



CB-SH

Horizontal Discharge Soffit Mounted Active Chilled Beam

CB-SH OVERVIEW

The Carson Solutions (CB-SH) horizontal discharge soffit/ ceiling mounted active chilled beam comes standard with a horizontally mounted hydronic heat exchanger and linear discharge slot. The (CB-SH) active chilled beam can be installed recessed in the ceiling, above in the soffit. The (CB-SH) configuration offers a modernized look and feel as compared to more traditional overhead chilled beams. This modern, alternative look is accomplished by utilizing linear bar grilles or linear diffusers (supplied and installed by others) to deliver the architectural integrated look within the overhead soffit. The (CB-SH) is offered in two size configurations to accommodate buildings design constraints. The CB-SH-12 is a shorter /wider model, and the CB-SH-17 is a taller /narrower model. Both (CB-SH) models are engineered to provide high cooling and heating capacities by conditioning the room air while simultaneously supplying fresh conditioned, code required, outside (primary) air to the occupied areas.

CB-SH 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 chilled beam, 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-SH 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 by 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 the 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-SH INDOOR AIR QUALITY & SYSTEM EFFICIENCY

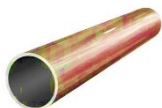
Chilled Beam Benefits:

- ❖ 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 the chilled beam 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 room's space versus an "all-air" method. Compared to air, water is denser and a more efficient medium for addressing space loads.



1" Diameter Water Pipe



18"x18" Air Duct

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

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

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 beams into designs can help engineers deliver proven efficiencies and reduce utility bills for the owners.

CB-SH 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-SH THERMAL COMFORT

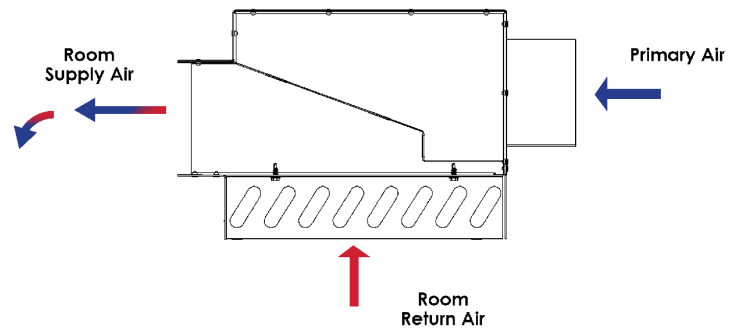
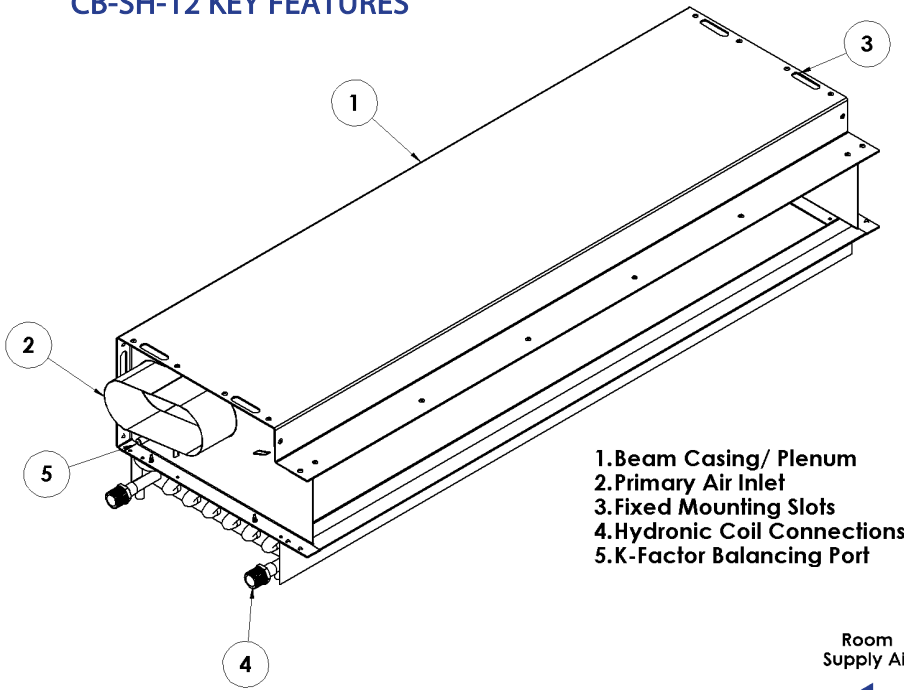
With the Carson Solutions (CB-SH) chilled beam offering, occupants will notice an overall increase in thermal comfort in comparison to other traditional HVAC systems. This is due to the chilled beam's inherent design characteristics which results in decreasing sound, draft conditions, and temperature irregularities. Chilled beams are typically operated with sound levels near 20 NC which is lower than a traditional overhead air distribution system 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 a traditional overhead air distribution system. The guidelines in 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.



