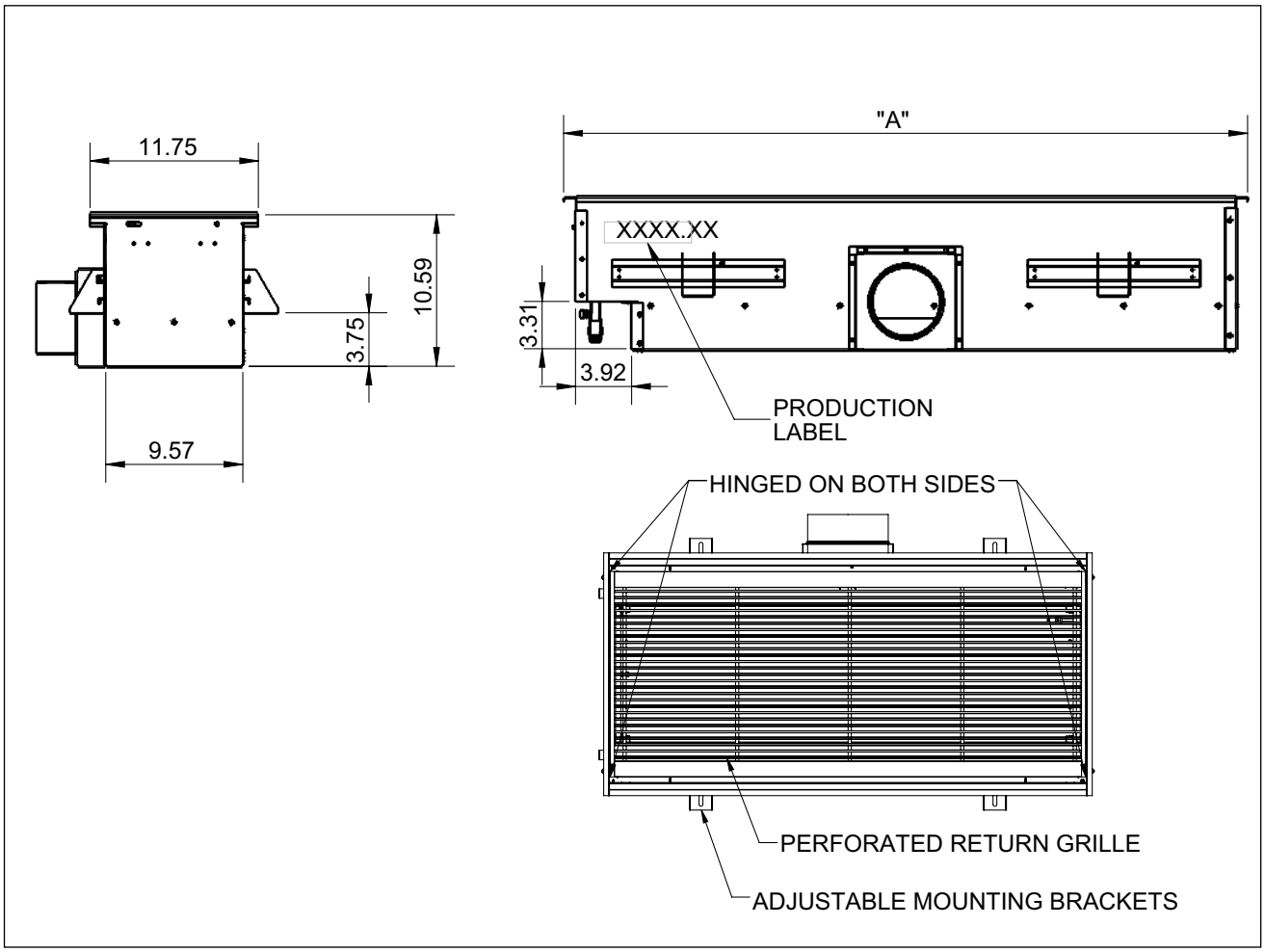
CBLV-12 2-Way



## OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- 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-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 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

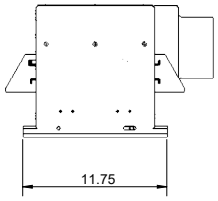
Integrated ¼" pressure port for balancing/commissioning accessable from roomside opposite coil connection



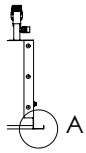


All dimensions are in inches

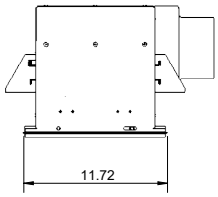
## CBLV-12 UNIT OPTION DETAILS



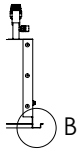

LAY-IN BORDER TYPE



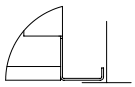

LAY-IN CROPPED SIDE VIEW



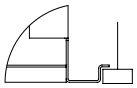

NT BORDER TYPE




NT CROPPED SIDE VIEW

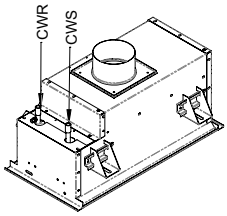


DETAIL A
SCALE 4 : 6

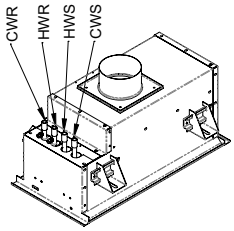


DETAIL B
SCALE 4 : 6

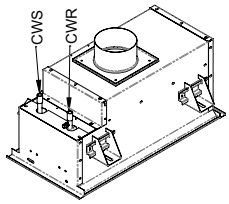
## CBLV-12 INLET, DISCHARGE AND PIPING CONFIGURATION



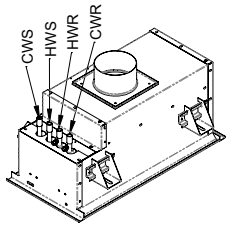

TOP INLET
1-WAY FRONT THROW
2-PIPE LEFT HAND COIL
OR
1-WAY BACK THROW
2-PIPE RIGHT HAND COIL



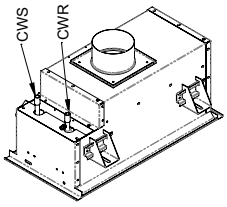

TOP INLET
1-WAY FRONT THROW
4-PIPE LEFT HAND COIL
OR
1-WAY BACK THROW
4-PIPE RIGHT HAND COIL



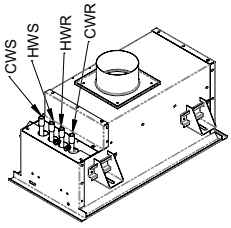

TOP INLET
1-WAY BACK THROW
2-PIPE LEFT HAND COIL
OR
1-WAY FRONT THROW
2-PIPE RIGHT HAND COIL




TOP INLET
1-WAY BACK THROW
4-PIPE LEFT HAND COIL
OR
1-WAY FRONT THROW
4-PIPE RIGHT HAND COIL




TOP INLET
2-WAY THROW
2-PIPE LEFT HAND COIL
OR
2-WAY THROW
2-PIPE RIGHT HAND COIL




TOP INLET
2-WAY THROW
4-PIPE LEFT HAND COIL
OR
2-WAY THROW
4-PIPE RIGHT HAND COIL

## CBLV-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 | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 5 | 15 | 0.24 | 15 | 842 | 0.70 | 853 | 1.60 | 864 | 2.90 | 870 | 4.50 | 3.4 | 2-3-5 |
| | | | 20 | 0.42 | 18 | 1048 | | 1070 | | 1087 | | 1096 | | | 2-3-5 |
| | | | 25 | 0.65 | 21 | 1238 | | 1271 | | 1296 | | 1309 | | | 3-4-6 |
| | M17 | 5 | 25 | 0.27 | 15 | 1143 | | 1171 | | 1191 | | 1203 | | 2.3 | 3-3-6 |
| | | | 35 | 0.53 | 20 | 1450 | | 1499 | | 1534 | | 1553 | | | 3-4-7 |
| | | | 40 | 0.7 | 21 | 1582 | | 1644 | | 1686 | | 1709 | | | 4-6-8 |
| | M23 | 5 | 40 | 0.21 | 16 | 1195 | | 1226 | | 1248 | | 1260 | | 1.9 | 4-5-7 |
| | | | 60 | 0.47 | 22 | 1583 | | 1643 | | 1685 | | 1708 | | | 5-7-9 |
| | | | 75 | 0.73 | 25 | 1830 | | 1916 | | 1974 | | 2006 | | | 6-7-10 |
| | M31 | 6 | 75 | 0.24 | 20 | 1394 | | 1428 | | 1454 | | 1469 | | 1.3 | 5-6-8 |
| | | | 100 | 0.42 | 23 | 1708 | | 1765 | | 1805 | | 1827 | | | 6-8-11 |
| | | | 130 | 0.71 | 28 | 2034 | | 2121 | | 2181 | | 2213 | | | 7-8-11 |
| 6 | M13 | 5 | 20 | 0.19 | 16 | 1156 | 1.00 | 1174 | 2.30 | 1191 | 4.20 | 1199 | 6.50 | 3.4 | 2-3-5 |
| | | | 30 | 0.42 | 21 | 1546 | | 1591 | | 1623 | | 1641 | | | 3-5-8 |
| | | | 40 | 0.75 | 25 | 1906 | | 1979 | | 2029 | | 2057 | | | 4-5-7 |
| | M17 | 5 | 40 | 0.31 | 19 | 1766 | | 1826 | | 1868 | | 1892 | | 2.3 | 3-5-8 |
| | | | 50 | 0.49 | 22 | 2050 | | 2139 | | 2199 | | 2232 | | | 4-6-9 |
| | | | 60 | 0.71 | 25 | 2312 | | 2431 | | 2510 | | 2552 | | | 5-7-10 |
| | M23 | 6 | 60 | 0.21 | 20 | 1766 | | 1825 | | 1866 | | 1890 | | 1.9 | 4-6-10 |
| | | | 85 | 0.42 | 24 | 2235 | | 2342 | | 2413 | | 2452 | | | 6-8-11 |
| | | | 110 | 0.7 | 27 | 2628 | | 2785 | | 2890 | | 2946 | | | 7-10-12 |
| | M31 | 8 | 110 | 0.22 | 22 | 2020 | | 2085 | | 2132 | | 2158 | | 1.3 | 6-8-12 |
| | | | 150 | 0.42 | 26 | 2498 | | 2610 | | 2685 | | 2726 | | | 7-10-13 |
| | | | 190 | 0.67 | 29 | 2910 | | 3070 | | 3178 | | 3235 | | | 9-11-14 |
| 8 | M13 | 5 | 30 | 0.24 | 19 | 1800 | 1.40 | 1848 | 3.00 | 1883 | 5.40 | 1901 | 8.50 | 3.4 | 3-4-8 |
| | | | 40 | 0.43 | 23 | 2204 | | 2288 | | 2343 | | 2374 | | | 3-5-9 |
| | | | 50 | 0.67 | 26 | 2599 | | 2718 | | 2795 | | 2838 | | | 4-6-9 |
| | M17 | 6 | 50 | 0.28 | 21 | 2419 | | 2521 | | 2588 | | 2625 | | 2.3 | 4-6-8 |
| | | | 65 | 0.48 | 24 | 2886 | | 3041 | | 3141 | | 3196 | | | 5-7-10 |
| | | | 80 | 0.72 | 27 | 3301 | | 3511 | | 3647 | | 3722 | | | 6-8-11 |
| | M23 | 8 | 80 | 0.22 | 22 | 2507 | | 2617 | | 2689 | | 2728 | | 1.9 | 5-7-10 |
| | | | 110 | 0.42 | 26 | 3093 | | 3273 | | 3390 | | 3454 | | | 7-9-13 |
| | | | 140 | 0.67 | 30 | 3584 | | 3839 | | 4003 | | 4094 | | | 8-10-14 |
| | M31 | 10 | 140 | 0.22 | 25 | 2533 | | 2637 | | 2705 | | 2743 | | 1.3 | 7-9-13 |
| | | | 195 | 0.42 | 29 | 3174 | | 3349 | | 3463 | | 3525 | | | 8-10-15 |
| | | | 250 | 0.69 | 34 | 3710 | | 3962 | | 4125 | | 4214 | | | 10-12-17 |
| 10 | M13 | 5 | 35 | 0.22 | 21 | 2815 | 1.70 | 2941 | 3.80 | 3022 | 6.70 | 3067 | 10.50 | 3.4 | 4-5-9 |
| | | | 50 | 0.45 | 25 | 3603 | | 3821 | | 3960 | | 4037 | | | 4-6-10 |
| | | | 60 | 0.64 | 27 | 4045 | | 4329 | | 4512 | | 4612 | | | 5-7-11 |
| | M17 | 6 | 60 | 0.27 | 22 | 3804 | | 4052 | | 4211 | | 4298 | | 2.3 | 4-6-9 |
| | | | 80 | 0.49 | 26 | 4528 | | 4899 | | 5137 | | 5270 | | | 5-8-11 |
| | | | 95 | 0.69 | 28 | 4986 | | 5452 | | 5751 | | 5919 | | | 6-9-12 |
| | M23 | 8 | 95 | 0.22 | 25 | 3970 | | 4243 | | 4418 | | 4514 | | 1.9 | 5-8-11 |
| | | | 135 | 0.44 | 29 | 4880 | | 5322 | | 5605 | | 5764 | | | 7-9-12 |
| | | | 170 | 0.69 | 32 | 5500 | | 6091 | | 6473 | | 6687 | | | 8-10-15 |
| | M31 | 10 | 170 | 0.23 | 28 | 3784 | | 4029 | | 4186 | | 4272 | | 1.3 | 7-9-13 |
| | | | 230 | 0.41 | 32 | 4544 | | 4919 | | 5159 | | 5292 | | | 8-11-16 |
| | | | 290 | 0.66 | 40 | 5162 | | 5670 | | 5997 | | 6180 | | | 11-13-18 |

