

Suggested Specifications

Price Active & Passive Beams

Division 23 – Heating, Ventilating, and Air Conditioning

Section 23 82 14 – Chilled Beams

Section 23 82 26 – Induction Units

The following specification is for a defined application. Price would be pleased to assist in developing a specification for your specific need.

PART 1 – GENERAL

1.01 Section Includes:

- A. Active beams.
- B. Passive beams.

1.02 Related Requirements

- A. Section 01 30 00 – Administrative Requirements
- B. Section 01 40 00 – Quality Requirements
- C. Section 01 60 00 – Product Requirements
- D. Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- E. Section 01 78 00 – Closeout Submittals
- F. Section 01 79 00 – Demonstration and Training
- G. Section 23 00 00 – Heating, Ventilating, and Air Conditioning (HVAC)
- H. Section 23 37 13 – Diffusers, Registers, and Grilles

1.03 Reference Standards

- A. All referenced standards and recommended practices in this section pertain to the most recent publication thereof, including all addenda and errata.
- B. AHRI Standard 410 – Standard for Forced-Circulation Air-Cooling and Air-Heating Coils
- C. ASHRAE Standard 55 – Thermal Environmental Conditions for Human Occupancy
- D. ASHRAE Standard 70 – Method of Testing the Performance of Air Outlets and Air Inlets
- E. ASHRAE Standard 170 – Ventilation of Health Care Facilities
- F. ASHRAE Standard 200 – Method of Testing for Performance Rating of Chilled Beams
- G. ASTM Standard D610 – Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces
- H. ASTM Standard D714 – Standard Test Method for Evaluating Degree of Blistering of Paints
- I. ASTM Standard D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- J. ASTM Standard D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
- K. ASTM Standard D4752 – Standard Practice for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub
- L. CSA Standard 22.2 – General Requirements, Canadian Electrical Code
- M. CSA Standard Z317.2-10 – Special Requirements for Heating, Ventilation, and Air-conditioning (HVAC) Systems in Health Care Facilities
- N. CSN European Standard EN 14518 – Ventilation for Buildings - Chilled Beams - Testing and Rating of Passive Chilled Beams
- O. EN60529 – Degrees of Protection Provided by Enclosures (IP Code)
- P. SMACNA (SRM) – Seismic Restraint Manual Guidelines for Mechanical Systems; Sheet Metal and Air Conditioning Contractors' National Association
- Q. UL Standard 94 – Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
- R. UL Standard 723 – Standard for Test for Surface Burning Characteristics of Building Materials
- S. UL Standard 873 – Standard for Temperature-Indicating and –Regulating Equipment
- T. UL Standard 2043 – Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces

1.04 Administrative Requirements

- A. Pre-installation Meeting: Conduct a pre-installation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and efficient manner.

1.05 Submittals

- A. See Section 01 30 00 – Administrative Requirements for submittal procedures.
- B. Product Data: For each type of product indicated, include rated capacities, furnished specialties, air pattern throw and drop, sound-power ratings, wet weight, and accessories.
- C. Shop Drawings: Detail equipment assemblies and indicated dimensions, required clearances, method of field assembly, components, and locations and size of each field connection.
 - 1. Include a schedule showing unique model designation, room location, model number, size, and accessories furnished.

Suggested Specifications

- D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension assembly members.
 - 2. Method of attaching hangers to building structure.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - E. Operation and Maintenance Data: For beam units to include in emergency, operation and maintenance manuals.
- 1.03 Quality Assurance**
- A. Product Options: Drawings indicating size, profiles, and dimensional requirements of active and passive beam units and are based on the specific system indicated.
 - B. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - C. Active and passive beams and accessories shall be rated and tested for pressure as shown on the Drawings.
- 1.04 Coordination**
- A. Coordinate layout and installation of active and passive beams and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 – PRODUCTS

