

**YORK**<sup>®</sup> PASSIVE CHILLED BEAMS  
ENGINEERING GUIDE

# Contents

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YORK® Passive Chilled Beams	3
CB-PBE-YK / CB-PBR-YK Performance Data	5
CB-PBE-YK Dimensions	7
CB-PBR-YK Dimensions	8
Specifications	9

# YORK® Passive Chilled Beams

## Comfortable, 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 into 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, displacement ventilation systems or even active chilled beam 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.

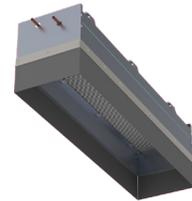
## Available Models:

CB-PBE-YK: Exposed Passive Chilled Beam

CB-PBR-YK: Recessed Passive Chilled Beam



CB-PBE-YK



CB-PBR-YK

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## Standard Features and Options:

- 2 foot to 10 foot lengths, 1 foot increments
- 5 unit widths
- 3 unit heights
- 2-pipe coil configuration
- Mounting brackets with adjustments in two directions
- 1/2" Sweat water coil connections
- Coil air vent

## Options and Accessories:

- Coil drain valve
- 1/2" MNPT water coil connections
- 12 inch, 18 inch or 24 inch stainless steel braided hoses

COOLING CAPACITY OF EXPOSED AND RECESSED PASSIVE BEAMS

Chilled Water Flow Rate, GPM													
Nominal Length ft	Coil Width in	0.75 GPM		1.0 GPM		1.25 GPM		1.5 GPM		2.0 GPM		2.5 GPM	
		Q <sub>SENS</sub>	ΔP <sub>w</sub>										
		Btu/h	ft wg										
4	12.5	963	0.33	1,000	0.75	1,029	1.17	1,054	1.62	1,094	2.69	1,127	4.01
	15.0	1,045	0.40	1,085	0.90	1,117	1.41	1,144	1.94	1,188	3.23	1,223	4.81
	17.5	1,121	0.46	1,164	1.06	1,198	1.64	1,227	2.26	1,274	3.77	1,312	5.61
	20.0	1,190	0.53	1,236	1.21	1,272	1.88	1,303	2.59	1,353	4.31	1,393	6.41
	22.5	1,255	0.60	1,303	1.36	1,342	2.11	1,374	2.91	1,427	4.84	1,469	7.21
6	12.5	1,444	0.45	1,499	1.05	1,544	1.63	1,581	2.24	1,642	3.70	1,690	5.48
	15.0	1,568	0.54	1,628	1.26	1,676	1.95	1,717	2.68	1,782	4.44	1,835	6.58
	17.5	1,681	0.63	1,745	1.46	1,797	2.28	1,840	3.13	1,911	5.18	1,967	7.67
	20.0	1,785	0.72	1,854	1.67	1,909	2.60	1,955	3.58	2,029	5.92	2,089	8.77
	22.5	1,883	0.81	1,955	1.88	2,013	2.93	2,061	4.02	2,140	6.66	2,204	9.86
8	12.5	1,925	0.57	1,999	1.34	2,058	2.08	2,108	2.85	2,189	4.71	2,254	6.95
	15.0	2,091	0.68	2,171	1.61	2,235	2.50	2,289	3.42	2,376	5.65	2,447	8.35
	17.5	2,241	0.79	2,327	1.87	2,396	2.91	2,454	4.00	2,548	6.59	2,623	9.74
	20.0	2,380	0.91	2,472	2.14	2,545	3.33	2,606	4.57	2,706	7.53	2,786	11.13
	22.5	2,510	1.02	2,606	2.41	2,684	3.75	2,748	5.14	2,854	8.47	2,938	12.52
10	12.5	2,407	0.68	2,499	1.63	2,573	2.54	2,635	3.47	2,736	5.71	2,817	8.43
	15.0	2,613	0.82	2,713	1.96	2,794	3.04	2,861	4.17	2,971	6.86	3,059	10.11
	17.5	2,801	0.96	2,909	2.28	2,995	3.55	3,067	4.86	3,185	8.00	3,279	11.80
	20.0	2,975	1.09	3,089	2.61	3,181	4.06	3,258	5.56	3,382	9.14	3,482	13.49
	22.5	3,138	1.23	3,258	2.94	3,354	4.56	3,435	6.25	3,567	10.28	3,673	15.17

