PRMH20241661

City of Puyallup Development & Permitting Services ISSUED PERMIT
Building | Planning | Engineering | Public Works | Fire | Traffic

Calculations required to be provided by the Permittee on site for all Inspections

City of Puyallup Building REVIEWED FOR COMPLIANCE
SKinnear
10/31/2024
9:35:45 AM

R&W ENGINEERING, INC.
9615 SW Allen Boulevard, Suite 107 ▪ Beaverton, OR 97005
www.rweng.com ▪ Phone: 503.292.6000

TECHNICAL MEMORANDUM

Project Number 1730.001

DATE: ..... March 29, 2023

TO: COMPANY: ..... Geary Pacific
ATTENTION: .... Bob Deschenes

FROM: ..... Mark D. Jones, P.E.

MARK D. JONES STATE OF WASHINGTON #43743 REGISTERED PROFESSIONAL ENGINEER
2023.03.29 11:02:18-07'00'

SUBJECT: ..... Washington State Energy Study – Bard Units

1. Introduction:

Geary Pacific has hired R&W Engineering, Inc. to verify that 18 HVAC units which Bard manufactures to be used for modular classrooms comply with minimum efficiency requirements and energy credits of the 2021 Washington State Energy Code (WSEC). This code establishes minimum efficiency and credit requirements for buildings and systems and will be enforced starting July 1, 2023. The HVAC equipment to be assessed are Bard models indicated in Table 1 below.

MODEL			
C36HY	C24H2	I30H1	I36Z1
C42HY	C30H2	I36H1	I48Z1
C48HY	C36H1	I42H1	I60Z1
C60HY	C42H1	I48H1	
	C48H1	I60H1	
	C60H1		

Table 1

Each model is categorized by code as an electrically operated, Single-package Vertical Heat Pump (SPVHP). Their rated efficiencies, provided by the manufacturer, are shown in Figures 1-4 below.

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CAPACITY AND EFFICIENCY RATINGS

MODELS	C24H2	C30H2	C36HY	C42HY	C48HY	C60HY
Cooling Capacity in BTUH, Stage 2 (Full Load)	22,400	28,000	34,000	41,000	45,500	55,500
Unit Efficiency in EER	11.00	11.00	11.00	11.20	11.50	11.00
Cooling Rated CFM (Constant Airflow)	740	900	1,100	1,300	1450	1650
IPLV (Integrated Stage 1 and Stage 2)	15.9	14.9	14.7	15.3	15.8	15.3
Hi Temp Heating (47F) BTUH, Stage 2 (Full Load)	19,400	24,400	31,000	37,400	42,000	52,500
Coefficient of Performance (COP)	3.30	3.30	3.30	3.30	3.30	3.30
Heating Rated CFM (Constant Airflow)	740	900	1,100	1,300	1450	1650

① Certified in accordance with ANSI/AHRI Standard 390-2021 for Single Package Vertical Units.
② Stage 2 Cooling Capacity and Efficiency provided at 80°F DB/67°F WB indoor, 95°F outcoor conditions.

② EER = Energy Efficiency Ratio. EER and COP are certified in accordance with ANSI/ARI Standard 390-2021. All ratings based on fresh air intake being 100% closed (no outside air introduction).

② IPLV = Integrated Part Load Value. This is a weighted average of 25%, 50%, 75% and 100% output. IPLV is normally used to show actual energy usage during practical conditions.

Figure 1

Certified Capacity and Efficiency Ratings at Full Capacity

MODELS	C24H2	C30H2	C36H1	C42H1	C48H1	C60H1
Cooling BTUH, Stage 2 (Full Capacity) ① 80/67-95	22,400	28,000	35,000	40,000	45,500	55,500
EER ①②	11.0	11.0	11.0	11.0	11.0	11.0
Rated CFM	740	900	1100	1250	1500	1650
IPLV (Integrated Stage 1 and Stage 2) ①③ 80/67-80	15.9	14.9	14.5	14.5	15.0	14.8
High Temperature 47° Heating BTUH, Stage 2 (Full Capacity)	19,400	24,400	31,000	38,500	41,500	51,000
COP ①④	3.30	3.30	3.30	3.40	3.40	3.30
Rated CFM	740	900	1100	1250	1500	1650

① Certified in accordance with ARI Standard 390-2003 for single package vertical units
② EER = Energy Efficiency Ratio - BTU/WATT efficiency
③ Integrated Part Load Value - BTU/WATT efficiency (combines Stage 1 & 2 performance)
④ COP = Coefficient of Performance - BTU/WATT efficiency

Figure 2

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CAPACITY AND EFFICIENCY RATINGS (STAGE 2) FULL LOAD OPERATION

MODELS	I30H1	I36H1	I42H1	I48H1	I60H1
Cooling BTUH, Full Load Capacity, 95-80/67 EER ① Rated CFM	27,800 11.7 900	35,000 12.0 1150	41,500 12.0 1300	47,000 12.0 1500	54,000 11.2 1700
IPLV (Integrated Full & Part Load) ② 80-80/67	15.4	16.5	15.7	16.1	15.5
Heating BTUH, Full Load Capacity 47/43-70 COP ③ Rated CFM	26,600 3.6 900	32,800 3.7 1150	38,500 3.7 1300	44,500 3.7 1500	54,000 3.6 1700

① EER = Energy Efficiency Ratio - BTU/WATT efficiency
② IPLV = Integrated Part Load Value - BTU/WATT efficiency (combines full and part load performance)
③ COP = Coefficient of Performance - BTU/WATT efficiency

CAPACITY AND EFFICIENCY RATINGS (STAGE 1) PART LOAD OPERATION

MODELS	I30H1	I36H1	I42H1	I48H1	I60H1
Cooling BTUH, Part Load Capacity, 80-80/67 EER ① Rated CFM	20,500 11.8 650	25,500 12.7 850	30,000 12.3 950	33,500 12.0 1050	38,500 11.5 1200
Heating BTUH, Part Load Capacity 47/43-70 COP ③ Rated CFM	19,800 3.5 650	22,800 3.6 850	27,000 3.6 950	30,500 3.6 1050	36,500 3.4 1200

① EER = Energy Efficiency Ratio - BTU/WATT efficiency
② IPLV = Integrated Part Load Value - BTU/WATT efficiency (combines full and part load performance)
③ COP = Coefficient of Performance - BTU/WATT efficiency

Figure 3

Capacity & Efficiency Ratings (Stage 2) Full Load Operation

MODELS	I36Z1	I48Z1	I60Z1
Cooling BTUH, Full Load Capacity, 95-80/67 EER ① Rated CFM	35,000 12.0 1150	47,000 11.8 1400	54,000 11.0 1600
IPLV (Integrated Full & Part Load) ② 80-80/67	16.5	16.1	15.2
Heating BTUH, Full Load Capacity 47/43-70 COP ③ Rated CFM	31,800 3.7 1150	44,500 3.7 1400	54,000 3.5 1600

Capacity & Efficiency Ratings (Stage 1) Part Load Operation

MODELS	I36Z1	I48Z1	I60Z1
Cooling BTUH, Part Load Capacity, 95-80/67 EER ① Rated CFM	25,000 12.7 850	32,500 12.0 1050	37,000 11.0 1200
Heating BTUH, Part Load Capacity 47/43-70 COP ③ Rated CFM	23,100 3.6 850	30,500 3.6 1050	36,500 3.4 1200

① EER = Energy Efficiency Ratio - BTU/WATT efficiency
② IPLV = Integrated Part Load Value - BTU/WATT efficiency (combines full and part load performance)
③ COP = Coefficient of Performance - BTU/WATT efficiency

Figure 4

Section C406.2.2 More Efficient HVAC System Performance states:

> *"All heating and cooling systems shall meet the minimum requirements of Section C403 and efficiency improvements shall be referenced to the minimum efficiency requirements listed in the tables in Section C403.3.2."*

By the cut sheets shown in the Appendix of this memorandum, the Bard units in consideration are Single Packaged Vertical Heap Pumps (SPVHP). All units considered have a size capacity of less than 65,000 Btu/h.

Figure 5 below, along with Figures 1-4, demonstrate each Bard unit meets the required minimum efficiencies in Section C403.3.2.

Table C403.3.2(4)
Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners and Room Air-Conditioner Heat Pumps—Minimum Efficiency Requirements[a]

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure[a]
SPVHP (cooling mode)	< 65,000 Btu/h	95°F db/75°F wb outdoor air[c]	11.0 EER	AHRI 390
	≥ 65,000 Btu/h and < 135,000 Btu/h		10.0 EER	
	≥ 135,000 Btu/h and < 240,000 Btu/h		10.0 EER	
SPVHP (heating mode)	<65,000 Btu/h	47°F db/43°F wb outdoor air	3.3 COP	AHRI 390
	≥ 65,000 Btu/h and < 135,000 Btu/h		3.0 COP	
	≥ 135,000 Btu/h and < 240,000 Btu/h		3.0 COP	

For SI: 1 British thermal unit per hour = 0.2931 W, °C = [(°F) - 32]/1.8.