2.01 Active Beams

- A. Basis of Design: Price Industries, Inc.
 - 1. Active Beams: Models ACBC, ACBR, ACBL, ACBM.
- B. General:
 - 1. The active beams shall utilize induction of room air across a water coil mounted within the unit to provide sensible cooling or heating as required.
 - 2. The induced air shall mix with primary air and shall be supplied into the space via integrated discharge slot(s).
 - 3. The induced air shall mix with primary air and be supplied into the space at low velocity to produce a displacement system to provide sensible cooling or heating as required. **(Model ACBC only)**
- C. Performance:
 - 1. Active beam capacity shall be tested and certified by the manufacturer in accordance with ASHRAE Standard 200 to meet the performance listed on the schedule.
 - 2. Testing of performance shall be conducted in a validated, ISO certified facility with demonstrated capability of testing in accordance with the ASHRAE Standard 200 standard for a minimum of three years with documentation demonstrating repeatability of a standard beam within five percent year over year.
 - 3. Should any performance rating, including supply air volume, chilled water supply temperature, or plenum static pressure, deviate from the schedule, the manufacturer shall submit updated capacity, throw and noise data as well as computational fluid dynamic modeling demonstrating that any changes shall not impact the air distribution in a room that would cause a detriment to the PMV and ADPI rating from the design conditions.
 - 4. Manufacturer shall have a factory testing facility available to perform performance tests of units in accordance with ASHRAE Standard 200 as required.
 - a. Upon request, up to one percent of units (with a minimum of one for each beam model type) for the project can be tested in accordance with the standard. A request for such testing shall be made with the order and prior to shipment of the active beams.
 - b. Engineer will have the option of witnessing this test.
 - 5. Manufacturer shall also provide performance including the de-rate associated with the discharge grille when applicable to recessed chilled beams **(Model ACBR only)**.
- D. Construction:
 - 1. Active beams shall consist of an air inlet, pressurization cavity, metal formed induction nozzles, and enclosed water coil with [2-pipe] or [4-pipe] water connections as indicated on the drawings, linear bar grille, perforated panel, or slot diffuser where applicable, and shall have [1-way], [2-way] or [4-way] discharge as per contract schedule.
 - 2. Air plenum and body casing shall be constructed of minimum 20 gauge [galvanneal] or [powder coated steel], consisting of at least one air inlet. Manufacturer shall present data indicating that the pressurized section has a maximum leakage of five percent of the supplied airflow at 1.0 inch water gauge.
 - 3. Exposed active beam casing shall be constructed of minimum 16 gauge powder coated heavy duty steel, consisting of at least one air inlet. Manufacturer shall present data indicating that the pressurized section has a maximum leakage of five percent of the supplied airflow at 1.0 inch water gauge. The casing construction shall allow maintenance personnel to stand on the top of the unit. **(Model ACBC only)**
- E. Water Coil:
 - 1. The water coil shall consist of copper tubing mechanically expanded into aluminum plate fins.
 - 2. Coils shall be leak tested by manufacturer to 390 pounds per square inch, to within plus or minus 10 pounds per square inch, shall have a working pressure of 300 pounds per square inch, and shall be AHRI 410 certified.

