



Turn to the experts

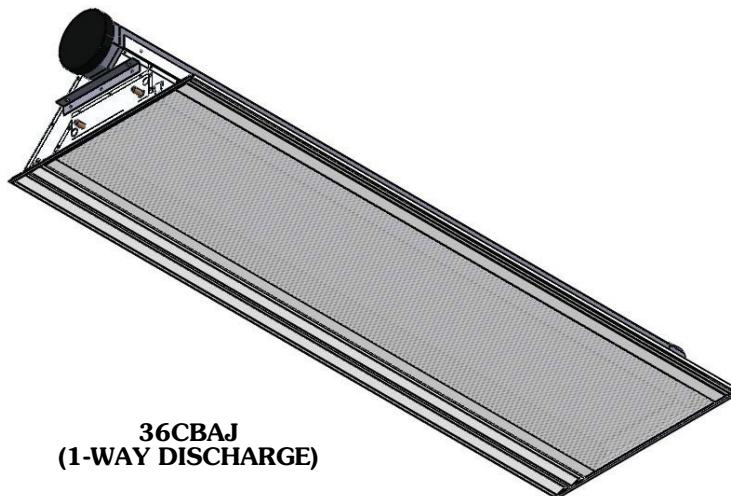
Product Data

36CBAL,CBAJ Series Active Chilled Beams

8 to 180 cfm



**36CBAL
(2-WAY DISCHARGE)**



**36CBAJ
(1-WAY DISCHARGE)**

Features/ Benefits



Chilled beam systems are suitable for use in sensible cooling load applications where individual temperature control is required.

Active chilled beam units offer:

- Precise control of ventilation airflow
- Sensible cooling and heating options

Active chilled beam systems

An active chilled beam takes a source of primary air at an inlet static pressure ranging from 0.2 to 0.8 in. wg. It distributes this air through a bank of specially designed aerodynamic nozzles and discharges the air at a high velocity into a mixing chamber. This creates a differential pressure which enables a draw of room air across a coil, imparting either cooling or heating to the air as it passes over the coil. The primary air and induced air are mixed and discharged through a grille in a Coanda effect air distribution at the ceiling.

This air circulates throughout the room and is gently drawn back up through the return section of the chilled beam grille. Because the return air to the terminal is located at the ceiling and is moving so gently, dirt is not carried

along with it and filters are not required to protect the coils. This eliminates the cost and labor required for this routine maintenance.

Active chilled beams are flexible and enhance the savings and effectiveness of primary air systems such as those using dedicated outside air. When using our chilled beams, the primary air system, which includes the dedicated outside air unit and the supply and exhaust ductwork, can be sized to handle only the required ventilation air. This reduces the size of the equipment and ducting making it easier to fit into a building space. The energy required to supply the ventilation to the building is also reduced. The total room air circulation is created solely by the induction principle within the terminal; therefore, there is no electric motor requiring an electric power source or maintenance for a fan motor. As a result, the chilled beam is a very quiet and efficient way to provide comfort in a space.

36CB Series chilled beams

The models 36CBAL (2-way) and 36CBAJ (1-way) are ceiling mounted chilled beams that have a linear dimension. The units are available in 2 x 2 ft, 2 x 4 ft and 2 x 6 ft with linear return

air grille and slot opening on the supply air side. This model is a perfect fit for office space, labs and dormitories.

These units are designed to handle the sensible cooling loads of a space, and do not include drain pans, eliminating the need for condensate piping throughout the building.

The return air chamber is aerodynamically designed and insulated with an acoustic quality foam for low noise operation.

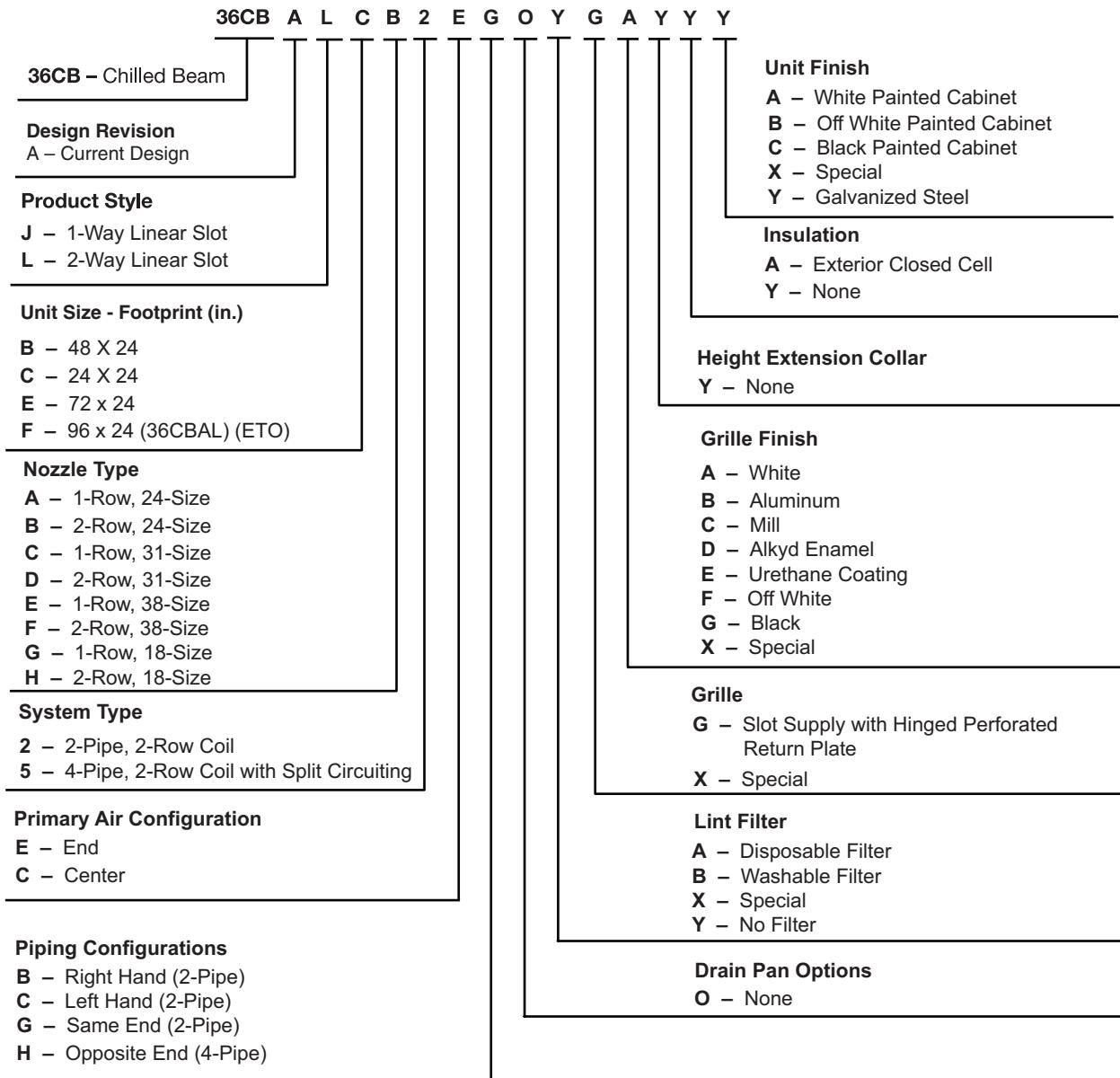
Pressure taps are included on the primary air chamber for ease of balancing the ventilation airflow to the beams.

Mounting brackets are included with all beams for use with wire hanging systems, increasing the speed and ease of installation.

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Model number nomenclature



Physical data

36CBAL, CBAJ UNIT PHYSICAL DATA

36CBAL,J UNIT SIZE	02	04	06
Beam Length (ft)	2	4	6
Beam Width (ft)		2	
Coil Connection Size (in.)		1/2	
Dry Weight (lb)	40	58	76
Wet Weight (lb)	56	74	92

NOTE: 36BAL,J unit size 02 = Size C in Model Number Nomenclature.
 36BAL,J unit size 04 = Size B in Model Number Nomenclature.
 36BAL,J unit size 06 = Size E in Model Number Nomenclature.

Factory-installed options



Factory-installed options

Induction nozzles are available in various sizes to match capacity requirements.