"Cap" = The rated cooling capacity of the product in Btu/h. If the unit's capacity is less than 7,000 Btu/h, use 7,000 Btu/h in the calculation. If the unit's capacity is greater than 15,000 Btu/h, use 15,000 Btu/h in the calculations.

a. Chapter 6 contains a complete specification of the referenced standards, which include test procedures, including the referenced year version of the test procedure.

b. Nonstandard size units must be factory labeled as follows: "MANUFACTURED FOR NONSTANDARD SIZE APPLICATIONS ONLY: NOT TO BE INSTALLED IN NEW STANDARD PROJECTS." Nonstandard size efficiencies apply only to units being installed in existing sleeves having an external wall opening of less than 16 inches (406 mm) high or less than 42 inches (1067 mm) wide and having a cross-sectional area less than 670 square inches (0.43 m²).

c. The cooling-mode wet bulb temperature requirement only applies for units that reject condensate to the condenser coil.

d. "Cap" in EER and COPH equations for PTACs and PTHPs means cooling capacity in Btu/h at 95°F outdoor dry-bulb temperature.

e. This table is a replica of ASHRAE 90.1 Table 6.8.1-4 Electrically Operated Packaged Terminal Air Conditioners, Packaged Terminal Heat Pumps, Single-Package Vertical Air Conditioners, Single-Package Vertical Heat Pumps, Room Air Conditioners, and Room Air-Conditioner Heat Pumps—Minimum Efficiency Requirements.

Figure 5

Section C406.2.2 continues to state:

> *"For occupancies and systems required to comply with Section C403.1.1, credits are permitted to be achieved by meeting the requirements of Section C406.2.2.1."*

Figure 6 below shows Section C403.1.1 and some of the exceptions.

C403.1.1 HVAC Total System Performance Ratio (HVAC TSPR)

For systems serving office (including medical office), retail, library, and education occupancies and buildings, which are subject to the requirements of Section C403.3.5 without exceptions, and the dwelling units and residential common areas within Group R-2 multi-family buildings, the *HVAC total system performance ratio (HVAC TSPR)* of the *proposed design* HVAC system shall be greater than or equal to the *HVAC TSPR* of the *standard reference design* as calculated according to Appendix D, Calculation of HVAC Total System Performance Ratio.

EXCEPTIONS:

1. Buildings where the sum of the *conditioned floor area* of office, retail, education, library and multifamily spaces is less than 5,000 square feet. Areas that are eligible for any of the exceptions below do not count towards the 5,000 square feet.
2. HVAC systems using district heating water, chilled water or steam.
3. HVAC systems connected to a *low-carbon district energy exchange system*.
4. HVAC systems not included in Table D601.10.1.

Figure 6

Figure 7 below shows Table D601.10.1 which shows the SPVHP units are exempt from being required to comply with Section C403.1.1 and Section C406.2.2.1.

Table D601.10.1
Proposed Building HVAC Systems
Supported by HVAC TSPR Simulation Software

System No.	System Name	System Abbreviation
1	Packaged Terminal Air Conditioner	PTAC
2	Packaged Terminal Air Heat Pump	PTHP
3	Packaged Single Zone Gas Furnace (includes split system)	PSZGF
4	Packaged Single Zone Heat Pump (air to air only) (includes split system)	PSZHP
5	Variable Refrigerant Flow (air cooled only)	VRF
6	Four Pipe Fan Coil	FPFC
7	Water Source Heat Pump	WSHP
8	Ground Source Heat Pump	GSHP
9	Packaged Variable Air Volume (dx cooling)	PVAV
10	Variable Air Volume (hydronic cooling)	VAV
11	Variable Air Volume with Fan Powered Terminal Units	VAVFPTU
12	Dedicated Outdoor Air System (in conjunction with systems 1-8)	DOAS

Figure 7

Therefore, to comply with Section C406.2.2 More Efficient HVAC System Performance, the section states

"systems are permitted to achieve credits by meeting the requirements of either:

1. *Section C406.2.2.2, More efficient HVAC equipment cooling and fan performance.*
2. *Section C406.2.2.3, More efficient HVAC equipment heating performance.*
3. *Section C406.2.2.4, High performance dedicated outdoor air system (DOAS).*
4. *Any combination of Sections C406.2.2.2, C406.2.2.3, and C406.2.2.4."*

2. Analysis:

Per Section C406.2.2.2, Equation 4-15 was used to calculate the cooling energy efficiencies and credits for each unit in question. See Appendix for Section C406.2.2.2. See Figure 8 for Cooling Efficiency and Credit Calculations.

Per Section C406.2.2.3, Equation 4-16 was used to calculate the heating energy efficiencies and credits for each unit in question. See Appendix for Section C406.2.2.2. See Figure 8 for Heating Efficiency and Credit Calculations.

2021 WSEC Energy Credit Calculator for Bard High Efficiency 2 stage Heat Pumps															
	Cooling Efficiency			Heating Efficiency			2021 Washington State Energy Credits (Section C406.2.2.2.2) EEC_{HEC} (By Building Occupancy)				2021 Washington State Energy Credits (Section C406.2.2.2.2) EEC_{HEH} (By Building Occupancy)			
Model	Seasonal Rated Efficiency (IPLV)	Code Minimum Efficiency (EER)	Performance Above Code (Cooling) CEI	Rated Efficiency (COP)	Min (COP)	Performance Above Code (Heating) HEI	Group E	Group B	Group M	All Other	Group E	Group B	Group M	All Other
C36HY	14.7	11.0	20.0%	3.3	3.3	0%	16	12	12	8	0	0	0	0
C42HY	15.3	11.0	20.0%	3.3	3.3	0%	16	12	12	8	0	0	0	0
C48HY	15.8	11.0	20.0%	3.3	3.3	0%	16	12	12	8	0	0	0	0
C60HY	15.3	11.0	20.0%	3.3	3.3	0%	16	12	12	8	0	0	0	0
C24H2	15.9	11.0	20.0%	3.3	3.3	0%	16	12	12	8	0	0	0	0
C30H2	14.9	11.0	20.0%	3.3	3.3	0%	16	12	12	8	0	0	0	0
C36H1	14.5	11.0	20.0%	3.3	3.3	0%	16	12	12	8	0	0	0	0
C42H1	14.5	11.0	20.0%	3.4	3.3	3%	16	12	12	8	6	2	10	4
C48H1	15.0	11.0	20.0%	3.4	3.3	3%	16	12	12	8	6	2	10	4
C60H1	14.8	11.0	20.0%	3.3	3.3	0%	16	12	12	8	0	0	0	0
I30H1	15.4	11.0	20.0%	3.6	3.3	9%	16	12	12	8	18	5	29	13
I36H1	16.5	11.0	20.0%	3.7	3.3	12%	16	12	12	8	24	7	39	17
I42H1	15.7	11.0	20.0%	3.7	3.3	12%	16	12	12	8	24	7	39	17
I48H1	16.1	11.0	20.0%	3.7	3.3	12%	16	12	12	8	24	7	39	17
I60H1	15.5	11.0	20.0%	3.6	3.3	9%	16	12	12	8	18	5	29	13
I36Z1	16.5	11.0	20.0%	3.7	3.3	12%	16	12	12	8	24	7	39	17
I48Z1	16.1	11.0	20.0%	3.7	3.3	12%	16	12	12	8	24	7	39	17
I60Z1	15.2	11.0	20.0%	3.3	3.3	0%	16	12	12	8	0	0	0	0

Figure 8

3. Conclusion:

The 18 Bard units analyzed meet minimum Washington State Energy Code requirements. All 18 units have the maximum Energy Credits for cooling for occupancy groups E, B, M, and All Other.

Models C36HY, C42HY, C48HY, C60HY, C24H2, C30H2, C36H1, C60H1, and I60Z1 do not have any Energy Credits for heating.

However, since all units have Energy Credits for cooling, per Section C406.2.2, all 18 Bard units meet the Washington State Energy Code More Efficient HVAC System Performance Requirements.