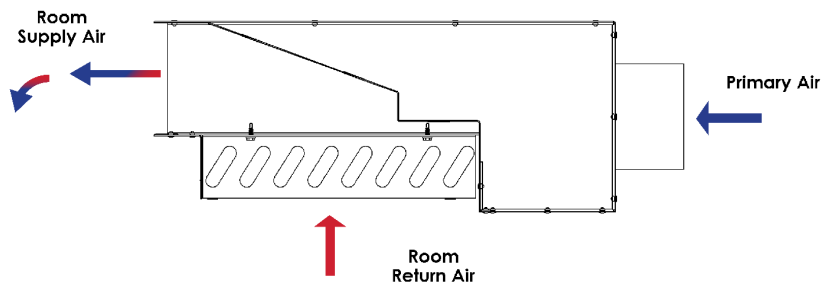
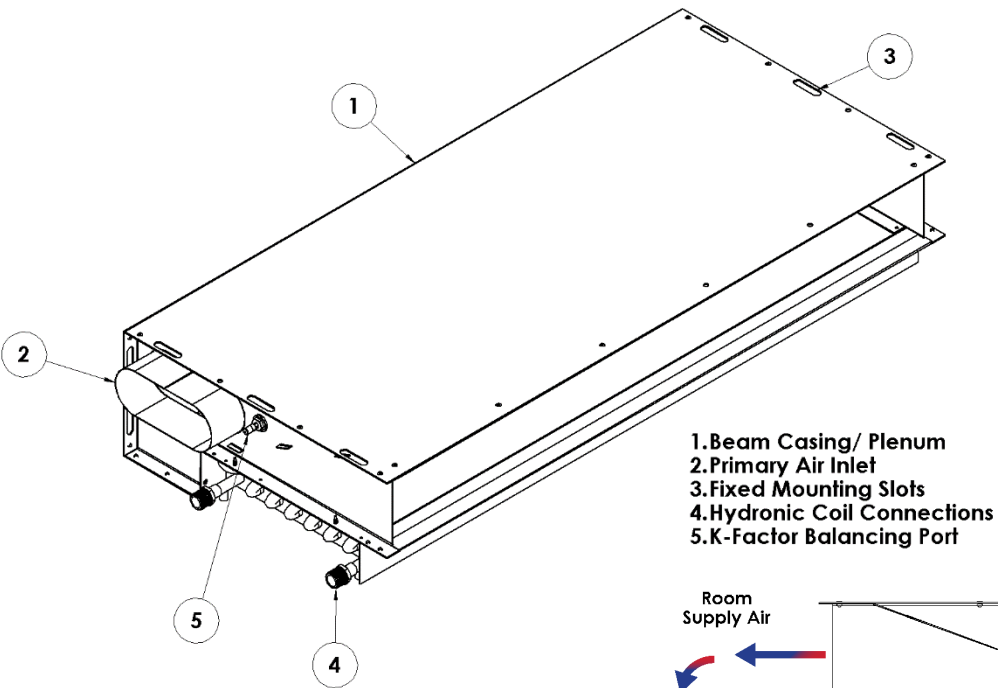
CB-SH DESIGN FEATURES