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

## CBLV-12 / 4-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Sensible Heating (Btu/h) | | | | | | | | Induction ratio | Throw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 5 | 15 | 0.24 | 15 | 1500 | 0.10 | 1599 | 0.20 | 1620 | 0.50 | 1639 | 1.00 | 3.4 | 2-3-5 |
| | | | 20 | 0.42 | 18 | 1844 | | 1997 | | 2037 | | 2068 | | | 2-3-5 |
| | | | 25 | 0.65 | 21 | 2158 | | 2367 | | 2427 | | 2471 | | | 3-4-6 |
| | M17 | 5 | 25 | 0.27 | 15 | 2018 | | 2197 | | 2246 | | 2283 | | 2.3 | 3-3-6 |
| | | | 35 | 0.53 | 20 | 2517 | | 2804 | | 2893 | | 2955 | | | 3-4-7 |
| | | | 40 | 0.70 | 21 | 2727 | | 3069 | | 3180 | | 3256 | | | 4-6-8 |
| | M23 | 5 | 40 | 0.21 | 16 | 2178 | | 2372 | | 2426 | | 2467 | | 1.9 | 4-5-7 |
| | | | 60 | 0.47 | 22 | 2840 | | 3178 | | 3288 | | 3363 | | | 5-7-9 |
| | | | 75 | 0.73 | 25 | 3259 | | 3706 | | 3860 | | 3966 | | | 6-7-10 |
| | M31 | 6 | 75 | 0.24 | 20 | 2695 | | 2919 | | 2982 | | 3028 | | 1.3 | 5-6-8 |
| | | | 100 | 0.42 | 23 | 3285 | | 3621 | | 3724 | | 3796 | | | 6-8-11 |
| | | | 130 | 0.71 | 28 | 3902 | | 4372 | | 4529 | | 4637 | | | 7-8-11 |
| 6 | M13 | 5 | 20 | 0.19 | 16 | 2041 | 0.10 | 2192 | 0.30 | 2226 | 0.80 | 2255 | 1.40 | 3.4 | 2-3-5 |
| | | | 30 | 0.42 | 21 | 2666 | | 2950 | | 3030 | | 3089 | | | 3-5-8 |
| | | | 40 | 0.75 | 25 | 3232 | | 3652 | | 3784 | | 3874 | | | 4-5-7 |
| | M17 | 5 | 40 | 0.31 | 19 | 3037 | | 3401 | | 3508 | | 3585 | | 2.3 | 3-5-8 |
| | | | 50 | 0.49 | 22 | 3477 | | 3966 | | 4127 | | 4235 | | | 4-6-9 |
| | | | 60 | 0.71 | 25 | 3878 | | 4494 | | 4707 | | 4849 | | | 5-7-10 |
| | M23 | 6 | 60 | 0.21 | 20 | 3150 | | 3509 | | 3615 | | 3690 | | 1.9 | 4-6-10 |
| | | | 85 | 0.42 | 24 | 3924 | | 4491 | | 4684 | | 4811 | | | 6-8-11 |
| | | | 110 | 0.70 | 27 | 4557 | | 5335 | | 5617 | | 5806 | | | 7-10-12 |
| | M31 | 8 | 110 | 0.22 | 22 | 3835 | | 4239 | | 4356 | | 4441 | | 1.3 | 6-8-12 |
| | | | 150 | 0.42 | 26 | 4709 | | 5317 | | 5519 | | 5654 | | | 7-10-13 |
| | | | 190 | 0.67 | 29 | 5460 | | 6276 | | 6566 | | 6759 | | | 9-11-14 |
| 8 | M13 | 5 | 30 | 0.24 | 19 | 3093 | 0.10 | 3407 | 0.50 | 3494 | 1.00 | 3557 | 1.80 | 3.4 | 3-4-8 |
| | | | 40 | 0.43 | 23 | 3709 | | 4190 | | 4341 | | 4441 | | | 3-5-9 |
| | | | 50 | 0.67 | 26 | 4308 | | 4957 | | 5171 | | 5310 | | | 4-6-9 |
| | M17 | 6 | 50 | 0.28 | 21 | 4062 | | 4632 | | 4816 | | 4936 | | 2.3 | 4-6-8 |
| | | | 65 | 0.48 | 24 | 4752 | | 5556 | | 5834 | | 6016 | | | 5-7-10 |
| | | | 80 | 0.72 | 27 | 5348 | | 6385 | | 6764 | | 7009 | | | 6-8-11 |
| | M23 | 8 | 80 | 0.22 | 22 | 4348 | | 4954 | | 5152 | | 5281 | | 1.9 | 5-7-10 |
| | | | 110 | 0.42 | 26 | 5257 | | 6172 | | 6497 | | 6709 | | | 7-9-13 |
| | | | 140 | 0.67 | 30 | 6005 | | 7220 | | 7681 | | 7976 | | | 8-10-14 |
| | M31 | 10 | 140 | 0.22 | 25 | 4741 | | 5326 | | 5513 | | 5636 | | 1.3 | 7-9-13 |
| | | | 195 | 0.42 | 29 | 5877 | | 6780 | | 7095 | | 7300 | | | 8-10-15 |
| | | | 250 | 0.69 | 34 | 6829 | | 8045 | | 8499 | | 8792 | | | 10-12-17 |
| 10 | M13 | 5 | 35 | 0.22 | 21 | 4572 | 0.10 | 5265 | 0.60 | 5491 | 1.30 | 5638 | 2.30 | 3.4 | 4-5-9 |
| | | | 50 | 0.45 | 25 | 5662 | | 6766 | | 7159 | | 7411 | | | 4-6-10 |
| | | | 60 | 0.64 | 27 | 6239 | | 7618 | | 8130 | | 8459 | | | 5-7-11 |
| | M17 | 6 | 60 | 0.27 | 22 | 5954 | | 7183 | | 7630 | | 7917 | | 2.3 | 4-6-9 |
| | | | 80 | 0.49 | 26 | 6883 | | 8596 | | 9266 | | 9695 | | | 5-8-11 |
| | | | 95 | 0.69 | 28 | 7448 | | 9503 | | 10344 | | 10884 | | | 6-9-12 |
| | M23 | 8 | 95 | 0.22 | 25 | 6340 | | 7672 | | 8164 | | 8479 | | 1.9 | 5-8-11 |
| | | | 135 | 0.44 | 29 | 7559 | | 9530 | | 10326 | | 10837 | | | 7-9-12 |
| | | | 170 | 0.69 | 32 | 8361 | | 10837 | | 11903 | | 12591 | | | 8-10-15 |
| | M31 | 10 | 170 | 0.23 | 28 | 6527 | | 7743 | | 8185 | | 8468 | | 1.3 | 7-9-13 |
| | | | 230 | 0.41 | 32 | 7715 | | 9439 | | 10114 | | 10547 | | | 8-11-16 |
| | | | 290 | 0.66 | 40 | 8683 | | 10879 | | 11795 | | 12384 | | | 11-13-18 |

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

## CBLV-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 | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 5 | 15 | 0.24 | 15 | 884 | 1.00 | 896 | 2.20 | 907 | 3.80 | 913 | 6.00 | 3.4 | 2-3-5 |
| | | | 20 | 0.42 | 18 | 1100 | | 1123 | | 1141 | | 1151 | | | 2-3-5 |
| | | | 25 | 0.65 | 21 | 1300 | | 1335 | | 1360 | | 1375 | | | 3-4-6 |
| | M17 | 5 | 25 | 0.27 | 15 | 1200 | | 1229 | | 1251 | | 1263 | | 2.3 | 3-3-6 |
| | | | 35 | 0.53 | 20 | 1522 | | 1574 | | 1610 | | 1631 | | | 3-4-7 |
| | | | 40 | 0.70 | 21 | 1661 | | 1726 | | 1770 | | 1795 | | | 4-6-8 |
| | M23 | 5 | 40 | 0.21 | 16 | 1255 | | 1287 | | 1310 | | 1323 | | 1.9 | 4-5-7 |
| | | | 60 | 0.47 | 22 | 1662 | | 1725 | | 1769 | | 1793 | | | 5-7-9 |
| | | | 75 | 0.73 | 25 | 1922 | | 2011 | | 2073 | | 2106 | | | 6-7-10 |
| | M31 | 6 | 75 | 0.24 | 20 | 1463 | | 1500 | | 1527 | | 1542 | | 1.3 | 5-6-8 |
| | | | 100 | 0.42 | 23 | 1793 | | 1853 | | 1895 | | 1919 | | | 6-8-11 |
| | | | 130 | 0.71 | 28 | 2135 | | 2227 | | 2290 | | 2324 | | | 7-8-11 |
| 6 | M13 | 5 | 20 | 0.19 | 16 | 1213 | 1.40 | 1233 | 3.10 | 1250 | 5.50 | 1258 | 8.70 | 3.4 | 2-3-5 |
| | | | 30 | 0.42 | 21 | 1623 | | 1670 | | 1704 | | 1723 | | | 3-5-8 |
| | | | 40 | 0.75 | 25 | 2001 | | 2077 | | 2130 | | 2159 | | | 4-5-7 |
| | M17 | 5 | 40 | 0.31 | 19 | 1854 | | 1917 | | 1961 | | 1986 | | 2.3 | 3-5-8 |
| | | | 50 | 0.49 | 22 | 2152 | | 2245 | | 2308 | | 2343 | | | 4-6-9 |
| | | | 60 | 0.71 | 25 | 2427 | | 2562 | | 2635 | | 2680 | | | 5-7-10 |
| | M23 | 6 | 60 | 0.21 | 20 | 1854 | | 1916 | | 1960 | | 1984 | | 1.9 | 4-6-10 |
| | | | 85 | 0.42 | 24 | 2347 | | 2459 | | 2534 | | 2575 | | | 6-8-11 |
| | | | 110 | 0.70 | 27 | 2760 | | 2924 | | 3034 | | 3093 | | | 7-10-12 |
| | M31 | 8 | 110 | 0.22 | 22 | 2121 | | 2190 | | 2239 | | 2266 | | 1.3 | 6-8-12 |
| | | | 150 | 0.42 | 26 | 2623 | | 2740 | | 2819 | | 2863 | | | 7-10-13 |
| | | | 190 | 0.67 | 29 | 3055 | | 3223 | | 3336 | | 3397 | | | 9-11-14 |
| 8 | M13 | 5 | 30 | 0.24 | 19 | 1889 | 1.80 | 1940 | 4.10 | 1977 | 7.30 | 1996 | 2.70 | 3.4 | 3-4-8 |
| | | | 40 | 0.43 | 23 | 2314 | | 2402 | | 2460 | | 2492 | | | 3-5-9 |
| | | | 50 | 0.67 | 26 | 2729 | | 2854 | | 2935 | | 2979 | | | 4-6-9 |
| | M17 | 6 | 50 | 0.28 | 21 | 2540 | | 2647 | | 2717 | | 2756 | | 2.3 | 4-6-8 |
| | | | 65 | 0.48 | 24 | 3030 | | 3193 | | 3298 | | 3356 | | | 5-7-10 |
| | | | 80 | 0.72 | 27 | 3466 | | 3687 | | 3829 | | 3907 | | | 6-8-11 |
| | M23 | 8 | 80 | 0.22 | 22 | 2633 | | 2748 | | 2823 | | 2864 | | 1.9 | 5-7-10 |
| | | | 110 | 0.42 | 26 | 3247 | | 3436 | | 3559 | | 3626 | | | 7-9-13 |
| | | | 140 | 0.67 | 30 | 3762 | | 4031 | | 4203 | | 4298 | | | 8-10-14 |
| | M31 | 10 | 140 | 0.22 | 25 | 2659 | | 2769 | | 2840 | | 2880 | | 1.3 | 7-9-13 |
| | | | 195 | 0.42 | 29 | 3332 | | 3516 | | 3635 | | 3700 | | | 8-10-15 |
| | | | 250 | 0.69 | 34 | 3896 | | 4160 | | 4330 | | 4424 | | | 10-12-17 |
| 10 | M13 | 5 | 35 | 0.22 | 21 | 2956 | 2.20 | 3088 | 5.00 | 3173 | 8.90 | 3220 | 3.70 | 3.4 | 4-5-9 |
| | | | 50 | 0.45 | 25 | 3782 | | 4012 | | 4158 | | 4238 | | | 4-6-10 |
| | | | 60 | 0.64 | 27 | 4247 | | 4545 | | 4737 | | 4842 | | | 5-7-11 |
| | M17 | 6 | 60 | 0.27 | 22 | 3994 | | 4254 | | 4421 | | 4513 | | 2.3 | 4-6-9 |
| | | | 80 | 0.49 | 26 | 4754 | | 5143 | | 5394 | | 5533 | | | 5-8-11 |
| | | | 95 | 0.69 | 28 | 5234 | | 5724 | | 6038 | | 6215 | | | 6-9-12 |
| | M23 | 8 | 95 | 0.22 | 25 | 4168 | | 4454 | | 4638 | | 4739 | | 1.9 | 5-8-11 |
| | | | 135 | 0.44 | 29 | 5124 | | 5587 | | 5885 | | 6051 | | | 7-9-12 |
| | | | 170 | 0.69 | 32 | 5774 | | 6395 | | 6796 | | 7021 | | | 8-10-15 |
| | M31 | 10 | 170 | 0.23 | 28 | 3973 | | 4230 | | 4395 | | 4485 | | 1.3 | 7-9-13 |
| | | | 230 | 0.41 | 32 | 4771 | | 5164 | | 5416 | | 5556 | | | 8-11-16 |
| | | | 290 | 0.66 | 40 | 5420 | | 5953 | | 6296 | | 6488 | | | 11-13-18 |

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

## CBLV-12 / 2-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Sensible Heating (Btu/h) | | | | | | | | Induction ratio | Throw |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 4 | M13 | 5 | 15 | 0.24 | 15 | 2417 | 0.20 | 2580 | 1.00 | 2613 | 2.20 | 2646 | 3.80 | 3.4 | 2-3-5 |
| | | | 20 | 0.42 | 18 | 2966 | | 3218 | | 3282 | | 3334 | | | 2-3-5 |
| | | | 25 | 0.65 | 21 | 3465 | | 3810 | | 3908 | | 3981 | | | 3-4-6 |
| | M17 | 5 | 25 | 0.27 | 15 | 3234 | | 3629 | | 3609 | | 3670 | | 2.3 | 3-3-6 |
| | | | 35 | 0.53 | 20 | 4020 | | 4493 | | 4639 | | 4741 | | | 3-4-7 |
| | | | 40 | 0.70 | 21 | 4349 | | 4912 | | 5096 | | 5220 | | | 4-6-8 |
| | M23 | 5 | 40 | 0.21 | 16 | 3445 | | 3764 | | 3854 | | 3921 | | 1.9 | 4-5-7 |
| | | | 60 | 0.47 | 22 | 4466 | | 5022 | | 5202 | | 5325 | | | 5-7-9 |
| | | | 75 | 0.73 | 25 | 5101 | | 5839 | | 6092 | | 6266 | | | 6-7-10 |
| | M31 | 6 | 75 | 0.24 | 20 | 4174 | | 4543 | | 4646 | | 4722 | | 1.3 | 5-6-8 |
| | | | 100 | 0.42 | 23 | 5057 | | 5610 | | 5780 | | 5898 | | | 6-8-11 |
| | | | 130 | 0.71 | 28 | 5968 | | 6741 | | 7001 | | 7177 | | | 7-8-11 |
| 6 | M13 | 5 | 20 | 0.19 | 16 | 3290 | 0.30 | 3638 | 1.40 | 3594 | 3.10 | 3642 | 5.50 | 3.4 | 2-3-5 |
| | | | 30 | 0.42 | 21 | 4284 | | 4751 | | 4883 | | 4980 | | | 3-5-8 |
| | | | 40 | 0.75 | 25 | 5180 | | 5872 | | 6088 | | 6238 | | | 4-5-7 |
| | M17 | 5 | 40 | 0.31 | 19 | 4859 | | 5458 | | 5635 | | 5761 | | 2.3 | 3-5-8 |
| | | | 50 | 0.49 | 22 | 5549 | | 6353 | | 6618 | | 6796 | | | 4-6-9 |
| | | | 60 | 0.71 | 25 | 6174 | | 7187 | | 7539 | | 7773 | | | 5-7-10 |
| | M23 | 6 | 60 | 0.21 | 20 | 4975 | | 5567 | | 5740 | | 5864 | | 1.9 | 4-6-10 |
| | | | 85 | 0.42 | 24 | 6161 | | 7095 | | 7412 | | 7623 | | | 6-8-11 |
| | | | 110 | 0.70 | 27 | 7116 | | 8397 | | 8861 | | 9172 | | | 7-10-12 |
| | M31 | 8 | 110 | 0.22 | 22 | 5928 | | 6592 | | 6786 | | 6924 | | 1.3 | 6-8-12 |
| | | | 150 | 0.42 | 26 | 7227 | | 8227 | | 8560 | | 8782 | | | 7-10-13 |
| | | | 190 | 0.57 | 29 | 8321 | | 9665 | | 10142 | | 10461 | | | 9-11-14 |
| 8 | M13 | 5 | 30 | 0.24 | 19 | 4986 | 0.50 | 5503 | 1.80 | 5647 | 4.10 | 5749 | 7.30 | 3.4 | 3-4-8 |
| | | | 40 | 0.43 | 23 | 5966 | | 6758 | | 7005 | | 7171 | | | 3-5-9 |
| | | | 50 | 0.67 | 26 | 6916 | | 7984 | | 8337 | | 8567 | | | 4-6-9 |
| | M17 | 6 | 50 | 0.28 | 21 | 6512 | | 7450 | | 7753 | | 7951 | | 2.3 | 4-6-8 |
| | | | 65 | 0.48 | 24 | 7595 | | 8918 | | 9377 | | 9675 | | | 5-7-10 |
| | | | 80 | 0.72 | 27 | 8523 | | 10231 | | 10854 | | 11258 | | | 6-8-11 |
| | M23 | 8 | 80 | 0.22 | 22 | 6877 | | 7875 | | 8201 | | 8413 | | 1.9 | 5-7-10 |
| | | | 110 | 0.42 | 26 | 8269 | | 9775 | | 10310 | | 10658 | | | 7-9-13 |
| | | | 140 | 0.67 | 30 | 9395 | | 11394 | | 12153 | | 12640 | | | 8-10-14 |
| | M31 | 10 | 140 | 0.22 | 25 | 7315 | | 8277 | | 8585 | | 8788 | | 1.3 | 7-9-13 |
| | | | 196 | 0.42 | 29 | 8992 | | 10477 | | 10996 | | 11334 | | | 8-10-15 |
| | | | 250 | 0.69 | 34 | 10365 | | 12367 | | 13115 | | 13596 | | | 10-12-17 |
| 10 | M13 | 5 | 35 | 0.22 | 21 | 7403 | 0.60 | 8545 | 2.20 | 8917 | 5.00 | 9159 | 8.90 | 3.4 | 4-5-9 |
| | | | 50 | 0.45 | 25 | 9146 | | 10963 | | 11610 | | 12024 | | | 4-6-10 |
| | | | 60 | 0.64 | 27 | 10061 | | 12331 | | 13173 | | 13714 | | | 5-7-11 |
| | M17 | 6 | 60 | 0.27 | 22 | 9591 | | 11614 | | 12350 | | 12822 | | 2.3 | 4-6-9 |
| | | | 80 | 0.49 | 26 | 11051 | | 13871 | | 14972 | | 15679 | | | 5-8-11 |
| | | | 95 | 0.69 | 28 | 11927 | | 15310 | | 16695 | | 17583 | | | 6-9-12 |
| | M23 | 8 | 95 | 0.22 | 25 | 10104 | | 12297 | | 13106 | | 13625 | | 1.9 | 5-8-11 |
| | | | 135 | 0.44 | 29 | 11970 | | 15215 | | 16526 | | 17366 | | | 7-9-12 |
| | | | 170 | 0.69 | 32 | 13168 | | 17243 | | 18998 | | 20130 | | | 8-10-15 |
| | M31 | 10 | 170 | 0.23 | 28 | 10149 | | 12151 | | 12878 | | 13344 | | 1.3 | 7-9-13 |
| | | | 230 | 0.41 | 32 | 11894 | | 14733 | | 15844 | | 16557 | | | 8-11-16 |
| | | | 290 | 0.66 | 40 | 13277 | | 16893 | | 18401 | | 19369 | | | 11-13-18 |