END OF MEMORANDUM

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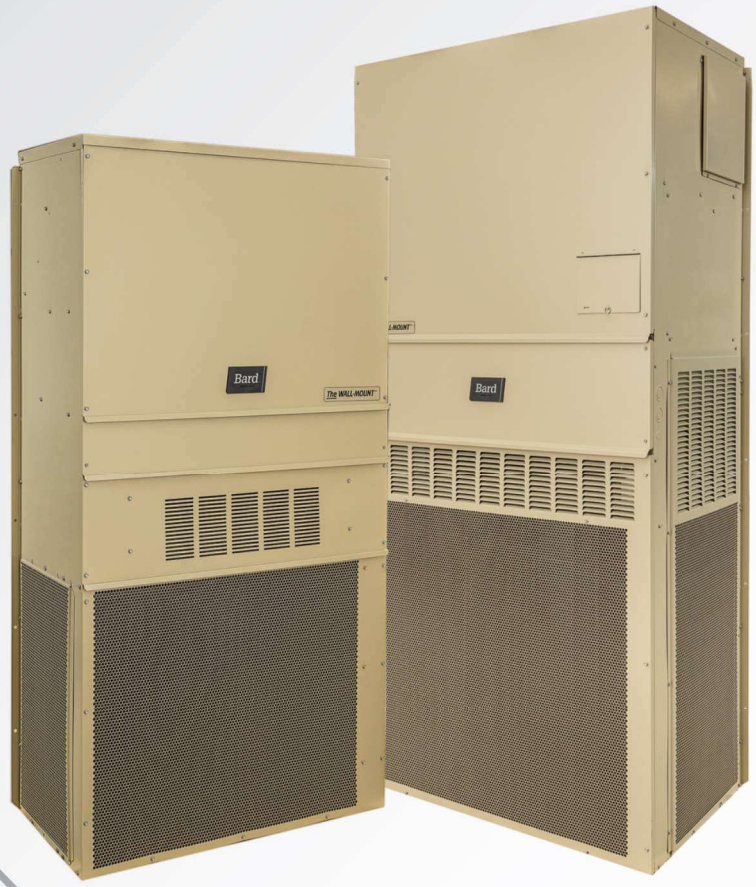

11EER C24H-C60H Series
Two Stage WALL-MOUNT™
Step Capacity Heat Pump

The Bard Step Capacity Wall-Mount Heat Pump is an energy efficient self contained system, which is designed to offer maximum indoor comfort at a minimal cost without using valuable indoor floor space or outside ground space. This unit is the ideal product for versatile applications such as: new construction, modular offices, school modernization, telecommunication structures, portable structures, correctional facilities and many more. Factory or field installed accessories are available to meet specific job requirements for your unique application.

- *Complies with efficiency requirements of ANSI/ASHRAE/IES 90.1-2019.*
- *Certified to AHRI Standard 390-2021 for SPVU (Single Package Vertical Units).*
- *Intertek ETL Listed to Standard for Safety Heating and Cooling Equipment ANSI/UL 1995/CSA 22.2 No. 236-05 Fourth Edition (C24 - 30H2).*
- *Intertek ETL Listed to Standard for Safety of Household and Similar Electrical Appliances ANSI/UL STD 60335-1 & ANSI/UL STD 60335-2-40/CSA STD C22.2 No. 60335-1 & CSA STD C22.2 No. 60335-2-40 Third Edition (C36-C60HY).*
- *Commercial Product - Not intended for residential applications.*
- *Bard is an ISO 9001:2015 Certified Manufacturer.*
- *The AHRI Certified® mark indicates Bard Manufacturing Company participation in the AHRI Certification program. For verification of individual certified products, go to www.ahridirectory.org.*

Bard® SINCE 1914

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Unit Modes of Operation

Cooling Operation:
The Bard CH Series products offer two stage compressor cooling operation using R410A refrigerant. Copper tube/Aluminum hydrophilic green fin coils are used to provide high efficiency and easy serviceability. Scroll compressor technology delivers years of quiet, reliable operation. Economizer vent options are available for increased energy efficiency during cooling operation when outdoor conditions are favorable.

Heating Operation:
The Bard CH Series products offer efficient two stage heat pump heating and optional single or two stage electric heat operation using resistance heaters. Circuit breaker disconnect protection is standard in all 208/230V units equipped with electric heat. 460V models use a toggle disconnect.

Ventilation:
The Wall-Mount product provides the perfect platform to not only cool and heat an indoor area, but also provide a means of bringing outdoor air into the building. By including ventilation in the Wall-Mount, expensive costs associated with additional outdoor air systems can be avoided. The Bard CH Series products offer optional ventilation operation that brings outdoor air into the structure, and vents can be factory or field installed. Ventilation can be used to bring in outdoor air for occupants, save energy by using outdoor air for free cooling, or positively pressurize a structure. Exhaust air options allow room air to be vented outdoors when fresh air is being brought into the structure. Energy recovery options are also available for occupied structures to save energy when ventilation is necessary regardless of outdoor temperature.

Filtration and Indoor Air Quality:
Providing the best air filtration solution is important to occupants and equipment inside a room or structure. Bard provides several filter options based on MERV filtration, and also other solutions to improve indoor air quality.

Low Outdoor Temperature Cooling Operation:
Equipment cooling often requires indoor areas to remain cool regardless of outdoor temperature. If your application requires operation of the compressor to provide cooling below 65° outdoor conditions, then just like any other HVAC system, a low ambient control (LAC) kit must be installed. The LAC will help maintain higher refrigerant pressure during compressor operation at lower outdoor temperatures. This is achieved by limiting outdoor fan operation based on low side system pressure. As temperatures decrease outdoors, outdoor fan use will continue to decrease. Applications that require cooling functionality from 0°F to -40°F outdoor temperatures must use economizer cooling operation.

Note: The LAC kit also includes a freeze stat installed on the unit indoor evaporator coil. The freeze stat helps monitor the indoor evaporator coil temperature and will cycle compressor operation when temperatures below freezing are indicated. Use of Balanced Climate or applications where indoor airflow will be reduced require the use of the LAC kit to help maintain adequate evaporator coil temperatures.

High Outdoor Temperature Cooling Operation:
The Bard CH Series products are designed and tested to function when used in higher outdoor temperature areas. Wall-Mount products utilize large, efficient condenser coils with high airflow condenser fan systems to save energy and lower high side refrigerant pressures. It is always important to follow all clearance guidelines supplied in the unit dimension section of this specification, and additional information provided in the user manual. Properly cleaning the condenser coil using a regular maintenance schedule along with filter changes will help maintain unit operation during high outdoor ambient temperature use. Always follow maintenance procedures provided in the user manual and installation instructions provided with your Bard product.

CAPACITY AND EFFICIENCY RATINGS

MODELS	C24H2	C30H2	C36HY	C42HY	C48HY	C60HY
Cooling Capacity in BTUH, Stage 2 (Full Load)	22,400	28,000	34,000	41,000	45,500	55,500
Unit Efficiency in EER	11.00	11.00	11.00	11.20	11.50	11.00
Cooling Rated CFM (Constant Airflow)	740	900	1,100	1,300	1450	1650
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Hi Temp Heating (47F) BTUH, Stage 2 (Full Load)	19,400	24,400	31,000	37,400	42,000	52,500
Coefficient of Performance (COP)	3.30	3.30	3.30	3.30	3.30	3.30
Heating Rated CFM (Constant Airflow)	740	900	1,100	1,300	1450	1650

① Certified in accordance with ANSI/AHRI Standard 390-2021 for Single Package Vertical Units.
② Stage 2 Cooling Capacity and Efficiency provided at 80°F DB/67°F WB indoor, 95°F outcoor conditions.

② EER = Energy Efficiency Ratio. EER and COP are certified in accordance with ANSI/ARI Standard 390-2021. All ratings based on fresh air intake being 100% closed (no outside air introduction).
② IPLV = Integrated Part Load Value. This is a weighted average of 25%, 50%, 75% and 100% output. IPLV is normally used to show actual energy usage during practical conditions.

GENERAL UNIT SPECIFICATIONS C24 (2 TON) THROUGH C42 (3.5 TON)

MODELS	C24H2-A	C24H2-B	C30H2-A	C30H2-B	C30H2-C
Electrical Rating--60 Hz	230/208-1	230/208-3	230/208-1	230/208-3	460-3
Operating Voltage Range	197 - 253	197 - 253	197 - 253	197 - 253	414 - 506
Compressor--Circuit A					
Voltage	203/208	230/208	230/208	230/208	460
Rated Load Amps	7.5 / 8.4	4.2 / 4.7	9.7 / 11.2	7.2 / 8.3	4.2
Branch Circuit Selection Current	11.7	6.5	13.1	8.7	4.3
Lock Rotor Amps	58.3	55.4	73	58	28
R410A Unit Refrigerant Charge	5.875 lbs.		5.500 lbs.		
Compressor Type	2-Stage Scroll Compressor				
Outdoor Fan Motor & Condenser Fan					
Fan Motor--HP-RPM-SPD	1/3HP - 1060 RPM - Variable Speed				
Fan Motor--Amps	1.7				
Fan--DIA/CFM	20" Dia. - 1900 CFM				
Indoor Blower Motor and Airflow					
Indoor Blower Motor	1/3 Variable ECM Motor with Constant Airflow				
Indoor Blower Motor - Amps	2.4		2.8		
Indoor Airflow CFM	740 CFM - .10 WC		900 CFM - .10 WC		
Filter Sizes (inches) STD.	16" x 30" x 1", 1 Required. 2" Pleated Filters Optional.				
Basic Unit Shipping Weight	380.0 lbs.				
B - Blank-Off Plate	additional 1.0 lbs.				
V - Commercial Room Ventilator	additional 35.0 lbs.				
S - Economizer	additional 45.0 lbs.				
R - Energy Recovery Ventilator	additional 64.0 lbs.				