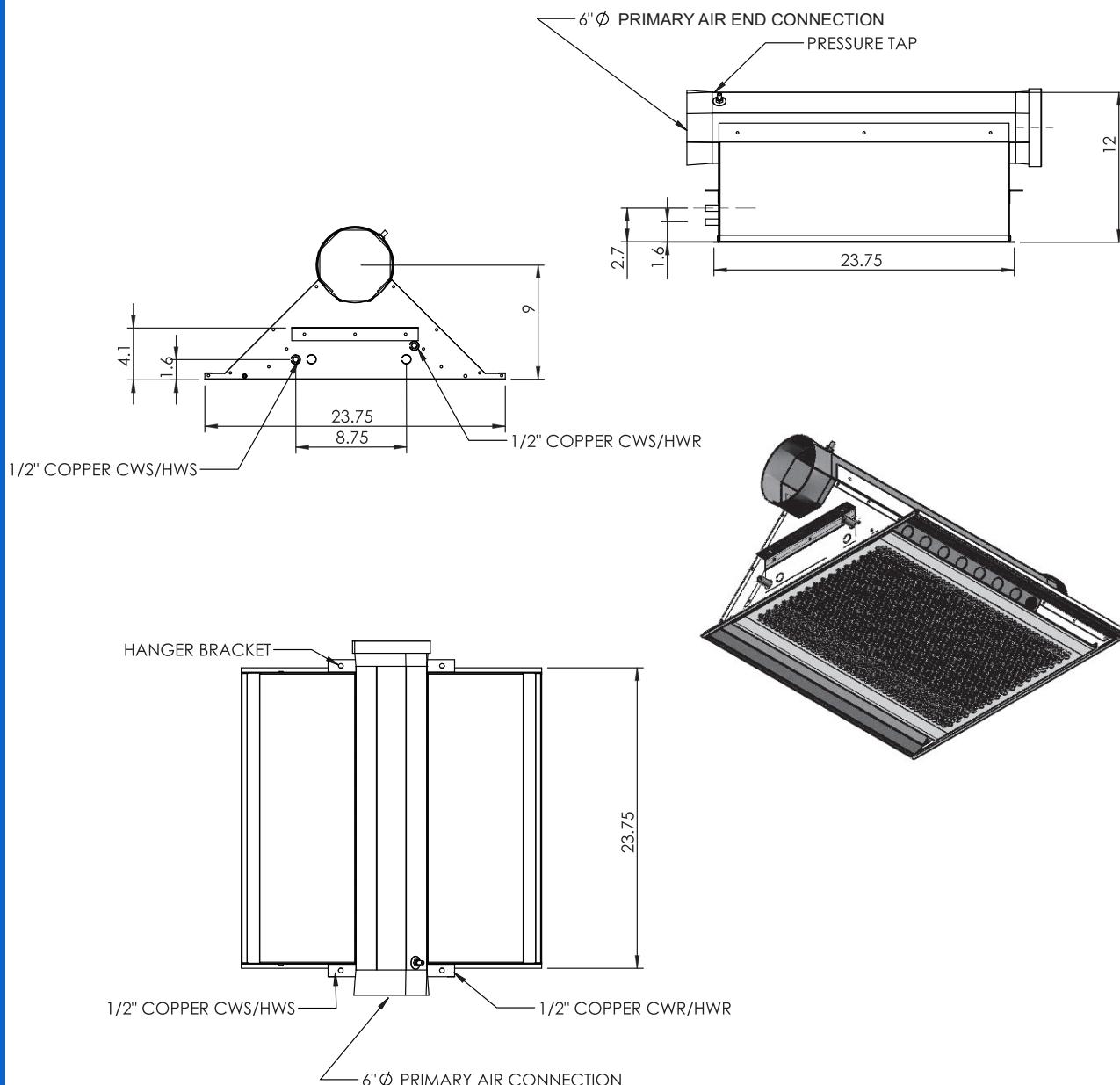
Coils are available in 2-pipe or 4-pipe configurations.

Grilles are available in various colors with perforated return and slot supply. The grille is hinged with easy access latches. Face and trim of the grille are painted standard white color.

Optional insulation on the unit exterior (including the primary air tube) is recommended when the primary air temperature supplied to the unit is below 55°F. The optional insulation used is Armacell Model AP sheet insulation. Insulation shall be $\frac{1}{4}$ in. thick to prevent beam cabinet from sweating.

Optional filters are available, including $\frac{1}{2}$ in. cleanable wire mesh lint screens or $\frac{1}{2}$ in. fiberglass disposable panel filters.

36CBAL, 2-PIPE, SIZE 02 UNIT DIMENSIONS



LEGEND

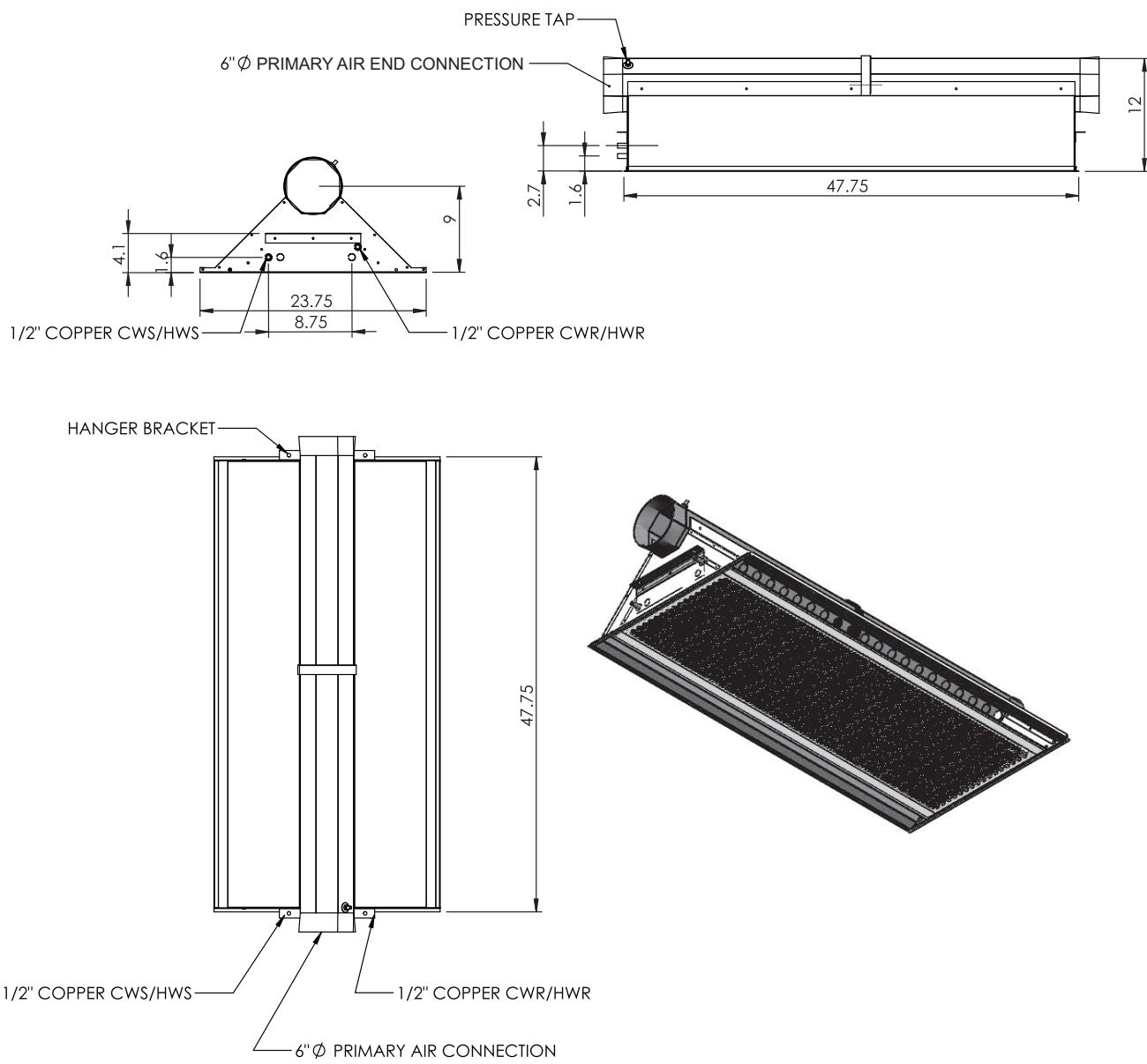
CWR	— Chilled Water Return
CWS	— Chilled Water Supply
HWR	— Heated Water Return
HWS	— Heated Water Supply

NOTE: Dimensions shown in inches unless otherwise indicated.

Dimensions (cont)

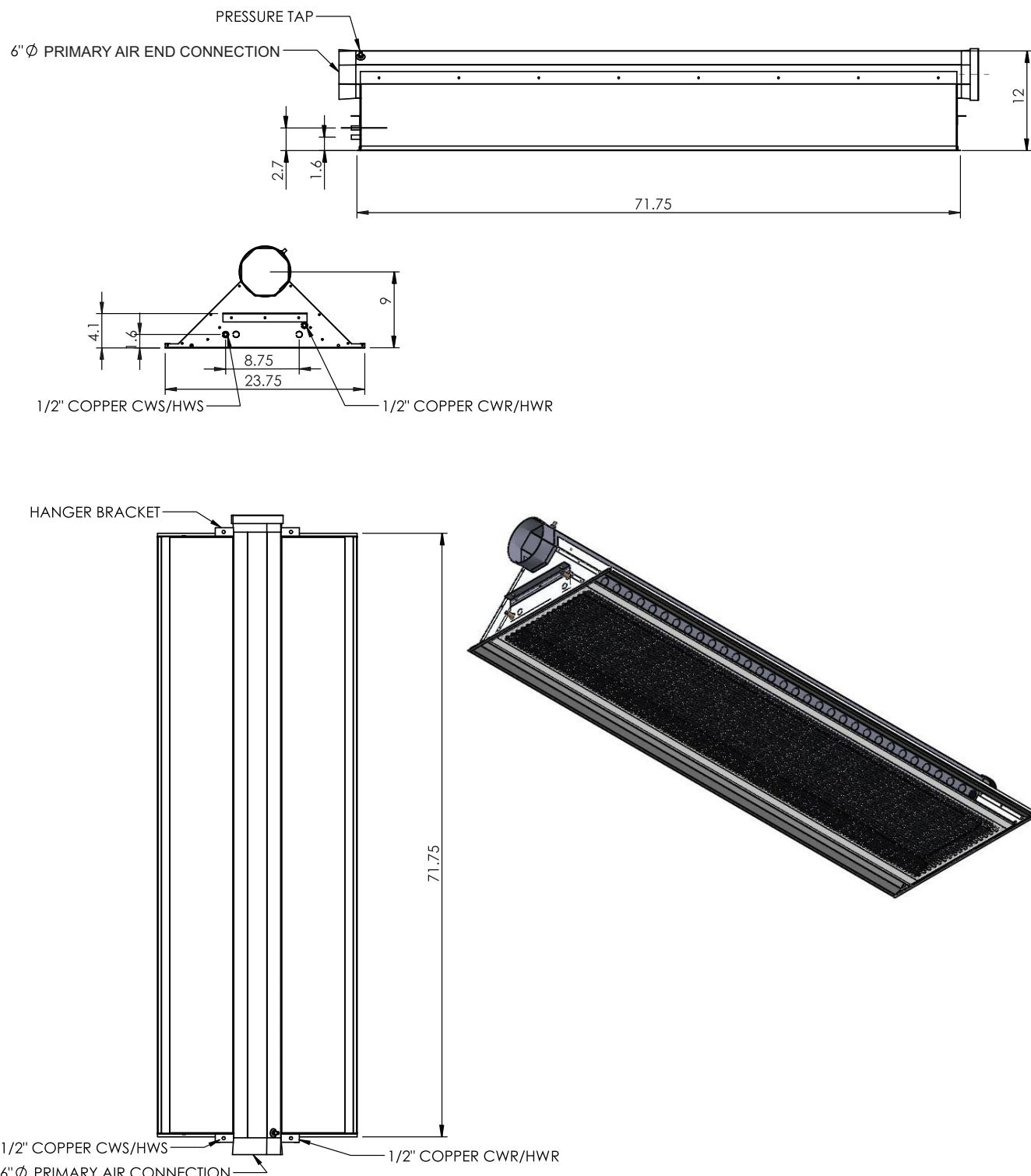


36CBAL, 2-PIPE, SIZE 04 UNIT DIMENSIONS



NOTE: Dimensions shown in inches unless otherwise indicated.