Suggested Specifications

3. Water connections shall be half inch diameter connections on one end only, and shall be suitable for solder, compression fittings, push on fittings or threaded connection.
 4. Fin spacing shall be no greater than 12 fins per inch to prevent dust bridging.
 5. Tube thickness shall be at least .016 inches.
 6. The coil shall be removable from the room side without requiring the removal of the beam casing from the ceiling.
 7. The coil pipe connections shall be upturned 90 degrees to avoid issues with coordination of ceiling installation. Casing shall have connection ports on each side to allow the location of piping connections to be reversed. **(Model ACBL only)**
- F. Fastening:
1. Mounting brackets shall be factory installed along the length of the air plenum on the unit.
 2. Each beam shall be individually supported by the building structure with a minimum of 4 laterally adjustable fixing points, or as recommended by the manufacturer.
 3. Installation hardware shall be in accordance with the manufacturer's recommendations and any local codes that dictate hanging requirements.
- G. Nozzles:
1. Nozzles shall be of a fixed size, selected with respect to cooling and heating requirement, and constructed of formed sheet metal.
- H. Face:
1. The coil shall be accessible from the room side for inspection and cleaning without the need for tools through a hinged face supported by the beam casing where applicable. **(Model ACBL only)** For recessed type beams, the coil can be accessed via the ceiling plenum. **(Model ACBR only)**
 - a. Room side accessible controls enclosure shall be furnished where indicated.
 - b. Integrated return section shall be furnished where indicated.
 - c. Integrated supply air section shall be furnished where indicated.
 2. The face shall be completely removable without the use of tools and allow for reversed orientation. **(Model ACBL only)**
 3. The coil shall be accessible from the room side or ceiling plenum for inspection and cleaning.
 4. The coil shall be accessible from the room side for inspection and cleaning through a removable face panel.
 - a. Room side accessible controls enclosure shall be furnished where indicated **(Model ACBC only)**
- I. Paint Finish:
1. The internal casing components and exterior shall be galvanized or painted white.
 2. Exposed casing, face, and frame component finish shall be **(select one)**:
 - a. Painted with a [B12 White] or [B17 Black] baked-on powder coat finish.
 - i. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
 - ii. The paint film thickness shall be a minimum of 2.0 mils.
 - iii. The finish shall have a hardness of 2H.
 - iv. The finish shall withstand a minimum salt spray exposure of 500 hours.
 - v. The finish shall have an impact resistance of 80 inch-pounds.
 - b. Painted a custom color to match a sample supplied by the architect.
 3. Entire unit shall be unpainted galvanized. **(Model ACBR only)**
- J. Balancing:
1. Integrated pressure port shall be included with k-factor to read the plenum pressure and corresponding supply air volume. Each active beam shall be supplied with a chart indicating a plenum pressure-primary supply air volume relationship to facilitate the reading and adjustment of the primary air volume to match the values indicated on the drawings.
- K. Water and air break-out connections:
1. The beams shall be shipped sealed to limit the introduction of dust and dirt during shipping and construction.
- L. Insulation **(All models except ACBL)**:
1. The exterior shall be insulated with half inch fiberglass insulation;
 2. The interior shall be insulated with 1/8 inch fiber-free insulation where indicated in the drawings.
- M. Insulation **(Model ACBL only)**:
1. The exterior and/or interior shall be insulated with half inch fiber-free insulation.
- N. Integrated Return **(Model ACBL only)**:
1. The return section shall be located at the end of the beam and shall have a minimum length of one foot.
 2. The beam face shall cover both the coil and the return section and shall be seamless.
- O. Integrated Diffuser **(Model ACBL only)**:
1. An integrated diffuser shall be included to provide additional air to the space.
 2. The diffuser shall be located at the end of the beam, and shall have a minimum length of one foot.
 3. The beam face shall cover both the coil and the diffuser and shall be seamless.
- P. Controls Enclosure **(Model ACBL only)**:
1. A blank section shall be provided at the end of the beam to house and allow easy access to controls. The beam face shall cover both the coil and the controls enclosure, and shall be seamless with a blank-off plate blocking the enclosure section.