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 200-2018.
2. $\Delta P_s$ 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. $\Delta P_{Coil}$ values are measured in feet of water. $\Delta P_{Coil}$ 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:

$\Delta P_S$ = 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]

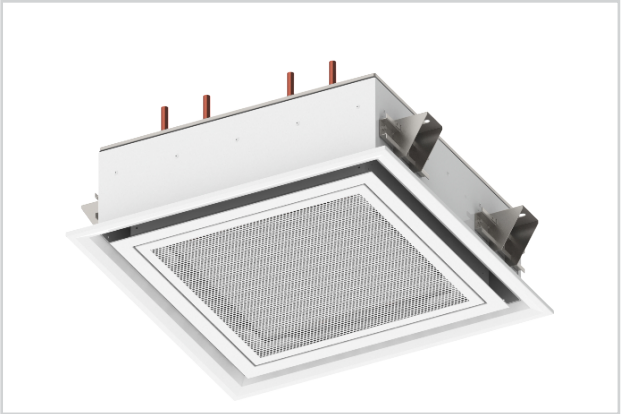
$T_{ROOM}$ = Temperature Room Air [°F]

$q_{SENSPA}$ = 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


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 CBAMs 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

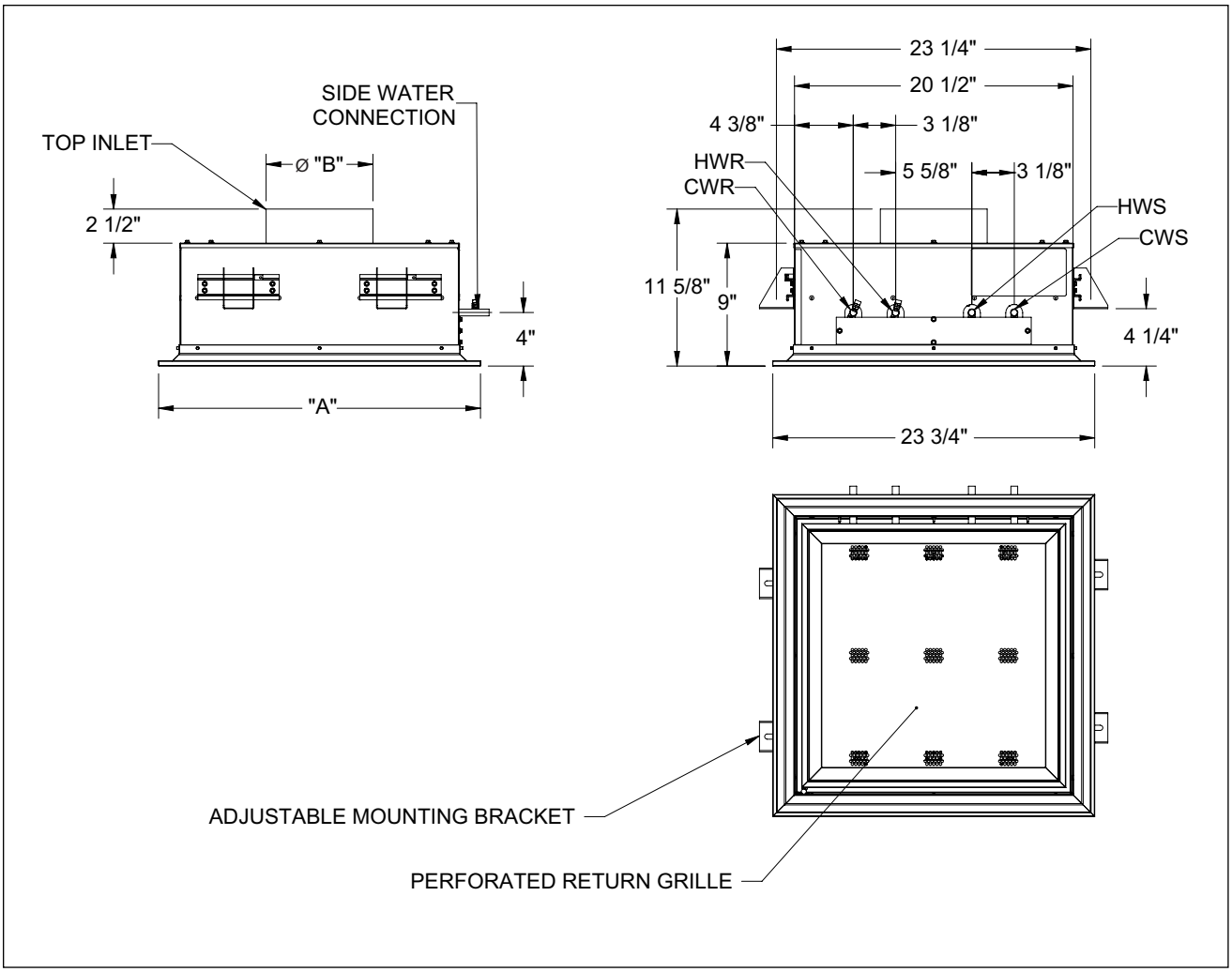
## CBAM STANDARD FEATURES

- 4-way way air distribution pattern
- 24-inch and 48 inch lengths
- 24-inch width
- Perforated 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
- Coil drain valve

## OPTIONS AND ACCESSORIES

- ½" thick foil-faced EcoShield, anti-microbial external insulation
- 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 |
|---|---|
| 4 | Ø 3⅞ |
| 5 | Ø 4⅞ |
| 6 | Ø 5⅞ |
| 8 | Ø 7⅞ |

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 | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 1.7 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 2 x 2 | M13 | 4 | 11 | 0.13 | 15 | 521 | 0.50 | 590 | 2.00 | 606 | 4.40 | -619 | 5.70 | 3.1 | 0 - 0 - 2 |
| | | | 16 | 0.28 | 15 | 686 | | 785 | | 808 | | -815 | | | 0 - 1 - 3 |
| | | | 21 | 0.49 | 15 | 869 | | 1042 | | 1072 | | -1102 | | | 1 - 1 - 6 |
| | M17 | 4 | 18 | 0.18 | 15 | 626 | | 711 | | 731 | | -738 | | 2.5 | 0 - 1 - 3 |
| | | | 24 | 0.33 | 15 | 793 | | 934 | | 962 | | -982 | | | 1 - 1 - 5 |
| | | | 30 | 0.51 | 18 | 936 | | 1096 | | 1138 | | -1160 | | | 1 - 2 - 8 |
| | M23 | 5 | 30 | 0.19 | 19 | 813 | | 940 | | 968 | | -981 | | 1.9 | 1 - 1 - 5 |
| | | | 45 | 0.44 | 24 | 1106 | | 1273 | | 1329 | | -1347 | | | 1 - 3 - 9 |
| | | | 60 | 0.77 | 28 | 1314 | | 1505 | | 1588 | | -1581 | | | 2 - 5 - 12 |
| | M31 | 6 | 55 | 0.17 | 16 | 1046 | | 1239 | | 1281 | | -1311 | | 1.5 | 1 - 3 - 9 |
| | | | 85 | 0.4 | 22 | 1358 | | 1554 | | 1639 | | -1637 | | | 3 - 6 - 13 |
| | | | 115 | 0.73 | 26 | 1511 | | 1689 | | 1787 | | -1791 | | | 5 - 9 - 16 |
| 4 x 2 | M13 | 4 | 18 | 0.15 | 15 | 851 | 1.00 | 923 | 3.90 | 951 | 8.70 | -956 | 11.20 | 3.5 | 0 - 1 - 3 |
| | | | 27 | 0.33 | 15 | 1228 | | 1368 | | 1446 | | -1487 | | | 1 - 2 - 6 |
| | | | 36 | 0.59 | 18 | 1497 | | 1708 | | 1804 | | -1844 | | | 1 - 3 - 11 |
| | M17 | 5 | 25 | 0.14 | 15 | 916 | | 999 | | 1032 | | -1038 | | 3.0 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 18 | 1366 | | 1543 | | 1633 | | -1675 | | | 1 - 2 - 10 |
| | | | 55 | 0.68 | 23 | 1645 | | 1907 | | 2033 | | -2061 | | | 2 - 5 - 14 |
| | M23 | 6 | 50 | 0.22 | 23 | 1439 | | 1609 | | 1705 | | -1756 | | 2.6 | 1 - 2 - 9 |
| | | | 75 | 0.49 | 28 | 1836 | | 2123 | | 2261 | | -2294 | | | 2 - 5 - 15 |
| | | | 95 | 0.79 | 31 | 2158 | | 2625 | | 2814 | | -2896 | | | 4 - 9 - 19 |
| | M31 | 8 | 90 | 0.18 | 20 | 1741 | | 1991 | | 2105 | | -2149 | | 1.8 | 2 - 5 - 14 |
| | | | 135 | 0.41 | 25 | 2247 | | 2749 | | 2949 | | -3040 | | | 5 - 11 - 20 |
| | | | 180 | 0.73 | 29 | 2611 | | 3166 | | 3481 | | -3562 | | | 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 | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 1.7 GPM | | | |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 2 x 2 | M13 | 4 | 11 | 0.13 | 15 | 858 | 0.10 | 971 | 0.30 | 998 | 0.70 | 1019 | 1.00 | 3.1 | 0 - 0 - 2 |
| | | | 16 | 0.28 | 15 | 1130 | | 1293 | | 1331 | | 1343 | | | 0 - 1 - 3 |
| | | | 21 | 0.49 | 15 | 1432 | | 1716 | | 1766 | | 1815 | | | 1 - 1 - 6 |
| | M17 | 4 | 18 | 0.18 | 15 | 1031 | | 1171 | | 1204 | | 1216 | | 2.5 | 0 - 1 - 3 |
| | | | 24 | 0.33 | 15 | 1306 | | 1538 | | 1584 | | 1617 | | | 1 - 1 - 5 |
| | | | 30 | 0.51 | 18 | 1542 | | 1805 | | 1874 | | 1911 | | | 1 - 2 - 8 |
| | M23 | 5 | 30 | 0.19 | 19 | 1339 | | 1548 | | 1594 | | 1615 | | 1.9 | 1 - 1 - 5 |
| | | | 45 | 0.44 | 24 | 1821 | | 2096 | | 2189 | | 2219 | | | 1 - 3 - 9 |
| | | | 60 | 0.77 | 28 | 2164 | | 2478 | | 2615 | | 2604 | | | 2 - 5 - 12 |
| | M31 | 6 | 55 | 0.17 | 16 | 1722 | | 2040 | | 2109 | | 2160 | | 1.5 | 1 - 3 - 9 |
| | | | 85 | 0.4 | 22 | 2237 | | 2560 | | 2700 | | 2697 | | | 3 - 6 - 13 |
| | | | 115 | 0.73 | 26 | 2488 | | 2782 | | 2943 | | 2949 | | | 5 - 9 - 16 |
| 4 x 2 | M13 | 4 | 18 | 0.15 | 15 | 1402 | 0.20 | 1519 | 0.70 | 1566 | 1.50 | 1575 | 2.00 | 3.5 | 0 - 1 - 3 |
| | | | 27 | 0.33 | 15 | 2022 | | 2253 | | 2382 | | 2448 | | | 1 - 2 - 6 |
| | | | 36 | 0.59 | 18 | 2465 | | 2813 | | 2971 | | 3037 | | | 1 - 3 - 11 |
| | M17 | 5 | 25 | 0.14 | 15 | 1509 | | 1645 | | 1699 | | 1710 | | 3.0 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 18 | 2249 | | 2541 | | 2689 | | 2758 | | | 1 - 2 - 10 |
| | | | 55 | 0.68 | 23 | 2710 | | 3141 | | 3349 | | 3394 | | | 2 - 5 - 14 |
| | M23 | 6 | 50 | 0.22 | 23 | 2369 | | 2649 | | 2808 | | 2892 | | 2.6 | 1 - 2 - 9 |
| | | | 75 | 0.49 | 28 | 3023 | | 3497 | | 3724 | | 3778 | | | 2 - 5 - 15 |
| | | | 95 | 0.79 | 31 | 3554 | | 4323 | | 4635 | | 4769 | | | 4 - 9 - 19 |
| | M31 | 8 | 90 | 0.18 | 20 | 2867 | | 3278 | | 3466 | | 3539 | | 1.8 | 2 - 5 - 14 |
| | | | 135 | 0.41 | 25 | 3700 | | 4527 | | 4857 | | 5007 | | | 5 - 11 - 20 |
| | | | 180 | 0.73 | 29 | 4300 | | 5213 | | 5732 | | 5866 | | | 9 - 14 - 23 |