36CBAL, 2-PIPE, SIZE 06 UNIT DIMENSIONS



LEGEND

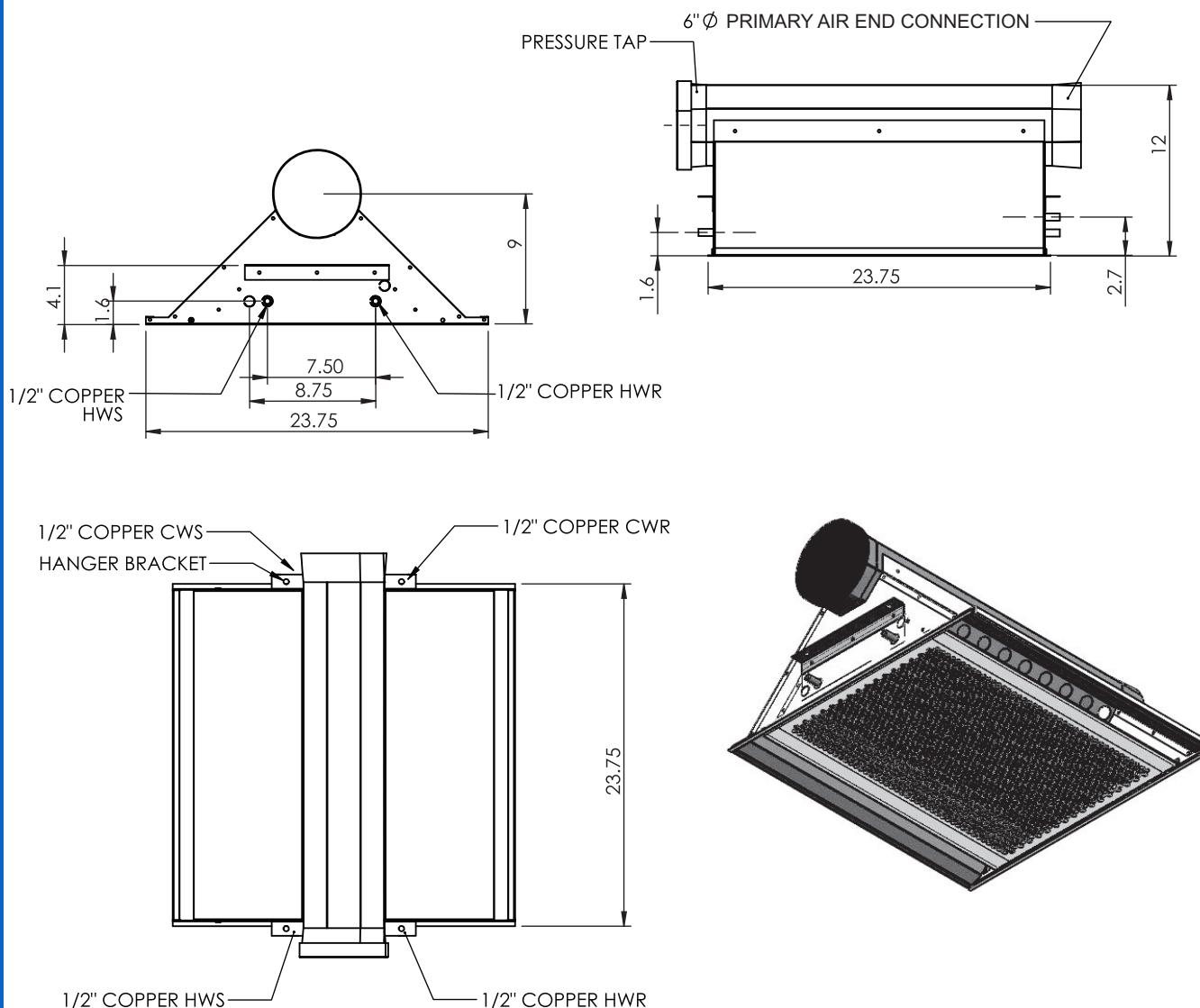
CWR	— Chilled Water Return
CWS	— Chilled Water Supply
HWR	— Heated Water Return
HWS	— Heated Water Supply

NOTE: Dimensions shown in inches unless otherwise indicated.

Dimensions (cont)



36CBAL, 4-PIPE, SIZE 02 UNIT DIMENSIONS

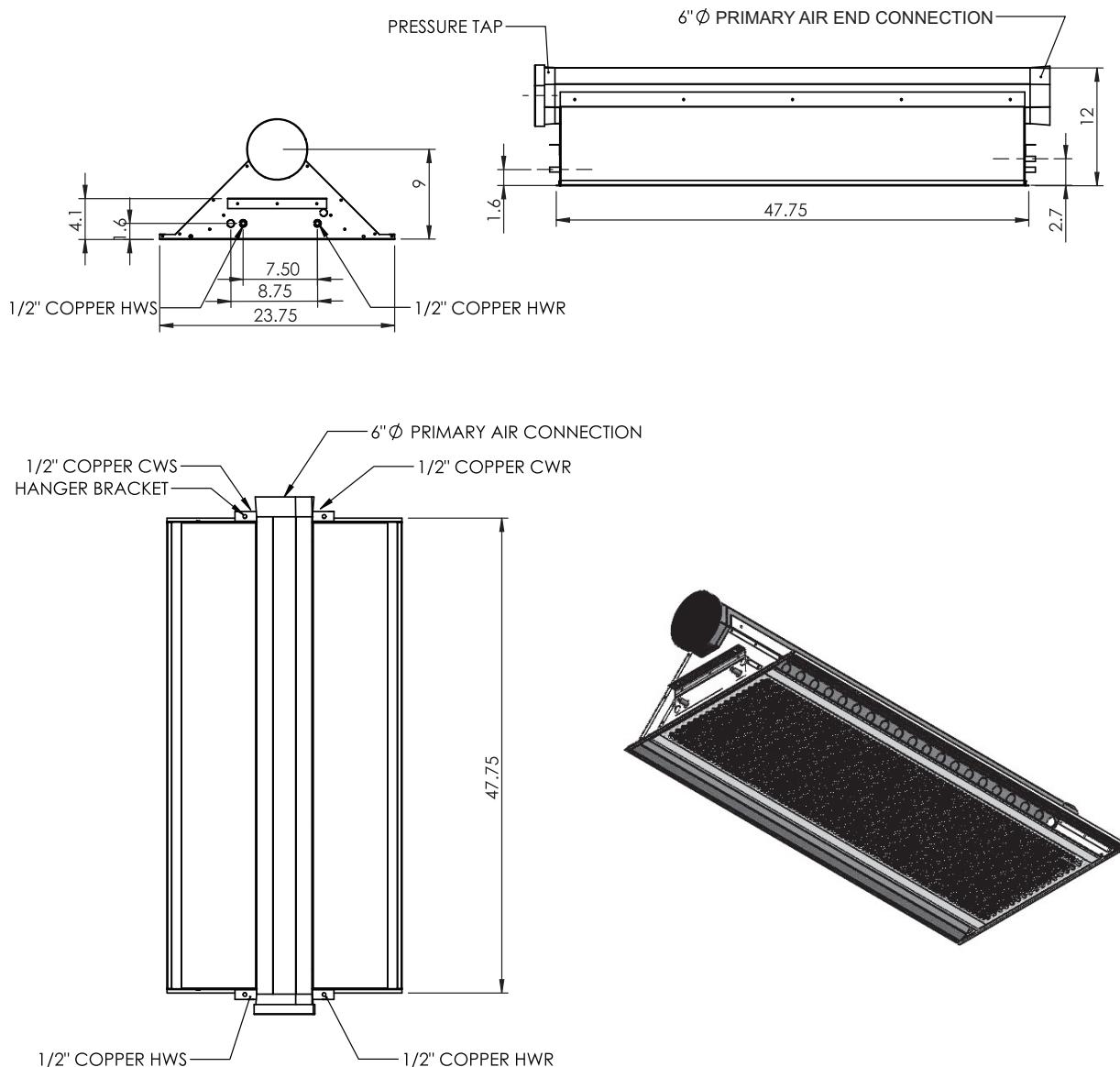


LEGEND

CWR	— Chilled Water Return
CWS	— Chilled Water Supply
HWR	— Heated Water Return
HWS	— Heated Water Supply

NOTE: Dimensions shown in inches unless otherwise indicated.