The Carson Solutions (CB-SH) is supplied with a horizontal discharge air throw pattern to provide optimal thermal comfort. The (CB-SH) galvanized plenum 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 or dual circuit arrangement. The (CB-SH) chilled beam can also be selected with four nozzle configurations depending on induction ratios needed to meet space load requirements. Three variable inlet sizes are selectable based upon optional chilled beam lengths from 2-6ft at 1ft increments. Water entering the heat exchange coils should be maintained at or above the dew point temperature of the space to mitigate condensation formation.

CB-SH-12 KEY FEATURES



CB-SH-17 KEY FEATURES



CB-SH 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 the room space. Additionally, when the primary air is kept to a minimum, chilled beams inherit designs offer quiet operation and a higher level of occupant thermal comfort. Primary airflow supply ranges from 10-25 cfm/lft. that delivers 400-1,300 btuh/lft. of chilled beam total sensible capacity. The resulting sound levels are determined based upon the selected induction ratio and the beam's available primary air inlet sizes 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/f)	Total Sensible Heating (Btu/h/f)	Sound Pressure Level NC
CB-SH Horizontal Discharge	400 - 1,200	500 – 1,300	15-40

Design Features	Standard Capacity (Horizontal Discharge)
Primary Airflow	10 to 25 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: 2.4 gpm
Water ΔP	0 – 10 ft
Air ΔP	0.2 – 0.8 in



CB-SH APPLICATIONS

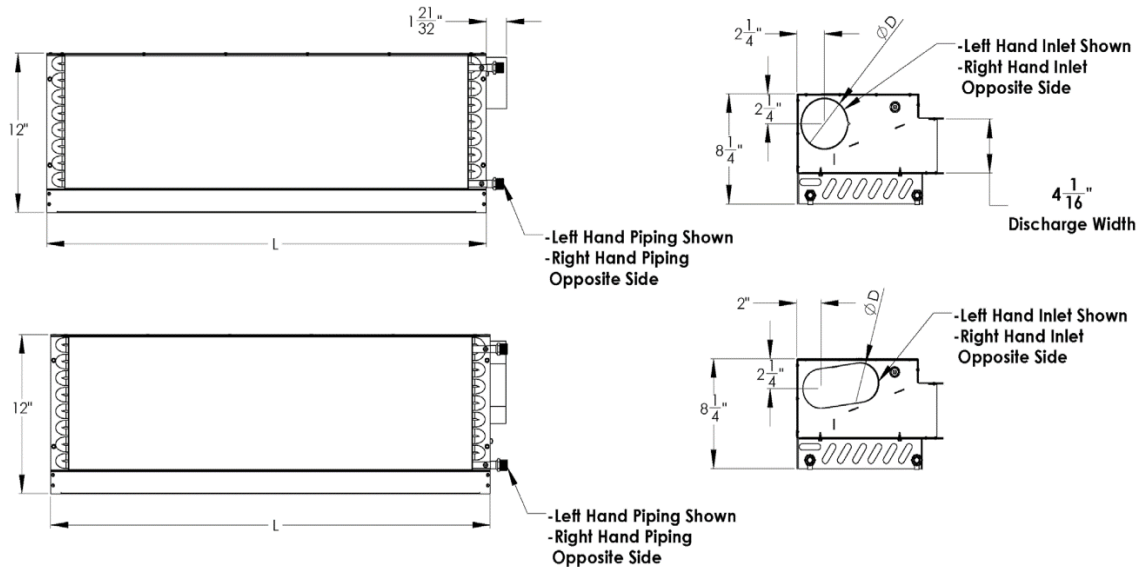
The Carson Solutions (CB-SH) is a suitable terminal device solution in a wide variety of applications such as: office buildings, K-12 and Higher Education environments, and varying laboratory spaces. Office building applications are typically installed in open office areas, private offices, conference rooms and 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 laboratory applications, beams are typically applied in load driven environments. Healthcare facilities commonly apply chilled beams in patient rooms and administrative areas.

