

The background of the top half of the page is a photograph of a modern classroom or lecture hall. It features rows of grey chairs and long wooden tables. The ceiling is white with a grid of recessed circular lights. A green curved graphic element separates the top image from the title area.

CB-S24

2-Way Active Chilled Beam with Condensate Tray

CB-S24 OVERVIEW

The Carson Solutions 24 inch wide comes standard with a slanted dual hydronic heat exchanger, linear discharge slots, and condensate drip tray. The (CB-S24) active chilled beam is designed to provide high cooling and heating capacities by conditioning the room air while simultaneously supplying fresh conditioned, code required, primary air to the occupied area. Hydronic heating or cooling where the hydronic systems are integrated with the primary ventilation system. The central Air Handling Unit (AHU) or Dedicated Outdoor Air Supply (DOAS), supplies the chilled beam with tempered and dehumidified conditioned primary air to maintain the required ventilation and humidity control of the space while addressing the latent load. The remaining space sensible loads are addressed with the integrated hydronic heat exchanger inside the chilled beam housing. The use of linear induction nozzles within the chilled beam induces the room air through the beam's face grille, then across a slanted dual hydronic heat exchanger which spans the full length of the beam housing. This unique design allows for a condensate drip tray to be mounted under the slanted dual hydronic heat exchanger for added protection when space humidity levels exceed control limits. Optional factory mounted condensate float switch can be installed for additional protection.

CB-S24 OVERVIEW (CONTINUED)

The central-station Air Handling Unit (AHU) or Dedicated Outdoor Air Supply (DOAS), supplies the chilled beam with dehumidified conditioned primary air, providing the required ventilation and humidity control of the space loads. The space sensible loads are addressed with the integrated hydronic heat exchanger inside the chilled beam housing. As the primary outside air (OA) pressurizes the plenum of the IDU, the air is forced out a series of induction nozzles. As the primary air exits the nozzles, that process creates a low-pressure area directly behind the hydronic coil, thereby pulling in (inducing) room air through the coil. As the room air passes through the coil, hot or chilled water flow supplementally heats or cools the room air prior to mixing with the OA to satisfy space setpoints.

The induced room air and the required primary OA mix, and then those combined airstreams are delivered into the occupied zone. This process increases efficiency which maximizes cooling and heating capacity per beam of the mixed air flow streams to deliver premium performance and thermal comfort. The air delivery process from the chilled beam has inherent characteristics related to temperature, velocity, and airflow throw to comfortably satisfy occupants. Chilled beams airflow throw characteristics relates to the velocity and temperature differentials that diminish at a rate that is directly proportional to the distance the air has traveled within the space. It is important to understand the room and occupant load and the space layout to properly layout desired chilled beams.



CB-S24 OVERVIEW (CONTINUED)

Chilled beam technology has been proven to reduce energy consumption and operating cost associated with removal of space sensible thermal loads while simultaneously supplying fresh conditioned air to the occupied area to maintain the proper indoor air quality (IAQ). By handling the sensible load within the space, chilled beam technology provides a way to decrease the volume of supply air required to the minimum ventilation rate. Further cost savings are recognized due to the reduction in the size and capacity of the AHU or DOAS equipment and other construction materials. Installation and equipment costs are also commonly reduced in chilled beam applications due to reduced code required primary air volume needed to operate each chilled beam. Reduced volume of primary air allows for smaller duct work sizing and the addition of the chilled beam low profile design makes it an ideal application solution for buildings with low ceiling heights. Utilizing chilled beams with a constant volume (DOAS) unit that delivers required minimum ventilation rate airflow may decrease the overall amount of outdoor air being supplied which decreases the energy output required to treat that air. Applications with low latent cooling loads could use 100% outdoor air allowing for use of a DOAS with energy recovery further reducing total system energy consumption.

CB-S24 INDOOR AIR QUALITY & SYSTEM EFFICIENCY

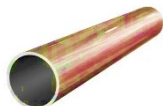
Chilled Beam Benefits:

- ❖ Acoustics
- ❖ Thermal Comfort
- ❖ Maintenance
- ❖ Indoor Air Quality (IAQ)
- ❖ Improved Energy Efficiency

Increased awareness of IAQ is prevalent with how it directly affects the presence of airborne contaminants. ASHRAE 62.1 outlines the industry standards for ventilation and acceptable indoor air quality. By applying a DOAS based air handler, the design team can ensure a quantifiable amount of OA is delivered to the occupied spaces. Then utilizing induction units, the code prescribed OA can be distributed to the spaces for proper fresh air ventilation.