36CBAL, 4-PIPE, SIZE 04 UNIT DIMENSIONS



LEGEND

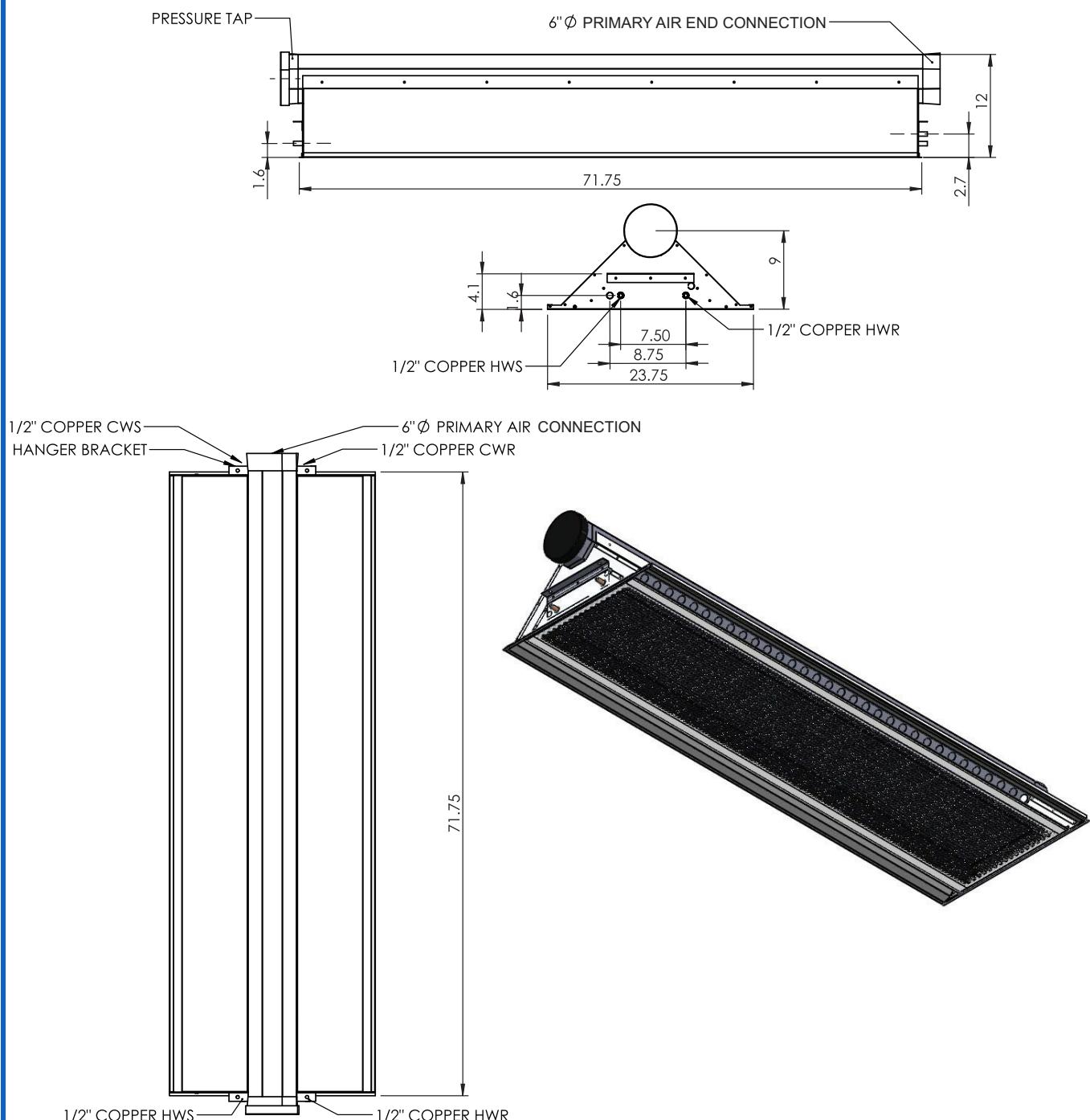
- CWR** — Chilled Water Return
- CWS** — Chilled Water Supply
- HWR** — Heated Water Return
- HWS** — Heated Water Supply

NOTE: Dimensions shown in inches unless otherwise indicated.

Dimensions (cont)



36CBAL, 4-PIPE, SIZE 06 UNIT DIMENSIONS

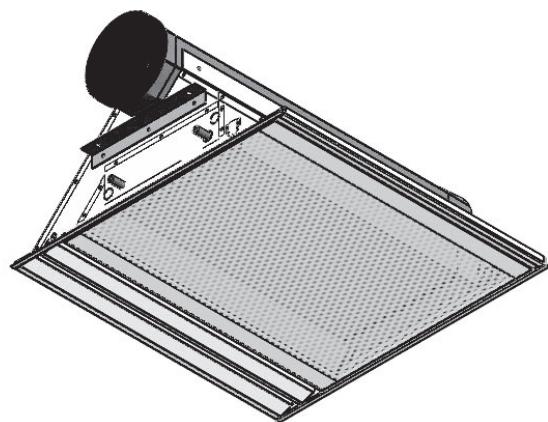
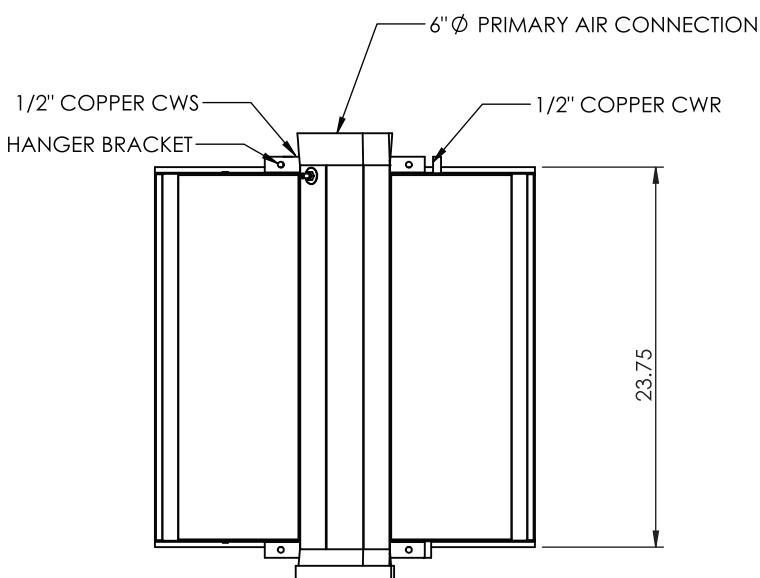
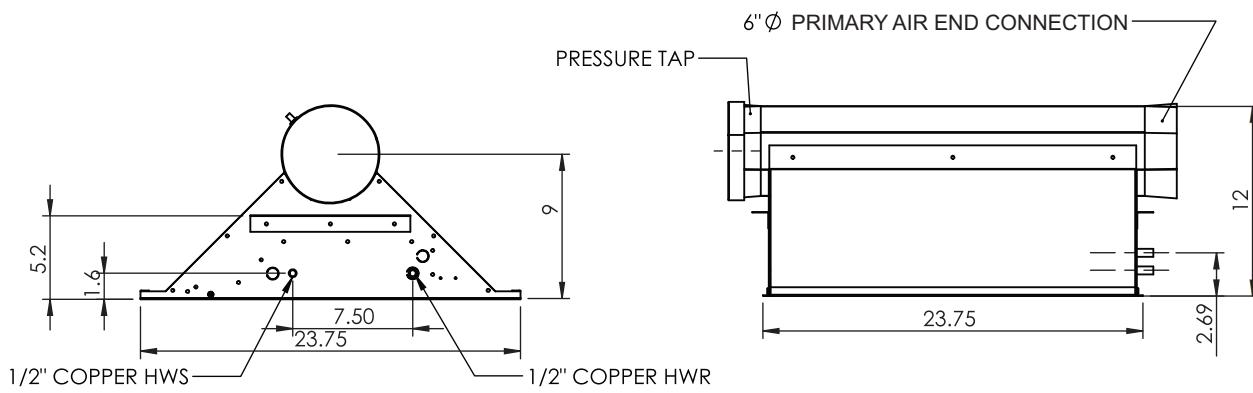


LEGEND

CWR	— Chilled Water Return
CWS	— Chilled Water Supply
HWR	— Heated Water Return
HWS	— Heated Water Supply

NOTE: Dimensions shown in inches unless otherwise indicated.