Note: Reference page U44 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 | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 1.7 GPM | | | |
| | | Inches | CFM | (in. H20) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 2 x 2 | M13 | 4 | 11 | 0.13 | 15 | 556 | 0.60 | 629 | 2.40 | 646 | 5.40 | 660 | 6.90 | 3.1 | 0 - 0 -2 |
| | | | 16 | 0.28 | 15 | 732 | | 837 | | 862 | | 870 | | | 0 - 1 -3 |
| | | | 21 | 0.49 | 15 | 927 | | 1111 | | 1144 | | 1176 | | | 1 - 1 -6 |
| | M17 | 4 | 18 | 0.18 | 15 | 668 | | 759 | | 780 | | 788 | | 2.5 | 0 - 1 - 3 |
| | | | 24 | 0.33 | 15 | 846 | | 996 | | 1026 | | 1047 | | | 1 - 1 - 5 |
| | | | 30 | 0.51 | 18 | 999 | | 1169 | | 1214 | | 1238 | | | 1 - 2 - 8 |
| | M23 | 5 | 30 | 0.19 | 19 | 868 | | 1003 | | 1033 | | 1046 | | 1.9 | 1 - 1 - 5 |
| | | | 45 | 0.44 | 24 | 1179 | | 1357 | | 1418 | | 1437 | | | 1 - 3 - 9 |
| | | | 60 | 0.77 | 28 | 1402 | | 1605 | | 1694 | | 1687 | | | 2 - 5 - 12 |
| | M31 | 6 | 55 | 0.17 | 16 | 1115 | | 1321 | | 1366 | | 1399 | | 1.5 | 1 - 3 -9 |
| | | | 85 | 0.4 | 22 | 1449 | | 1658 | | 1749 | | 1747 | | | 3 - 6 - 13 |
| | | | 115 | 0.73 | 26 | 1611 | | 1802 | | 1906 | | 1910 | | | 5 - 9 - 16 |
| 4 x 2 | M13 | 4 | 18 | 0.15 | 15 | 908 | 1.20 | 984 | 4.80 | 1014 | 10.70 | 1020 | 13.70 | 3.5 | 0 - 1 - 3 |
| | | | 27 | 0.33 | 15 | 1309 | | 1459 | | 1543 | | 1586 | | | 1 - 2 - 6 |
| | | | 36 | 0.59 | 18 | 1596 | | 1822 | | 1925 | | 1967 | | | 1 - 3 - 11 |
| | M17 | 5 | 25 | 0.14 | 15 | 977 | | 1065 | | 1101 | | 1107 | | 3.0 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 18 | 1457 | | 1646 | | 1741 | | 1786 | | | 1 - 2 - 10 |
| | | | 55 | 0.68 | 23 | 1755 | | 2034 | | 2169 | | 2198 | | | 2 - 5 - 14 |
| | M23 | 6 | 50 | 0.22 | 23 | 1535 | | 1716 | | 1819 | | 1873 | | 2.6 | 1 - 2 - 9 |
| | | | 75 | 0.49 | 28 | 1958 | | 2265 | | 2412 | | 2447 | | | 2 - 5 - 15 |
| | | | 95 | 0.79 | 31 | 2302 | | 2800 | | 3002 | | 3089 | | | 4 - 9 - 19 |
| | M31 | 8 | 90 | 0.18 | 20 | 1857 | | 2123 | | 2245 | | 2292 | | 1.8 | 2 - 5 - 14 |
| | | | 135 | 0.41 | 25 | 2397 | | 2932 | | 3146 | | 3243 | | | 5 - 11 - 20 |
| | | | 180 | 0.73 | 29 | 2785 | | 3377 | | 3713 | | 3799 | | | 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 | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 1.7 GPM | | | |
| | | Inches | CFM | (in. H20) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | |
| 2 x 2 | M13 | 4 | 11 | 0.13 | 15 | 1489 | 0.60 | 1685 | 2.40 | 1732 | 5.40 | 1769 | 6.90 | 3.1 | 0 - 0 - 2 |
| | | | 16 | 0.28 | 15 | 1962 | | 2244 | | 2311 | | 2330 | | | 0 - 1 - 3 |
| | | | 21 | 0.49 | 15 | 2485 | | 2978 | | 3065 | | 3151 | | | 1 - 1 - 6 |
| | M17 | 4 | 18 | 0.18 | 15 | 1790 | | 2033 | | 2090 | | 2111 | | 2.5 | 0 - 1 - 3 |
| | | | 24 | 0.33 | 15 | 2267 | | 2670 | | 2749 | | 2807 | | | 1 - 1 - 5 |
| | | | 30 | 0.51 | 18 | 2676 | | 3133 | | 3253 | | 3317 | | | 1 - 2 - 8 |
| | M23 | 5 | 30 | 0.19 | 19 | 2325 | | 2687 | | 2767 | | 2803 | | 1.9 | 1 - 1 - 5 |
| | | | 45 | 0.44 | 24 | 3161 | | 3638 | | 3799 | | 3851 | | | 1 - 3 - 9 |
| | | | 60 | 0.77 | 28 | 3756 | | 4301 | | 4538 | | 4520 | | | 2 - 5 - 12 |
| | M31 | 6 | 55 | 0.17 | 16 | 2989 | | 3541 | | 3661 | | 3748 | | 1.5 | 1 - 3 - 9 |
| | | | 85 | 0.4 | 22 | 3883 | | 4443 | | 4686 | | 4681 | | | 3 - 6 - 13 |
| | | | 115 | 0.73 | 26 | 4319 | | 4829 | | 5109 | | 5119 | | | 5 - 9 - 16 |
| 4 x 2 | M13 | 4 | 18 | 0.15 | 15 | 2433 | 1.20 | 2637 | 4.80 | 2718 | 10.70 | 2734 | 13.70 | 3.5 | 0 - 1 - 3 |
| | | | 27 | 0.33 | 15 | 3509 | | 3910 | | 4135 | | 4250 | | | 1 - 2 - 6 |
| | | | 36 | 0.59 | 18 | 4278 | | 4882 | | 5158 | | 5271 | | | 1 - 3 - 11 |
| | M17 | 5 | 25 | 0.14 | 15 | 2619 | | 2855 | | 2949 | | 2968 | | 3.0 | 0 - 1 - 4 |
| | | | 40 | 0.36 | 18 | 3905 | | 4410 | | 4667 | | 4788 | | | 1 - 2 - 10 |
| | | | 55 | 0.68 | 23 | 4703 | | 5451 | | 5813 | | 5891 | | | 2 - 5 - 14 |
| | M23 | 6 | 50 | 0.22 | 23 | 4113 | | 4598 | | 4875 | | 5019 | | 2.6 | 1 - 2 - 9 |
| | | | 75 | 0.49 | 28 | 5248 | | 6070 | | 6464 | | 6558 | | | 2 - 5 - 15 |
| | | | 95 | 0.79 | 31 | 6168 | | 7503 | | 8045 | | 8278 | | | 4 - 9 - 19 |
| | M31 | 8 | 90 | 0.18 | 20 | 4977 | | 5690 | | 6017 | | 6143 | | 1.8 | 2 - 5 - 14 |
| | | | 135 | 0.41 | 25 | 6423 | | 7858 | | 8430 | | 8691 | | | 5 - 11 - 20 |
| | | | 180 | 0.73 | 29 | 7463 | | 9049 | | 9950 | | 10182 | | | 9 - 14 - 23 |

Note: Reference page U44 for operational conditions used for performance notes

NOTES:

1. All performance data based on test performed in accordance with ASHRAE Standard 200-2018.
2. $\Delta P_s$ 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. $\Delta P_{Coil}$ values are measured in feet of water. $\Delta P_{Coil}$ 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 heating 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 HEATING 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:

$\Delta P_S$ = 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]

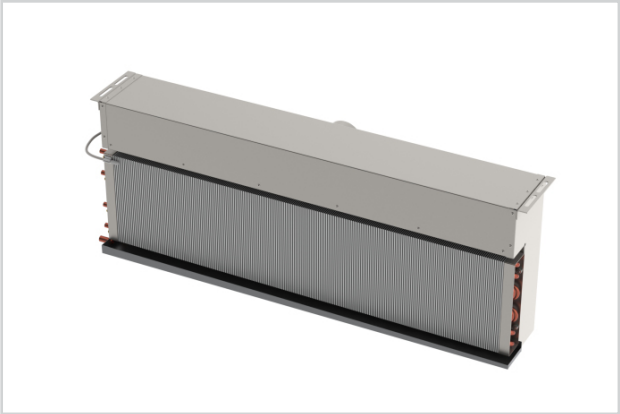
$T_{ROOM}$ = Temperature Room Air [°F]

$q_{LATENT}$ = 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


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 CBAVs 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

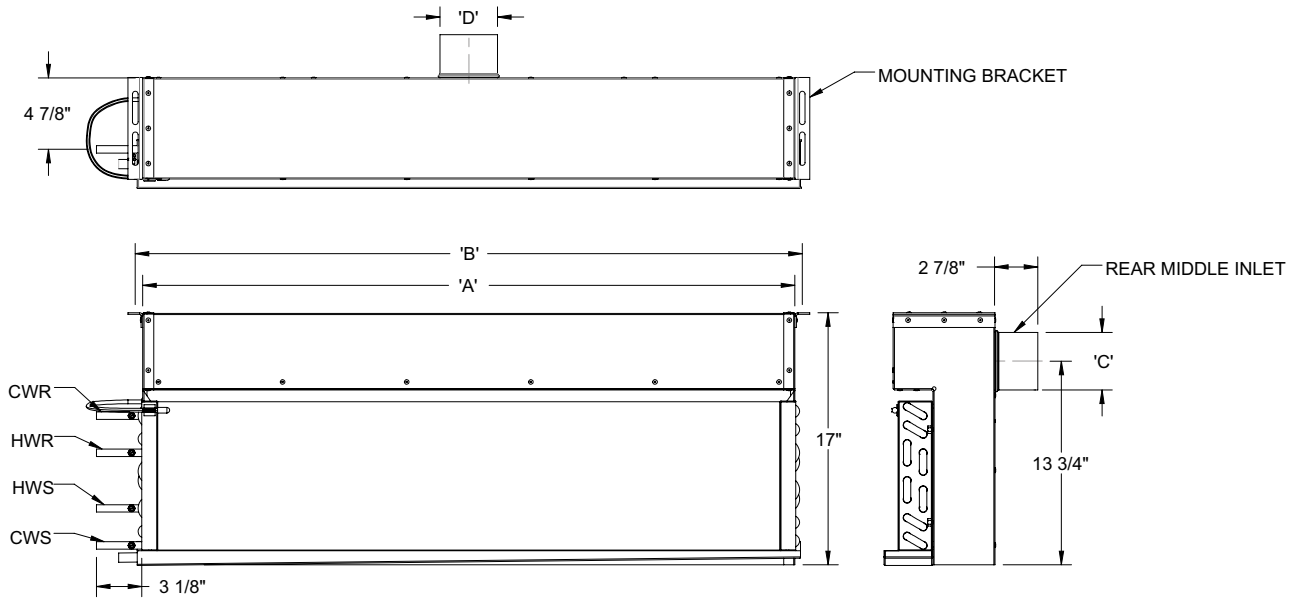
## CBAV STANDARD FEATURES

- 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 | Pri + Ind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | Total Flow Rate |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | CFM |
| 2 | M13 | 4 | 3 | 0.17 | 15 | 339 | 1.60 | 346 | 3.50 | 348 | 6.20 | 349 | 9.80 | 6.1 | 21 |
| | | | 5 | 0.48 | 15 | 536 | | 551 | | 555 | | 559 | | | 36 |
| | | | 6 | 0.69 | 17 | 631 | | 651 | | 656 | | 662 | | | 43 |
| | M17 | 4 | 5 | 0.2 | 15 | 435 | | 446 | | 448 | | 450 | | 4.9 | 30 |
| | | | 8 | 0.51 | 16 | 660 | | 681 | | 688 | | 693 | | | 47 |
| | | | 10 | 0.79 | 18 | 794 | | 823 | | 833 | | 840 | | | 59 |
| | M23 | 4 | 10 | 0.2 | 15 | 705 | | 729 | | 736 | | 742 | | 3.5 | 45 |
| | | | 15 | 0.45 | 15 | 985 | | 1027 | | 1043 | | 1054 | | | 68 |
| | | | 20 | 0.81 | 19 | 1225 | | 1289 | | 1316 | | 1334 | | | 90 |
| | M31 | 4 | 16 | 0.19 | 15 | 827 | | 857 | | 867 | | 874 | | 2.8 | 61 |
| | | | 25 | 0.46 | 19 | 1180 | | 1236 | | 1259 | | 1275 | | | 95 |
| | | | 32 | 0.75 | 22 | 1416 | | 1495 | | 1529 | | 1552 | | | 122 |
| 3 | M13 | 4 | 5 | 0.19 | 15 | 558 | 2.20 | 573 | 5.00 | 577 | 8.80 | 580 | 1.80 | 6.1 | 36 |
| | | | 8 | 0.47 | 17 | 848 | | 877 | | 887 | | 894 | | | 57 |
| | | | 10 | 0.74 | 20 | 1027 | | 1068 | | 1083 | | 1093 | | | 71 |
| | M17 | 4 | 8 | 0.2 | 15 | 690 | | 711 | | 717 | | 722 | | 4.9 | 47 |
| | | | 12 | 0.44 | 16 | 982 | | 1020 | | 1034 | | 1043 | | | 71 |
| | | | 16 | 0.79 | 20 | 1244 | | 1303 | | 1326 | | 1342 | | | 94 |
| | M23 | 4 | 15 | 0.17 | 15 | 1053 | | 1095 | | 1110 | | 1120 | | 3.5 | 68 |
| | | | 25 | 0.48 | 17 | 1575 | | 1665 | | 1702 | | 1728 | | | 113 |
| | | | 32 | 0.79 | 20 | 1882 | | 2009 | | 2065 | | 2105 | | | 144 |
| | M31 | 4 | 25 | 0.18 | 15 | 1272 | | 1329 | | 1351 | | 1367 | | 2.8 | 95 |
| | | | 40 | 0.45 | 21 | 1821 | | 1933 | | 1982 | | 2016 | | | 152 |
| | | | 50 | 0.71 | 24 | 2134 | | 2289 | | 2358 | | 2407 | | | 190 |
| 4 | M13 | 4 | 8 | 0.25 | 15 | 864 | 2.90 | 893 | 6.40 | 903 | 1.50 | 910 | 2.30 | 6.1 | 57 |
| | | | 12 | 0.56 | 19 | 1225 | | 1279 | | 1300 | | 1314 | | | 85 |
| | | | 14 | 0.76 | 21 | 1393 | | 1461 | | 1488 | | 1507 | | | 99 |
| | M17 | 4 | 12 | 0.23 | 15 | 1008 | | 1045 | | 1059 | | 1068 | | 4.9 | 71 |
| | | | 18 | 0.52 | 18 | 1414 | | 1483 | | 1511 | | 1531 | | | 106 |
| | | | 22 | 0.78 | 21 | 1653 | | 1749 | | 1788 | | 1815 | | | 130 |
| | M23 | 4 | 22 | 0.2 | 15 | 1482 | | 1556 | | 1586 | | 1607 | | 3.5 | 99 |
| | | | 34 | 0.48 | 18 | 2066 | | 2209 | | 2271 | | 2316 | | | 153 |
| | | | 42 | 0.74 | 21 | 2393 | | 2587 | | 2675 | | 2737 | | | 189 |
| | M31 | 6 | 35 | 0.18 | 16 | 1718 | | 1814 | | 1852 | | 1880 | | 2.8 | 133 |
| | | | 55 | 0.45 | 22 | 2404 | | 2588 | | 2671 | | 2729 | | | 209 |
| | | | 70 | 0.73 | 25 | 2824 | | 3081 | | 3202 | | 3287 | | | 266 |
| 6 | M13 | 4 | 10 | 0.18 | 15 | 932 | 4.10 | 957 | 9.30 | 969 | 2.10 | 978 | 3.30 | 6.1 | 71 |
| | | | 16 | 0.45 | 20 | 1396 | | 1454 | | 1483 | | 1504 | | | 114 |
| | | | 20 | 0.71 | 23 | 1656 | | 1741 | | 1785 | | 1815 | | | 142 |
| | M17 | 4 | 16 | 0.19 | 15 | 1139 | | 1178 | | 1198 | | 1212 | | 4.9 | 94 |
| | | | 25 | 0.46 | 20 | 1642 | | 1726 | | 1769 | | 1799 | | | 148 |
| | | | 32 | 0.76 | 24 | 2015 | | 2143 | | 2209 | | 2255 | | | 189 |
| | M23 | 6 | 35 | 0.23 | 16 | 1923 | | 2037 | | 2095 | | 2136 | | 3.5 | 158 |
| | | | 50 | 0.47 | 20 | 2646 | | 2858 | | 2970 | | 3048 | | | 225 |
| | | | 62 | 0.72 | 23 | 3091 | | 3386 | | 3545 | | 3657 | | | 279 |
| | M31 | 6 | 55 | 0.21 | 20 | 2231 | | 2375 | | 2450 | | 2503 | | 2.8 | 209 |
| | | | 80 | 0.44 | 25 | 3076 | | 3349 | | 3495 | | 3598 | | | 304 |
| | | | 105 | 0.75 | 28 | 3641 | | 4044 | | 4265 | | 4424 | | | 399 |