Additionally, increased system efficiencies can be recognized by the integration of this DOAS-chilled beam system approach. Proper sizing of the DOAS unit to handle the latent loads of the ventilation air and the occupants, truly decouples the moisture loads from the temperature or sensible loads of the space, thereby making the system more efficient, as the chilled beams only need to be sized for the sensible load.

The predominant efficiencies of a chilled beam system reside in the fact that beams are a hydronic method of treating the space versus an “all-air” method. Water is denser and a more efficient medium than air for addressing space loads.



1" Diameter Water Pipe



18"x18" Air Duct

CB-S24 INDOOR AIR QUALITY & SYSTEM EFFICIENCY (CONTINUED)

Additionally, the energy required to move water via pump energy is more efficient than fan power to move air, up to seven times more efficient.

National and local energy codes are ever evolving and placing more stringent requirements for higher operating efficiencies. ASHRAE 90.1 outlines the energy standard for most commercial building types and local codes should be reviewed carefully. The integration of DOAS-chilled beam into designs can help Engineers deliver proven efficiencies and reduced utility bills for the Owners.

CB-S24 DECARBONIZATION/ ELECTRIFICATION

An increasing trend in HVAC mechanical designs is the national and local presence of decarbonization or electrification into component selection. By selecting an appropriately designed DOAS unit together with a geothermal or electric based hydronic cooling and heating plant, the designers can check the electrification box for their needs. When using the chilled beam as a terminal device, it is a perfect complement to this electrified system design.



CB-S24 THERMAL COMFORT

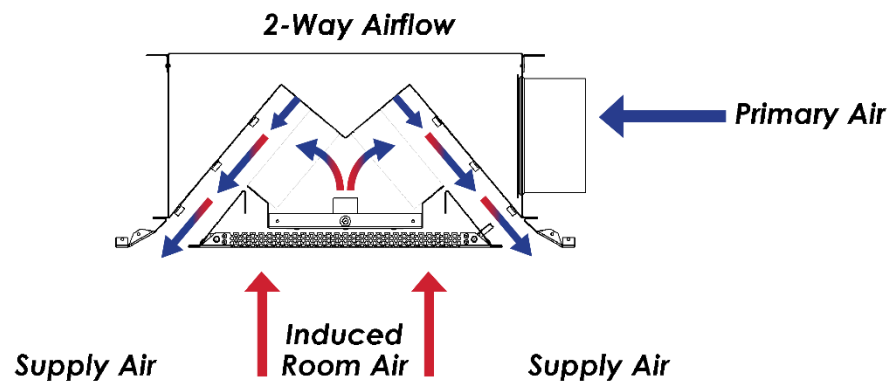
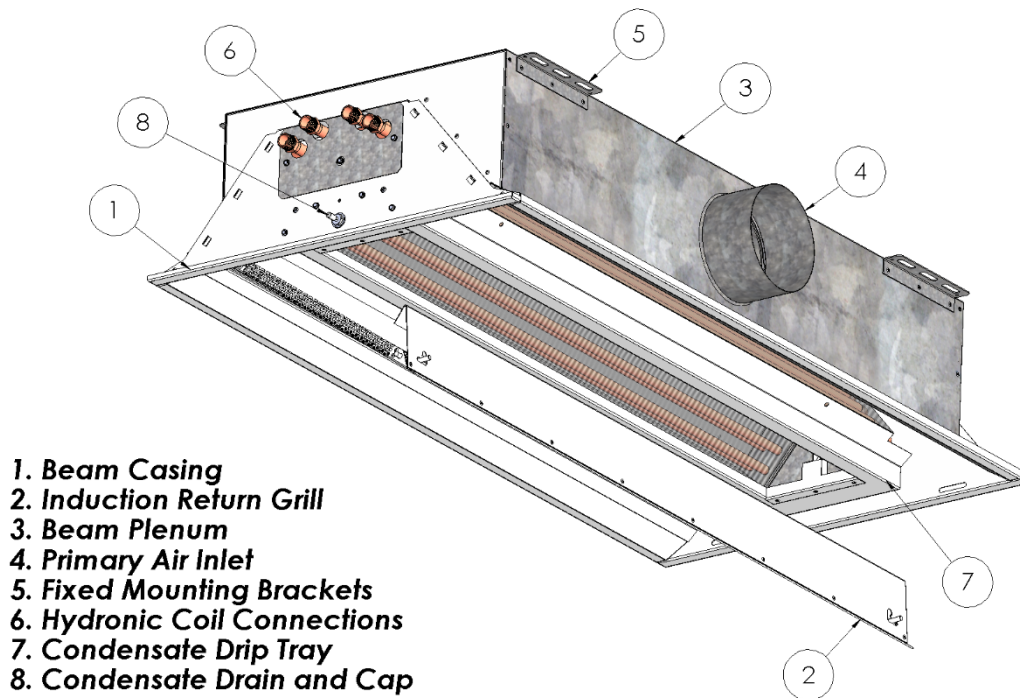
With the Carson Solutions (CB-S24) chilled beam offering, occupants will notice within a space that is conditioned with chilled beams an overall increase in thermal comfort beyond that which is achievable through traditional systems. This is due to the chilled beam's inherent design characteristics which results in decrease sound, draft conditions, and temperature irregularities. Chilled beams are typically operated with sound levels near 20 NC which is lower when compared to traditional overhead air distribution systems which can produce sound levels in the range of NC 35-40. Chilled beams deliver air at lower velocity than standard overhead systems which reduces cold/hot draft conditions. This also results in efficient and effective mixing of room air and required primary OA which creates comfortable and consistent room temperatures. Temperature control of each space is delivered by its own dedicated room thermostat. Occupant comfort should be a primary concern when evaluating airflow and air distribution requirements similar to traditional overhead air distribution systems. The guidelines in the ASHRAE Standard 55 must be followed as it relates to temperatures and velocities within the occupied zone that have a direct impact on occupant comfort.



