WRU-2014-0013-0004

FILED WITH
Executive Secretary

September 11, 2014

IOWA UTILITIES BOARD

REScheck Software Version 4.4.1

Compliance Certificate

Project Title: Altoona Towers - Building A

Energy Code: **2009 IECC**
Location: **Altoona, Iowa**
Construction Type: **Multifamily**
Glazing Area Percentage: **15%**
Heating Degree Days: **6931**
Climate Zone: **5**

Construction Site:
1414 Adventureland Drive
Altoona, IA 50009

Owner/Agent:
Keith Denner
Altoona Towers L.C.
5901 Vista Drive
West Des Moines, IA 50266
(515) 226-0000
keithd@ppm-inc.com

Designer/Contractor:
Ron Barkey
Imprint Architects
1605 N. Ankeny Blvd.
Ankeny, IA 50023
(515) 965-5336
ron@imprintarchitects.com

Compliance: **Passes using UA trade-off**

Compliance: **13.3% Better Than Code** Maximum UA: **3713** Your UA: **3216**

The % better or worse than code index reflects how close to compliance the house is based on code trade-off rules. It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or UA Door U-Factor	
Ceiling 1: Flat Ceiling or Scissor Truss	13900	25.0	25.0		278
Wall 1: Wood Frame, 16" o.c.	4334	19.5	2.3		194
Window 1: Vinyl Frame:Double Pane with Low-E	420			0.290	122
Door 1: Glass	84			0.330	28
Door 2: Solid	21			0.300	6
Wall 2: Wood Frame, 16" o.c.	7740	19.5	1.8		308
Window 2: Vinyl Frame:Double Pane with Low-E	80			0.290	23
Door 3: Glass	1848			0.330	610
Wall 3: Wood Frame, 16" o.c.	3970	19.5	1.8		183
Window 3: Vinyl Frame:Double Pane with Low-E	520			0.290	151
Wall 4: Wood Frame, 16" o.c.	11744	19.5	2.6		527
Window 4: Vinyl Frame:Double Pane with Low-E	1172			0.290	340
Door 4: Glass	42			0.330	14
Floor 1: Slab-On-Grade:Unheated	634		10.0		434
Insulation depth: 6.0'					

Compliance Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2009 IECC requirements in RES*check* Version 4.4.1 and to comply with the mandatory requirements listed in the RES*check* Inspection Checklist.

Name - Title	Signature	Date

Review Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been reviewed and found to meet the 2009 IECC requirements in RES*check* Version 4.4.1 and to comply with the mandatory requirements listed in the RES*check* Inspection Checklist.

Reviewer Name - Title	Signature	Date
REDACTED	REDACTED	12-25-13

LICENSED PROFESSIONAL ENGINEER
DOUGLAS A. CURRIE
9198
IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

REDACTED 12-25-13

DOUGLAS A. CURRIE, P.E. Lic. No. 9198 Date

My license renewal date is December 31, 2014.

Pages or sheets covered by this seal:

AP1-6

REScheck Software Version 4.4.1

Inspection Checklist

Ceilings:

☐ Ceiling 1: Flat Ceiling or Scissor Truss, R-25.0 cavity + R-25.0 continuous insulation
Comments: _____

Above-Grade Walls:

☐ Wall 1: Wood Frame, 16" o.c., R-19.5 cavity + R-2.3 continuous insulation
Continuous insulation specified for this above-grade wall has consistent R-value rating across full area of the wall.
Comments: _____

☐ Wall 2: Wood Frame, 16" o.c., R-19.5 cavity + R-1.8 continuous insulation
Continuous insulation specified for this above-grade wall has consistent R-value rating across full area of the wall.
Comments: _____

☐ Wall 3: Wood Frame, 16" o.c., R-19.5 cavity + R-1.8 continuous insulation
Continuous insulation specified for this above-grade wall has consistent R-value rating across full area of the wall.
Comments: _____

☐ Wall 4: Wood Frame, 16" o.c., R-19.5 cavity + R-2.6 continuous insulation
Continuous insulation specified for this above-grade wall has consistent R-value rating across full area of the wall.
Comments: _____

Windows:

☐ Window 1: Vinyl Frame:Double Pane with Low-E, U-factor: 0.290
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? Yes ____ No ____
Comments: _____

☐ Window 2: Vinyl Frame:Double Pane with Low-E, U-factor: 0.290
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? Yes ____ No ____
Comments: _____

☐ Window 3: Vinyl Frame:Double Pane with Low-E, U-factor: 0.290
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? Yes ____ No ____
Comments: _____

☐ Window 4: Vinyl Frame:Double Pane with Low-E, U-factor: 0.290
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? Yes ____ No ____
Comments: _____

Doors:

☐ Door 1: Glass, U-factor: 0.330
Comments: _____

☐ Door 2: Solid, U-factor: 0.300
Comments: _____

☐ Door 3: Glass, U-factor: 0.330
Comments: _____

☐ Door 4: Glass, U-factor: 0.330
Comments: _____

Floors:

☐ Floor 1: Slab-On-Grade:Unheated, 6.0' insulation depth, R-10.0 continuous insulation
Comments: _____

Slab insulation extends down from the top of the slab to at least 6.0 ft. OR down to at least the bottom of the slab then horizontally for a total distance of 6.0 ft.

Air Leakage:

☐ Joints (including rim joist junctions), attic access openings, penetrations, and all other such openings in the building envelope that are sources of air leakage are sealed with caulk, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material.

☐ Air barrier and sealing exists on common walls between dwelling units, on exterior walls behind tubs/showers, and in openings between window/door jambs and framing.

☐ Recessed lights in the building thermal envelope are 1) type IC rated and ASTM E283 labeled and 2) sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

☐ Access doors separating conditioned from unconditioned space are weather-stripped and insulated (without insulation compression or damage) to at least the level of insulation on the surrounding surfaces. Where loose fill insulation exists, a baffle or retainer is installed to maintain insulation application.

☐ Wood-burning fireplaces have gasketed doors and outdoor combustion air.