CB-SH 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.

CB-SH-12 DIMENSIONAL DATA

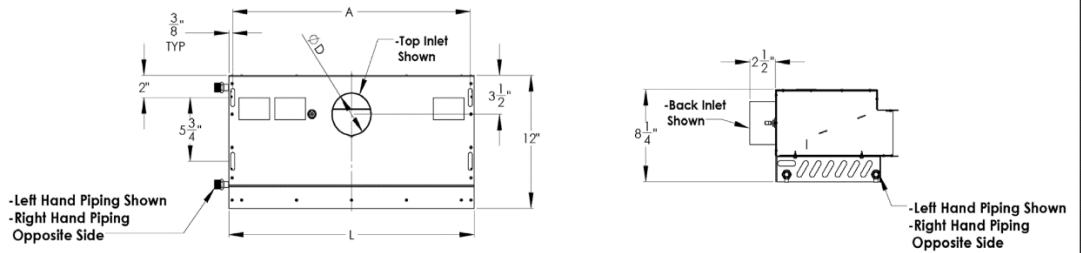
Side Inlet Locations



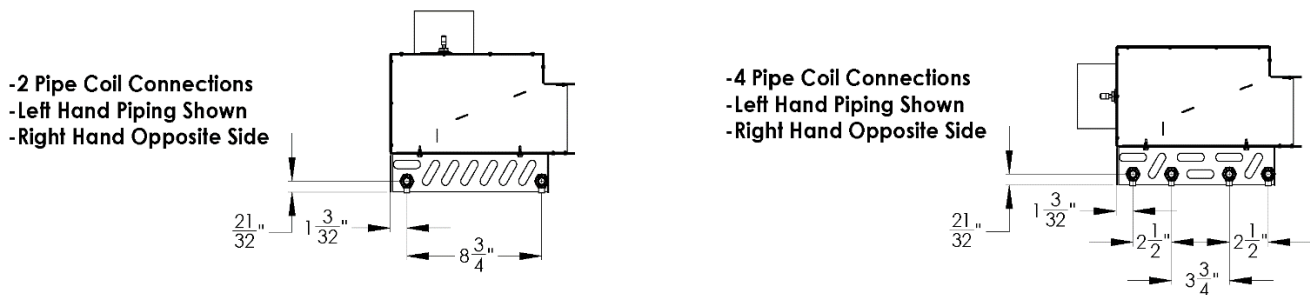
Back and Top Inlets and Fixed Bracket Mounting Locations

Beam Length	L (in)	A (in)
2'	24	23 1/4
3'	36	35 1/4
4'	48	47 1/4
5'	60	59 1/4
6'	72	71 1/4