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. Discharge through a minimum 50% free area face. Correction factors for other free areas are shown in table 3 below.
4. Free area for room air to enter ceiling cavity equal to free area of beam discharge into space.
5. 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<sub>SENS</sub> - Sensible Capacity, Coil [Btu/h]

ΔP<sub>w</sub> - Water coil pressure drop [ft wg]

TABLE 1: CORRECTION FOR UNIT HEIGHT

Unit Height (in)	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 FALSE CEILING FREE AREA

Face free area	Multiply Table Value by:
30%	0.94
40%	0.98
50% or more	1.00

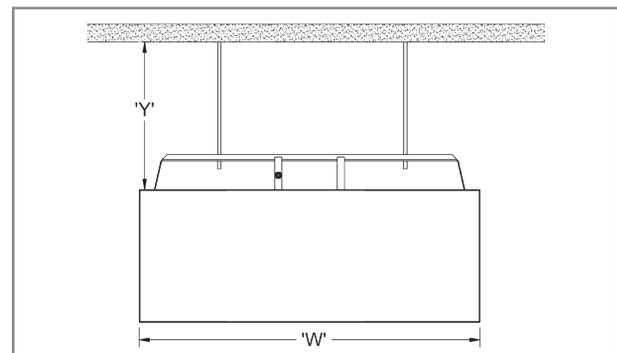


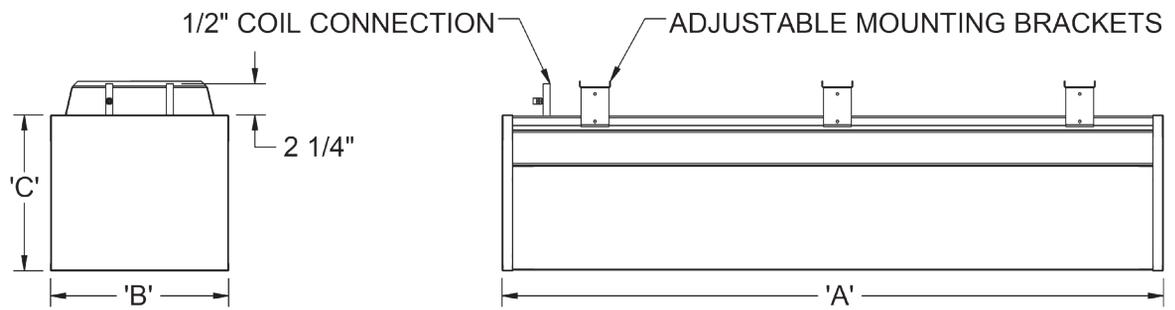
TABLE 4: CORRECTION FOR ( $\Delta T$ ) BETWEEN ENTERING AIR\* AND ENTERING CHILLED WATER

Actual $\Delta T$	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 an adjacent to the perimeter glazing, entering air temperature is typically 5 to 7°F above that of the room.