Air Sealing and Insulation:

☐ Building envelope air tightness and insulation installation complies by either 1) a post rough-in blower door test result of less than 7 ACH at 33.5 psf OR 2) the following items have been satisfied:

Air barriers and thermal barrier: Installed on outside of air-permeable insulation and breaks or joints in the air barrier are filled or repaired.
Ceiling/attic: Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed.
Above-grade walls: Insulation is installed in substantial contact and continuous alignment with the building envelope air barrier.
Floors: Air barrier is installed at any exposed edge of insulation.
Plumbing and wiring: Insulation is placed between outside and pipes. Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.
Corners, headers, narrow framing cavities, and rim joists are insulated.
Shower/tub on exterior wall: Insulation exists between showers/tubs and exterior wall.

Sunrooms:

☐ Sunrooms that are thermally isolated from the building envelope have a maximum fenestration U-factor of 0.50 and the maximum skylight U-factor of 0.75. New windows and doors separating the sunroom from conditioned space meet the building thermal envelope requirements.

Materials Identification and Installation:

☐ Materials and equipment are installed in accordance with the manufacturer's installation instructions.

☐ Insulation is installed in substantial contact with the surface being insulated and in a manner that achieves the rated R-value.

☐ Materials and equipment are identified so that compliance can be determined.

☐ Manufacturer manuals for all installed heating and cooling equipment and service water heating equipment have been provided.

☐ Insulation R-values and glazing U-factors are clearly marked on the building plans or specifications.

Duct Insulation:

☐ Supply ducts in attics are insulated to a minimum of R-8. All other ducts in unconditioned spaces or outside the building envelope are insulated to at least R-6.

Duct Construction and Testing:

☐ Building framing cavities are not used as supply ducts.

☐ All joints and seams of air ducts, air handlers, filter boxes, and building cavities used as return ducts are substantially airtight by means of tapes, mastics, liquid sealants, gasketing or other approved closure systems. Tapes, mastics, and fasteners are rated UL 181A or UL 181B and are labeled according to the duct construction. Metal duct connections with equipment and/or fittings are mechanically fastened. Crimp joints for round metal ducts have a contact lap of at least 1 1/2 inches and are fastened with a minimum of three equally spaced sheet-metal screws.

Exceptions:

Joint and seams covered with spray polyurethane foam.
Where a partially inaccessible duct connection exists, mechanical fasteners can be equally spaced on the exposed portion of the joint so as to prevent a hinge effect.
Continuously welded and locking-type longitudinal joints and seams on ducts operating at less than 2 in. w.g. (500 Pa).

☐ All ducts and air handlers are located within conditioned space.

Temperature Controls:

☐ Thermostats exist for each dwelling unit (non-dwelling areas must have one thermostat for each system or zone). A manual or automatic means to partially restrict or shut off the heating and/or cooling input to each room is provided.

Electric Systems:

☐ Separate electric meters exist for each dwelling unit.

Heating and Cooling Equipment Sizing:

☐ Additional requirements for equipment sizing are included by an inspection for compliance with the International Residential Code.

☐ For systems serving multiple dwelling units documentation has been submitted demonstrating compliance with 2009 IECC Commercial Building Mechanical and/or Service Water Heating (Sections 503 and 504).

Circulating Service Hot Water Systems:

☐ Circulating service hot water pipes are insulated to R-2.

☐ Circulating service hot water systems include an automatic or accessible manual switch to turn off the circulating pump when the system is not in use.

Heating and Cooling Piping Insulation:

☐ HVAC piping conveying fluids above 105 degrees F or chilled fluids below 55 degrees F are insulated to R-3.

Swimming Pools:

☐ Heated swimming pools have an on/off heater switch.

☐ Pool heaters operating on natural gas or LPG have an electronic pilot light.

☐ Timer switches on pool heaters and pumps are present.

Exceptions:

Where public health standards require continuous pump operation.

Where pumps operate within solar- and/or waste-heat-recovery systems.

☐ Heated swimming pools have a cover on or at the water surface. For pools heated over 90 degrees F (32 degrees C) the cover has a minimum insulation value of R-12.

Exceptions:

Covers are not required when 60% of the heating energy is from site-recovered energy or solar energy source.

Lighting Requirements:

☐ A minimum of 50 percent of the lamps in permanently installed lighting fixtures can be categorized as one of the following:

Compact fluorescent

T-8 or smaller diameter linear fluorescent

40 lumens per watt for lamp wattage <= 15

50 lumens per watt for lamp wattage > 15 and <= 40

60 lumens per watt for lamp wattage > 40

Other Requirements:

☐ Snow- and ice-melting systems with energy supplied from the service to a building shall include automatic controls capable of shutting off the system when a) the pavement temperature is above 50 degrees F, b) no precipitation is falling, and c) the outdoor temperature is above 40 degrees F (a manual shutoff control is also permitted to satisfy requirement 'c').

Certificate:

☐ A permanent certificate is provided on or in the electrical distribution panel listing the predominant insulation R-values; window U-factors; type and efficiency of space-conditioning and water heating equipment. The certificate does not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels.

NOTES TO FIELD: (Building Department Use Only)

2009 IECC Energy Efficiency Certificate

Insulation Rating	R-Value	
Ceiling / Roof	50.00	
Wall	22.12	
Floor / Foundation	10.00	
Ductwork (unconditioned spaces):	N.A. (All in conditioned spaces)	
Glass & Door Rating	**U-Factor**	**SHGC**
Window	0.29	0.30
Door	0.33	0.33
Heating & Cooling Equipment	**Efficiency**	
Heating System: (Fujitsu RLFCD Series)	11.5 HSPF*	
Cooling System: (Fujitsu RLFCD Series)	20.1 SEER**	
Water Heater: (Weil-McLain Ultra Series)	91.7% DOE AFUE	

Name: REDACTED Date: 12-25-13

Douglas A. Currie, P.E.

Comments:

* 11.5 is the lowest of the three main systems' HSPF. Other systems HSPFs are 12.2 and 13.0.

** 20.1 is the lowest of the three main systems' SEER. Other systems' SEERs are 21.9 and 24.0.

REScheck Software Version 4.4.1

Compliance Certificate

Project Title: Altoona Towers-Building B

Energy Code:	2009 IECC
Location:	Altoona, Iowa
Construction Type:	Multifamily
Glazing Area Percentage:	15%
Heating Degree Days:	6931
Climate Zone:	5

Construction Site:
1616 Adventureland Drive
Altoona, IA 50009

Owner/Agent:
Keith Denner
Altoona Towers LC
5901 Vista Drive
West Des Moines, IA 50266
(515) 226-0000
keithd@ppm-inc.com

Designer/Contractor:
Ron Barkey
Imprint Architects
1605 N. Ankeny Blvd.
Ankeny, IA 50023
(515) 965-5336
ron@imprintarchitects.com

Compliance: Passes using UA trade-off

Compliance: 13.5% Better Than Code Maximum UA: 4621 Your UA: 3997

The % Better or Worse Than Code index reflects how close to compliance the house is based on code trade-off rules.
It DOES NOT provide an estimate of energy use or cost relative to a minimum-code home.