36CBAJ, 2-PIPE, SIZE 02 UNIT DIMENSIONS



LEGEND

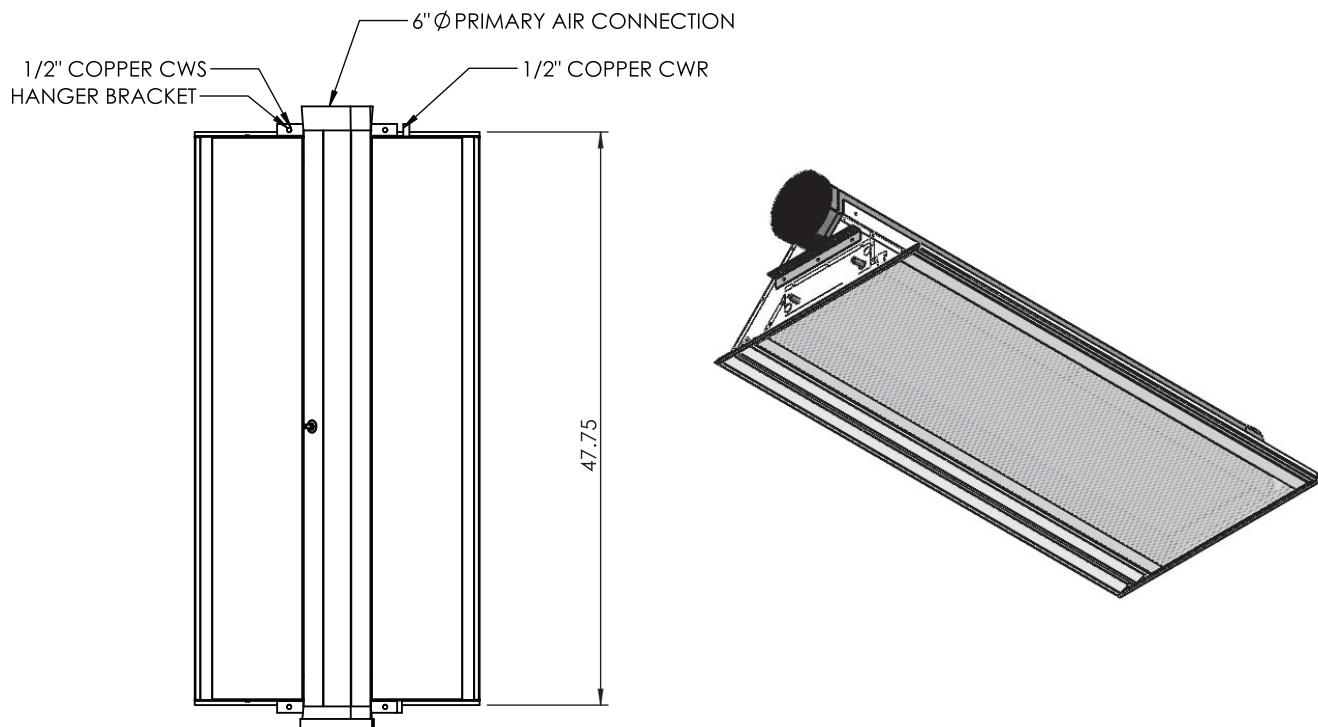
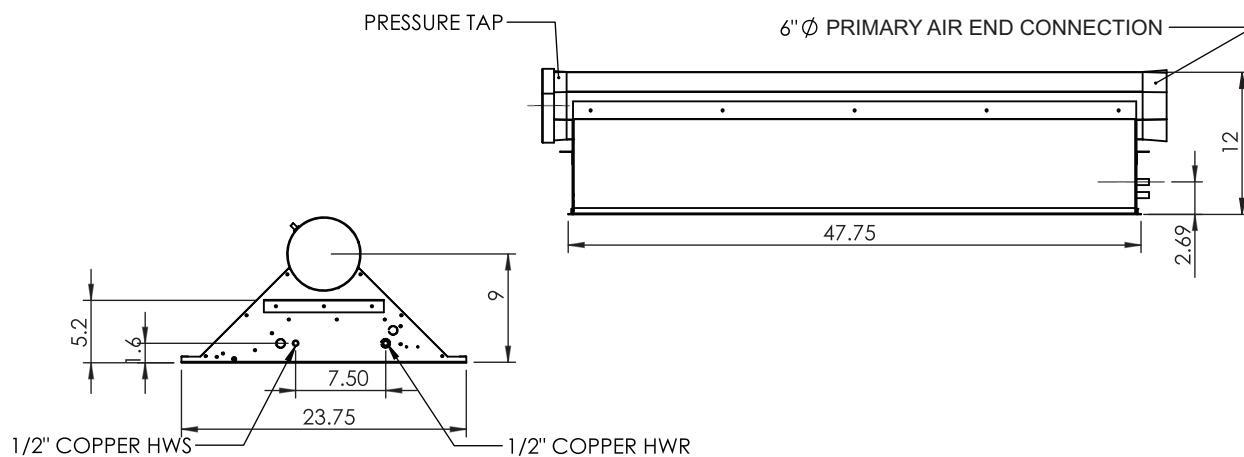
- CWR** — Chilled Water Return
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- HWS** — Heated Water Supply

NOTE: Dimensions shown in inches unless otherwise indicated.

Dimensions (cont)



36CBAJ, 2-PIPE, SIZE 04 UNIT DIMENSIONS

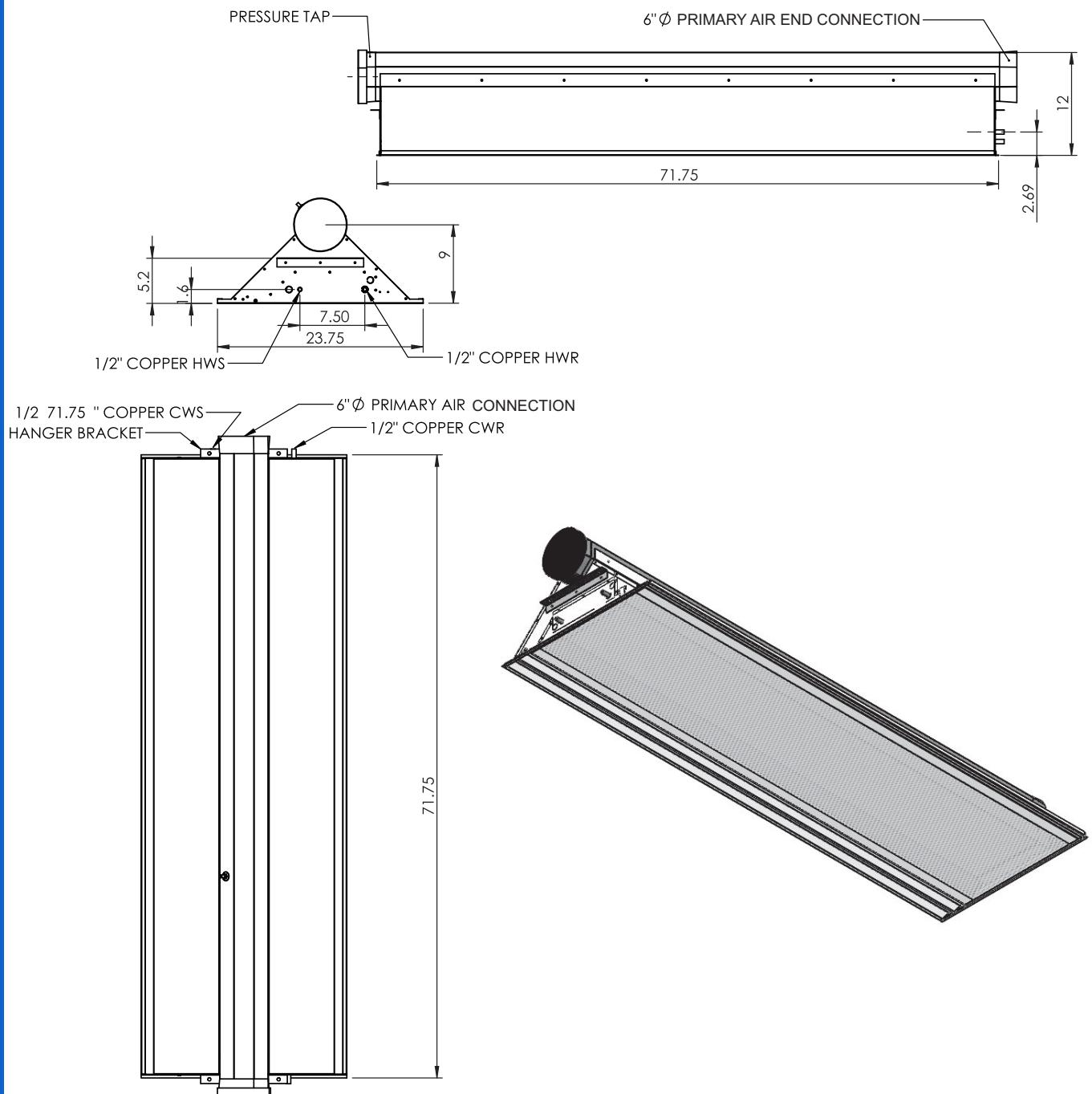


LEGEND

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NOTE: Dimensions shown in inches unless otherwise indicated.