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

## CBAV / 4-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Sensible Heating (Btu/h) | | | | | | | | Induction ratio | Pri + Ind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | Total Flow Rate |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | CFM |
| 2 | M13 | 4 | 3 | 0.17 | 15 | 674 | 0.10 | 733 | 0.30 | 749 | 0.80 | 753 | 1.40 | 6.1 | 21 |
| | | | 5 | 0.48 | 15 | 1050 | | 1161 | | 1193 | | 1202 | | | 36 |
| | | | 6 | 0.69 | 17 | 1231 | | 1366 | | 1409 | | 1421 | | | 43 |
| | M17 | 4 | 5 | 0.2 | 15 | 858 | | 942 | | 965 | | 970 | | 4.9 | 30 |
| | | | 8 | 0.51 | 16 | 1282 | | 1429 | | 1475 | | 1489 | | | 47 |
| | | | 10 | 0.79 | 18 | 1515 | | 1719 | | 1782 | | 1804 | | | 59 |
| | M23 | 4 | 10 | 0.2 | 15 | 1364 | | 1527 | | 1578 | | 1594 | | 3.5 | 45 |
| | | | 15 | 0.45 | 15 | 1849 | | 2132 | | 2223 | | 2258 | | | 68 |
| | | | 20 | 0.81 | 19 | 2249 | | 2653 | | 2792 | | 2848 | | | 90 |
| | M31 | 4 | 16 | 0.19 | 15 | 1584 | | 1791 | | 1854 | | 1877 | | 2.8 | 61 |
| | | | 25 | 0.46 | 19 | 2187 | | 2554 | | 2676 | | 2726 | | | 95 |
| | | | 32 | 0.75 | 22 | 2568 | | 3065 | | 3238 | | 3310 | | | 122 |
| 3 | M13 | 4 | 5 | 0.19 | 15 | 1095 | 0.10 | 1209 | 0.50 | 1240 | 1.10 | 1249 | 2.00 | 6.1 | 36 |
| | | | 8 | 0.47 | 17 | 1623 | | 1836 | | 1899 | | 1921 | | | 57 |
| | | | 10 | 0.74 | 20 | 1940 | | 2223 | | 2312 | | 2344 | | | 71 |
| | M17 | 4 | 8 | 0.2 | 15 | 1338 | | 1495 | | 1539 | | 1553 | | 4.9 | 47 |
| | | | 12 | 0.44 | 16 | 1860 | | 2127 | | 2209 | | 2238 | | | 71 |
| | | | 16 | 0.79 | 20 | 2307 | | 2694 | | 2821 | | 2870 | | | 94 |
| | M23 | 4 | 15 | 0.17 | 15 | 1988 | | 2279 | | 2370 | | 2403 | | 3.5 | 68 |
| | | | 25 | 0.48 | 17 | 2846 | | 3410 | | 3605 | | 3685 | | | 113 |
| | | | 32 | 0.79 | 20 | 3312 | | 4075 | | 4350 | | 4471 | | | 144 |
| | M31 | 4 | 25 | 0.18 | 15 | 2372 | | 2755 | | 2878 | | 2926 | | 2.8 | 95 |
| | | | 40 | 0.45 | 21 | 3251 | | 3942 | | 4186 | | 4290 | | | 152 |
| | | | 50 | 0.71 | 24 | 3712 | | 4620 | | 4955 | | 5105 | | | 190 |
| 4 | M13 | 4 | 8 | 0.25 | 15 | 1656 | 0.20 | 1870 | 0.60 | 1934 | 1.40 | 1956 | 2.50 | 6.1 | 57 |
| | | | 12 | 0.56 | 19 | 2286 | | 2653 | | 2769 | | 2814 | | | 85 |
| | | | 14 | 0.76 | 21 | 2568 | | 3017 | | 3163 | | 3222 | | | 99 |
| | M17 | 4 | 12 | 0.23 | 15 | 1913 | | 2181 | | 2263 | | 2292 | | 4.9 | 71 |
| | | | 18 | 0.52 | 18 | 2603 | | 3061 | | 3212 | | 3272 | | | 106 |
| | | | 22 | 0.78 | 21 | 2979 | | 3580 | | 3786 | | 3870 | | | 130 |
| | M23 | 4 | 22 | 0.2 | 15 | 2718 | | 3208 | | 3369 | | 3434 | | 3.5 | 99 |
| | | | 34 | 0.48 | 18 | 3613 | | 4472 | | 4782 | | 4917 | | | 153 |
| | | | 42 | 0.74 | 21 | 4082 | | 5182 | | 5601 | | 5792 | | | 189 |
| | M31 | 6 | 35 | 0.18 | 16 | 3113 | | 3720 | | 3927 | | 4011 | | 2.8 | 133 |
| | | | 55 | 0.45 | 22 | 4141 | | 5205 | | 5603 | | 5782 | | | 209 |
| | | | 70 | 0.73 | 25 | 4704 | | 6115 | | 6672 | | 6932 | | | 266 |
| 6 | M13 | 4 | 10 | 0.18 | 15 | 1774 | 0.20 | 2018 | 0.90 | 2071 | 2.10 | 2098 | 3.70 | 6.1 | 71 |
| | | | 16 | 0.45 | 20 | 2554 | | 3023 | | 3148 | | 3211 | | | 114 |
| | | | 20 | 0.71 | 23 | 2952 | | 3585 | | 3770 | | 3864 | | | 142 |
| | M17 | 4 | 16 | 0.19 | 15 | 2122 | | 2466 | | 2551 | | 2594 | | 4.9 | 94 |
| | | | 25 | 0.46 | 20 | 2931 | | 3555 | | 3737 | | 3830 | | | 148 |
| | | | 32 | 0.76 | 24 | 3585 | | 4362 | | 4639 | | 4783 | | | 189 |
| | M23 | 6 | 35 | 0.23 | 16 | 3402 | | 4164 | | 4409 | | 4535 | | 3.5 | 158 |
| | | | 50 | 0.47 | 20 | 4633 | | 5729 | | 6188 | | 6429 | | | 225 |
| | | | 62 | 0.72 | 23 | 5223 | | 6692 | | 7332 | | 7675 | | | 279 |
| | M31 | 6 | 55 | 0.21 | 20 | 3975 | | 4830 | | 5142 | | 5305 | | 2.8 | 209 |
| | | | 80 | 0.44 | 25 | 5277 | | 6659 | | 7252 | | 7566 | | | 304 |
| | | | 105 | 0.75 | 28 | 5961 | | 7884 | | 8755 | | 9233 | | | 399 |

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 | Pri + Ind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | Total Flow Rate |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | CFM |
| 2 | M13 | 4 | 3 | 0.17 | 15 | 352 | 2.10 | 360 | 4.70 | 361 | 8.40 | 363 | 1.70 | 6.1 | 21 |
| | | | 5 | 0.48 | 15 | 557 | | 573 | | 577 | | 580 | | | 36 |
| | | | 6 | 0.69 | 17 | 656 | | 676 | | 682 | | 688 | | | 43 |
| | M17 | 4 | 5 | 0.2 | 15 | 452 | | 463 | | 466 | | 468 | | 4.9 | 30 |
| | | | 8 | 0.51 | 16 | 686 | | 708 | | 715 | | 720 | | | 47 |
| | | | 10 | 0.79 | 18 | 825 | | 855 | | 866 | | 873 | | | 59 |
| | M23 | 4 | 10 | 0.2 | 15 | 733 | | 757 | | 765 | | 771 | | 3.5 | 45 |
| | | | 15 | 0.45 | 15 | 1023 | | 1067 | | 1084 | | 1096 | | | 68 |
| | | | 20 | 0.81 | 19 | 1274 | | 1340 | | 1367 | | 1386 | | | 90 |
| | M31 | 4 | 16 | 0.19 | 15 | 860 | | 890 | | 901 | | 908 | | 2.8 | 61 |
| | | | 25 | 0.46 | 19 | 1226 | | 1285 | | 1308 | | 1325 | | | 95 |
| | | | 32 | 0.75 | 22 | 1471 | | 1554 | | 1589 | | 1613 | | | 122 |
| 3 | M13 | 4 | 5 | 0.19 | 15 | 580 | 2.90 | 595 | 6.60 | 599 | 1.50 | 603 | 2.30 | 6.1 | 36 |
| | | | 8 | 0.47 | 17 | 881 | | 912 | | 922 | | 929 | | | 57 |
| | | | 10 | 0.74 | 20 | 1067 | | 1110 | | 1125 | | 1135 | | | 71 |
| | M17 | 4 | 8 | 0.2 | 15 | 717 | | 739 | | 746 | | 751 | | 4.9 | 47 |
| | | | 12 | 0.44 | 16 | 1021 | | 1060 | | 1074 | | 1084 | | | 71 |
| | | | 16 | 0.79 | 20 | 1293 | | 1354 | | 1378 | | 1394 | | | 94 |
| | M23 | 4 | 15 | 0.17 | 15 | 1094 | | 1138 | | 1153 | | 1164 | | 3.5 | 68 |
| | | | 25 | 0.48 | 17 | 1637 | | 1730 | | 1769 | | 1796 | | | 113 |
| | | | 32 | 0.79 | 20 | 1956 | | 2088 | | 2146 | | 2187 | | | 144 |
| | M31 | 4 | 25 | 0.18 | 15 | 1322 | | 1382 | | 1404 | | 1420 | | 2.8 | 95 |
| | | | 40 | 0.45 | 21 | 1892 | | 2009 | | 2059 | | 2095 | | | 152 |
| | | | 50 | 0.71 | 24 | 2217 | | 2379 | | 2451 | | 2502 | | | 190 |
| 4 | M13 | 4 | 8 | 0.25 | 15 | 898 | 3.80 | 928 | 8.60 | 939 | 1.90 | 946 | 3.00 | 6.1 | 57 |
| | | | 12 | 0.56 | 19 | 1273 | | 1329 | | 1351 | | 1366 | | | 85 |
| | | | 14 | 0.76 | 21 | 1448 | | 1518 | | 1546 | | 1566 | | | 99 |
| | M17 | 4 | 12 | 0.23 | 15 | 1047 | | 1086 | | 1100 | | 1110 | | 4.9 | 71 |
| | | | 18 | 0.52 | 18 | 1469 | | 1542 | | 1570 | | 1591 | | | 106 |
| | | | 22 | 0.78 | 21 | 1718 | | 1817 | | 1858 | | 1887 | | | 130 |
| | M23 | 4 | 22 | 0 20 | 15 | 1540 | | 1617 | | 1648 | | 1670 | | 3.5 | 99 |
| | | | 34 | 0.48 | 18 | 2147 | | 2295 | | 2360 | | 2406 | | | 153 |
| | | | 42 | 0.74 | 21 | 2487 | | 2689 | | 2780 | | 2845 | | | 189 |
| | M31 | 6 | 35 | 0.18 | 16 | 1786 | | 1885 | | 1925 | | 1954 | | 2.8 | 133 |
| | | | 55 | 0.45 | 22 | 2498 | | 2690 | | 2776 | | 2836 | | | 209 |
| | | | 70 | 0.73 | 25 | 2935 | | 3202 | | 3327 | | 3416 | | | 266 |
| 6 | M13 | 4 | 10 | 0.18 | 15 | 969 | 5.50 | 994 | 1.60 | 1007 | 2.80 | 1016 | 4.40 | 6.1 | 71 |
| | | | 16 | 0.45 | 20 | 1451 | | 1511 | | 1541 | | 1563 | | | 114 |
| | | | 20 | 0.71 | 23 | 1721 | | 1809 | | 1855 | | 1887 | | | 142 |
| | M17 | 4 | 16 | 0.19 | 15 | 1184 | | 1224 | | 1245 | | 1260 | | 4.9 | 94 |
| | | | 25 | 0.46 | 20 | 1707 | | 1794 | | 1838 | | 1870 | | | 148 |
| | | | 32 | 0.76 | 24 | 2094 | | 2227 | | 2296 | | 2344 | | | 189 |
| | M23 | 6 | 35 | 0.23 | 16 | 1999 | | 2117 | | 2177 | | 2219 | | 3.5 | 158 |
| | | | 50 | 0.47 | 20 | 2750 | | 2970 | | 3086 | | 3168 | | | 225 |
| | | | 62 | 0.72 | 23 | 3212 | | 3519 | | 3684 | | 3801 | | | 279 |
| | M31 | 6 | 55 | 0.21 | 20 | 2318 | | 2468 | | 2546 | | 2601 | | 2.8 | 209 |
| | | | 80 | 0.44 | 25 | 3196 | | 3481 | | 3632 | | 3739 | | | 304 |
| | | | 105 | 0.75 | 28 | 3784 | | 4202 | | 4432 | | 4597 | | | 399 |

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

## CBAV / 2-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Sensible Heating (Btu/h) | | | | | | | | Induction ratio | Pri + Ind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | Total Flow Rate |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | CFM |
| 2 | M13 | 4 | 3 | 0.17 | 15 | 967 | 0.50 | 1052 | 2.10 | 1075 | 4.70 | 1080 | 8.40 | 6.1 | 21 |
| | | | 5 | 0.48 | 15 | 1507 | | 1665 | | 1712 | | 1724 | | | 36 |
| | | | 6 | 0.69 | 17 | 1766 | | 1960 | | 2021 | | 2039 | | | 43 |
| | M17 | 4 | 5 | 0.2 | 15 | 1231 | | 1351 | | 1384 | | 1392 | | 4.9 | 30 |
| | | | 8 | 0.51 | 16 | 1840 | | 2050 | | 2116 | | 2136 | | | 47 |
| | | | 10 | 0.79 | 18 | 2173 | | 2466 | | 2556 | | 2589 | | | 59 |
| | M23 | 4 | 10 | 0.2 | 15 | 1958 | | 2192 | | 2264 | | 2287 | | 3.5 | 45 |
| | | | 15 | 0.45 | 15 | 2652 | | 3059 | | 3190 | | 3240 | | | 68 |
| | | | 20 | 0.81 | 19 | 3227 | | 3807 | | 4005 | | 4087 | | | 90 |
| | M31 | 4 | 16 | 0.19 | 15 | 2272 | | 2569 | | 2661 | | 2693 | | 2.8 | 61 |
| | | | 25 | 0.46 | 19 | 3138 | | 3665 | | 3840 | | 3911 | | | 95 |
| | | | 32 | 0.75 | 22 | 3685 | | 4398 | | 4646 | | 4750 | | | 122 |
| 3 | M13 | 4 | 5 | 0.19 | 15 | 1571 | 0.70 | 1734 | 2.90 | 1779 | 6.60 | 1792 | 1.50 | 6.1 | 36 |
| | | | 8 | 0.47 | 17 | 2328 | | 2634 | | 2725 | | 2756 | | | 57 |
| | | | 10 | 0.74 | 20 | 2783 | | 3190 | | 3317 | | 3364 | | | 71 |
| | M17 | 4 | 8 | 0.2 | 15 | 1919 | | 2145 | | 2209 | | 2229 | | 4.9 | 47 |
| | | | 12 | 0.44 | 16 | 2669 | | 3051 | | 3169 | | 3212 | | | 71 |
| | | | 16 | 0.79 | 20 | 3311 | | 3866 | | 4047 | | 4118 | | | 94 |
| | M23 | 4 | 15 | 0.17 | 15 | 2853 | | 3270 | | 3400 | | 3448 | | 3.5 | 68 |
| | | | 25 | 0.48 | 17 | 4084 | | 4893 | | 5172 | | 5287 | | | 113 |
| | | | 32 | 0.79 | 20 | 4753 | | 5847 | | 6242 | | 6415 | | | 144 |
| | M31 | 4 | 25 | 0.18 | 15 | 3403 | | 3953 | | 4130 | | 4198 | | 2.8 | 95 |
| | | | 40 | 0.45 | 21 | 4664 | | 5656 | | 6006 | | 6156 | | | 152 |
| | | | 50 | 0.71 | 24 | 5326 | | 6628 | | 7110 | | 7326 | | | 190 |
| 4 | M13 | 4 | 8 | 0.25 | 15 | 2376 | 1.00 | 2684 | 3.80 | 2775 | 8.60 | 2806 | 1.90 | 6.1 | 57 |
| | | | 12 | 0.56 | 19 | 3279 | | 3806 | | 3974 | | 4038 | | | 85 |
| | | | 14 | 0.76 | 21 | 3685 | | 4329 | | 4539 | | 4623 | | | 99 |
| | M17 | 4 | 12 | 0.23 | 15 | 2744 | | 3130 | | 3246 | | 3289 | | 4.9 | 71 |
| | | | 18 | 0.52 | 18 | 3734 | | 4393 | | 4608 | | 4694 | | | 106 |
| | | | 22 | 0.78 | 21 | 4275 | | 5137 | | 5432 | | 5553 | | | 130 |
| | M23 | 4 | 22 | 0.2 | 15 | 3901 | | 4603 | | 4835 | | 4928 | | 3.5 | 99 |
| | | | 34 | 0.48 | 18 | 5183 | | 6417 | | 6861 | | 7055 | | | 153 |
| | | | 42 | 0.74 | 21 | 5857 | | 7435 | | 8037 | | 8311 | | | 189 |
| | M31 | 6 | 35 | 0.18 | 16 | 4467 | | 5338 | | 5634 | | 5755 | | 2.8 | 133 |
| | | | 55 | 0.45 | 22 | 5942 | | 7468 | | 8040 | | 8297 | | | 209 |
| | | | 70 | 0.73 | 25 | 6750 | | 8774 | | 9573 | | 9946 | | | 266 |
| 6 | M13 | 4 | 10 | 0.18 | 15 | 2546 | 1.40 | 2895 | 5.50 | 2972 | 1.60 | 3010 | 2.80 | 6.1 | 71 |
| | | | 16 | 0.45 | 20 | 3665 | | 4338 | | 4517 | | 4608 | | | 114 |
| | | | 20 | 0.71 | 23 | 4235 | | 5143 | | 5409 | | 5544 | | | 142 |
| | M17 | 4 | 16 | 0.19 | 15 | 3045 | | 3538 | | 3660 | | 3722 | | 4.9 | 94 |
| | | | 25 | 0.46 | 20 | 4206 | | 5102 | | 5362 | | 5496 | | | 148 |
| | | | 32 | 0.76 | 24 | 5144 | | 6259 | | 6656 | | 6862 | | | 189 |
| | M23 | 6 | 35 | 0.23 | 16 | 4881 | | 5975 | | 6327 | | 6508 | | 3.5 | 158 |
| | | | 50 | 0.47 | 20 | 6647 | | 8220 | | 8880 | | 9225 | | | 225 |
| | | | 62 | 0.72 | 23 | 7494 | | 9602 | | 10520 | | 11013 | | | 279 |
| | M31 | 6 | 55 | 0.21 | 20 | 5704 | | 6930 | | 7379 | | 7612 | | 2.8 | 209 |
| | | | 80 | 0.44 | 25 | 7571 | | 9554 | | 10405 | | 10856 | | | 304 |
| | | | 105 | 0.75 | 28 | 8553 | | 11312 | | 12562 | | 13248 | | | 399 |