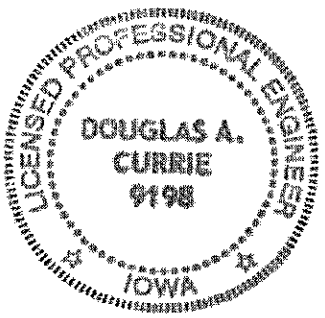
Assembly	Gross Area or Perimeter	Cavity R-Value	Cont. R-Value	Glazing or UA Door U-Factor	UA
Ceiling 1: Flat Ceiling or Scissor Truss	18600	25.0	25.0		372
Wall 1: Wood Frame, 16" o.c.	6024	19.5	2.3		265
Window 1: Vinyl Frame:Double Pane with Low-E	660			0.290	191
Door 1: Glass	147			0.330	49
Door 2: Solid	21			0.300	6
Wall 2: Wood Frame, 16" o.c.	11520	19.5	1.8		482
Window 2: Vinyl Frame:Double Pane with Low-E	280			0.290	81
Door 3: Glass	2142			0.330	707
Wall 3: Wood Frame, 16" o.c.	5020	19.5	1.8		233
Window 3: Vinyl Frame:Double Pane with Low-E	620			0.290	180
Wall 4: Wood Frame, 16" o.c.	11459	19.5	2.6		511
Window 4: Vinyl Frame:Double Pane with Low-E	1240			0.290	360
Floor 1: Slab-On-Grade:Unheated	818		10.0		560
Insulation depth: 6.0'					

Compliance Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the 2009 IECC requirements in RES*check* Version 4.4.1 and to comply with the mandatory requirements listed in the RES*check* Inspection Checklist.

Name - Title	Signature	Date

Review Statement: The proposed building design described here is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been reviewed and found to meet the 2009 IECC requirements in RES*check* Version 4.4.1 and to comply with the mandatory requirements listed in the RES*check* Inspection Checklist.

Reviewer Name - Title	Signature	Date
REDACTED	REDACTED	12-25-13



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed [redacted] Iowa.

REDACTED

12-25-13

DOUGLAS A. CURRIE, P.E. Lic. No. 9198 Date

My license renewal date is December 31, 2014.

Pages or sheets covered by this seal:

pp. 1-6

RES*check* Software Version 4.4.1

Inspection Checklist

Ceilings:

☐ Ceiling 1: Flat Ceiling or Scissor Truss, R-25.0 cavity + R-25.0 continuous insulation
Comments: _____

Above-Grade Walls:

☐ Wall 1: Wood Frame, 16" o.c., R-19.5 cavity + R-2.3 continuous insulation
Continuous insulation specified for this above-grade wall has consistent R-value rating across full area of the wall.
Comments: _____

☐ Wall 2: Wood Frame, 16" o.c., R-19.5 cavity + R-1.8 continuous insulation
Continuous insulation specified for this above-grade wall has consistent R-value rating across full area of the wall.
Comments: _____

☐ Wall 3: Wood Frame, 16" o.c., R-19.5 cavity + R-1.8 continuous insulation
Continuous insulation specified for this above-grade wall has consistent R-value rating across full area of the wall.
Comments: _____

☐ Wall 4: Wood Frame, 16" o.c., R-19.5 cavity + R-2.6 continuous insulation
Continuous insulation specified for this above-grade wall has consistent R-value rating across full area of the wall.
Comments: _____

Windows:

☐ Window 1: Vinyl Frame:Double Pane with Low-E, U-factor: 0.290
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? Yes ____ No ____
Comments: _____

☐ Window 2: Vinyl Frame:Double Pane with Low-E, U-factor: 0.290
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? Yes ____ No ____
Comments: _____

☐ Window 3: Vinyl Frame:Double Pane with Low-E, U-factor: 0.290
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? Yes ____ No ____
Comments: _____

☐ Window 4: Vinyl Frame:Double Pane with Low-E, U-factor: 0.290
For windows without labeled U-factors, describe features:
#Panes _____ Frame Type _____ Thermal Break? Yes ____ No ____
Comments: _____

Doors:

☐ Door 1: Glass, U-factor: 0.330
Comments: _____

☐ Door 2: Solid, U-factor: 0.300
Comments: _____

☐ Door 3: Glass, U-factor: 0.330
Comments: _____

Floors:

☐ Floor 1: Slab-On-Grade:Unheated, 6.0' insulation depth, R-10.0 continuous insulation
Comments: _____

Slab insulation extends down from the top of the slab to at least 6.0 ft. OR down to at least the bottom of the slab then horizontally for a total distance of 6.0 ft.

Air Leakage:

☐ Joints (including rim joist junctions), attic access openings, penetrations, and all other such openings in the building

envelope that are sources of air leakage are sealed with caulk, gasketed, weatherstripped or otherwise sealed with an air barrier material, suitable film or solid material.

☐ Air barrier and sealing exists on common walls between dwelling units, on exterior walls behind tubs/showers, and in openings between window/door jambs and framing.

☐ Recessed lights in the building thermal envelope are 1) type IC rated and ASTM E283 labeled and 2) sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

☐ Access doors separating conditioned from unconditioned space are weather-stripped and insulated (without insulation compression or damage) to at least the level of insulation on the surrounding surfaces. Where loose fill insulation exists, a baffle or retainer is installed to maintain insulation application.

☐ Wood-burning fireplaces have gasketed doors and outdoor combustion air.

Air Sealing and Insulation:

☐ Building envelope air tightness and insulation installation complies by either 1) a post rough-in blower door test result of less than 7 ACH at 33.5 psf OR 2) the following items have been satisfied:

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Ceiling/attic: Air barrier in any dropped ceiling/soffit is substantially aligned with insulation and any gaps are sealed.
Above-grade walls: Insulation is installed in substantial contact and continuous alignment with the building envelope air barrier.
Floors: Air barrier is installed at any exposed edge of insulation.
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☐ Sunrooms that are thermally isolated from the building envelope have a maximum fenestration U-factor of 0.50 and the maximum skylight U-factor of 0.75. New windows and doors separating the sunroom from conditioned space meet the building thermal envelope requirements.