MODELS	C36HY-A	C36HY-B	C36HY-C	C42HY-A	C42HY-B	C42HY-C
Electrical Rating--60 Hz	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Operating Voltage Range	197 - 253	197 - 253	414 - 506	197 - 253	197 - 253	414 - 506
Compressor--Circuit A						
Voltage	203/208	230/208	460	230/208	230/208	460
Rated Load Amps	15.5/18.1	10.6/12.4	6.6	19.7/22.9	15.7/18.2	8
Branch Circuit Selection Current	14.1	9.6	5.1	17.9	14.2	6.2
Lock Rotor Amps	84.2	73.8	37	96	88	44
R410A Unit Refrigerant Charge	7.750 lbs.			9.875 lbs.		
Compressor Type	2-Stage Scroll Compressor					
Outdoor Fan Motor & Condenser Fan						
Fan Motor--HP-RPM-SPD	1/3HP - 825 RPM - 1 Speed					
Fan Motor--Amps	1.7					
Fan--DIA/CFM	24" Dia. - 2900 CFM					
Indoor Blower Motor and Airflow						
Indoor Blower Motor	1/3 Variable ECM Motor with Constant Airflow					
Indoor Blower Motor - Amps	2.4	2.4	1.0	2.4	2.4	1.0
Indoor Airflow CFM	1100 CFM - .15 WC			1300 CFM - .15 WC		
Filter Sizes (inches) STD.	20" x 20" x 1", 2 Required. 2" Pleated Filters Optional.					
Basic Unit Shipping Weight	490.0 lbs.					
X - Barometric Fresh Air Damper	additional 13.0 lbs.					
A - Barometric Damper w/Exhaust	additional 16.0 lbs.					
B - Blank-Off Plate	additional 14.0 lbs.					
M,V - Commercial Room Ventilator	additional 42.0 lbs.					
D, Y, Z - Economizer	additional 44.0 lbs.					
R - Energy Recovery Ventilator	additional 87.0 lbs.					

General Specifications

Electrical Ratings:
Units are available with 208/230V single or three phase 60hz electrical ratings. 460V three phase 60hz models are also available. It is important to supply the unit with a clean, consistent supply of power within the operating voltage range.

Compressor Circuit and Refrigeration System:
2-Stage scroll compressors are used with R410A refrigerant. Review all electrical data including Locked Rotor Amps when units are to be used with a generator or shore power.

Outdoor Fan Motor and Condenser Fan:
Axial outdoor fans are used for condenser airflow. Outdoor motors are enclosed with a ball bearing design. Outdoor airflow CFM is shown following all unit clearances provided.

Indoor Blower Motor and Airflow:
Dual indoor fan housings are used with a dual shaft motor. ECM blower motors are used that vary torque based on supply airflow static.

Basic Unit Shipping Weight:
Shipping weight is provided with unit attached to skid with carton posts and carton top (packaging weight varies, approximately 20 lbs). Optional ventilation packages add additional weight to the basic unit shipping weight.

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GENERAL UNIT SPECIFICATIONS C48 (4 TON) THROUGH C60 (5 TON)

MODELS	C48HY-A	C48HY-B	C48HY-C	C60HY-A	C60HY-B	C60HY-C
Electrical Rating - 60 Hz	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Operating Voltage Range	197 - 253	197 - 253	414 - 506	197 - 253	197 - 253	414 - 506
Compressor Circuit and Refrigeration System						
Voltage	203/208	230/208	460	230/208	230/208	460
Rated Load Amps	21.7/25.3	14.9/17.4	8	24.5/28.3	17.8/20.5	9
Branch Circuit Selection Current	20.4	14.0	6.4	22.8	16.5	7.2
Lock Rotor Amps	122.1	83.1	41	147.4	110	52
R410A Unit Refrigerant Charge	10.8125 lbs.			10.250 lbs.		
Compressor Type	2-Stage Scroll Compressor					
Outdoor Fan Motor and Condenser Fan						
Fan Motor--HP-RPM-SPD	1/3HP - 825 RPM - 1 Speed					
Fan Motor--Amps	1.7					
Fan--DIA/CFM	24" Dia. - 2900 CFM					
Indoor Blower Motor and Airflow						
Indoor Blower Motor	1/3 Variable ECM Motor with Constant Airflow					
Indoor Blower Motor - Amps	3.2	3.2	1.7	3.2	3.2	1.7
Indoor Airflow CFM	1450 CFM - .20 WC			1650 CFM - .20 WC		
Filter Sizes (inches) STD.	20" x 20" x 1", 2 Required. 2" Pleated Filters Optional.					
Basic Unit Shipping Weight	495.0 lbs.			505.0 lbs.		
X - Barometric Fresh Air Damper	additional 13.0 lbs.					
A - Barometric Damper w/Exhaust	additional 16.0 lbs.					
B - Blank-Off Plate	additional 14.0 lbs.					
M,V - Commercial Room Ventilator	additional 42.0 lbs.					
D, Y, Z - Economizer	additional 44.0 lbs.					
R - Energy Recovery Ventilator	additional 87.0 lbs.					

INDOOR AIRFLOW, STATIC PRESSURES, AND FILTER INFORMATION

INDOOR BLOWER PERFORMANCE					
Model	**Rated ESP**	**Max ESP**	**Full Load CFM (Rated)**	**Part Load CFM**	**Blower only**
C24H2	0.1	0.5	740	550	550
C30H2	0.1	0.5	900	650	650
C36HY	0.15	0.5	1100	800	800
C42HY	0.15	0.5	1300	900	800
C48HY	0.2	0.5	1450	1050	850
C60HY	0.2	0.5	1650	1150	850

FILTER CODE	FILTER MERV RATING	FILTER STATIC INCHES WC.	FILTRATION LEVEL
X	**MERV 2**	0" WC	Low Filtration, 1" Thickness Disposable Media.
W	**MERV 2**	-.02" WC	Low Filtration, 1" Thickness Permanent Media.
P	**MERV 8**	.03" WC	Average Filtration, 2" Thickness Pleated Disposable Media.
M	**MERV 11**	.05" WC	Above Average Filtration, 2" Thickness Pleated Disposable Media.
N	**MERV 13**	.08" WC	High Filtration, 2" Thickness Pleated Disposable Media.

The airflow amount that passes through the unit is very important when considering cooling capacity and proper unit operation. Restriction of the amount of air passing through the unit is called external static pressure (ESP). As the amount of air passing through the unit is restricted, the ESP value increases. This will have a direct impact on how heating and cooling equipment performs when used in an application. It is important to have a professional HVAC contractor, distributor, or technician complete a duct static calculation if supply or return ducts are used with the unit. Unit filter static must also be calculated into the total ESP value.

Supply Duct Static: Supply duct static will include duct work connected to the unit supply opening, supply registers, filtration installed in the supply duct, or any other device in the supply airstream that will restrict airflow. All ducts must be sealed to reduce duct air leakage, and flex duct work must not include restriction due to installation. Duct static must be calculated by a HVAC professional and include all factors of the duct design.

Return Duct Static: Return duct static will include duct work connected to the unit return opening, return registers, filtration installed in the return duct, or any other device in the return airstream that will restrict airflow. All ducts must be sealed to reduce duct air leakage, and flex duct work must not include restriction due to installation.Duct static must be calculated by a HVAC professional and include all factors of the duct design.

Unit Filter Static: The CH series uses a unit filter installed before the indoor blower assembly that filters both indoor air from the room and outdoor air entering through the ventilation device. When additional filtration is required (higher MERV rating), additional static will need to be added to the total external static pressure (ESP). The following chart is to be used to estimate additional static pressure for a installed clean filter.

Calculating Total External Static Pressure: Supply duct static, return duct static, unit filter static, and any other source of additional static pressure are added together. Once this is calculated, the actual unit airflow amount can be reviewed by using the Indoor Airflow CFM charts provided.

Total External Static Pressure Calculation:

Supply Duct Static + Return Duct Static + Filter Static + Additional External Static = Total External Static Pressure (ESP)

Non-Ducted Applications: Applications that do not include supply or return ducts inside the structure, use Bard supplied supply and return louvers, and do not have additional sources of external static will typically reflect rated airflow amounts shown in the Indoor Airflow CFM charts. Additional filter static must still be added as necessary to the rated airflow total external static pressure (ESP). Field supplied supply and return louvers must match Bard supplied supply and return louvers to achieve shown in the Indoor Airflow CFM charts. Adjustment of 4-way deflection supply louver may effect unit supply airflow. See louver deflection and throw characteristics provided in this document.