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 200-2018.
2. All performance data based on installation with matched Titus LL-1Linear louver diffusers - contact the Titus Specialty Group for performance with other linear diffusers.
3. $\Delta P_s$ values are measured in inches of water.
4. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
5. $\Delta P_{Coil}$ values are measured in feet of water. $\Delta P_{Coil}$ values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit 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 heating 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 HEATING 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:

$\Delta P_S$ = 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


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 CBASs 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

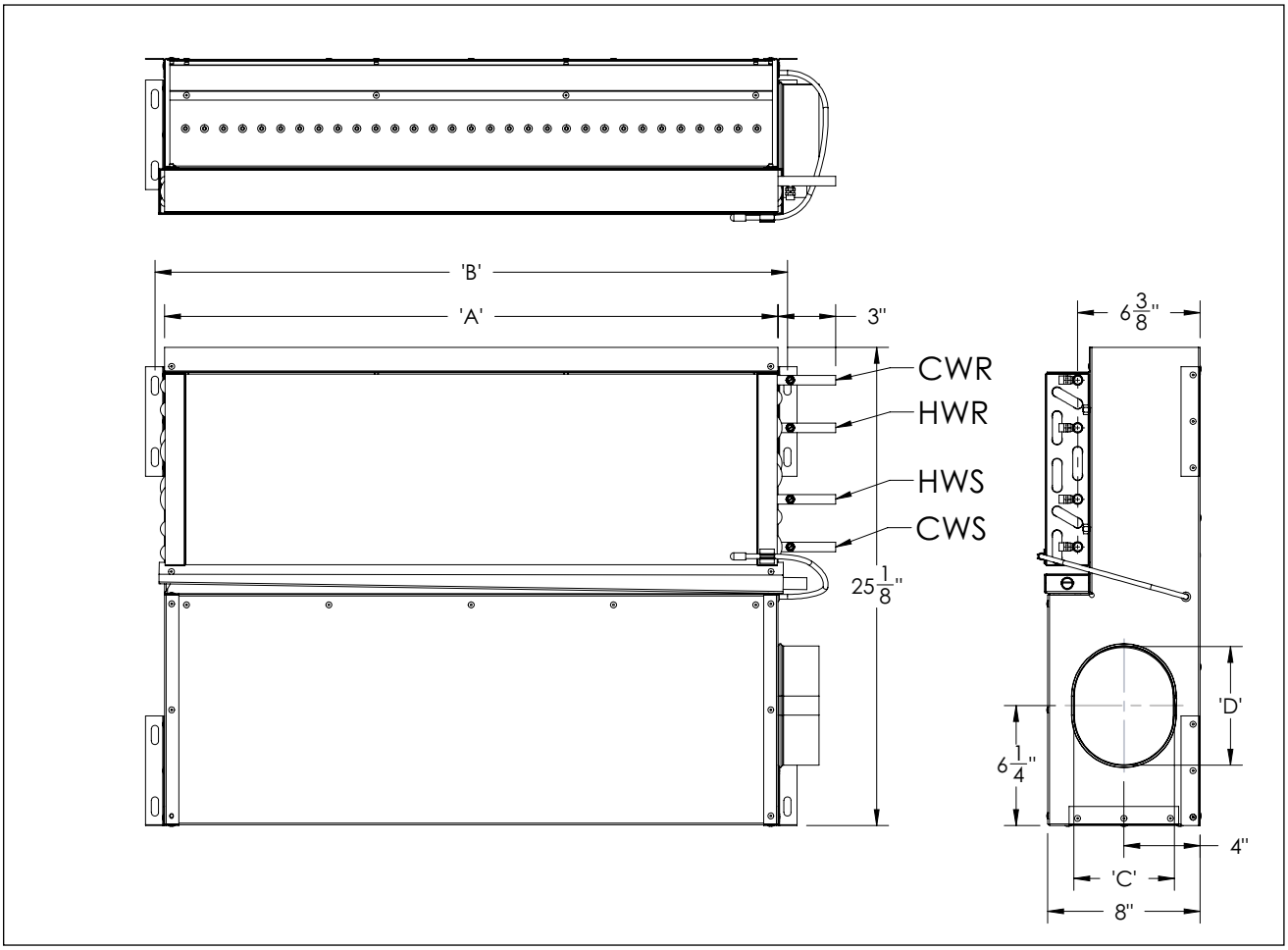
## CBAS STANDARD FEATURES

- 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 | Pri + Ind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | Total Flow Rate |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | CFM |
| 3 | M13 | 4 | 6 | 0.27 | 15 | 657 | 2.20 | 676 | 5.00 | 682 | 8.80 | 687 | 1.80 | 6.1 | 43 |
| | | | 8 | 0.47 | 17 | 848 | | 877 | | 887 | | 894 | | | 57 |
| | | | 10 | 0.74 | 20 | 1027 | | 1068 | | 1083 | | 1093 | | | 71 |
| | M17 | 4 | 8 | 0.20 | 15 | 690 | | 711 | | 717 | | 722 | | 4.9 | 47 |
| | | | 12 | 0.44 | 16 | 982 | | 1020 | | 1034 | | 1043 | | | 71 |
| | | | 16 | 0.79 | 20 | 1244 | | 1303 | | 1326 | | 1342 | | | 94 |
| | M23 | 4 | 16 | 0.20 | 15 | 1109 | | 1155 | | 1173 | | 1184 | | 3.5 | 72 |
| | | | 25 | 0.48 | 17 | 1575 | | 1665 | | 1702 | | 1728 | | | 113 |
| | | | 32 | 0.79 | 20 | 1882 | | 2009 | | 2065 | | 2105 | | | 144 |
| | M31 | 4 | 28 | 0.22 | 16 | 1395 | | 1463 | | 1489 | | 1508 | | 2.8 | 106 |
| | | | 42 | 0.50 | 22 | 1886 | | 2007 | | 2059 | | 2097 | | | 160 |
| | | | 52 | 0.77 | 25 | 2193 | | 2356 | | 2430 | | 2482 | | | 198 |
| 4 | M13 | 4 | 8 | 0.25 | 15 | 864 | 2.90 | 893 | 6.40 | 903 | 1.50 | 910 | 2.30 | 6.1 | 57 |
| | | | 12 | 0.56 | 19 | 1225 | | 1279 | | 1300 | | 1314 | | | 85 |
| | | | 14 | 0.76 | 21 | 1393 | | 1461 | | 1488 | | 1507 | | | 99 |
| | M17 | 4 | 12 | 0.23 | 15 | 1008 | | 1045 | | 1059 | | 1068 | | 4.9 | 71 |
| | | | 18 | 0.52 | 18 | 1414 | | 1483 | | 1511 | | 1531 | | | 106 |
| | | | 22 | 0.78 | 21 | 1653 | | 1749 | | 1788 | | 1815 | | | 130 |
| | M23 | 4 | 22 | 0.20 | 15 | 1482 | | 1556 | | 1586 | | 1607 | | 3.5 | 99 |
| | | | 34 | 0.48 | 18 | 2066 | | 2209 | | 2271 | | 2316 | | | 153 |
| | | | 42 | 0.74 | 21 | 2393 | | 2587 | | 2675 | | 2737 | | | 189 |
| | M31 | 4 | 38 | 0.22 | 18 | 1834 | | 1942 | | 1986 | | 2018 | | 2.8 | 144 |
| | | | 55 | 0.47 | 24 | 2404 | | 2588 | | 2671 | | 2729 | | | 209 |
| | | | 70 | 0.76 | 31 | 2824 | | 3081 | | 3202 | | 3287 | | | 266 |
| 5 | M13 | 4 | 10 | 0.25 | 15 | 917 | 3.50 | 942 | 7.90 | 955 | 1.80 | 964 | 2.80 | 6.1 | 71 |
| | | | 14 | 0.49 | 19 | 1224 | | 1270 | | 1293 | | 1308 | | | 99 |
| | | | 18 | 0.81 | 22 | 1500 | | 1570 | | 1606 | | 1630 | | | 128 |
| | M17 | 4 | 15 | 0.24 | 15 | 1065 | | 1100 | | 1117 | | 1129 | | 4.9 | 89 |
| | | | 22 | 0.51 | 20 | 1460 | | 1526 | | 1560 | | 1583 | | | 130 |
| | | | 28 | 0.83 | 23 | 1811 | | 1915 | | 1967 | | 2004 | | | 165 |
| | M23 | 4 | 30 | 0.24 | 15 | 1690 | | 1778 | | 1823 | | 1854 | | 3.5 | 135 |
| | | | 45 | 0.55 | 20 | 2434 | | 2612 | | 2706 | | 2772 | | | 203 |
| | | | 55 | 0.82 | 24 | 2784 | | 3025 | | 3153 | | 3245 | | | 248 |
| | M31 | 6 | 50 | 0.24 | 19 | 2080 | | 2205 | | 2269 | | 2313 | | 2.8 | 190 |
| | | | 75 | 0.54 | 24 | 2877 | | 3119 | | 3248 | | 3339 | | | 285 |
| | | | 95 | 0.86 | 28 | 3331 | | 3668 | | 3852 | | 3983 | | | 361 |
| 6 | M13 | 4 | 12 | 0.26 | 16 | 1087 | 4.10 | 1123 | 9.30 | 1141 | 2.10 | 1154 | 3.30 | 6.1 | 85 |
| | | | 16 | 0.45 | 20 | 1396 | | 1454 | | 1483 | | 1504 | | | 114 |
| | | | 22 | 0.86 | 24 | 1785 | | 1885 | | 1936 | | 1971 | | | 156 |
| | M17 | 4 | 18 | 0.24 | 16 | 1262 | | 1310 | | 1334 | | 1351 | | 4.9 | 106 |
| | | | 26 | 0.50 | 21 | 1693 | | 1783 | | 1829 | | 1861 | | | 153 |
| | | | 32 | 0.76 | 24 | 2015 | | 2143 | | 2209 | | 2255 | | | 189 |
| | M23 | 6 | 35 | 0.23 | 16 | 1923 | | 2037 | | 2095 | | 2136 | | 3.5 | 158 |
| | | | 50 | 0.47 | 20 | 2646 | | 2858 | | 2970 | | 3048 | | | 225 |
| | | | 64 | 0.77 | 24 | 3149 | | 3459 | | 3625 | | 3744 | | | 288 |
| | M31 | 6 | 55 | 0.21 | 20 | 2231 | | 2375 | | 2450 | | 2503 | | 2.8 | 209 |
| | | | 82 | 0.46 | 25 | 3126 | | 3410 | | 3562 | | 3669 | | | 312 |
| | | | 105 | 0.75 | 28 | 3641 | | 4044 | | 4265 | | 4424 | | | 399 |

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

## CBAS / 4-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Sensible Heating (Btu/h) | | | | | | | | Induction ratio | Pri + Ind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | Total Flow Rate |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | CFM |
| 3 | M13 | 4 | 6 | 0.27 | 15 | 1277 | 0.10 | 1423 | 0.50 | 1465 | 1.10 | 1477 | 2.00 | 6.1 | 43 |
| | | | 8 | 0.47 | 17 | 1623 | | 1836 | | 1899 | | 1921 | | | 57 |
| | | | 10 | 0.74 | 20 | 1940 | | 2223 | | 2312 | | 2344 | | | 71 |
| | M17 | 4 | 8 | 0.2 | 15 | 1338 | | 1495 | | 1539 | | 1553 | | 4.9 | 47 |
| | | | 12 | 0.44 | 16 | 1860 | | 2127 | | 2209 | | 2238 | | | 71 |
| | | | 16 | 0.79 | 20 | 2307 | | 2694 | | 2821 | | 2870 | | | 94 |
| | M23 | 4 | 16 | 0.2 | 15 | 2084 | | 2401 | | 2502 | | 2539 | | 3.5 | 72 |
| | | | 25 | 0.48 | 17 | 2846 | | 3410 | | 3605 | | 3685 | | | 113 |
| | | | 32 | 0.79 | 20 | 3312 | | 4075 | | 4350 | | 4471 | | | 144 |
| | M31 | 4 | 28 | 0.22 | 16 | 2578 | | 3021 | | 3167 | | 3225 | | 2.8 | 106 |
| | | | 42 | 0.5 | 22 | 3347 | | 4083 | | 4345 | | 4458 | | | 160 |
| | | | 52 | 0.77 | 25 | 3798 | | 4747 | | 5102 | | 5261 | | | 198 |
| 4 | M13 | 4 | 8 | 0.25 | 15 | 1656 | 0.20 | 1870 | 0.60 | 1934 | 1.40 | 1956 | 2.50 | 6.1 | 57 |
| | | | 12 | 0.56 | 19 | 2286 | | 2653 | | 2769 | | 2814 | | | 85 |
| | | | 14 | 0.76 | 21 | 2568 | | 3017 | | 3163 | | 3222 | | | 99 |
| | M17 | 4 | 12 | 0.23 | 15 | 1913 | | 2181 | | 2263 | | 2292 | | 4.9 | 71 |
| | | | 18 | 0.52 | 18 | 2603 | | 3061 | | 3212 | | 3272 | | | 106 |
| | | | 22 | 0.78 | 21 | 2979 | | 3580 | | 3786 | | 3870 | | | 130 |
| | M23 | 4 | 22 | 0.2 | 15 | 2718 | | 3208 | | 3369 | | 3434 | | 3.5 | 99 |
| | | | 34 | 0.48 | 18 | 3613 | | 4472 | | 4782 | | 4917 | | | 153 |
| | | | 42 | 0.74 | 21 | 4082 | | 5182 | | 5601 | | 5792 | | | 189 |
| | M31 | 4 | 38 | 0.22 | 18 | 3295 | | 3972 | | 4205 | | 4301 | | 2.8 | 144 |
| | | | 55 | 0.47 | 24 | 4141 | | 5205 | | 5603 | | 5782 | | | 209 |
| | | | 70 | 0.76 | 31 | 4704 | | 6115 | | 6672 | | 6932 | | | 266 |
| 5 | M13 | 4 | 10 | 0.25 | 15 | 1742 | 0.20 | 1984 | 0.80 | 2040 | 1.70 | 2068 | 3.10 | 6.1 | 71 |
| | | | 14 | 0.49 | 19 | 2269 | | 2650 | | 2750 | | 2799 | | | 99 |
| | | | 18 | 0.81 | 22 | 2709 | | 3247 | | 3400 | | 3477 | | | 128 |
| | M17 | 4 | 15 | 0.24 | 15 | 2002 | | 2307 | | 2382 | | 2419 | | 4.9 | 89 |
| | | | 22 | 0.51 | 20 | 2645 | | 3160 | | 3305 | | 3378 | | | 130 |
| | | | 28 | 0.83 | 23 | 3324 | | 3922 | | 4145 | | 4260 | | | 165 |
| | M23 | 4 | 30 | 0.24 | 15 | 3075 | | 3659 | | 3849 | | 3946 | | 3.5 | 135 |
| | | | 45 | 0.55 | 20 | 4335 | | 5269 | | 5656 | | 5858 | | | 203 |
| | | | 55 | 0.82 | 24 | 4809 | | 6027 | | 6549 | | 6827 | | | 248 |
| | M31 | 6 | 50 | 0.24 | 19 | 3829 | | 4503 | | 4773 | | 4912 | | 2.8 | 190 |
| | | | 75 | 0.54 | 24 | 4998 | | 6229 | | 6753 | | 7032 | | | 285 |
| | | | 95 | 0.86 | 28 | 5571 | | 7213 | | 7942 | | 8339 | | | 361 |
| 6 | M13 | 4 | 12 | 0.26 | 16 | 2035 | 0.20 | 2354 | 0.90 | 2431 | 2.10 | 2470 | 3.70 | 6.1 | 85 |
| | | | 16 | 0.45 | 20 | 2554 | | 3023 | | 3148 | | 3211 | | | 114 |
| | | | 22 | 0.86 | 24 | 3151 | | 3865 | | 4081 | | 4191 | | | 156 |
| | M17 | 4 | 18 | 0.24 | 16 | 2329 | | 2732 | | 2836 | | 2888 | | 4.9 | 106 |
| | | | 26 | 0.5 | 21 | 3010 | | 3667 | | 3860 | | 3959 | | | 153 |
| | | | 32 | 0.76 | 24 | 3585 | | 4362 | | 4639 | | 4783 | | | 189 |
| | M23 | 6 | 35 | 0.23 | 16 | 3402 | | 4164 | | 4409 | | 4535 | | 3.5 | 158 |
| | | | 50 | 0.47 | 20 | 4633 | | 5729 | | 6188 | | 6429 | | | 225 |
| | | | 64 | 0.77 | 24 | 5293 | | 6819 | | 7488 | | 7849 | | | 288 |
| | M31 | 6 | 55 | 0.21 | 20 | 3975 | | 4830 | | 5142 | | 5305 | | 2.8 | 209 |
| | | | 82 | 0.46 | 25 | 5341 | | 6769 | | 7384 | | 7711 | | | 312 |
| | | | 105 | 0.75 | 28 | 5961 | | 7884 | | 8755 | | 9233 | | | 399 |