Materials Identification and Installation:

☐ Materials and equipment are installed in accordance with the manufacturer's installation instructions.

☐ Insulation is installed in substantial contact with the surface being insulated and in a manner that achieves the rated R-value.

☐ Materials and equipment are identified so that compliance can be determined.

☐ Manufacturer manuals for all installed heating and cooling equipment and service water heating equipment have been provided.

☐ Insulation R-values and glazing U-factors are clearly marked on the building plans or specifications.

Duct Insulation:

☐ Supply ducts in attics are insulated to a minimum of R-8. All other ducts in unconditioned spaces or outside the building envelope are insulated to at least R-6.

Duct Construction and Testing:

☐ Building framing cavities are not used as supply ducts.

☐ All joints and seams of air ducts, air handlers, filter boxes, and building cavities used as return ducts are substantially airtight by means of tapes, mastics, liquid sealants, gasketing or other approved closure systems. Tapes, mastics, and fasteners are rated UL 181A or UL 181B and are labeled according to the duct construction. Metal duct connections with equipment and/or fittings are mechanically fastened. Crimp joints for round metal ducts have a contact lap of at least 1 1/2 inches and are fastened with a minimum of three equally spaced sheet-metal screws.

Exceptions:

Joint and seams covered with spray polyurethane foam.
Where a partially inaccessible duct connection exists, mechanical fasteners can be equally spaced on the exposed portion of the joint so as to prevent a hinge effect.
Continuously welded and locking-type longitudinal joints and seams on ducts operating at less than 2 in. w.g. (500 Pa).

☐ All ducts and air handlers are located within conditioned space.

Temperature Controls:

☐ Thermostats exist for each dwelling unit (non-dwelling areas must have one thermostat for each system or zone). A manual or automatic means to partially restrict or shut off the heating and/or cooling input to each room is provided.

Electric Systems:

☐ Separate electric meters exist for each dwelling unit.

Heating and Cooling Equipment Sizing:

☐ Additional requirements for equipment sizing are included by an inspection for compliance with the International Residential Code.

☐ For systems serving multiple dwelling units documentation has been submitted demonstrating compliance with 2009 IECC Commercial Building Mechanical and/or Service Water Heating (Sections 503 and 504).

Circulating Service Hot Water Systems:

☐ Circulating service hot water pipes are insulated to R-2.

☐ Circulating service hot water systems include an automatic or accessible manual switch to turn off the circulating pump when the system is not in use.

Heating and Cooling Piping Insulation:

☐ HVAC piping conveying fluids above 105 degrees F or chilled fluids below 55 degrees F are insulated to R-3.

Swimming Pools:

☐ Heated swimming pools have an on/off heater switch.

☐ Pool heaters operating on natural gas or LPG have an electronic pilot light.

☐ Timer switches on pool heaters and pumps are present.
Exceptions:
Where public health standards require continuous pump operation.
Where pumps operate within solar- and/or waste-heat-recovery systems.

☐ Heated swimming pools have a cover on or at the water surface. For pools heated over 90 degrees F (32 degrees C) the cover has a minimum insulation value of R-12.
Exceptions:
Covers are not required when 60% of the heating energy is from site-recovered energy or solar energy source.

Lighting Requirements:

☐ A minimum of 50 percent of the lamps in permanently installed lighting fixtures can be categorized as one of the following:
Compact fluorescent
T-8 or smaller diameter linear fluorescent
40 lumens per watt for lamp wattage <= 15
50 lumens per watt for lamp wattage > 15 and <= 40
60 lumens per watt for lamp wattage > 40

Other Requirements:

☐ Snow- and ice-melting systems with energy supplied from the service to a building shall include automatic controls capable of shutting off the system when a) the pavement temperature is above 50 degrees F, b) no precipitation is falling, and c) the outdoor temperature is above 40 degrees F (a manual shutoff control is also permitted to satisfy requirement 'c').

Certificate:

☐ A permanent certificate is provided on or in the electrical distribution panel listing the predominant insulation R-values; window U-factors; type and efficiency of space-conditioning and water heating equipment. The certificate does not cover or obstruct the visibility of the circuit directory label, service disconnect label or other required labels.

NOTES TO FIELD: (Building Department Use Only)

2009 IECC Energy Efficiency Certificate

Insulation Rating	R-Value
Ceiling / Roof	50.00
Wall	22.12
Floor / Foundation	10.00
Ductwork (unconditioned spaces):	N.A. (All in conditioned spaces)

Glass & Door Rating	U-Factor	SHGC
Window	0.29	0.30
Door	0.33	0.33

Heating & Cooling Equipment	Efficiency
Heating System: (Fujitsu RLFCD Series)	11.5 HSPF*
Cooling System: (Fujitsu RLFCD Series)	20.1 SEER**
Water Heater: (Weil-McLain Ultra Series)	91.7% DOE AFUE

Name: REDACTED Date: 12/25/13

Douglas A. Currie, P.E.

Comments:

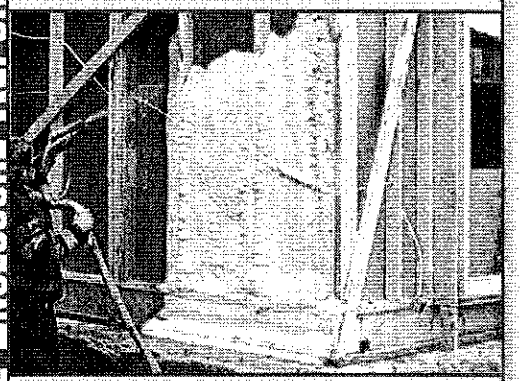
* 11.5 is the lowest of the three main systems' HSPF. Other systems' HSPFs are 12.2 and 13.0.