Suggested Specifications

- Q. Drain Pans (**Models ACBR and ACBC only**):
1. Drain pans shall be provided below the vertically mounted coils to capture condensation that forms on the coil. The drain pan shall include a half inch MNPT drain connection.
- R. Grille Options (**Model ACBR only**):
1. Manufacturer shall supply return and supply grille and/or linear diffuser as per Section 23 37 13 – Diffusers Registers & Grilles, as indicated and required on the drawings. Manufacturer shall also provide performance including the de-rate associated with the discharge grille.
- S. Pattern Controllers (**Model ACBL, 24 inch wide only**):
1. The discharge slots shall include pattern controllers to control the direction of the discharge air. The pattern controllers shall be adjustable to 0, 15, 30 and 45 degrees in both directions.
- T. Accessories:
1. Valves and Hoses:
 - a. Manufacturer shall supply [12 inch], [18 inch], [24 inch], **or** [36 inch] stainless steel braided hose as noted on the schedule and drawings, and shall be capable of withstanding 400 psi at 248 degrees Fahrenheit without failure.
 - b. Manufacturer shall supply automatic flow control valves that must control flow within five percent or manual flow control valves that must control flow within three percent of design. Shafts shall be blowout-proof and contain double shaft seals.
 - c. Manufacturer shall supply automatic temperature control valves that must control flow rate between a temperature range of 34 to 230 degrees Fahrenheit. The actuator must have a two position 24 VAC or 120 VAC control with spring return or a 0-10 VDC modulating control and must meet UL873 and NEMA 1 standards. Valve bodies must be either 2-way or 3-way mixing and meet ANSI Class III, Class 125, and Group 70-2 ratings for piping systems.
 2. Flow Regulators:
 - a. Manufacturer shall supply UL2043 listed and UL94 rated plastic volume flow regulators (VFR) to fit within rigid round ducting and maintain an air tight seal by utilizing an integrated gasket. The actual airflows shall be within ten percent (fifteen percent for 50 cubic feet per minute or less) for one of the following rated airflows as selected by the engineer:
 - i. 10, 20, 25, 30, 35, 45, 50, or 60 cubic feet per minute for a four inch duct
 - ii. 35, 50, 60, 75, 90, or 105 cubic feet per minute for a five inch duct
 - iii. 75, 90, 105, 125, 140, 160, or 175 cubic feet per minute for a six inch duct
 - iv. 125, 140, 160, 175, 205, 235, 265, or 295 cubic feet per minute for an eight inch duct
 3. Lint Screens (**Model ACBRonly**):
 - a. Manufacturer shall supply lint screens with extruded 6063 aluminum frames. The screen material shall be fiberglass mesh and shall be held in place with a T-spline.
 4. Dampers:
 - a. Integral manual inlet balancing damper shall be included with locking handle where indicated on the drawings.
 - b. VAV inlet damper shall be included with actuator where indicated on the drawings. The electric actuator shall be 24 VAC bi-directional, floating point, and directly coupled to the damper shaft. Motor shall be capable of at least 44 inch-pounds of torque with a 90 second runtime for complete 90 degree rotation and manual override. The actuator must be non-spring return and capable of operating in the stalled position without overheating or mechanical damage. Standard operating temperatures shall be between negative 22 and positive 130 degrees Fahrenheit. The actuator must comply with UL873, CSA22.2, NEMA 2, and IP54 per EN60529, and manufactured under ISO 9002 and ISO 14000 procedures.
 5. Coanda Wings (**Models ACBL and ACBM only**):
 - a. Manufacturer shall supply six inch wide coanda wings or exposed casing for open ceiling installations. Wings and exposed casings shall be constructed of 20 gauge painted steel or 0.060 inch thick aluminum extrusion and installed with no fasteners or hardware visible from the room side.
 6. Tegular Casing (**Model ACBL only**):
 - a. The manufacturer will provide an edge detail to allow the beam to sit flush with the face of the T-bar ceiling.
 - b. Tegular profiles of 9/16 inch and 15/16 inch shall be accommodated.
 7. Slimline Coupling (**Model ACBL only**):
 - a. The manufacturer shall provide a means for installing several beams together, end-to-end, such that they appear as a single unit.
 - b. The discharge slot shall appear as a continuous open channel with no obstructions or visual cues of the multiple beam installation.
 8. Bookshelf (**Model ACBC only**):
 - a. The manufacturer shall supply and integrated bookshelf painted to match the active unit.
 9. Fill-In Sections (**Model ACBC only**):
 - a. The manufacturer shall supply fill-in sections painted to match active unit.
 10. Duct Covers (**Model ACBC only**):
 - a. The manufacturer shall supply duct covers painted to match active unit.

Suggested Specifications

2.02 PASSIVE BEAMS

- A. Basis of Design: Price Industries, Inc.
 - 1. Passive Beams: Models PCBL
- B. General:
 - 1. The passive beams shall utilize natural convection of room air across a water coil mounted within the unit to provide sensible cooling when required.
 - 2. The air shall be drawn from [a ceiling cavity (concealed)] **or** [the surrounding air in the occupied space (exposed)], and pass through the coil and into the space below.
- C. Performance:
 - 1. Passive beam capacity shall be tested and certified by manufacturer in accordance with EN Standard 14518 to meet the performance listed on the schedule.
 - 2. Testing of performance shall be conducted in a validated, ISO certified facility with demonstrated capability of testing in accordance with the EN 14518 standard for a minimum of three years with documentation demonstrating repeatability of a standard beam within five percent year over year.
 - 3. Should any performance rating deviate from the schedule, the manufacturer shall submit updated capacity, and velocity discharge data, as well as computational fluid dynamic modeling demonstrating that any changes do not impact the air distribution in a room that would cause a detriment to the ADPI rating from the design conditions.
 - 4. Manufacturer shall have factory testing facility available to perform performance test of units in accordance with said standard, as required.
 - 5. Upon request, up to one percent of units (with a minimum of one for each beam model type) for the project can be tested in accordance with the standard. The request shall be made with the order and prior to the shipment of active beams.
 - 6. Engineer will have the option of witnessing this test.
 - 7. Manufacturer shall submit velocity and temperature profiles beneath the passive beam in accordance with ASRHAE Standard 55-2010 under conditions obtained in the EN 14518 test procedure.
- D. Configuration:
 - 1. Passive beams shall consist of an enclosed water coil of a 2-pipe water connections configuration. Drip pans and/or drain pans are not acceptable.
- E. Casing:
 - 1. The enclosure shall be constructed of painted sheet metal.
- F. Water Coil:
 - 1. Coil shall consist of copper tubing mechanically expanded into aluminum plate fins. Coils shall have a minimum working pressure of 300 pounds per square inch. Water connections shall be one end only. Pipes shall terminate in a half inch connection.
- G. Fastening:
 - 1. Adjustable mounting brackets shall be factory installed along the length of the air plenum on the unit. Each beam shall be individually supported by the building structure by a minimum of four laterally adjustable fixing points, or as recommended by the manufacturer. Installation hardware shall be in accordance with the manufacturer's recommendations and any local codes that dictate hanging requirements.
- H. Paint Finish:
 - 1. Internal casing components and exterior shall be painted black for concealed applications, white for visible applications or other color as chosen by the architect (**select applicable paint**):
 - a. Paint shall be a [B12 White] or [B17 Black] baked-on powder coat finish.
 - i. The paint finish must demonstrate no degradation when tested in accordance with ASTM D1308 (covered and spot immersion) and ASTM D4752 (MEK double rub) paint durability tests.
 - ii. The paint film thickness shall be a minimum of 2.0 mils.
 - iii. The finish shall have a hardness of 2H.
 - iv. The finish shall withstand a minimum salt spray exposure of 500 hours.
 - v. The finish shall have an impact resistance of 80 inch-pounds.
 - b. Paint shall be a custom color to match a sample supplied by the architect.
 - i. The paint shall be powder coat polyester with 500 hour salt spray rating and periodic cross hatch and bend adhesion tests.