CB-S24 DESIGN FEATURES

The Carson Solutions (CB-S24) is supplied with a 2-way air throw pattern to provide optimal thermal comfort. The (CB-S24) construction is made using the latest state of the art CNC laser, punching, and forming manufacturing technologies to ensure the highest level of precision throughout the manufacturing process. Currently available are two types of heat exchange coils, a two-pipe system for cooling or heating using a changeover valve and a four-pipe system which enables any room to be cooled or heated independently. Both two and four-piped coils are manufactured as a single circuit arrangement. The (CB-S24) chilled beam can also be selected with four nozzle configurations depending on induction ratios needed to meet space load requirements. Four variable inlet sizes are selectable based upon optional chilled beam lengths from 2-8ft in 1ft increments. Integration into grid style suspended ceiling systems can easily be accommodated with our three boarder style options along with an exposed mounting beam for open room or hallway areas. Condensate drip trays come with welded internal corners and powdercoated and mounted behind the perforated grille face. The condensate drip trays come standard with a ¼" drain connection and is capped from the factory. Optional factory mounted condensate float switch can be installed for additional protection. Water entering the heat exchange coils should be maintained at or above the dew point temperature of the space to mitigate condensation formation. The condensation drip trays should be viewed as safety feature for when conditions fall outside of the design parameters.

CB-S24 KEY FEATURES



CB-S24 PERFORMANCE CHARACTERISTICS

Due to the energy density of water compared to air, on average it takes about 1/10 the energy to move the same amount of thermal energy with hydronic transfer than it does with air transfer through ductwork. Chilled beams achieve a higher level of mixed air distribution within a space. Additionally, when the primary air is kept to a minimum chilled beams offer quiet operation and a higher level of occupant thermal comfort. Primary airflow supply ranges from 45-360 cfm/ft. in which delivers 300-1,500 btuh/ft. of chilled beam total sensible capacity. Resulting sound levels are determined based upon the selected induction ratio and the beam's available primary air inlet sizes in order to deliver low NC acoustic levels. Although uncommon, concerns about the potential for condensation, it is common for the designer to explore using a condensate sensor as a safety feature in the event the moisture load is too great.