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THE WALL-MOUNT™ STEP CAPACITY HEAT PUMPS

Integrated Part Load Value (IPLV) Efficiency Up To 15.0 BTU/WATT

GREEN REFRIGERANT R-410A

Models:	**C24H to C60H**	**Up to 11.0 EER**
Cooling Capacities:		**22,200 to 55,500 BTUH**
Heating Capacities:		**19,200 to 51,000 BTUH**

The Bard Wall-Mount Heat Pump is a self-contained energy efficient heating and cooling system, which is designed to offer maximum indoor comfort at a minimal cost without using valuable indoor floor space or outside ground space. This unit is the ideal product for versatile applications such as: new construction, modular offices, school modernization, and the like. Factory or field installed accessories are available to meet specific job requirements.

CH Series Special Features

ECM Indoor Blower Motor:
Features a variable speed motor providing super-high efficiency, low sound levels & soft-start capabilities. The motor is self-adjusting to provide the proper airflow rate for the staged capacity, and for higher static pressure in ducted installations without user adjustment or wiring changes.

Step Capacity Compressor:
Scroll 2-Stage Compressors are standard on all 2 to 5 ton models. Eliminates need for crankcase heater.
Double isolated floating compressor mounting system, compressor sound blanket, and discharge line muffler for reduced sound level.

Quiet Curb Options:
Various curbs are specially designed for the CH product family that reduce sound levels for school and occupied building applications.

Draw-Thru Condenser Airflow:
Condenser air is brought in from the front of the unit condenser section, and exhausted through the side grilles. This allows quiet operation, and avoids heat pump defrost water accumulation in front of the CH unit.

Engineered Features

Copper Tube/Aluminum Fin Coils:
Grooved copper tubing and enhanced aluminum fins provide maximum heat transfer and high energy efficiency. Optional phenolic-coated coils are also available.

Twin Blowers:
Move air quietly. All models feature variable speed blower motors providing airflow adjustment for high and low static operation. Motor overload protection is standard on all models.

Phase Rotation Monitor:
Standard on all 3 phase scroll compressors. Protects against reverse rotation if power supply is not properly connected.

R-410A Refrigerant:
Designed with R-410A (HFC) non-ozone depleting refrigerant in compliance with the Montreal protocol and 2010 EPA requirements.

Liquid Line Filter Drier:
Standard on all units. Protects system against moisture.

Foil Faced Insulation:
Standard on all units.

Galvanized 20 Gauge Zinc Coated Cabinet:
Cleaned, rinsed, sealed and dried before the polyurethane primer is applied. The cabinet is handsomely finished with a baked on, beige textured enamel, which allows it to withstand 1000 hours of salt spray tests per ASTM B117-03. Stainless Steel cabinets available.

Electrical Components:
Are easily accessible for routine inspection and maintenance through a right side, service panel opening. Features a lockable, hinged access cover to the circuit breaker or rotary disconnect switch.

Electric Heat Strips:
Features an automatic limit and thermal cut-off safety control. Heater packages are factory or field installed for all 2 through 5 ton models. Features easy slide-in field assembly with various BTUH outputs.

Condenser Fan and Motor Shroud Assembly:
Slide out for easy access.

Filter Service Door:
Separate service door provides easy access for filter change.

One Inch, Disposable Air Filters:
Are standard equipment. Filter rack permits the addition of 2" pleated filter. Factory or field installed.

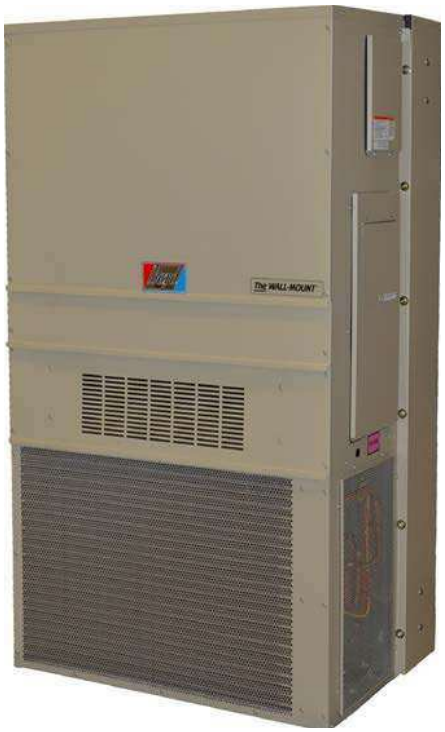
Solid State Electronic Heat Pump Control:
Provides efficient 30, 60 or 90 minute defrost cycle. A thermistor sensor, speed up terminal for service and 10 minute defrost override are standard on the electronic heat pump control.

High & Low Pressure Switches are Auto-Reset:
Standard on all units. Built-in lockout circuit resets from the room thermostat. Provides commercial quality protection to the compressor.

Five Minute Compressor Time Delay:
Short cycle protection is standard. Built into the heat pump control.

Built-in Circuit Breakers:
Standard on all electric heat versions of single (230/208 volt) and three phase (230/208 volt) equipment. Rotary disconnects are standard on three phase (460 volt) equipment. 460V circuit breaker

QUIET CLIMATE FLEX™ ✳



Model C42H shown with TCURBF3660 Wall Curb Attached
✳ Quiet Curb Option must be added to obtain Quiet Climate Flex™ sound ratings.

available as option on OKW only.

Slope Top:
Standard feature for water run-off.

Full Length Mounting Brackets:
Built into cabinet for improved appearance and easy installation. NOTE: Bottom mounting bracket included to assist in installation.

Top Rain Flashing:
Standard feature on all models.

Outdoor Coil Drain Pan:
Standard built in feature. 8620-160 Drain Connnection Kit is standard (recommended for non-freezing climates only).

* The AHRI Certified® mark indicates Bard Manufacturing Company participation in the AHRI Certification program. For verification of individual certified products, go to www.ahridirectory.org.

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Certified Capacity and Efficiency Ratings at Full Capacity

MODELS	C24H2	C30H2	C36H1	C42H1	C48H1	C60H1
Cooling BTUH, Stage 2 (Full Capacity) ① 80/67-95	22,400	28,000	35,000	40,000	45,500	55,500
EER ①②	11.0	11.0	11.0	11.0	11.0	11.0
Rated CFM	740	900	1100	1250	1500	1650
IPLV (Integrated Stage 1 and Stage 2) ①③ 80/67-80	15.9	14.9	14.5	14.5	15.0	14.8
High Temperature 47° Heating BTUH, Stage 2 (Full Capacity)	19,400	24,400	31,000	38,500	41,500	51,000
COP ①④	3.30	3.30	3.30	3.40	3.40	3.30
Rated CFM	740	900	1100	1250	1500	1650

① Certified in accordance with ARI Standard 390-2003 for single package vertical units
② EER = Energy Efficiency Ratio - BTU/WATT efficiency
③ Integrated Part Load Value - BTU/WATT efficiency (combines Stage 1 & 2 performance)
④ COP = Coefficient of Performance - BTU/WATT efficiency

Specifications 2-1/2 through 3 Ton

MODELS	C24H2-A	C24H2-B	C30H2-A	C30H2-B	C30H2-C	C36H1-A	C36H1-B	C36H1-C
Electrical Rating--60 Hz	230/208-1	230/208-3	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Operating Voltage Range	197 - 253	197 - 253	197 - 253	197 - 253	414 - 506	197 - 253	197 - 253	414 - 506
Compressor--Circuit A								
Voltage	203/208	230/208	230/208	230/208	460	230/208	230/208	460
Rated Load Amps	7.5 / 8.4	4.2 / 4.7	9.7 / 11.2	7.2 / 8.3	4.2	11.8 / 13.3	9.0 / 10.1	5.0
Branch Circuit Selection Current	11.7	6.5	13.1	8.7	4.3	15.3	11.7	5.8
Lock Rotor Amps	58.3 / 58.3	55.4 / 55.4	73 / 73	58 / 58	28	83 / 83	73 / 73	38
Compressor Type	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Fan Motor & Condenser								
Fan Motor--HP-RPM-SPD	1/3-1060-1	1/3-1060-1	1/3-1060-1	1/3-1060-1	1/3-1060-1	1/3-825-2	1/3-825-2	1/3-825-2
Fan Motor--Amps	1.7	1.7	1.7	1.7	1.7	2.5	2.5	1.3
Fan--DIA/CFM	20"-1900	20"-1900	20"-1900	20"-1900	20"-1900	24"-2900	24"-2900	24"-2900
Blower Motor & Evap.								
Blower Motor--HP-RPM-SPD	1/3 Var.	1/3 Var.	1/3 Var.	1/3 Var.	1/3 Var.	1/2 Var.	1/2 Var.	1/2 Var.
Blower Motor--Amps	2.4	2.4	2.8	2.8	2.8	2.8	2.8	2.8
CFM w/Filter ①	740 - .10	740 - .10	900 - .10	900 - .10	900 - .10	1100 - .15	1100 - .15	1100 - .15
Filter Sizes (inches) STD.	16 x 30 x 1	16 x 30 x 1	16 x 30 x 1	16 x 30 x 1	16 x 30 x 1	20 x 30 x 1	20 x 30 x 1	20 x 30 x 1
Basic Unit Weight-LBS.	380	380	380	380	380	475	475	475
Blank-Off Plate	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Commercial Room Ventilator	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Economizer	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Energy Recovery Ventilator	64.0	64.0	64.0	64.0	64.0	64.0	64.0	64.0