## DIMENSIONAL INFORMATION

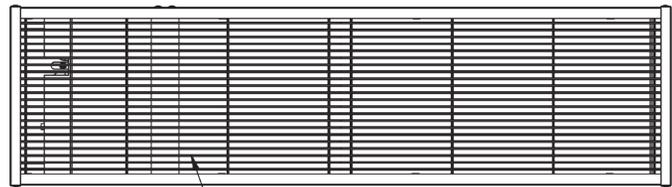
CB-PBE-YK



NOMINAL LENGTH (FT)	'A' (IN)
2	13/4
3	23/4
4	33/4
5	43/4
6	53/4
7	63/4
8	73/4
9	83/4
10	93/4

NOMINAL WIDTH (FT)	'B' (IN)
13	12 3/4
17	16 3/4
18	17 3/4
22	21 3/4
24	23 3/4

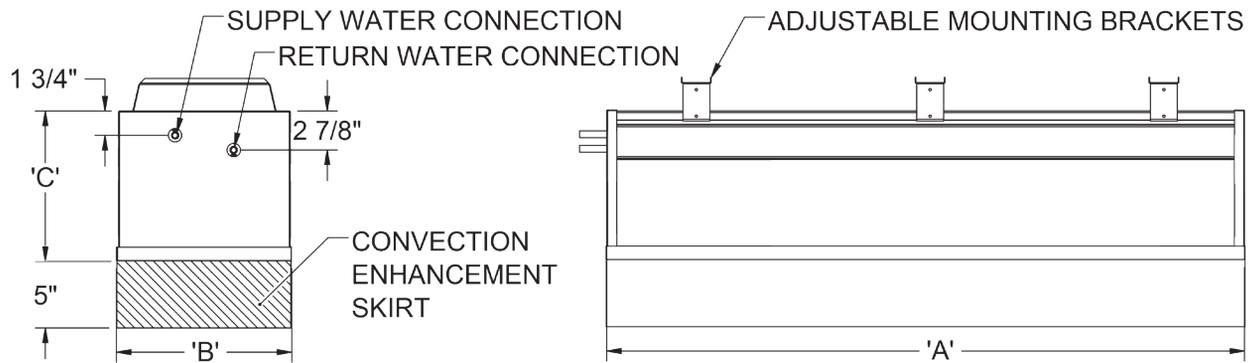
NOMINAL HEIGHT (IN)	'C' (IN)
8	8 7/8
10	10 7/8
12	12 7/8



REMOVABLE GRILLE FACE  
(PERFORATED OR LINEAR BAR)

## DIMENSIONAL INFORMATION

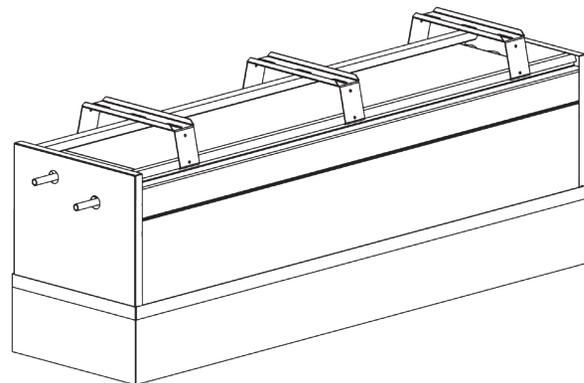
CB-PBR-YK



NOMINAL LENGTH (FT)	'A' (IN)
2	13/4
3	23/4
4	33/4
5	43/4
6	53/4
7	63/4
8	73/4
9	83/4
10	93/4

NOMINAL WIDTH (FT)	'B' (IN)
13	12 3/4
17	16 3/4
18	17 3/4
22	21 3/4
24	23 3/4

NOMINAL HEIGHT (IN)	'C' (IN)
8	8 7/8
10	10 7/8
12	12 7/8



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## Guide Specification: CB-PBR-YK Passive Chilled Beams

### PART 1- GENERAL

#### 1.01 Summary

This section describes the passive chilled beams.

#### 1.02 Submittals

Submit product data for all items complete with the following information:

1. Operating weights and dimensions of all unit assemblies.
2. Performance data, including sensible capacity, chilled water flow rates, and water side pressure losses.
3. Construction details including manufacturers recommendations for installation, mounting and connection.

### PART 2- PRODUCTS

#### 2.01 General

Materials and products required for the work of this section shall not contain asbestos, polychlorinated biphenyls (PCB) or other hazardous materials identified by the engineer or owner.

#### 2.02 Design

1. Furnish and install YORK® CB-PBR-YK series recessed passive chilled beams of sizes and capacities as indicated on the drawings and within the mechanical equipment schedules. The quantity and length of the beams shall be as shown on the drawings, without EXCEPTION. The beams shall be constructed and delivered to the job site as single units.
2. The face of the beam shall fully open. The face

section shall include a "skirt" of plenum rated fabric to create continuous convective current from the ceiling cavity through the false ceiling.