** 20.1 is the lowest of the three main systems' SEER. Other systems' SEERs are 21.9 and 24.0.

Spray Foam Wall Construction

Spray Foam Wall Construction Details (*Wall 8a and 8b*)[1]

- 2x6 wood frame wall at 24" o.c.
- Spray foam cavity insulation
- OSB sheathing
- Housewrap

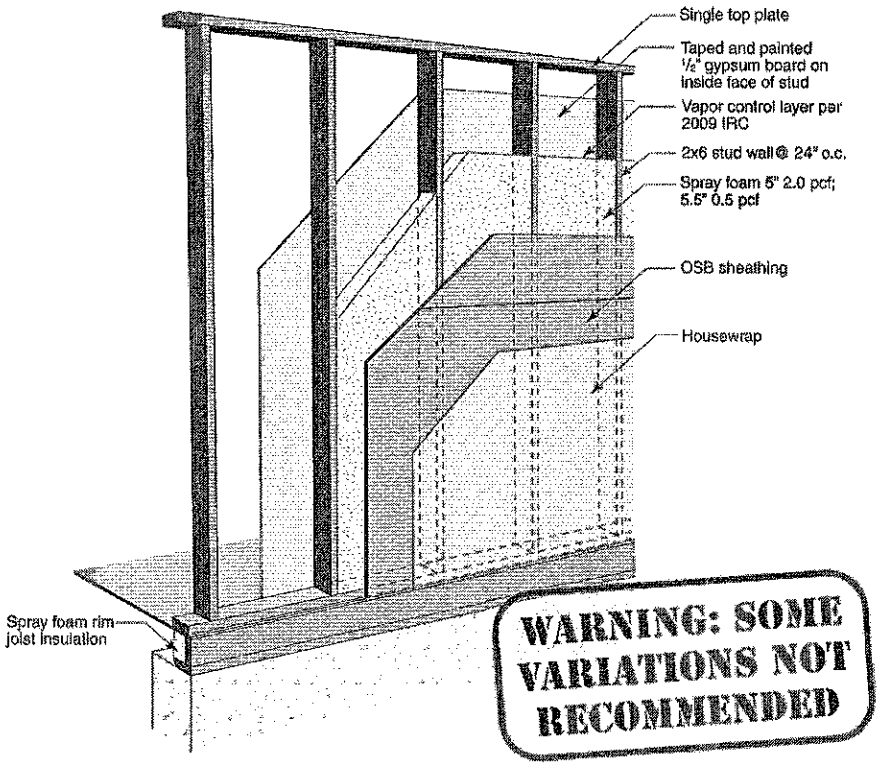


Scoring: How It Rates

The scoring of each wall system is based on the following five categories. A score of 1 is the lowest score in each category and represents the worst possible technology for each category or highest possible relative cost. A score of 5 is the highest score available in each category, and is representative of the best available technology available on the market or lowest relative cost.

Thermal Control	5
Durability	5
Buildability	4
Cost	2
Material Use	4
Total	**20**

Both low and high density foam increase the air tightness of the enclosure and reduce the risks to air leakage related durability risks. The R-values of both the low and high density spray foam are significantly reduced by thermal bridging of the wall framing and rim joist, demonstrating the value of insulated sheathing.



Introduction

This overview summarizes spray foam wall construction including the advantages and disadvantages of this construction strategy. A more detailed analysis and direct comparison to several other walls can be found online.[1] The scoring system is subjective based on the relative performance and specifications between different wall systems. Complex two dimensional heat flow analysis and one dimensional hygrothermal modeling were used to determine moisture related durability risks for analysis.

For a more complete analysis of this and other wall constructions, go to www.buildingscience.com.

Thermal Control

Installed Insulation R-value: The installed insulation R-value depends somewhat on the company and but generally speaking, high density foam (2.0 pcf) ranges between R-5.5 and R-6.5 per inch for the aged R-value, and low density foam (0.5pcf) has an R-value of approximately R-3.6/inch. Since high density foam is generally installed short of the cavity to avoid trimming, the installed insulation R-value is approximately R-30 (using R-6/inch). Low density is generally installed deliberately overflowing the cavity and trimmed off resulting in an R-value of approximately R-21.

Whole-wall R-value: Using two dimensional heat flow analysis with thermal bridging effects and average framing factors, it is clear that the thermal bridging through the framing, bottom plate, and top plate reduces the effectiveness of the spray foam insulation.[1] The R-value of the high density spray foam wall decreases from an installed R-value of R-30 to approximately R-20, a decrease of R-10 because of thermal bridging. The low density spray foam wall decreases from an installed insulation R-value of 21 to a whole wall R-value of approximately R-16.

Building America U.S. Department of Energy
Research Toward Zero Energy Homes

This summary has been prepared by Building Science Corporation for the Department of Energy's Building America Program, a private/public partnership that develops energy solutions for new and existing homes. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or any agency thereof.

For more information about Building America go to www.buildingamerica.gov.

bsc Building Science Corporation
30 Forest Street
Somerville, MA 02143
www.buildingscience.com

Air Leakage Control: Both low density and high density foam form an air barrier decreasing thermal losses through air leakage. Air leakage is still common under the bottom plate and at the rim joist if these areas are not detailed correctly.[2]

Typical Insulation Products: Low density 0.5 pcf foam, or high density 2.0 pcf foam.

Durability

Rain Control: Rain control is typically addressed using a shingle lapped and/or taped drainage plane such as building paper or a synthetic WRB (i.e. homewrap). Intersections, windows, doors and other penetrations must be detailed to prevent the penetration of rain water.[3]

Air Leakage Control: Air leakage is significantly minimized by installing spray foam insulation in the stud space since both low density and high density spray foam act as an air barrier. This increases the durability of the wall system considerably over standard construction.[4]

Vapor Control: High density (2.0 pcf) foam forms a vapor control layer reducing vapor movement through the enclosure, minimizing the potential for wintertime vapor condensation and summertime inward vapor drive. Low density foam allows moisture vapor movement through the foam so other methods of vapor control such as poly, kraft paper, or vapor barrier paint may be required based on the geographic location.[5]

Drying: Both of the spray foam walls dry relatively slowly if water enters the enclosure, since they do not experience convective looping and air movement similar to air permeable insulations. Spray foam does not provide any buffering capacity or redistribution. Foam is relatively moisture tolerant and will be able to dry given enough time. Ventilation behind vapor impermeable claddings and interior components (e.g. kitchen cabinets) can encourage drying.

Built- in Moisture: Care should always be taken to build with dry materials where possible, and allow drying of wet materials before close in. High density foam will inhibit the drying of wet building materials more than low density vapor permeable foam.