Specifications 3-1/2 through 5 Ton

MODELS	C42H1-A	C42H1-B	C42H1-C	C48H1-A	C48H1-B	C48H1-C	C60H1-A	C60H1-B	C60H1-C
Electrical Rating--60 Hz	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Operating Voltage Range	197 - 253	197 - 253	414 - 506	197 - 253	197 - 253	414 - 506	197 - 253	197 - 253	414 - 506
Compressor--Circuit A									
Voltage	230/208	230/208	460	230/208	230/208	460	230/208	230/208	460
Rated Load Amps	14.0 / 15.9	11.2 / 12.7	5.6	16.8 / 19.2	11.1 / 12.7	5.8	21.4 / 23.3	13.1 / 14.2	6.2
Branch Circuit Selection Current	18.0	14.2	6.3	21.2	14.1	6.5	27.2	16.6	7.3
Lock Rotor Amps	96 / 96	88 / 88	44	104	83 / 83	41	153 / 153	110 / 110	52
Compressor Type	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Fan Motor & Condenser									
Fan Motor--HP-RPM-SPD	1/3-825-2	1/3-825-2	1/3-825-1	1/3-825-2	1/3-825-2	1/3-825-1	1/2-1025-1	1/2-1025-1	1/2-1025-1
Fan Motor--Amps	2.5	2.5	1.3	2.5	2.5	1.3	4.1	4.1	4.1
Fan--DIA/CFM	24"-2900	24"-2900	24"-2900	24"-2900	24"-2900	24"-2900	24"-3700	24"-3700	24"-3700
Blower Motor & Evap.									
Blower Motor--HP-RPM-SPD	3/4 Var.	3/4 Var.	3/4 Var.	3/4 Var.	3/4 Var.	3/4 Var.	3/4 Var.	3/4 Var.	3/4 Var.
Blower Motor--Amps	3.8	3.8	3.8	4.4	4.4	4.4	4.7	4.7	4.7
CFM w/Filter ①	1250 - .15	1250 - .15	1250 - .15	1550 - .2	1550 - .2	1550 - .2	1650 - .2	1650 - .2	1650 - .2
Filter Sizes (inches) STD.	20 x 30 x 1	20 x 30 x 1	20 x 30 x 1	20 x 30 x 1	20 x 30 x 1	20 x 30 x 1	20 x 30 x 1	20 x 30 x 1	20 x 30 x 1
Basic Unit Weight-LBS.	520	520	540	550	550	595	555	555	600
Blank-Off Plate	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Commercial Room Ventilator	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
Economizer	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
Energy Recovery Ventilator	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0

See Curb Weights - Page 10

2.5 - 5 Ton Capacity I30H - I60H Models 208V - 460V 60hz

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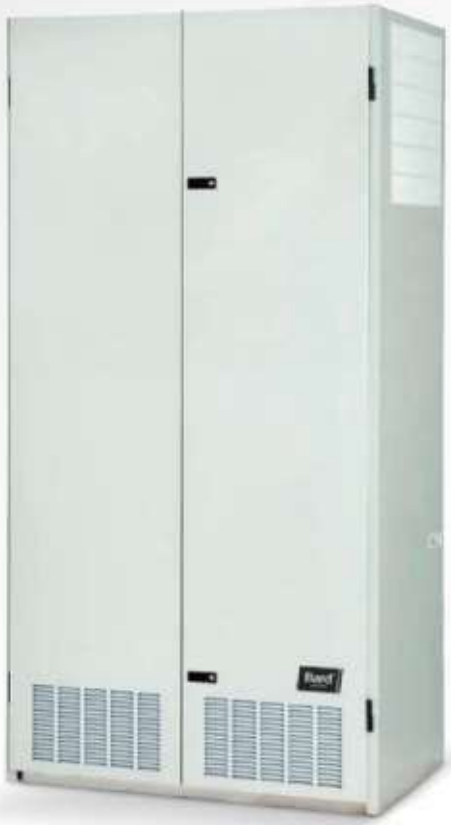

IH Series I-TEC™ Heat Pump

The I-TEC is one of the most advanced systems of its kind. It meets the most stringent sound level requirements while offering premium efficiency. Because the outdoor air portion of the unit is above the sill at window level, installing the unit is simple and it blends in seamlessly with the building's exterior. Two stage step capacity operation using ECM fan technology provides quiet and efficient operation. All these features and more make the I-TEC the ideal product for new construction and rennovation projects.

- *Complies with efficiency requirements of ASHRAE/IESNA 90.1-2019*
- *Certified to ASNI/ARI Standard 390-2021 for SPVU (Single Package Vertical Units)*
- *Intertek ETL Listed to Standard for Safety Heating and Cooling Equipment ANSI/UL 1995/CSA 22.2 No. 236-05 Fourth Edition*
- *Commercial Product - Not intended for residential application*
- *Bard is an ISO 9001:2015 Certified Manufacturer*
- *The AHRI Certified® mark indicates Bard Manufacturing Company participation in the AHRI Certification program. For verification of individual certified products, go to www.ahridirectory.org.*

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CAPACITY AND EFFICIENCY RATINGS

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CAPACITY AND EFFICIENCY RATINGS (STAGE 2) FULL LOAD OPERATION

MODELS	I30H1	I36H1	I42H1	I48H1	I60H1
Cooling BTUH, Full Load Capacity, 95-80/67 EER ① Rated CFM	27,800 11.7 900	35,000 12.0 1150	41,500 12.0 1300	47,000 12.0 1500	54,000 11.2 1700
IPLV (Integrated Full & Part Load) ② 80-80/67	15.4	16.5	15.7	16.1	15.5
Heating BTUH, Full Load Capacity 47/43-70 COP ③ Rated CFM	26,600 3.6 900	32,800 3.7 1150	38,500 3.7 1300	44,500 3.7 1500	54,000 3.6 1700

① EER = Energy Efficiency Ratio - BTU/WATT efficiency
② IPLV = Integrated Part Load Value - BTU/WATT efficiency (combines full and part load performance)
③ COP = Coefficient of Performance - BTU/WATT efficiency

CAPACITY AND EFFICIENCY RATINGS (STAGE 1) PART LOAD OPERATION

MODELS	I30H1	I36H1	I42H1	I48H1	I60H1
Cooling BTUH, Part Load Capacity, 80-80/67 EER ① Rated CFM	20,500 11.8 650	25,500 12.7 850	30,000 12.3 950	33,500 12.0 1050	38,500 11.5 1200
Heating BTUH, Part Load Capacity 47/43-70 COP ③ Rated CFM	19,800 3.5 650	22,800 3.6 850	27,000 3.6 950	30,500 3.6 1050	36,500 3.4 1200

① EER = Energy Efficiency Ratio - BTU/WATT efficiency
② IPLV = Integrated Part Load Value - BTU/WATT efficiency (combines full and part load performance)
③ COP = Coefficient of Performance - BTU/WATT efficiency

UNIT SHIPPING WEIGHTS

MODELS	NO VENT	CRV	ERV
I30H1-A	816	908	943
I30H1-B	816	908	943
I30H1-C	851	943	978
I36H1-A	846	938	973
I36H1-B	846	938	973
I36H1-C	881	973	1008
I42H1-A	896	988	1023
I42H1-B	896	988	1023
I42H1-C	931	1023	1058
I48H1-A	884	976	1011
I48H1-B	884	976	1011
I48H1-C	919	1011	1046
I60H1-A	931	1023	1058
I60H1-B	931	1023	1058
I60H1-C	966	1058	1093

MODELS	NO VENT	CRV	ERV
I30H1DA	830	920	955
I30H1DB	830	920	955
I30H1DC	865	955	990
I36H1DA	858	950	985
I36H1DB	858	950	985
I36H1DC	893	985	1020
I42H1DA	908	1000	1035
I42H1DB	908	1000	1035
I42H1DC	943	1035	1070
I48H1DA	930	1022	1057
I48H1DB	930	1022	1057
I48H1DC	965	1057	1092
I60H1DA	943	1035	1070
I60H1DB	943	1035	1070
I60H1DC	978	1070	1105

Deduct 49# from all values for installed weight.