Performance Range	Total Sensible Cooling (Btu/h/ft)	Total Sensible Heating (Btu/h/ft)	Sound Pressure Level NC
CB-S24 2-Way Discharge	300 - 1,500	500 – 1,300	15-40

Design Features	Standard Capacity (2-Way Discharge)
Primary Airflow	5 to 45 cfm/ft
Cooling Capacity	Up to 12,000 Btu/h
Heating Capacity	Up to 10,000 Btu/h
Cooling Room Air Temp	73° - 77°F
Heating Room Air Temp	68° - 72°F
Primary Supply Air Temp	55° - 66°F
EWT Cooling	1-2°F Over Space Dew Point
EWT Heating	140 – 200°F
Water ΔT Cooling	2 – 6°F
Water ΔT Heating	9 – 18°F
Water Flow Rate	min: 0.25 gpm max: 1.5 gpm
Water ΔP	0 – 10 ft
Air ΔP	0.2 – 0.8 in



CB-S24 APPLICATIONS

The Carson Solutions (CB-S24) is a suitable terminal device solution in a wide variety of applications such as: office buildings, K-12 and Higher Education environments, and varying laboratory spaces. Office building applications are typically installed in open office areas, private offices, conference rooms, hallways which can be utilized in both interior and perimeter zones. For schools and universities, active chilled beams can be applied in multiple spaces including libraries, classrooms, offices, lecture halls, and labs. In lab spaces applications, beams are typically applied in load driven environments. Healthcare facilities commonly apply chilled beams in patient rooms and administrative areas.

CB-S24 OPERATION AND MAINTENANCE

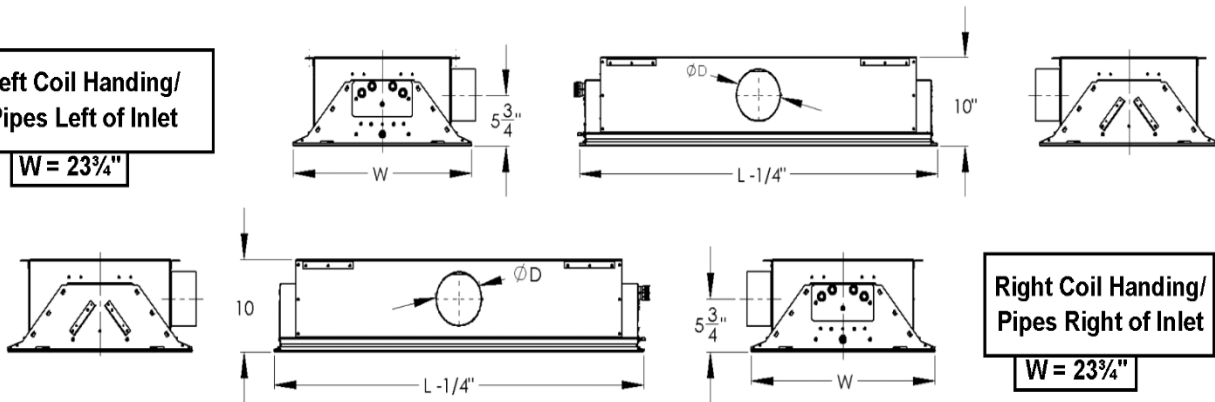
The Carson Solutions chilled beam operation and maintenance is minimal because the supply air is supplied by fans upstream thereby eliminating the need for any electrical connections for each chilled beam. Within the chilled beam there are no moving parts that need to be maintained, reducing the need for replacement parts. Typically, all the maintenance required for the beam itself is "as needed (typically once a year)" vacuuming of the coil, which can be accessed through the ceiling cavity. This also helps keep the service costs to a minimum because all the air filtration occurs upstream within the DOAS unit rather than having to replace individual filters for each chilled beam. Proper water treatment should be addressed to prevent corrosion within the hydronic water coil. The chilled beam hydronic coil can be drained with the supplied drain valve in case of an issue within the space. If needed, the condensation drip tray can be flushed to remove debris.