Durability Summary: The primary durability risks associated with these wall assemblies involve moisture damage related to rain water penetration. Both air leakage and vapor diffusion durability is significantly increased with spray foam but some vapor control may be necessary with low density spray foam in cold climates.

Buildability

Using spray foam as the stud space insulation is a very simple modification to the construction technique. Generally, the wall construction is the same as standard or advanced framing construction, and spray foam is sprayed into the cavity. Spray foam significantly reduces risks of poor air tightness detailing of the exterior sheathing or interior drywall.

Cost

Using spray foam will increase construction costs considerably but these increased costs may be outweighed by the benefits to energy efficiency, and occupancy comfort from reduced drafts.

Material Use

Wood framing required for spray foam insulation is the same required for the standard construction, or advanced framed wall depending on the framing strategy used.

Total Score

Both low and high density foam increase the air tightness of the enclosure and reduce the risks to air leakage related durability risks. A vapor control (ie. polyethylene, kraft paper, SVR) with high density foam is generally not required and vapor control with low density spray foam will be climate specific. The R-values of both the low and high density spray foam are significantly reduced by thermal bridging of the wall framing and rim joist, demonstrating the value of insulated sheathing. It may be possible to use spray foam insulation in combination with another insulation strategy to maximize the R-value gained with the spray foam insulation.

References

1 Straube, J., & Smegal, J. (2009). *Building America Special Research Project - High-R Walls Case Study Analysis.* Retrieved from buildingscience.com.

2 Straube, J. (2009, 04 22). *BSD-014 Air Flow Control in Buildings.* Retrieved from buildingscience.com.

3 Lstiburek, J. W. (2006). *Water Management Guide.* Westford: Building Science Press Inc.

4 Lstiburek, J. (2008, 08 20). *BSD-104: Understanding Air Barriers.* Retrieved from buildingscience.com.

5 Lstiburek, J. (2008, 10 17). *BSD-106 Understanding Vapor Barriers.* Retrieved from buildingscience.com.

The Performance Value of Spray Polyurethane Foam

Spray polyurethane foam (SPF) is more than just insulation: it can also be an air barrier and a vapor retarder. This multi-purpose building material has many performance properties. There are different types of spray foam, and each provides unique benefits. The chart below shows a few of the performance properties of each type of spray foam.

	Low Density or Open Cell SPF	Medium Density or Closed Cell SPF	Closed Cell Roofing SPF
Thermal Performance: R-Value	3.6-4.5 per inch	5.8-6.8 per inch	5.8-6.8 per inch
Air Barrier	X	X	X
Vapor Retarder: Class II rating			X

Thermal Performance & R-Value

R-value measures a material's resistance to heat transfer. Higher R-values mean that the material is more resistant to heat passing through it, making the material a better insulator. R-values are often listed at 1-inch depth for ease of comparing insulation products. To find out the R-value for a specific insulation, refer to the product's label or technical data sheets, often available online.

Open cell foam, closed cell foam and roofing foam can all provide high R-values and act as effective insulations.

Air Barriers & Permeability

SPF is also an air barrier, meaning it is impermeable to air. Air barriers are important considerations in building science because they can improve insulation performance and indoor air quality.

Ever wonder why leaving the refrigerator door or the top of your ice chest open significantly decreases its performance? The refrigerator or ice chest materials have not changed, but now you have introduced air flow into the equation. As warm air moves into a cold refrigerator or ice chest, it has the same effect as warm air moving into a home or building. The air flow impacts the climate, both inside your refrigerator and inside a building.

Air barriers also keep pollen, dust, insects and other undesirables from entering the home or building through cracks or crevices in the wall assemblies. Spray polyurethane foam adheres to the walls, boards and studs of your home, creating an air-tight seal.

Vapor Retarder

Closed cell spray foam often qualifies as a Class II vapor retarder, as defined by the International Residential Code. A vapor retarder prevents moisture (water vapor) from easily passing through the building material. Good building design and practices include controlling the movement of moisture inside and outside of a home or building. Excessive moisture inside a building has the potential to allow mold growth and degrade building or home performance and building material service life.

Spray Foam: More than Just Insulation

When you are considering different types of insulation, choose a product that offers more. Spray polyurethane foam can provide effective R-values, act as an air barrier, and prevent moisture infiltration. Learn more about the benefits of spray foam at www. whysprayfoam.org

Neither the ACC, Spray Foam Coalition, nor the individual member companies of the Center for the Polyurethanes Industry of the ACC, nor any of their respective directors, officers, employees, subcontractors, consultants, or other assigns, makes any warranty or representation, either express or implied, with respect to the accuracy or completeness of the information contained herein; nor do the ACC, SFC or any member companies assume any liability or responsibility for any use or misuse, or the results of such use or misuse, of any information, procedure, conclusion, opinion, product, or process disclosed in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

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ICYNENE®
THE EVOLUTION OF INSULATION™

Advantages of open and closed-cell spray insulation in residential applications

Understanding the advantages of open and closed-cell in residential applications lets you know your building projects are equipped with the best insulation material on the market.