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 | Pri + Ind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | 2.5 GPM | | | Total Flow Rate |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | CFM |
| 3 | M13 | 4 | 6 | 0.27 | 15 | 683 | 2.90 | 703 | 6.60 | 709 | 1.50 | 714 | 2.30 | 6.1 | 43 |
| | | | 8 | 0.47 | 17 | 881 | | 912 | | 922 | | 929 | | | 57 |
| | | | 10 | 0.74 | 20 | 1067 | | 1110 | | 1125 | | 1135 | | | 71 |
| | M17 | 4 | 8 | 0.2 | 15 | 717 | | 739 | | 746 | | 751 | | 4.9 | 47 |
| | | | 12 | 0.44 | 16 | 1021 | | 1060 | | 1074 | | 1084 | | | 71 |
| | | | 16 | 0.79 | 20 | 1293 | | 1354 | | 1378 | | 1394 | | | 94 |
| | M23 | 4 | 16 | 0.2 | 15 | 1153 | | 1201 | | 1219 | | 1231 | | 3.5 | 72 |
| | | | 25 | 0.48 | 17 | 1637 | | 1730 | | 1769 | | 1796 | | | 113 |
| | | | 32 | 0.79 | 20 | 1956 | | 2088 | | 2146 | | 2187 | | | 144 |
| | M31 | 4 | 28 | 0.22 | 16 | 1450 | | 1520 | | 1548 | | 1567 | | 2.8 | 106 |
| | | | 42 | 0.5 | 22 | 1960 | | 2086 | | 2140 | | 2179 | | | 160 |
| | | | 52 | 0.77 | 25 | 2279 | | 2449 | | 2525 | | 2580 | | | 198 |
| 4 | M13 | 4 | 8 | 0.25 | 15 | 898 | 3.80 | 928 | 8.60 | 939 | 1.90 | 946 | 3.00 | 6.1 | 57 |
| | | | 12 | 0.56 | 19 | 1273 | | 1329 | | 1351 | | 1366 | | | 85 |
| | | | 14 | 0.76 | 21 | 1448 | | 1518 | | 1546 | | 1566 | | | 99 |
| | M17 | 4 | 12 | 0.23 | 15 | 1047 | | 1086 | | 1100 | | 1110 | | 4.9 | 71 |
| | | | 18 | 0.52 | 18 | 1469 | | 1542 | | 1570 | | 1591 | | | 106 |
| | | | 22 | 0.78 | 21 | 1718 | | 1817 | | 1858 | | 1887 | | | 130 |
| | M23 | 4 | 22 | 0.2 | 15 | 1540 | | 1617 | | 1648 | | 1670 | | 3.5 | 99 |
| | | | 34 | 0.48 | 18 | 2147 | | 2295 | | 2360 | | 2406 | | | 153 |
| | | | 42 | 0.74 | 21 | 2487 | | 2689 | | 2780 | | 2845 | | | 189 |
| | M31 | 4 | 38 | 0.22 | 18 | 1906 | | 2018 | | 2064 | | 2097 | | 2.8 | 144 |
| | | | 55 | 0.47 | 24 | 2498 | | 2690 | | 2776 | | 2836 | | | 209 |
| | | | 70 | 0.76 | 31 | 2935 | | 3202 | | 3327 | | 3416 | | | 266 |
| 5 | M13 | 4 | 10 | 0.25 | 15 | 952 | 4.70 | 979 | 1.30 | 993 | 2.40 | 1002 | 3.70 | 6.1 | 71 |
| | | | 14 | 0.49 | 19 | 1272 | | 1320 | | 1343 | | 1360 | | | 99 |
| | | | 18 | 0.81 | 22 | 1559 | | 1632 | | 1669 | | 1694 | | | 128 |
| | M17 | 4 | 15 | 0.24 | 15 | 1107 | | 1143 | | 1161 | | 1173 | | 4.9 | 89 |
| | | | 22 | 0.51 | 20 | 1517 | | 1586 | | 1621 | | 1645 | | | 130 |
| | | | 28 | 0.83 | 23 | 1882 | | 1990 | | 2045 | | 2083 | | | 165 |
| | M23 | 4 | 30 | 0.24 | 15 | 1756 | | 1848 | | 1894 | | 1927 | | 3.5 | 135 |
| | | | 45 | 0.55 | 20 | 2529 | | 2715 | | 2812 | | 2881 | | | 203 |
| | | | 55 | 0.82 | 24 | 2893 | | 3143 | | 3277 | | 3372 | | | 248 |
| | M31 | 6 | 50 | 0.24 | 19 | 2162 | | 2291 | | 2358 | | 2404 | | 2.8 | 190 |
| | | | 75 | 0.54 | 24 | 2990 | | 3242 | | 3375 | | 3470 | | | 285 |
| | | | 95 | 0.86 | 28 | 3462 | | 3812 | | 4003 | | 4139 | | | 361 |
| 6 | M13 | 4 | 12 | 0.26 | 16 | 1130 | 5.50 | 1167 | 1.60 | 1186 | 2.80 | 1199 | 4.40 | 6.1 | 85 |
| | | | 16 | 0.45 | 20 | 1451 | | 1511 | | 1541 | | 1563 | | | 114 |
| | | | 22 | 0.86 | 24 | 1855 | | 1959 | | 2011 | | 2048 | | | 156 |
| | M17 | 4 | 18 | 0.24 | 16 | 1311 | | 1361 | | 1386 | | 1404 | | 4.9 | 106 |
| | | | 26 | 0.5 | 21 | 1760 | | 1853 | | 1900 | | 1934 | | | 153 |
| | | | 32 | 0.76 | 24 | 2094 | | 2227 | | 2296 | | 2344 | | | 189 |
| | M23 | 6 | 35 | 0.23 | 16 | 1999 | | 2117 | | 2177 | | 2219 | | 3.5 | 158 |
| | | | 50 | 0.47 | 20 | 2750 | | 2970 | | 3086 | | 3168 | | | 225 |
| | | | 64 | 0.77 | 24 | 3273 | | 3594 | | 3768 | | 3891 | | | 288 |
| | M31 | 6 | 55 | 0.21 | 20 | 2318 | | 2468 | | 2546 | | 2601 | | 2.8 | 209 |
| | | | 82 | 0.46 | 25 | 3249 | | 3544 | | 3701 | | 3813 | | | 312 |
| | | | 105 | 0.75 | 28 | 3784 | | 4202 | | 4432 | | 4597 | | | 399 |

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

## CBAS / 2-PIPE HEATING

| Nominal Length ft | Nozzle Size | Primary Air | | | Sound | Coil Sensible Heating (Btu/h) | | | | | | | | Induction ratio | Pri + Ind. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inlet Dia. | Flow Rate | Inlet ΔPS | | 0.5 GPM | | 1.0 GPM | | 1.5 GPM | | 2.0 GPM | | | Total Flow Rate |
| | | Inches | CFM | (in. H2O) | NC | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | qTOTAL | ΔCOIL | | CFM |
| 3 | M13 | 4 | 6 | 0.27 | 15 | 1832 | 0.70 | 2042 | 2.90 | 2101 | 6.60 | 2120 | 1.50 | 6.1 | 43 |
| | | | 8 | 0.47 | 17 | 2328 | | 2634 | | 2725 | | 2756 | | | 57 |
| | | | 10 | 0.74 | 20 | 2783 | | 3190 | | 3317 | | 3364 | | | 71 |
| | M17 | 4 | 8 | 0.2 | 15 | 1919 | | 2145 | | 2209 | | 2229 | | 4.9 | 47 |
| | | | 12 | 0.44 | 16 | 2669 | | 3051 | | 3169 | | 3212 | | | 71 |
| | | | 16 | 0.79 | 20 | 3311 | | 3866 | | 4047 | | 4118 | | | 94 |
| | M23 | 4 | 16 | 0.2 | 15 | 2990 | | 3445 | | 3589 | | 3643 | | 3.5 | 72 |
| | | | 25 | 0.48 | 17 | 4084 | | 4893 | | 5172 | | 5287 | | | 113 |
| | | | 32 | 0.79 | 20 | 4753 | | 5847 | | 6242 | | 6415 | | | 144 |
| | M31 | 4 | 28 | 0.22 | 16 | 3699 | | 4335 | | 4544 | | 4627 | | 2.8 | 106 |
| | | | 42 | 0.5 | 22 | 4803 | | 5858 | | 6234 | | 6397 | | | 160 |
| | | | 52 | 0.77 | 25 | 5450 | | 6812 | | 7320 | | 7549 | | | 198 |
| 4 | M13 | 4 | 8 | 0.25 | 15 | 2376 | 1.00 | 2684 | 3.80 | 2775 | 8.60 | 2806 | 1.90 | 6.1 | 57 |
| | | | 12 | 0.56 | 19 | 3279 | | 3806 | | 3974 | | 4038 | | | 85 |
| | | | 14 | 0.76 | 21 | 3685 | | 4329 | | 4539 | | 4623 | | | 99 |
| | M17 | 4 | 12 | 0.23 | 15 | 2744 | | 3130 | | 3246 | | 3289 | | 4.9 | 71 |
| | | | 18 | 0.52 | 18 | 3734 | | 4393 | | 4608 | | 4694 | | | 106 |
| | | | 22 | 0.78 | 21 | 4275 | | 5137 | | 5432 | | 5553 | | | 130 |
| | M23 | 4 | 22 | 0.2 | 15 | 3901 | | 4603 | | 4835 | | 4928 | | 3.5 | 99 |
| | | | 34 | 0.48 | 18 | 5183 | | 6417 | | 6861 | | 7055 | | | 153 |
| | | | 42 | 0.74 | 21 | 5857 | | 7435 | | 8037 | | 8311 | | | 189 |
| | M31 | 4 | 38 | 0.22 | 18 | 4728 | | 5699 | | 6033 | | 6171 | | 2.8 | 144 |
| | | | 55 | 0.47 | 24 | 5942 | | 7468 | | 8040 | | 8297 | | | 209 |
| | | | 70 | 0.76 | 31 | 6750 | | 8774 | | 9573 | | 9946 | | | 266 |
| 5 | M13 | 4 | 10 | 0.25 | 15 | 2499 | 1.20 | 2847 | 4.70 | 2927 | 1.30 | 2967 | 2.40 | 6.1 | 71 |
| | | | 14 | 0.49 | 19 | 3256 | | 3803 | | 3945 | | 4016 | | | 99 |
| | | | 18 | 0.81 | 22 | 3887 | | 4660 | | 4878 | | 4988 | | | 128 |
| | M17 | 4 | 15 | 0.24 | 15 | 2873 | | 3310 | | 3417 | | 3471 | | 4.9 | 89 |
| | | | 22 | 0.51 | 20 | 3795 | | 4535 | | 4742 | | 4847 | | | 130 |
| | | | 28 | 0.83 | 23 | 4769 | | 5627 | | 5948 | | 6112 | | | 165 |
| | M23 | 4 | 30 | 0.24 | 15 | 4412 | | 5250 | | 5523 | | 5663 | | 3.5 | 135 |
| | | | 45 | 0.55 | 20 | 6220 | | 7560 | | 8116 | | 8406 | | | 203 |
| | | | 55 | 0.82 | 24 | 6901 | | 8648 | | 9397 | | 9796 | | | 248 |
| | M31 | 6 | 50 | 0.24 | 19 | 5494 | | 6462 | | 6849 | | 7048 | | 2.8 | 190 |
| | | | 75 | 0.54 | 24 | 7171 | | 8938 | | 9690 | | 10089 | | | 285 |
| | | | 95 | 0.86 | 28 | 7994 | | 10349 | | 11396 | | 11965 | | | 361 |
| 6 | M13 | 4 | 12 | 0.26 | 16 | 2920 | 1.40 | 3377 | 5.50 | 3488 | 1.60 | 3544 | 2.80 | 6.1 | 85 |
| | | | 16 | 0.45 | 20 | 3665 | | 4338 | | 4517 | | 4608 | | | 114 |
| | | | 22 | 0.86 | 24 | 4521 | | 5546 | | 5855 | | 6013 | | | 156 |
| | M17 | 4 | 18 | 0.24 | 16 | 3342 | | 3920 | | 4069 | | 4144 | | 4.9 | 106 |
| | | | 26 | 0.5 | 21 | 4319 | | 5261 | | 5539 | | 5681 | | | 153 |
| | | | 32 | 0.76 | 24 | 5144 | | 6259 | | 6656 | | 6862 | | | 189 |
| | M23 | 6 | 35 | 0.23 | 16 | 4881 | | 5975 | | 6327 | | 6508 | | 3.5 | 158 |
| | | | 50 | 0.47 | 20 | 6647 | | 8220 | | 8880 | | 9225 | | | 225 |
| | | | 64 | 0.77 | 24 | 7595 | | 9784 | | 10745 | | 11263 | | | 288 |
| | M31 | 6 | 55 | 0.21 | 20 | 5704 | | 6930 | | 7379 | | 7612 | | 2.8 | 209 |
| | | | 82 | 0.46 | 25 | 7664 | | 9712 | | 10595 | | 11064 | | | 312 |
| | | | 105 | 0.75 | 28 | 8553 | | 11312 | | 12562 | | 13248 | | | 399 |

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 200-2018.
2. All performance data based on installation with matched Titus CT-580 Linear Bar Grille - contact the Titus Specialty Group for performance with other grilles.
3. $\Delta P_s$ values are measured in inches of water.
4. NC values are based on room absorption of 10 dB. A dash (-) indicates an NC value less than 15.
5. $\Delta P_{Coil}$ values are measured in feet of water. $\Delta P_{Coil}$ values in shaded cells indicate use of a two circuit coil. All other values represent a single circuit 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 heating 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 HEATING 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:

$\Delta P_S$ = 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]

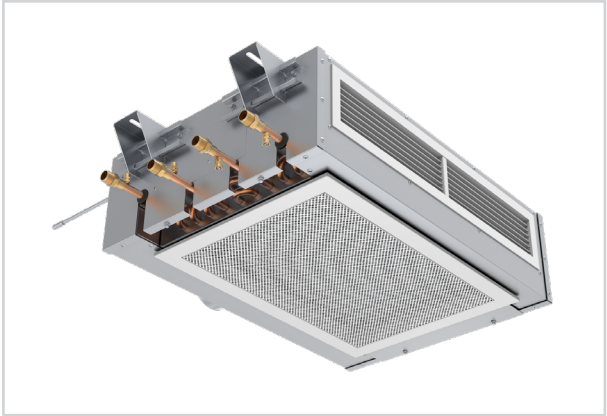
# Bulkhead Mounted Recessed Active Chilled Beams