DIMENSIONAL DATA

Side Inlet - Coil Mount Handings

Left Coil Handling/
Pipes Left of Inlet

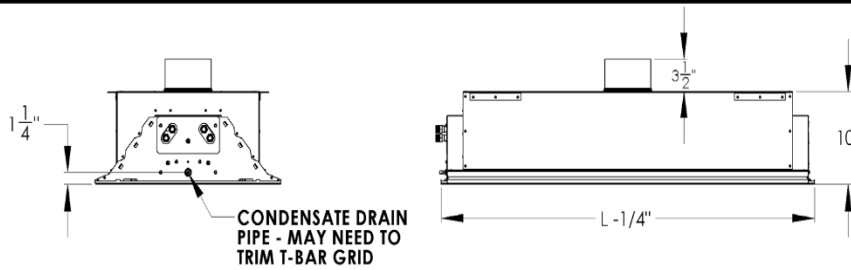
$$W = 23\frac{3}{4}"$$



Right Coil Handling/
Pipes Right of Inlet

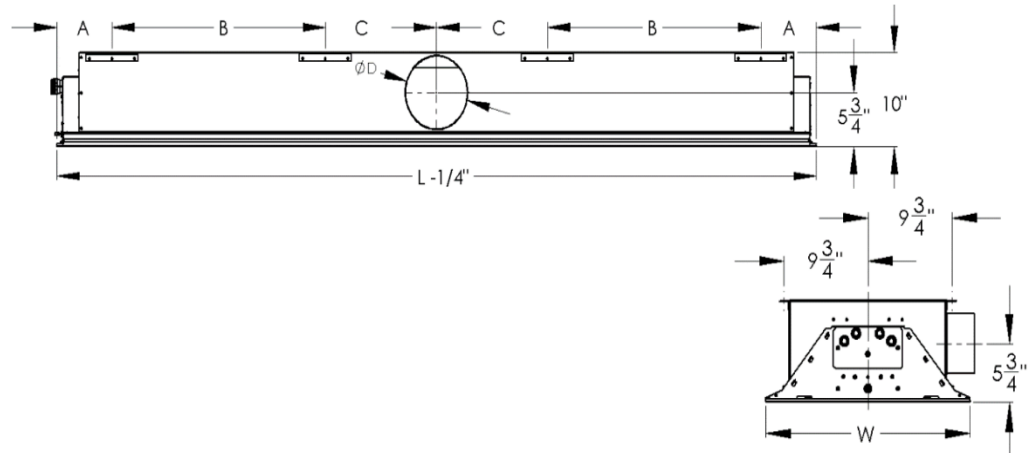
$$W = 23\frac{3}{4}"$$

Top Inlet Casing is Universal



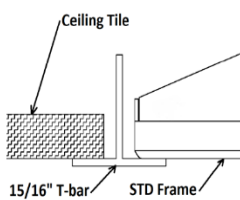
Fixed Bracket Mounting Locations

Beam Length	A (in)	B (in)	C (in)
2'	7	-	-
3'			
4'			
5'			
6'			
7'		18 7/8	10
8'		22 7/8	12
		26 7/8	14

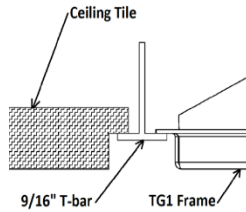


Ceiling Grid T-Bar Border Style Options

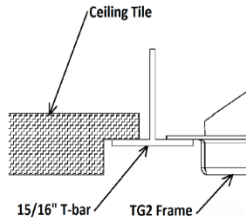
Standard (STD)



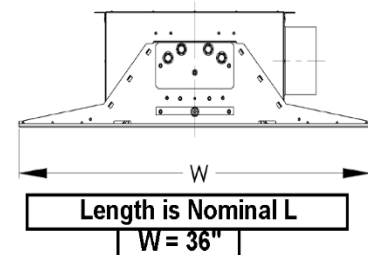
9/16" Tegular (TG1)



15/16" Tegular (TG2)



Exposed Mount Border



CB-S24 STANDARD SPEC FEATURES

- 2-way air distribution pattern
- 24" width
- 2' to 8' lengths, 1' increments
- Perforated induction air grille
- Left hand or right hand coil connections
- Side or top air inlet locations
- AHRI Standard 410 certified hydronic coil
- 2-pipe and 4-pipe coil configurations
- ½" MNPT water coil connections
- Coil drain valves
- Condensate drip trays with a capped ¼" drain connection
- Optional factory mounted condensate float switch
- Four types of induction ratio nozzles
- Commissioning port with room-side balancing
- Fixed heavy gauge mounting brackets
- 20GA Galv plenum construction sealed for protection against air leakage
- 20GA CRS casing construction
- Lay-in, tegular tee and exposed mounted border styles
- Reversible swing down hinged induced air grille
- Durable textured powder coat finish RAL9010 or RAL9016, custom colors available

OPTIONS AND ACCESSORIES

- ⅛" or ½" thick Armacell external insulation
- ½" sweet coil connections
- 12-inch, 18-inch, or 24-inch stainless steel braided hoses

CB-S24 NOMENCLATURE