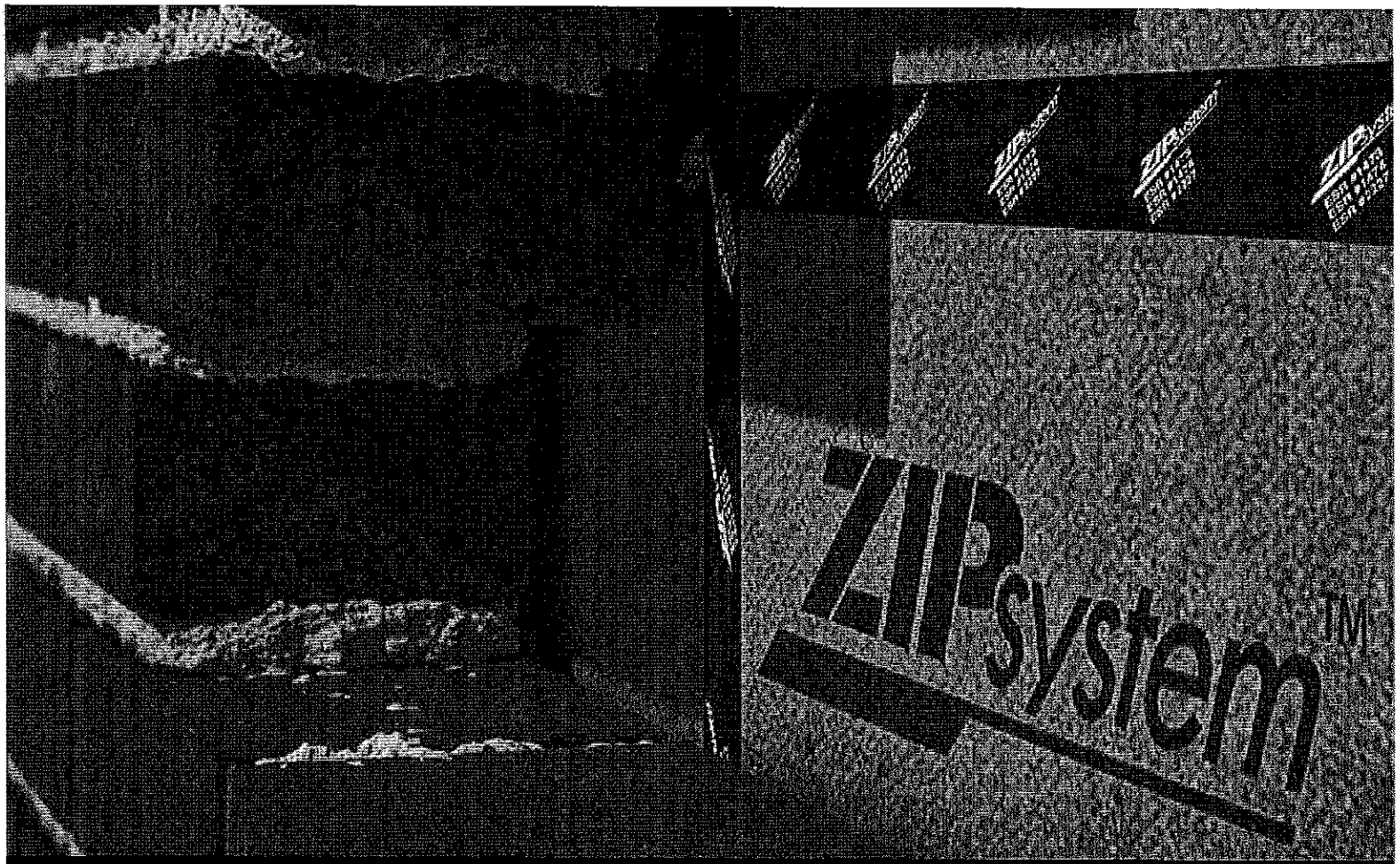
	Open-Cell Spray Foam	Closed-Cell Spray Foam
Insulation and Air Barrier	✓	✓
Vapor Barrier		✓
Vapor Permeable	✓	✓
Adds structural reinforcement/strength		✓
Able to deflect water and reject bulk water		✓
Able to accommodate seasonal movement	✓	
Cannot sustain mold	✓	✓
Typical R-Value	3.7 per inch	6 per inch
Blowing Agent	Water	Chemical
Suitability	Interior	Interior, Exterior
Sound dampening	✓	
Cost	$	$$$

There are additional advantages of open and closed-cell in residential applications. Using open-cell spray foam insulation allows:

- The soft, sponge texture to retain a continual air seal throughout the building's structural movement and settling
- Bi-directional drying as well as lets bulk water to pass through to eliminate the chance of condensation and mold growth

Builders considering closed-cell spray insulation can also gain from:

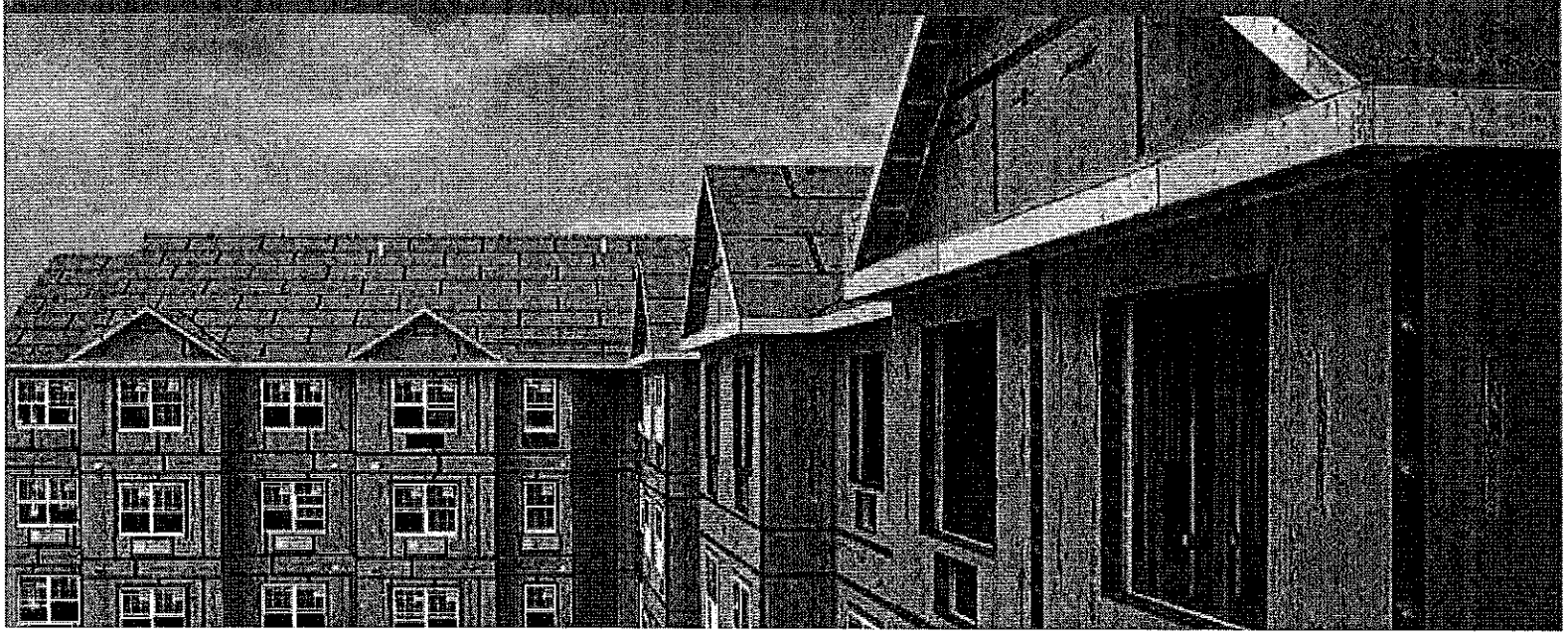
- Higher R-Value per inch, can accommodate code requirements in narrow spaces
- Rigid texture adds wall racking strength and impact resistance



6|7 INNOVATIVE SOLUTIONS FOR MULTIFAMILY & LIGHT COMMERCIAL

HUBER ENGINEERED WOODS

ZIP System® Roof & Wall Sheathing



The Optimal Solution

ZIP System® Sheathing is designed specifically to address the growing need for building performance, comfort and energy efficiency and is the only all-in-one solution that delivers the strength, durability and efficiency of engineered wood while sealing out air and water.