## 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


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

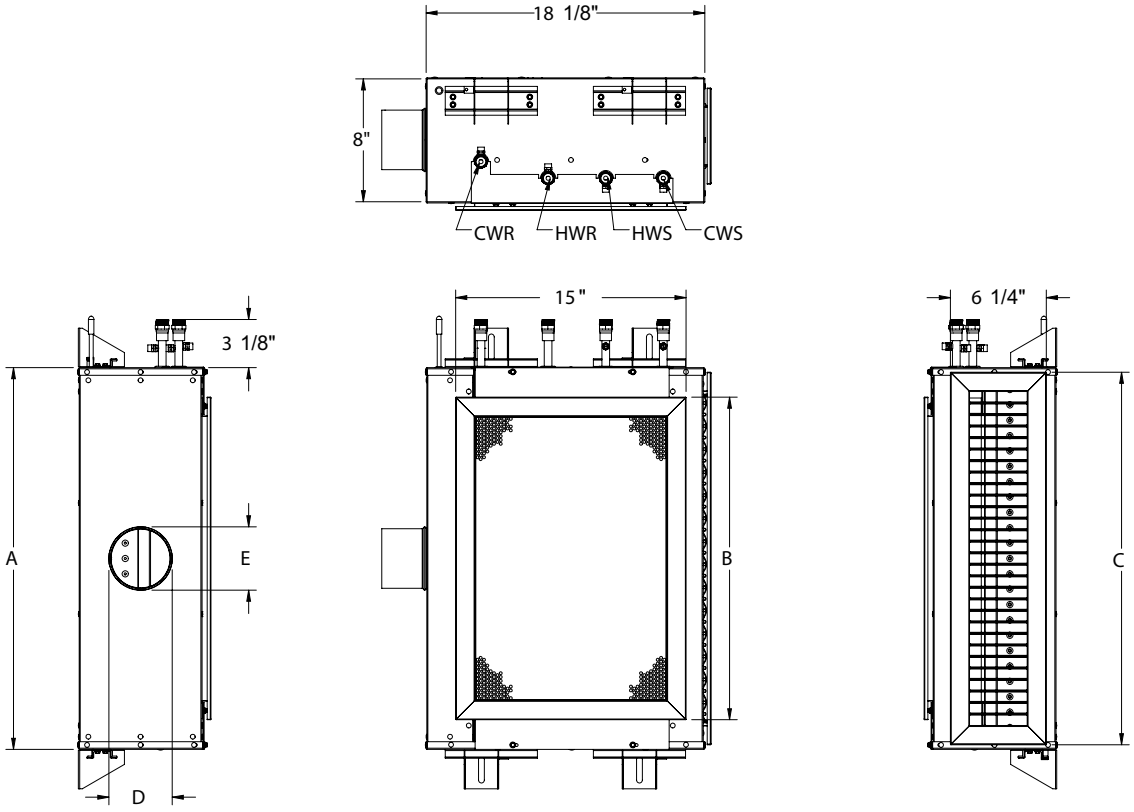
## CBAB STANDARD FEATURES

- 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 200-2018.
2. $\Delta P_s$ 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. $\Delta P_{Coil}$ values are measured in feet of water. $\Delta P_{Coil}$ 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:

$\Delta P_S$ = 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]

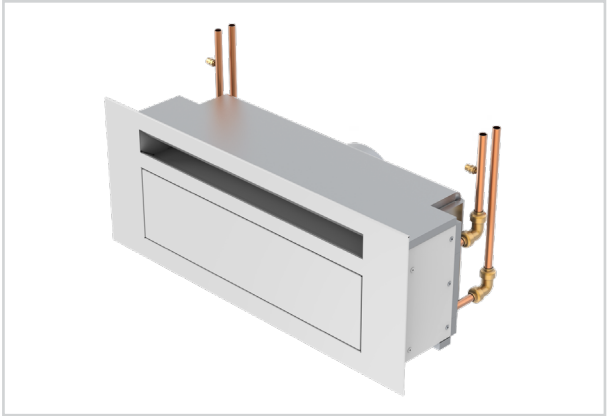
$q_{SENSPA}$ = Latent Capacity, Primary Air [Btu/h]

# 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


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

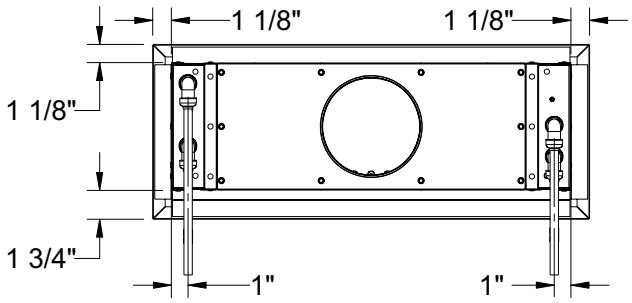
## OPTIONS AND ACCESSORIES

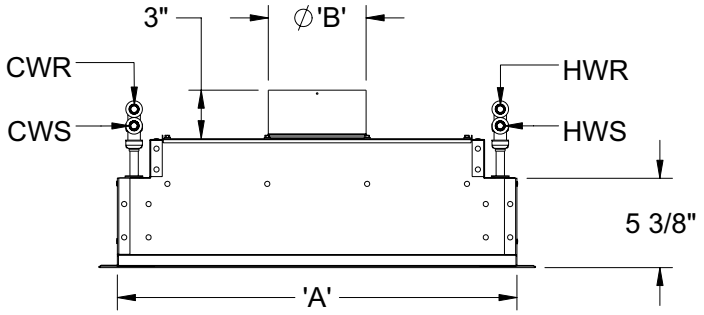
- Linear bar grille
- ½" thick foil-faced EcoShield, anti-microbial external insulation
- Coil drain valve
- ½" or ¾ MNPT water coil connections
- 12-inch, 18-inch or 24-inch stainless steel braided hoses
- Coil lint screen
- Constant volume regulator

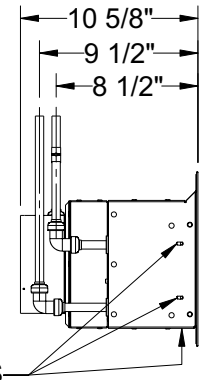
## CBAW UNIT DIMENSIONS

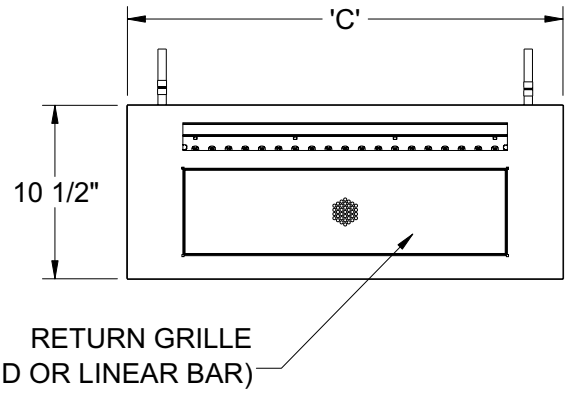
| Nominal Length | A | C |
|---|---|---|
| 2ft | 24 | 26⅛ |
| 3ft | 36 | 38⅛ |
| 4ft | 48 | 50⅛ |
| 5ft | 60 | 62⅛ |
| 6ft | 72 | 74⅛ |
| 7ft | 84 | 86⅛ |
| 8ft | 96 | 98⅛ |
| 9ft | 108 | 110⅛ |
| 10ft | 120 | 122⅛ |

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




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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 | M17 | 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 |
| | M23 | 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 |
| | M31 | 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 200-2018.
2. $\Delta P_s$ 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. $\Delta P_{Coil}$ values are measured in feet of water. $\Delta P_{Coil}$ 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:

$\Delta P_S$ = 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]

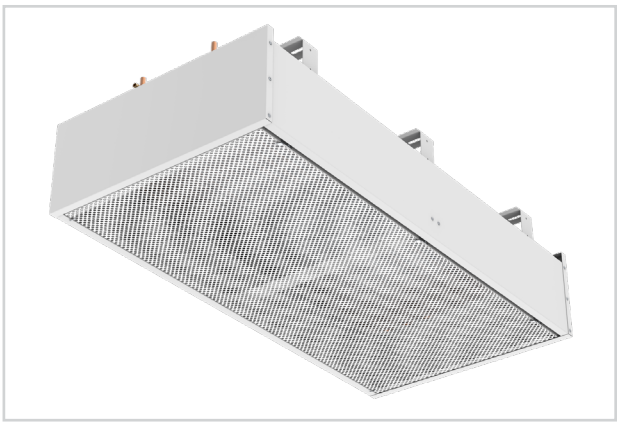
$T_{ROOM}$ = Temperature Room Air [°F]

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

# Linear Passive Chilled Beams

## CBPE

- 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



energy solutions | office spaces | universities | k-12 education

See website for Specifications

## MODELS:

CBPE / Exposed 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.

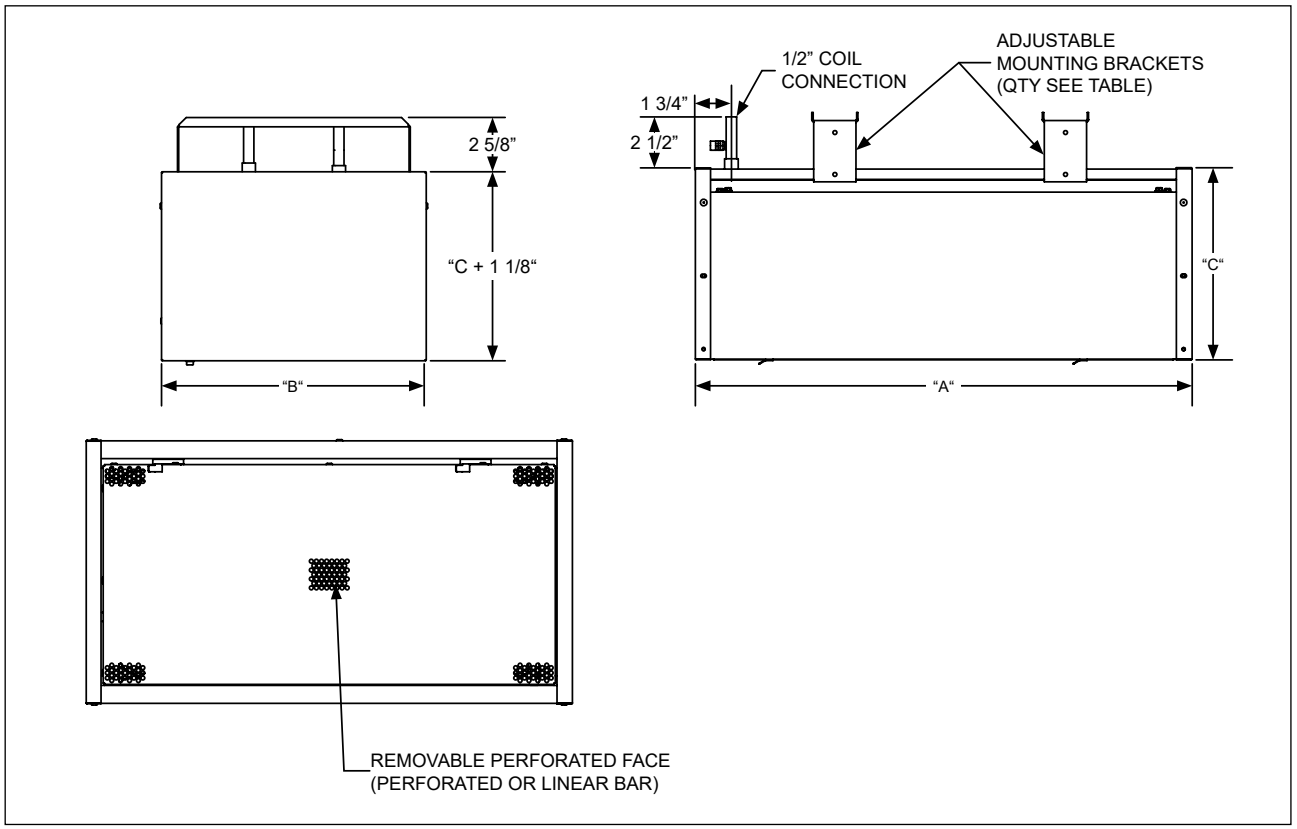
The airflow pattern generated from a passive beam is unidirectional with direct downward projection from the bottom of the beam. As the thermal buoyancy of the cool air drives the airflow down into space it will begin to mix with ambient room air and diffuse throughout the space. To maximize occupant 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.

## 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

## CBPE / CBPR SENSIBLE COOLING CAPACITY

| Chilled Water Flow Rate, GPM | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nominal Length | Nominal Width | 0.75 | | 1.0 | | 1.25 | | 1.5 | | 1.75 | | 2.00 | |
| | | $Q_{SENS}$ | $\Delta P_W$ | $Q_{SENS}$ | $\Delta P_W$ | $Q_{SENS}$ | $\Delta P_W$ | $Q_{SENS}$ | $\Delta P_W$ | $Q_{SENS}$ | $\Delta P_W$ | $Q_{SENS}$ | $\Delta P_W$ |
| 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 | 637 | 0.33 | 691 | 0.75 | 733 | 1.17 | 765 | 1.62 | 785 | 2.16 | 795 | 2.69 |
| | 18 | 859 | 0.46 | 932 | 1.06 | 989 | 1.64 | 1,032 | 2.26 | 1,060 | 3.02 | 1,073 | 3.77 |
| | 24 | 1,163 | 0.60 | 1,212 | 1.36 | 1,261 | 2.11 | 1,310 | 2.91 | 1,359 | 3.88 | 1,408 | 4.84 |
| 6 | 13 | 955 | 0.45 | 1,036 | 1.05 | 1,100 | 1.63 | 1,147 | 2.24 | 1,178 | 2.97 | 1,193 | 3.70 |
| | 18 | 1,289 | 0.63 | 1,398 | 1.46 | 1,484 | 2.28 | 1,548 | 3.13 | 1,590 | 4.16 | 1,610 | 5.18 |
| | 24 | 1,745 | 0.81 | 1,818 | 1.88 | 1,892 | 2.93 | 1,964 | 4.02 | 2,038 | 5.34 | 2,111 | 6.66 |
| 8 | 13 | 1,273 | 0.57 | 1,381 | 1.34 | 1,467 | 2.08 | 1,529 | 2.85 | 1,571 | 3.78 | 1,591 | 4.71 |
| | 18 | 1,719 | 0.79 | 1,864 | 1.87 | 1,979 | 2.91 | 2,064 | 4.00 | 2,120 | 5.30 | 2,147 | 6.59 |
| | 24 | 2,326 | 1.02 | 2,424 | 2.41 | 2,522 | 3.75 | 2,619 | 5.14 | 2,717 | 6.81 | 2,815 | 8.47 |
| 10 | 13 | 1,592 | 0.68 | 1,727 | 1.63 | 1,833 | 2.54 | 1,912 | 3.47 | 1,963 | 4.59 | 1,988 | 5.71 |
| | 18 | 2,148 | 0.96 | 2,330 | 2.28 | 2,473 | 3.55 | 2,580 | 4.86 | 2,650 | 6.43 | 2,683 | 8.00 |
| | 24 | 2,908 | 1.23 | 3,030 | 2.94 | 3,153 | 4.56 | 3,274 | 6.25 | 3,396 | 8.27 | 3,519 | 10.28 |

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. Free area for room air to enter ceiling cavity equal to free area of beam discharge into space.
4. 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]

$\Delta P_w$ - 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 |

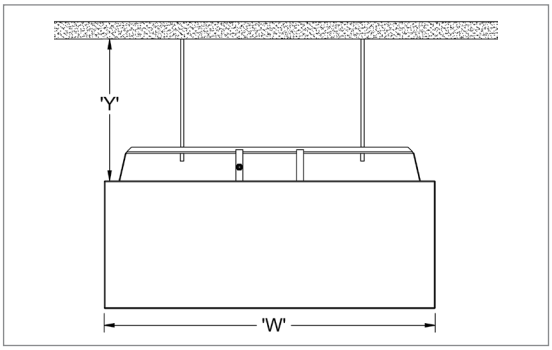



TABLE 3: CORRECTION FOR (ΔT) BETWEEN ENTERING AIR* AND ENTERING CHILLED WATER

| 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.

# Notes

# Icons

supplies both heating and cooling from one air device

dual-function

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

energy solutions

can be used in open ceiling environments

open ceiling

for use in retrofitting older products into modern designs & systems

retrofit

Can be used in office environments such as: open-plan workstations, private offices, meeting rooms, and collaborative spaces.

office spaces

ideally suited for occupant spaces on university and college campuses

universities

excellent air distribution device for schools and other educational facilities

k-12 education

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

healthcare

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

hotels / motels

can be used in laboratory environments such as: research labs, testing facilities, clean rooms, and controlled environments.

laboratories