Inlet	D (in)
3"	2 3/4
4"	3 3/4
5" Oval	2 1/2 x 6 1/4

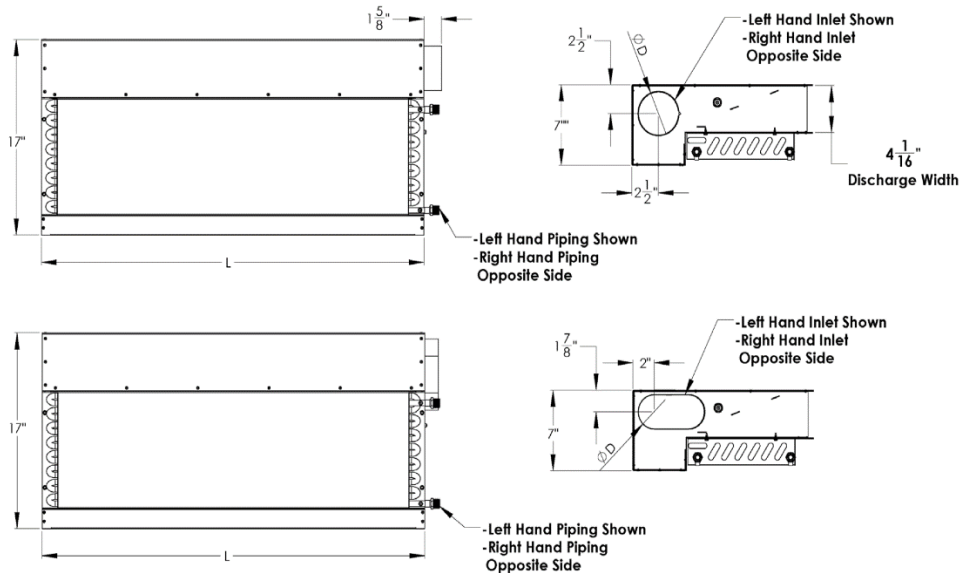


Piping Configurations



CB-SH-17 DIMENSIONAL DATA

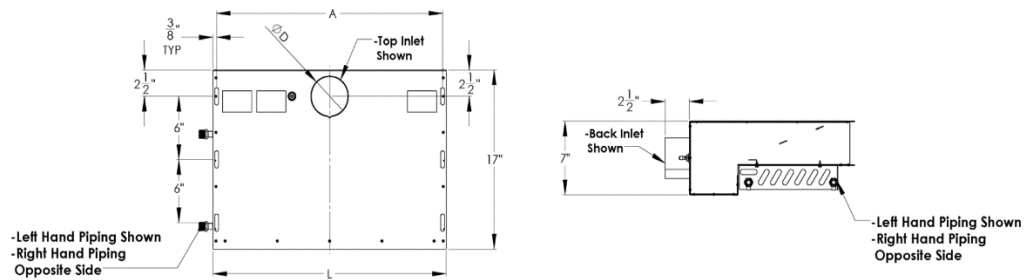
Side Inlet Locations



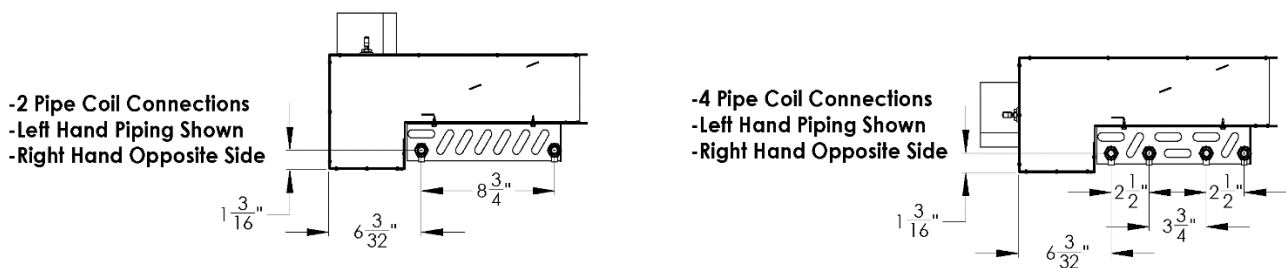
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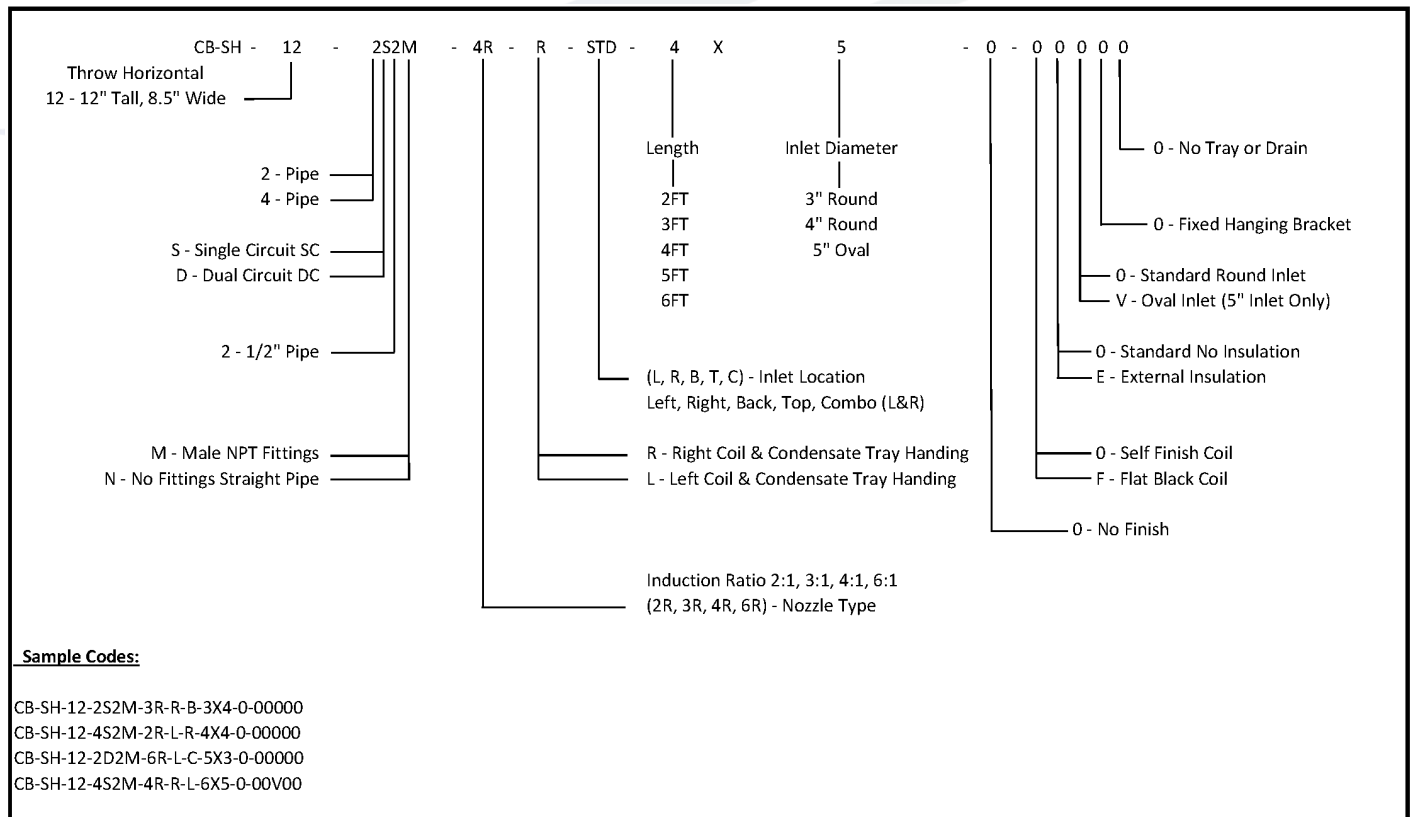
CB-SH STANDARD SPEC FEATURES

- Horizontal air distribution
- 8.5" or 7" heights
- 12" or 17" widths
- 2' – 6' lengths, 1' increments
- Left hand or right hand coil connections
- Side, front, back, and 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
- Four types of induction ratio nozzles
- Commissioning port for balancing
- Fixed slotted mounting locations
- 20GA Galv plenum construction sealed for protection against air leakage

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-SH-12 NOMENCLATURE



CB-SH-17 NOMENCLATURE