2.03 QUALITY CONTROL

- A. Identification: Label each beam with appropriate tag number.
- B. Verification of Performance:
 - 1. Rate active beam capacity, throw and noise criteria in accordance with ASHRAE Standard 200.
 - 2. Rate passive beam capacity in accordance with EN Standard 14518. Thermal comfort data shall be collected in accordance with ASHRAE Standard 55-2010.

Suggested Specifications

PART 3 – EXECUTION

3.01 Examination

- A. Verify that conditions are suitable for installation.
- B. Verify that field measurements are as shown on the drawings.

3.02 Installation

- A. Install beam level and plumb. Maintain sufficient clearance for normal services, maintenance, or in accordance with construction drawings.
- B. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - 1. Verify inlet duct connections are as recommended by manufacture to achieve proper performance.
 - 2. Verify controls and control enclosures are accessible.
 - 3. Verify control connections are complete to control valves as needed.
 - 4. Verify that any identification tags are visible.
 - 5. Verify controls respond to inputs as specified.
- C. Piping installation requirements are specified in other Division 23 Sections. Drawings indicated general arrangement of piping, fittings, and specialties.
- D. Install piping adjacent to beams to allow service and maintenance.
- E. In addition to Division 23 Section "Hydronic Piping", connect coils to supply with shutoff valve, strainer, control valve, and union or flange, and to return with balancing valve and union or flange.
- F. Connect ducts to beams according to Division 23 Section "Metal Ducts".
- G. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables".
- H. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening.

3.03 Field Quality Control

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing beam and after electrical circuitry has been energized, test for compliance with requirements.
 - 2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to conform to proper unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report any findings in writing.
- C. Remove and replace malfunctioning units and retest as specified above.
- D. See Section 01 40 00 – Quality Requirements for additional requirements.

3.04 Cleaning

- A. Clean all visible surfaces of equipment; touch up as required.
- B. Protect all units before, during and after installation. Damaged materials due to improper protection shall be cause for rejection.
- C. See Section 01 74 19 – Construction Waste Management and Disposal for additional requirements.

3.05 Closeout Activities

- A. Installer shall visit the beam factory, or factory-authorized representative, prior to the arrival of the product on site, to become familiar with the beams. Manufacturer shall include the cost of such a visit for one installer in the bid.
- B. Manufacturer or factory-authorized representative shall visit the site regularly during the installation process to ensure proper means and methods are being employed. Bid shall include the cost of a minimum of two such visits.
- C. Manufacturer or factory-authorized representative shall provide start-up and training services to Owners staff to adjust, operate, and maintain beam. A minimum of eight hours of such services shall be included in bid.
- D. See Section 01 78 00 – Closeout Submittals for closeout documentation requirements.
- E. See Section 01 79 00 – Demonstration and Training from additional requirements.