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2½ THROUGH 3½ TON

MODELS	I30H1-A	I30H1-B	I30H1-C	I36H1-A	I36H1-B	I36H1-C	I42H1-A	I42H1-B	I42H1-C
ELECTRICAL RATING--60 HZ	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Operating Voltage Range	197-253		414-506	197-253		414-506	197-253		414-506
COMPRESSOR									
Volts	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Rated Load Amps (230/208)	10.0/11.5	7.4/8.4	4.2	11.1/13	8.5/9.9	4.9	13.8/15.6	11.0/12.4	5.5
Branch Circuit Selection Current	13.1	8.7	4.3	15.3	11.7	5.8	18.0	14.2	6.3
Locked Rotor Amps	73	58	28	83	73	38	96	88	44
ENERGY RECOVERY VENTILATOR									
Volts	230/208-60-1			230/208-60-1			230/208-60-1		
Full Load Amps (3-motors)	2.2			2.2			2.2		
FAN MOTOR – ECM									
Horsepower	1/3			1/3			1/3		
Volts	230/208-60-1			230/208-60-1			230/208-60-1		
Full Load Amps	1.7			2.6			2.6		
+ CFM	1950			2300			2300		
BLOWER MOTOR – ECM									
Horsepower	1/3			1/2			1/2		
Volts	230/208-60-1			230/208-60-1			230/208-60-1		
Full Load Amps	1.9			2.5			2.5		

+ CFM @ rating points, will modulate based upon O.D. ambient.

4 AND 5 TON

MODELS	I48H1-A	I48H1-B	I48H1-C	I60H1-A	I60H1-B	I60H1-C
ELECTRICAL RATING--60 HZ	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Operating Voltage Range	197-253		414-506	197-253		414-506
COMPRESSOR						
Volts	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Rated Load Amps (230/208)	15.6/17.5	10.4/11.6	5.4	22/23.4	13.4/14.3	6.3
Branch Circuit Selection Current	19.9	11.6	6.4	27.2	16.6	7.2
Locked Rotor Amps	104.0	83.1	41	152.9	110.0	52.0
ENERGY RECOVERY VENTILATOR						
Volts	230/208-60-1			230/208-60-1		
Full Load Amps (3-motors)	2.2			2.2		
FAN MOTOR – ECM						
Horsepower	1/2			1/2		
Volts	230/208-60-1			230/208-60-1		
Full Load Amps	3.2			3.2		
+ CFM	2600			2600		
BLOWER MOTOR – ECM						
Horsepower	1/2			3/4		
Volts	230/208-60-1			230/208-60-1		
Full Load Amps	3.2			4.4		

+ CFM @ rating points, will modulate based upon O.D. ambient.

CUT SHEETS FOR MODELS: I36Z1 - I48Z1 - I60Z1

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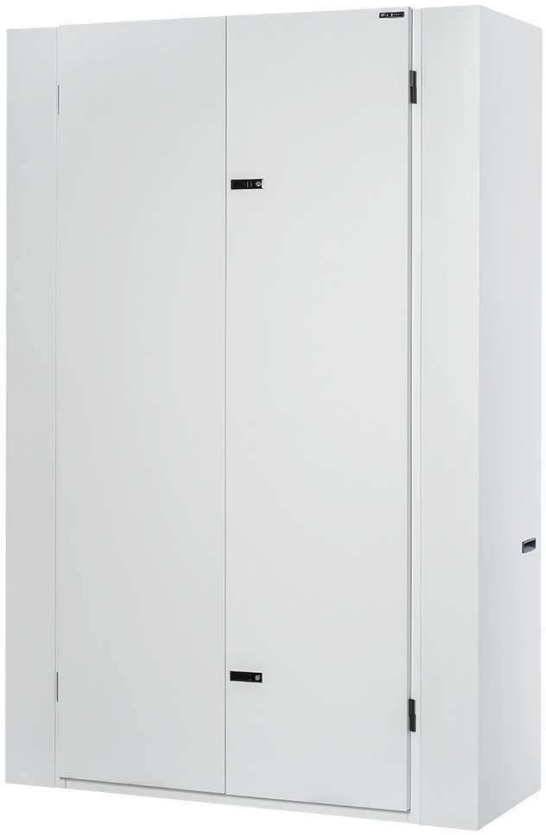
I-TEC® I36Z-I60Z 2-Stage Compressor High Efficiency Air Source Heat Pumps

Cooling Capacities: 25,000 to 54,000 Btuh Heating Capacities: 22,800 to 54,000 Btuh

The Bard I-TEC Indoor Heat Pump system is designed for classrooms and other similar applications demanding high efficiency and the lowest possible sound levels that are practical and achievable, and also accommodates the over-the-window sill requirement for many replacement projects on older school buildings. The I-TEC Series meets that challenge with many innovative design features resulting in a highly refined appearance while at the same time improving on the very important maintenance and serviceability features needed by the facilities maintenance and service staffs.

I-TEC Standard Features

- Double wall construction, 20-ga. exterior skin, no visible fasteners
- Non fiberglass insulation
- Hinged, lockable, removable doors
- Removable sides and modularized construction for transporting through standard doors or in elevators allows installation on second and third floor
- Can be installed in left or right corners with no modifications
- Non-corrosive drainpans with no standing water
- 2-Stage scroll compressors with discharge muffler, double floating isolation mounting system, and sound muffling cover
- R-410A Green Refrigerant
- Heating and cooling thermostatic expansion valves
- Extra large full width control panel for easy access to all controls
- All 230/208V units with or without electric heat have circuit breaker. All 460V units have Toggle Disconnect. Option for 460V circuit breaker on 0KW models only.
- Evaporator coils constructed with hydrophilic fin stock w/the following advantages:
  - Acrylic coating
  - Wettable surface with low contact angle – no bead-up condensate, lower wet-coil air-side pressure drop, improved draining & lower re-entrainment of moisture back into the air stream in continuous blower operating modes
  - Antimicrobial properties provide microbial resistance to fungicidal growth
  - Resistant to Mold and Mildew, ASTM D3273 – no growth
  - Seals fin surface against aluminum oxide formation
- 24VAC 75VA control transformer with circuit breaker
- 24VAC low-voltage terminal strip for thermostat or DDC control
- ECM indoor and outdoor motors
- Modulating outdoor fan motor and low ambient control
- Modulating indoor fan motor for constant CFM in different operating modes up to 0.50" ESP
- High and Low Pressure switches with lockout circuit
- Electronic heat pump control board with diagnostics
- Liquid line filter/drier
- Readily accessible service ports located behind locking hinged doors
- Pleated 2" MERV 8 filter
- Designed for over-the-window sill wall penetration and has 3" vertical adjustment for wall sleeve attachment
- Units designed to be flush to a smooth interior wall and not require trim kits by use of adjustable wall sleeves; Trim Kits available where required
- Low sound levels are achieved by numerous system design innovations including special acoustical insulation



- Installation flexibility. Can be installed in corner applications with one side against a wall.
- Condensate overflow detection system with diagnostics monitors equipment and shuts down compressor to prevent condensate overflow.
- Freezestat on indoor coil safeguards against indoor coil freeze up by shutting down the compressor.

I-TEC Optional Features & Accessories

Ventilation Option:

CRV has ECM motor, filter system, and positive shut-off.

***Commercial Room Ventilator* (CRV)** is a fan powered ventilation package to manage intake & exhaust air at fixed rates but without energy recovery capability.

- The rates are: 300-375-450, are independently selectable, and has positive shutoff on intake and exhaust sides when unoccupied.
- Requires control system that has a dedicated ventilation control output to be ON during Occupied and OFF during Unoccupied. CO2 controller with ON/OFF output relay can be used.
- Factory setting is 375 CFM balanced to meet pressurization requirements of ASHRAE.

Accessories:

- Outdoor louver grilles: Clear, Medium Bronze, Dark Bronze
- Telescoping Wall Sleeves
- Wall Sleeve Ranges (wall thickness): 5.5" to 8.5", 8" to 13.5", 13" to 23.5"
- 3" and 6" Riser Platforms available if required
- Electric heat packages factory installed within the basic unit cabinet
- Accessories for Duct-Free and Ducted installations

Other Options:

- Low Ampacity Models available

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Specifications - 3, 4 & 5 Ton

MODELS	I36Z1-A	I36Z1-B	I36Z1-C	I48Z1-A	I48Z1-B	I48Z1-C	I60Z1-A	I60Z1-B	I60Z1-C
ELECTRICAL RATING--60 HZ	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Operating Voltage Range	197-253		414-506	197-253		414-506	197-253		414-506
COMPRESSOR									
Volts	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3	230/208-1	230/208-3	460-3
Rated Load Amps (230/208)	11.1/13	8.5/9.9	4.9	15.6/17.5	10.4/11.6	5.4	22/23.4	13.4/14.3	6.3
Branch Circuit Selection Current	15.3	11.7	5.8	19.9	11.6	6.4	27.2	16.6	7.2
Locked Rotor Amps	83	73	38	104.0	83.1	41	152.9	110.0	52.0
ENERGY RECOVERY VENTILATOR									
Volts	230/208-60-1			230/208-60-1			230/208-60-1		
Full Load Amps (3-motors)	2.2			2.2			2.2		
FAN MOTOR – ECM									
Horsepower	1/3			1/2			1/2		
Volts	230/208-60-1			230/208-60-1			230/208-60-1		
Full Load Amps	2.6			3.2			3.2		
+ CFM	2300			2600			2600		
BLOWER MOTOR – ECM									
Horsepower	1/2			1/2			3/4		
Volts	230/208-60-1			230/208-60-1			230/208-60-1		
Full Load Amps	2.5			3.2			4.4		

+ CFM @ rating points, will modulate based upon O.D. ambient.