36CBAJ, 2-PIPE, SIZE 06 UNIT DIMENSIONS



LEGEND

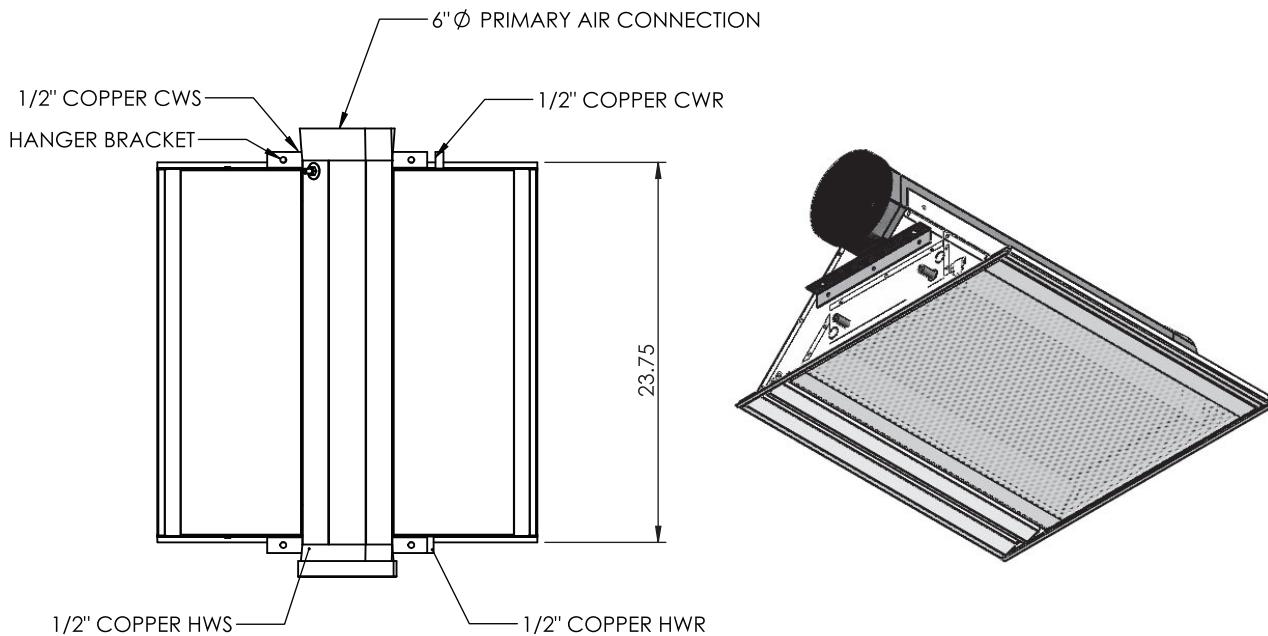
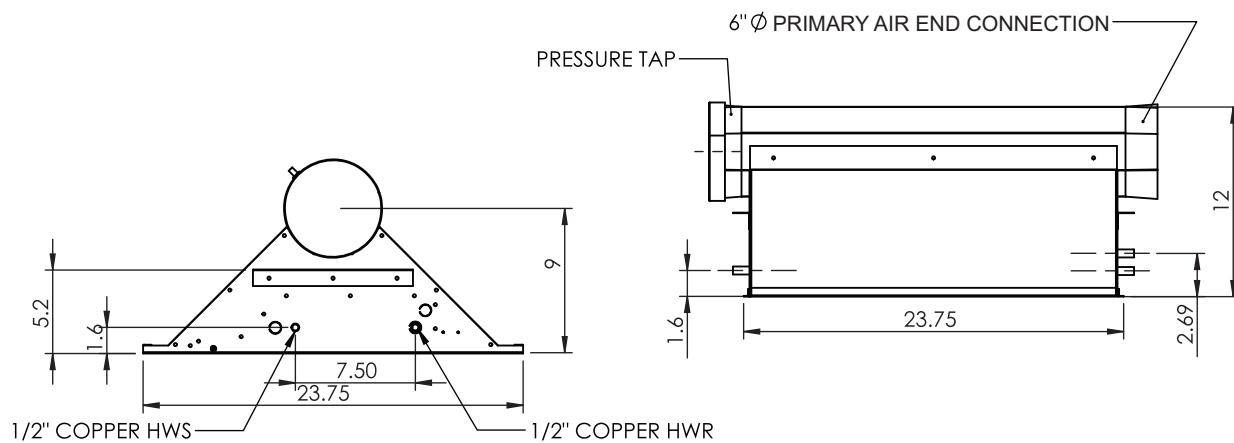
CWR — Chilled Water Return
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NOTE: Dimensions shown in inches unless otherwise indicated.

Dimensions (cont)



36CBAJ, 4-PIPE, SIZE 02 UNIT DIMENSIONS

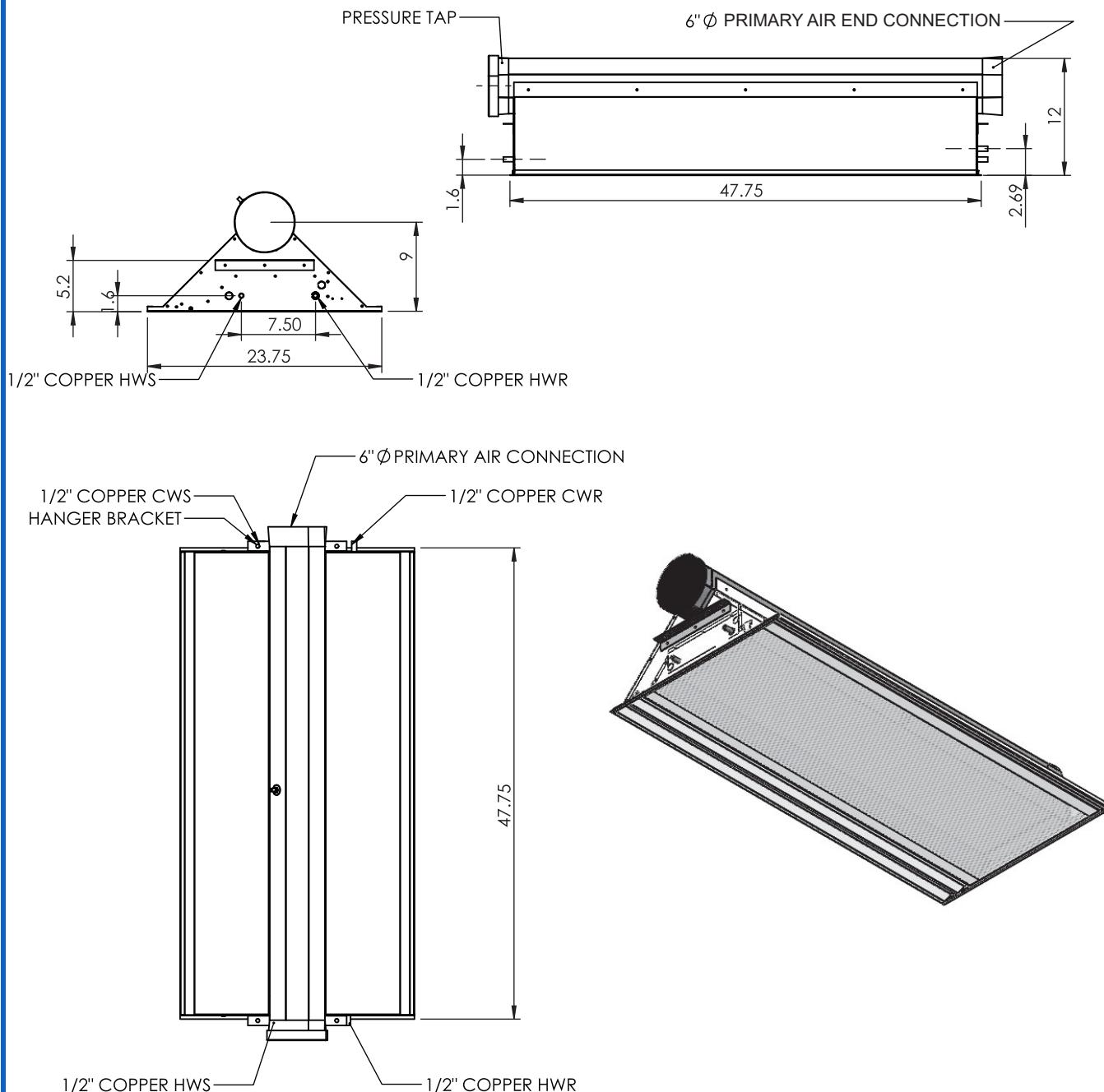


LEGEND

- CWR** — Chilled Water Return
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NOTE: Dimensions shown in inches unless otherwise indicated.

36CBAJ, 4-PIPE, SIZE 04 UNIT DIMENSIONS



LEGEND

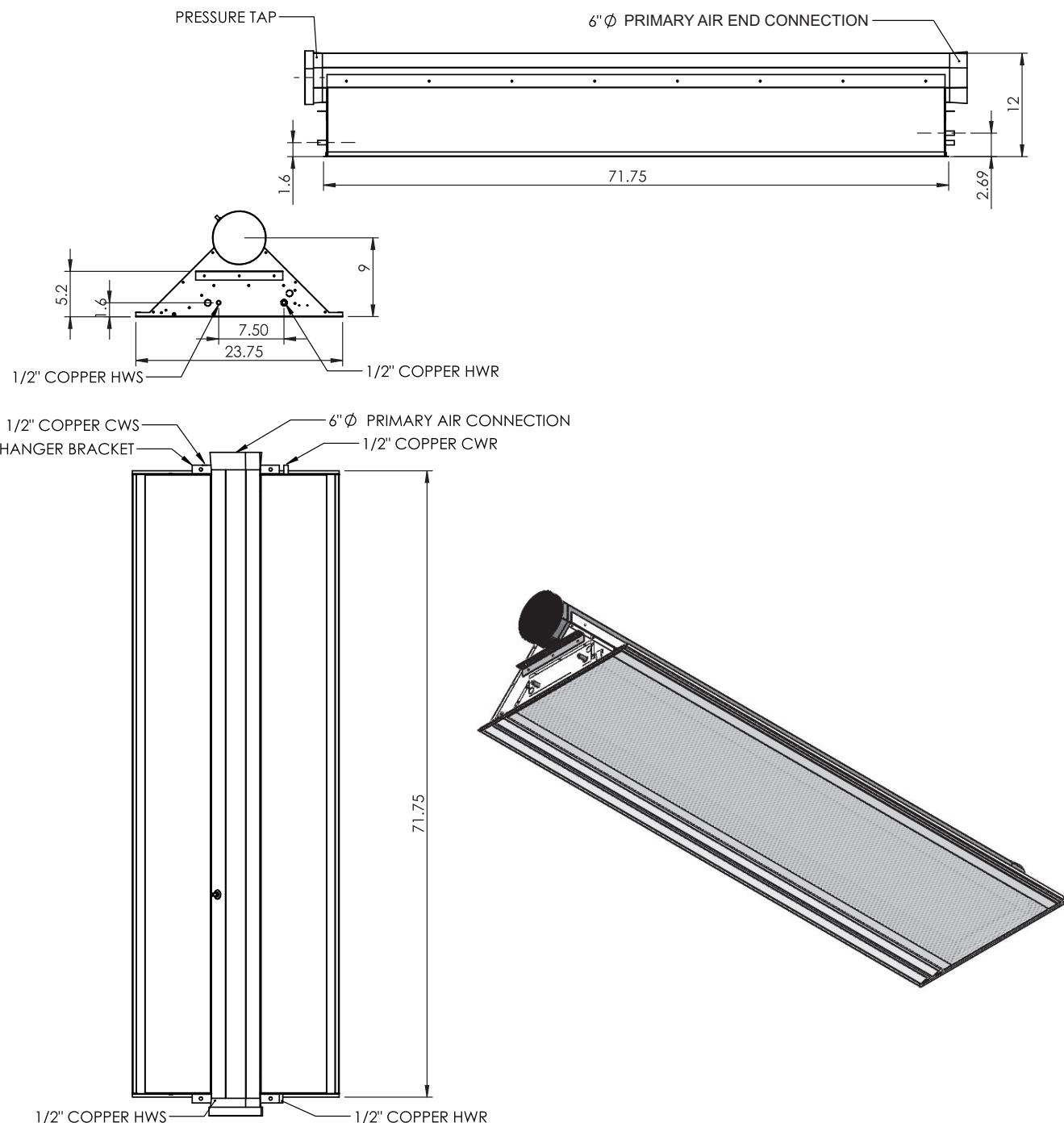
CWR — Chilled Water Return
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HWS — Heated Water Supply

NOTE: Dimensions shown in inches unless otherwise indicated.