3. The beams shall consist of a minimum 20 gauge galvanized steel housing encasing the integral sensible cooling coil.

4. Beams shall be provided with connections for 2 pipe water connections as indicated on plans and schedules. The coil shall be mounted horizontally and shall be manufactured with seamless copper tubing (1/2" outside diameter) with minimum .016 inch wall thickness mechanically fixed to aluminum fins. The aluminum fins shall be limited to no more than ten (10) fins per inch.

The coil shall have a working pressure of at least 300 PSI, and be factory tested for leakage at a minimum pressure of 360 PSI. Each chilled beam shall be provided with factory integrated manual air vents. (OPTIONAL, coil shall be provided with factory integrated drain fittings.) Unless otherwise specified, coil connections shall be bare copper for field sweating to the water supply circuit. Connections shall face upwards, be located near the end of the beam. (OPTIONAL, the chilled water coil shall be provided with NPT male threaded fittings. These fittings must be suitable for field connection to a similar NPT female flexible hose spigot and shall be at least 1 1/2" long to facilitate field connection (by others).

5. Beams shall be delivered clean, flushed and capped to prevent ingress of dirt

#### 2.03 Performance

1. All performance shall be in compliance with that shown on the equipment schedule.
2. Coils shall be rated in accordance with AHRI Standard 410, but their cooling capacities shall be established in accordance with EN Standard 14518.
3. Chilled water flow rates to the beams shall be limited

to that which results in a maximum ten (10) foot head loss. Water flow velocities through the beam shall not exceed 4 FPS.

## PART 3- EXECUTION

### 3.02 Installation

1. Coordinate the size, tagging and capacity of the beams to their proper location.
2. Chilled beams up to six feet in length shall be independently suspended from the structure above by a four (4) threaded rods of 3/8" diameter (provided by the installing contractor). For beams beyond six feet in length, six (6) threaded rods of 3/8" diameter shall be used. The upper end of the rods shall be suspended from strut channels that are a) mounted perpendicular to the beam length and b) at least four inches wider than the beam to facilitate relocation of the threaded rods along their length. The beam shall then be positioned above the acoustical ceiling grid and lowered into the grid module by adjusting the nuts connecting the threaded rods to the beam.
3. Before connecting the supply water system(s) to the beams, contractor shall flush the piping system(s) to assure that all debris and other matter have been removed.
4. Contractor shall perform connection of beams to the chilled water circuit by method specified (hard connection using sweated connection or connection using flexible hoses).
5. Flexible connector hoses shall be furnished by others (optionally by the manufacturer). Hoses shall be twenty four (12, 18, or 24) inches in length and suitable for operation with a bend radius as small as five (5) inches. Connector hoses shall consist of a PTFE lined hose with a wire braided jacket. The hoses shall be suitable for

operation in an environment between -40 and 200°F, rated for a least 300 PSI and tested for leakage at a minimum pressure of 360 PSI. Contractor shall assure that the chilled water supplying the beams has been properly treated in accordance to BSRIA publication AG 2/93.

6. No power or direct control connections shall be required for the operation of the chilled beam.

### 3.03 Cleaning and Protection

1. Air and water connections shall be covered before shipment and remain so until final installation. Damaged material due to improper site protection shall be cause for rejection.
2. Clean equipment, repair damaged finishes as required to restore beams to as-new appearance.

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Materials and products required for the work of this section shall not contain asbestos, polychlorinated biphenyls (PCB) or other hazardous materials identified by the engineer or owner.

### 2.02 Design

1. Furnish and install YORK® CB-PBE-YK series exposed passive chilled beams of sizes and capacities as indicated on the drawings and within the mechanical equipment schedules. The quantity and length of the beams shall be as shown on the drawings, without EXCEPTION. The beams shall be constructed and delivered to the job site as single units.
2. The face of the beam shall consist of 50% free area perforated (optional linear bar type) section. The face section shall be sectioned into two pieces so either section can be moved to the opposing side for coil cleaning. The entire visible face sections and all visible surfaces shall be finished in white powder coat paint or as specified by the architect.
3. Beams shall be provided with side and end details which will allow its integration into the applicable (nominal 24 inch wide) acoustical ceiling grid as specified by the architect.
4. The beams shall consist of a minimum 20 gauge galvanized steel housing encasing the integral sensible cooling coil.
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