- Complies with efficiency requirements of ASHRAE/IESNA 90.1-2013.
- Certified to ARI Standard 390-2003 for SPVU (Single Package Vertical Units).
- Intertek ETL Listed to Standard for Safety Heating and Cooling Equipment ANSI/UL 1995/CSA 22.2 No. 236-05, Fourth Edition.
- Commercial Product - Not intended for Residential application.

* The AHRI Certified® mark indicates Bard Manufacturing Company participation in the AHRI Certification program. For verification of individual certified products, go to www.ahridirectory.org.

Indoor Blower Performance

Model	Rated ESP	Max. ESP	② Continuous CFM	Rated 2nd Stage CFM	Rated 1st Stage CFM	③ 4-10 KW CFM	④ 15-20 KW CFM
I36Z1	0.15	0.50	600	1150	850	700	1050
I48Z1	0.20	0.50	700	1400	1050	700	1400
I60Z1	0.20	0.50	800	1600	1100	700	1400

① Motor will deliver consistent CFM through voltage supply range with no deterioration.
② Continous fan CFM is the total air being circulated during continuous fan mode.
③ Will operate @ rated Full Load Airflow when operating with Heat Pump.
④ Will occur automatically with a call for "W3" or "Emergency Heat" signal from thermostat (Heat Pump Operation is terminated @ this condition).

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Capacity & Efficiency Ratings (Stage 2) Full Load Operation

MODELS	I36Z1	I48Z1	I60Z1
Cooling BTUH, Full Load Capacity, 95-80/67 EER ① Rated CFM	35,000 12.0 1150	47,000 11.8 1400	54,000 11.0 1600
IPLV (Integrated Full & Part Load) ② 80-80/67	16.5	16.1	15.2
Heating BTUH, Full Load Capacity 47/43-70 COP ③ Rated CFM	31,800 3.7 1150	44,500 3.7 1400	54,000 3.5 1600

Capacity & Efficiency Ratings (Stage 1) Part Load Operation

MODELS	I36Z1	I48Z1	I60Z1
Cooling BTUH, Part Load Capacity, 95-80/67 EER ① Rated CFM	25,000 12.7 850	32,500 12.0 1050	37,000 11.0 1200
Heating BTUH, Part Load Capacity 47/43-70 COP ③ Rated CFM	23,100 3.6 850	30,500 3.6 1050	36,500 3.4 1200

① EER = Energy Efficiency Ratio - BTU/WATT efficiency
② IPLV = Integrated Part Load Value - BTU/WATT efficiency (combines full and part load performance)
③ COP = Coefficient of Performance - BTU/WATT efficiency

Unit Weights

MODELS	NO VENT	CRV
I36Z1-A	990	1080
I36Z1-B	990	1080
I36Z1-C	1025	1115
I48Z1-A	1030	1120
I48Z1-B	1030	1120
I48Z1-C	1065	1155
I60Z1-A	1075	1165
I60Z1-B	1075	1165
I60Z1-C	1110	1200

Deduct 65# from all values for installed weight.

Unit Charge Rates

UNIT	Std. Unit - Lbs.	Dehum. Units - Lbs.
I36Z1 - High Efficiency Step Capacity Indoor HP	10.5625	N/A
I48Z1 - High Efficiency Step Capacity Indoor HP	14.1875	N/A
I60Z1 - High Efficiency Step Capacity Indoor HP	12.8750	N/A

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C406.2.2.2 More Efficient HVAC Equipment Cooling and Fan Performance

No less than 90 percent of the total HVAC capacity serving the total *conditioned floor area* of the entire building, building addition or tenant space in accordance with Section C406.1.1 shall comply with Sections C406.2.2.2.1 through C406.2.2.2.3. Where individual equipment efficiencies vary, weigh them based on capacity.

C406.2.2.2.1 HVAC System Selection

Equipment installed shall be types that are listed in the tables in Section C403.3.2.

C406.2.2.2.2 Cooling Equipment Efficiency

Equipment shall exceed the minimum cooling efficiency requirements listed in the tables in Section C403.3.2 by at least 5 percent. Where equipment exceeds the minimum annual cooling efficiency and heat rejection efficiency requirements by more than 5 percent, energy efficiency credits for cooling shall be determined using Equation 4-15, rounded to the nearest whole number.

(Equation 4-15)

$$EEC_{HEC} = EEC_5 \times \left[1 + \frac{CEI - 0.05}{0.05}\right]$$

Where:

EEC_{HEC} = Energy efficiency credits for cooling efficiency improvement.

EEC_5 = Section C406.2.2.2 credits from Table C406.2.

CEI = The lesser of the improvement above minimum cooling efficiency requirements, minimum heat rejection efficiency requirements, or 20 percent (0.20). Where cooling efficiency varies by system, use the capacity weighted average efficiency improvement for all cooling equipment combined. The CEI expressed as a fraction shall be determined one of the following ways:

For metrics that increase as efficiency increases, CEI shall be calculated as follows:

$$CEI = \frac{CM_{DES}}{CM_{MIN}} - 1$$

For metrics that decrease as efficiency increases, CEI shall be calculated as follows:

$$CEI = \frac{CM_{MIN}}{CM_{DES}} - 1$$

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Where:

CM_{DES} = Design cooling efficiency metric, part-load or annualized where available.

CM_{MIN} = Minimum required cooling efficiency metric, part-load or annualized where available from Section C403.3.2.

For data centers using ASHRAE 90.4, CEI shall be calculated as follows:

$$CEI = \frac{AMLC_{MAX}}{AMLC_{DES}} - 1$$

Where:

$AMLC_{DES}$ = As-designed annualized mechanical load component calculated in accordance with ASHRAE 90.4 Section 6.5.

$AMLC_{MAX}$ = Maximum annualized mechanical load component from ASHRAE 90.4 Table 6.5.

C406.2.2.2.3 Minimum Fan Efficiency

Where fan energy is not included in packaged equipment rating or it is and the fan size has been increased from the as-rated equipment condition, fan power or horsepower shall be less than 95 percent of the allowed fan power in Section C403.8.1.

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C406.2.2.3 More Efficient HVAC Equipment Heating Performance

No less than 90 percent of the total HVAC capacity serving the total *conditioned floor area* of the entire building, building addition or tenant space in accordance with Section C406.1.1 shall comply with Sections C406.2.2.3.1 through C406.2.2.3.2.

C406.2.2.3.1 HVAC System Selection

Equipment installed shall be types that are listed in the tables in Section C403.3.2. Electric resistance heating shall be limited to 20 percent of system capacity, with the exception of heat pump supplemental heating.

C406.2.2.3.2 Heating Equipment Efficiency

Equipment shall exceed the minimum heating efficiency requirements of the tables in Section C403.3.2 by at least 5 percent. Where equipment exceeds the minimum annual heating efficiency requirements by more than 5 percent, energy efficiency credits for heating shall be determined using Equation 4-16, rounded to the nearest whole number.

(Equation 4-16)

$$EEC_{HEH} = EEC_5 \times \left[1 + \frac{HEI - 0.05}{0.05}\right]$$

Where:

EEC_{HEH}	=	Energy efficiency credits for heating efficiency improvement.
EEC_5	=	Section C406.2.2.2 credits from Table C406.2.
HEI	=	The lesser of the improvement above minimum heating efficiency requirements or 20 percent (0.20). Where heating efficiency varies by system, use the capacity weighted average percentage for all heating equipment combined. For metrics that increase as efficiency increases, HEI shall be calculated as follows:

$$HEI = \frac{HM_{DES}}{HM_{MIN}} - 1$$

Where:

HM_{DES}	=	Design heating efficiency metric, part-load or annualized where available.
HM_{MIN}	=	Minimum required heating efficiency metric, part-load or annualized where available from Section C403.3.2.

EXCEPTION: In low energy spaces complying with Section C402.1.1 and *semi-heated spaces* complying with Section C402.1.1.2, no less than 90 percent of the installed heating capacity is provided by electric infrared or gas-fired radiant heating equipment for localized heating applications. Such spaces shall achieve credits for EEC_5.