Dimensions (cont)



36CBAJ, 4-PIPE, SIZE 06 UNIT DIMENSIONS



LEGEND

- CWR** — Chilled Water Return
- CWS** — Chilled Water Supply
- HWR** — Heated Water Return
- HWS** — Heated Water Supply

NOTE: Dimensions shown in inches unless otherwise indicated.

Selection procedure



Refer to Carrier Electronic Selection Program or contact your Carrier representative to determine unit size for your application.

Application data

Systems with chilled beams are suitable for use in sensible cooling load applications and/or where there is a requirement for individual temperature control. In offices with normal room heights, the maximum cooling capacity is 25 to 30 Btuh per sq ft of floor area. The limit is set by the maximum permissible velocity in the occupied zone, therefore high room heights can provide the opportunity for supplying a greater cooling effect.

Cooling load calculations must take in account the building's dynamic and thermal storage capacity. Simply adding the "gross loads" together gives an estimate of cooling load which can be approximately 50% too large.

The primary airflow is responsible for the air quality in the room and while also providing latent cooling. The maximum recommended difference for the primary air is 18°F. In certain cases, the supply-air temperature can be increased by a few degrees with a falling outdoor temperature. The chilled beam covers the rest of the cooling load. The water flow is controlled according to the load using a room sensor.

Compared with a system where the cooling duty is supplied entirely by air, a chilled beam system reduces the fan power requirements and space needed for air-handling plant equipment and ducting.

Chilled beams in a system

The primary benefits of a chilled beam system are allowing the ventilation air requirements to be decoupled from the sensible load needs of the different zones of a building. The ventilation air is pretreated by a dedicated outside air unit to provide dehumidified air which will account for the latent loads of the space. This pretreated air is ducted to the beams under a minimal amount of pressure and discharged along the length of the beam. The air moves along the length of a hydronic heat exchange coil inside the beam and induces room air to pass through the coil, thus accounting for the sensible load of the space. Since the dedicated outside air unit is only providing ventilation and latent load volumes of air, the amount of air can be down-sized, thus allowing less fan power to be used.

The chilled beam system is comprised of both air side and water side components. The air side is comprised of 100% outside air which is treated through a central air-handling unit and is ducted to the unit. The chilled beam also has a

coil which is connected to a water management system. The water provided to the beams should be a degree or two above the dew point (58°F to 60°F) of the space to avoid any condensation. Typically there are no drain pans in the chilled beams.

Due to water temperatures higher than a traditional building HVAC system there are many alternative system schemes that can be used in an applied chilled beam system. A few examples include:

Double use of the water

In a large building application the cold water, typically 45°F, which is exiting the chillers can first be delivered to the air-handling units. This cold water is used to condition the incoming outside air which is used to satisfy the latent loads. The existing water is then sent to the beams. A three-way valve with a dew point sensor monitors the zone, mixes the water, and provides water to the beams slightly above the dew point of the zone. The water is then returned to the chiller at a very large temperature delta.

Secondary water loop

Another common method in a chilled beam system is to use a secondary water loop to supply water to the beams. The chiller provides cold water to both the dedicated outside AHU (air-handling unit) to treat the ventilation air and to a heat exchanger. The heat exchanger then provides water to the beams at the desired 58 to 60°F water temperature. The heat exchanger has a dew point sensor providing information of the zone's relative humidity levels and adjusts the water temperature accordingly.

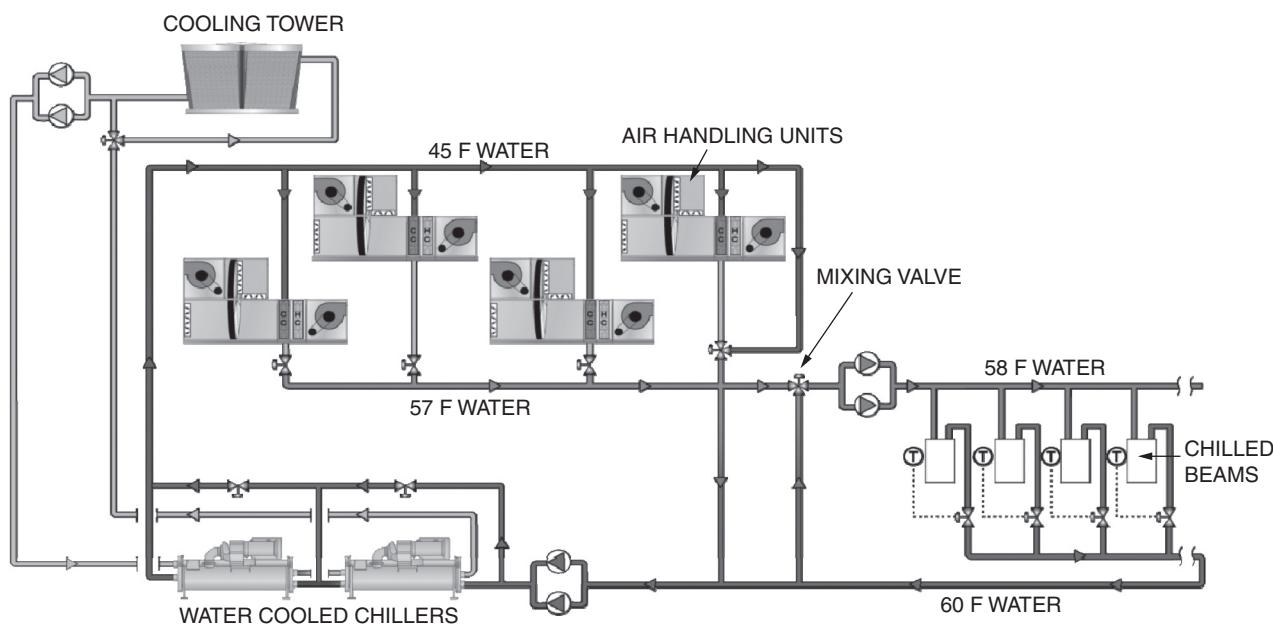
Separate systems altogether

It is also possible to separate the air side and the water side of the system completely and bring them together at the chilled beam. The ventilation air can be treated by a dedicated air unit that is DX (direct expansion) controlled such as a DOAS (direct outdoor air option) rooftop unit. The outside air is treated to provide both the ventilation and latent requirements of the building and sent directly to the beams. The water for the beams can be supplied by a dedicated chiller loop. Due to the higher water temperatures required by the chilled beams the COP (coefficient of performance) of the chiller can be improved.

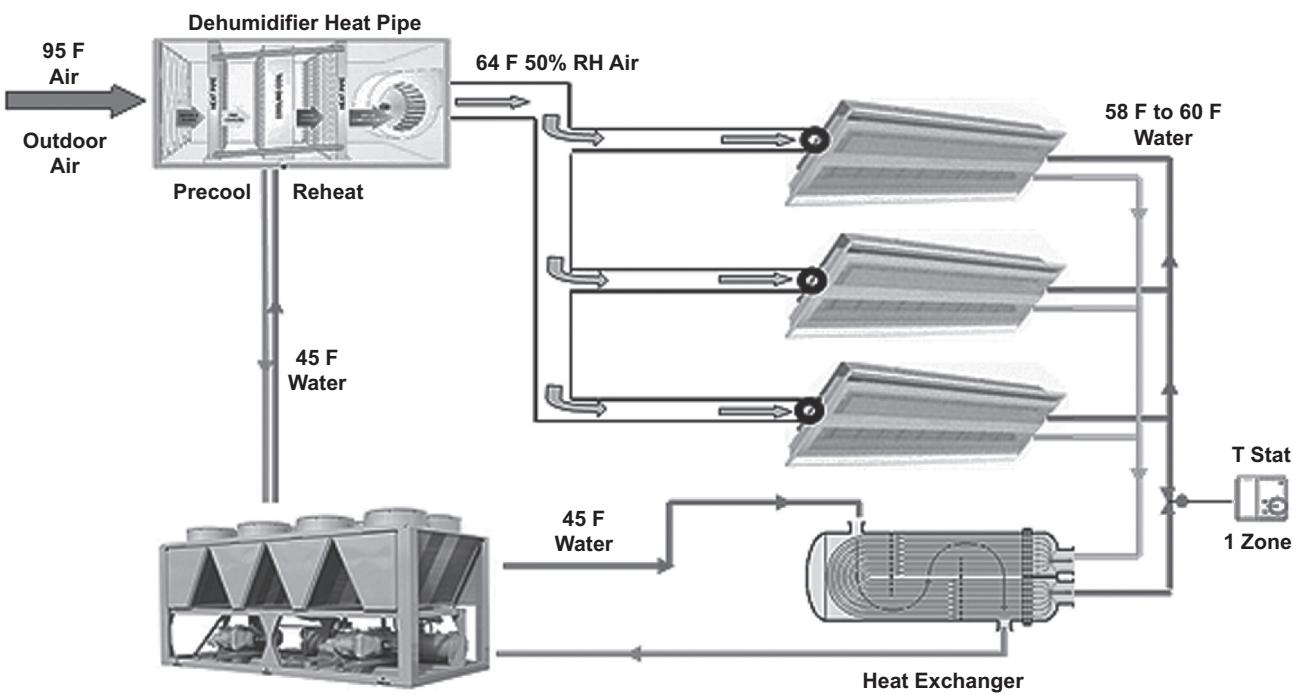
Application data (cont)

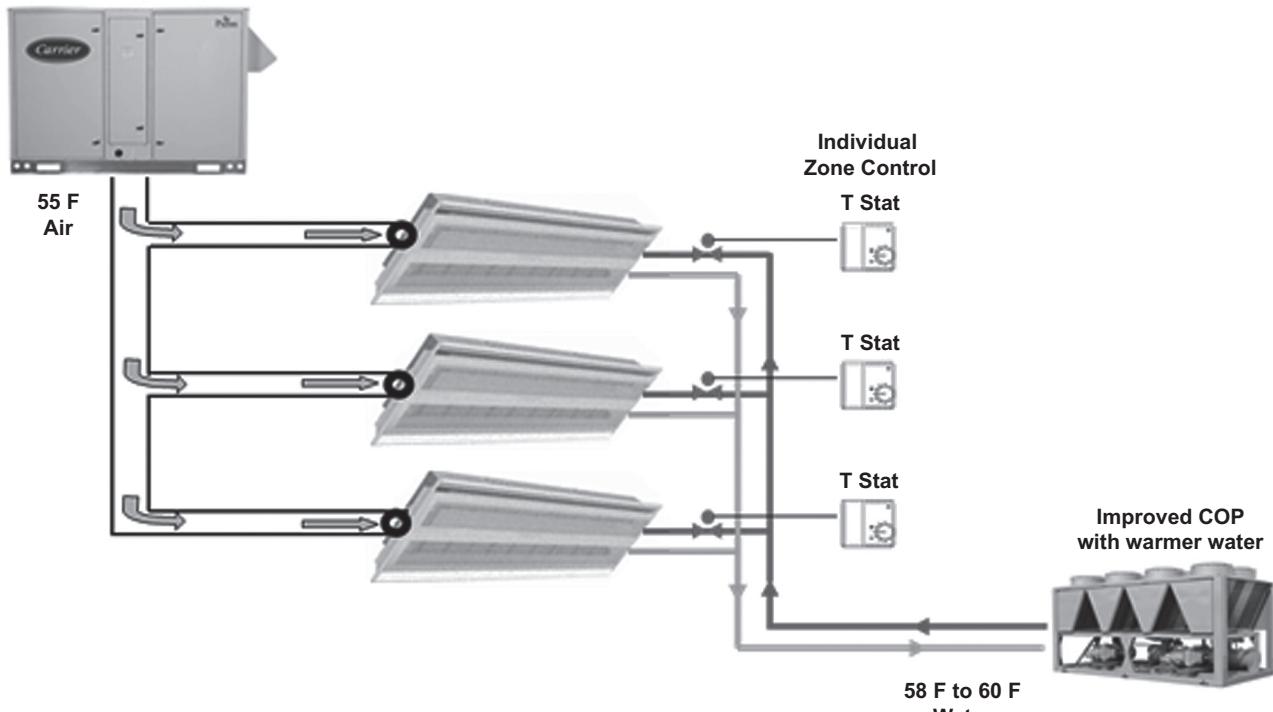


DOUBLE USE OF THE WATER



SECONDARY WATER LOOP



SEPARATE SYSTEMS ALTOGETHER

Guide specifications



Active Chilled Beams

HVAC Guide Specifications

Size Range: **2, 4, and 6 ft**

Carrier Model Number: **36CBAL,J**

Part 1 — General

1.01 SYSTEM DESCRIPTION

- A. Integrated chilled beam system for ventilation, cooling, and heating.
- B. Chilled beam unit shall be constant volume primary airflow unit designed to induce a secondary airflow within the conditioned space using the primary conditioned air supply. Capacities and characteristics as listed in the schedule and the guide specifications that follow.

1.02 QUALITY ASSURANCE

- A. Unit coils shall be tested in general accordance with the AHRI (Air-Conditioning, Heating and Refrigeration Institute) 410, latest edition, standard "Forced-Circulation Air-Cooling and Air-Heating Coil."
- B. Units shall be factory-tested for performance data, including coil capacity and pressure drop, airflow and air-side pressure drop, sound levels, and throw.

Part 2 — Product

2.01 EQUIPMENT

A. General:

1. The chilled beam unit shall be designed for flush mounting in a false ceiling and shall be sized to match a standard 2 ft false ceiling module.
2. Unit shall be provided with hanging brackets. Hanger rods or other approved hanging system to be field supplied and installed in the field by installing contractor.
3. Units shall be equipped with round low velocity pressure primary inlet transition, one air plenum and air induction nozzle plate, one chilled/ hot water coil, a supply and a return chilled water piping connection, a supply and return hot water piping connection, and one or two-slot supply opening with return air grille for a full one-way or 2-way Coanda effect room air distribution. The grille shall have a hinged core to provide full access to the return air side of the coil. The unit shall be capable of inducing secondary airflow within the conditioned space using the velocity pressure of the primary airflow. This secondary air must flow directly from the room to the unit and shall not use the ceiling as a return air plenum.
4. Latent conditioning of the air supply to the space shall be performed at the dedicated outdoor air unit and controlled by exhaust air humidity sensors. Humidity within the building envelope is to be controlled to not exceed 50% relative humidity.
5. Unit shall include a built-in pressure tap on the primary air inlet for air static pressure measurement and balancing.

B. Unit Construction:

1. The entire unit shall be constructed of 20 gage galvanized G90 sheet metal. The primary air plenum and nozzles shall be designed and configured to provide uniform air distribution with low noise operation to all nozzles.
2. Units shall be supplied with slot supply openings to evenly distribute the mixed primary air in a linear one-way or 2-way Coanda effect air distribution pattern.
3. The grille return section shall be perforated. The grille shall be hinged for easy access to the interior of the unit without tools. Access to the unit interior shall occur through the grille face from within the occupied space. Grille latches and hinges shall be concealed.

C. Induction Nozzles:

Induction nozzles shall be aerodynamically designed and made of DuPont Hytrel¹ 4069 Engineering Polymers with a temperature range of -40°F to 122°F and tested and rated by test method UL94 and UL746. Each nozzle shall incorporate a tapered design allowing the airflow to enter the nozzle more effectively and perform more efficiently without dirt build-up.

D. Water Coil Assembly:

1. Coils shall be of the hot and chilled water type utilizing aluminum fins and copper tubes. Coils shall be factory leak tested at 350 psig water. Coil connections shall be indicated on the drawings.
2. Coils must be one flat plate assembly with no interconnecting joints to minimize leakage. Each coil shall be of the fin plate design surrounding the copper tube wall via fin spacing of 8 fins per inch. The coil tubes shall be designed with 0.016 in. thick copper wall.
3. The water coil assembly shall consist of a two-row copper tube and aluminum fins for cooling and heating on each side. The heating row shall be mounted on the return side of the cooling coil, thus not allowing a reheat concept to be used. Return air will see the row for heating on its first run through the coil.
4. Control valves for cooling and heating can control one or more chilled beam units in a given zone. Control valves for the units shall be supplied by the Automatic Temperature Control Contractor.

E. Grille Finish:

The standard grille finish shall consist of baked-on acrylic enamel.

F. Optional Exterior Insulation:

Insulation on the unit and primary air plenum exterior shall be provided when the primary air tempera-

1. Registered trademark of Dupont.

ture supplied to the unit is below 55°F. The unit and collar exterior insulation shall be closed-cell elastomeric foam that prevents moisture intrusion, inhibits mold and mildew, is fiber-free, formaldehyde-free, and low in VOCs (volatile organic compounds). Insulation shall be $\frac{1}{4}$ in. thick and shall meet the following criteria:

1. Thermal conductivity of 0.27 BTU * in./hr. * ft²
* °F per ASTM (American Society for Testing and Materials) C 177 or C 518.
2. Water vapor permeability of 0.08 (1.16 x 10 in.) per ASTM E 96.
3. Flame spread rating shall be 25 or less per ASTM E 84.
4. Smoke spread rating shall be 50 or less per ASTM E 84.
5. Specific compliance shall include ASTM C 534 Type II sheet grade 1, ASTM E 84, NFPA

(National Fire Protection Association) 255, UL 723, CAN/ULC S-102, UL94 5V-A, V-0, File E 55798, NFPA 90A, 90B, ASTM D 1056, 2B1, Mil-P-15280J Form S, Mil-C-3133C (Mil Std 670B) Grade SBE 3, MEA 107-89-M, City of Los Angeles—RR 7642, CGSB Can 2-51.40-M80, ASTM C 1534.

G. Optional Lint Filters:

1. Lint filters shall be supplied by the beam manufacturer as washable or disposable type.
2. Washable filters are $\frac{1}{2}$ in. in depth and have an aluminum frame with woven nylon mesh media.
3. Disposable panel filters are $\frac{1}{2}$ in. in depth and have fiberglass media.
4. Disposable filters comply with UL 217V.