ZIP System Sheathing brings together multiple layers of innovation, offering a true system approach where all of the layers are specifically designed to work together. A high quality oriented-strand-board panel is pressed at the mill with a revolutionary built-in weather-resistant barrier that eliminates the need for building wrap or felt. Simply install the panels and then tape the seams with ZIP System® Tape, a high-performance, acrylic-based tape that has been specifically designed for use with ZIP System Sheathing.

By combining these layers of technology, ZIP System Sheathing offers three primary benefits:

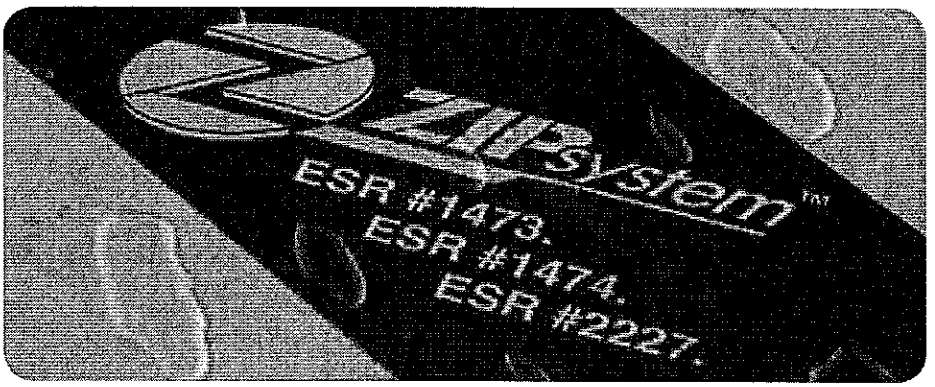
1. **Superior Moisture Protection**
2. **Superior Air Protection**
3. **Simplicity and Ease of Installation**

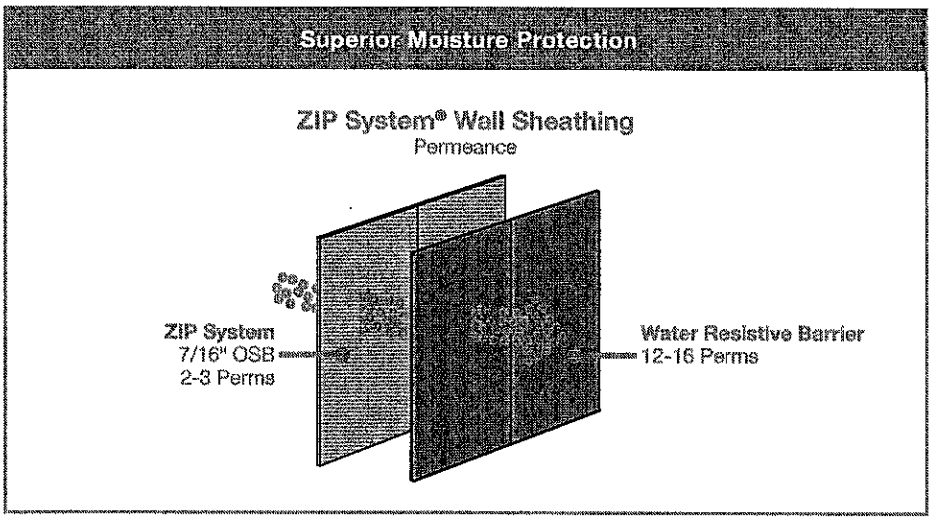
Offering peace of mind, ZIP System panels have undergone extensive performance testing and are backed by a best-in-class 30-year system warranty for delamination, as well as air and water hold-out.

ZIP System® Roof & Wall Sheathing Benefits

Superior Moisture Protection

- ZIP System® panels have built-in protective barriers that protect the entire panel surface from moisture. Install panels and seal seams with acrylic-based ZIP System® Tape to achieve one continuous barrier against water infiltration.
- ZIP System Sheathing has an integrated moisture barrier that is more durable than building wrap and felt, ensuring superior moisture protection during construction and throughout the service life of the building.
- The ZIP System Sheathing overlay protects against water intrusion while providing an optimal permeance level (12-16 perms) to allow panels to breathe and dry out.

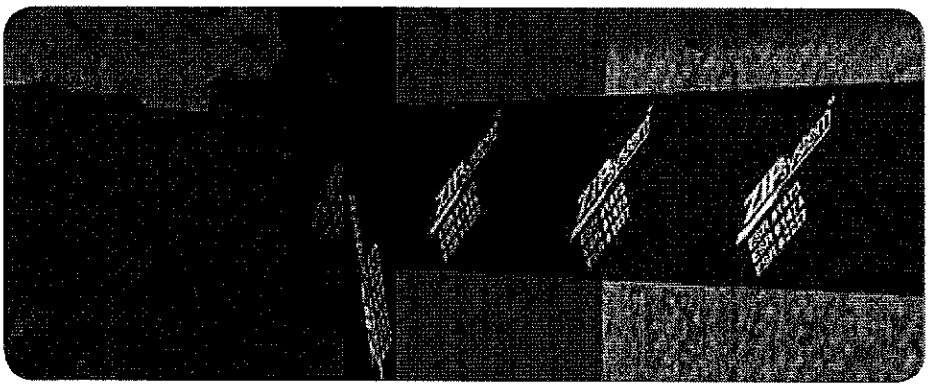




ZIP System® Roof & Wall Sheathing Benefits

Superior Air Protection

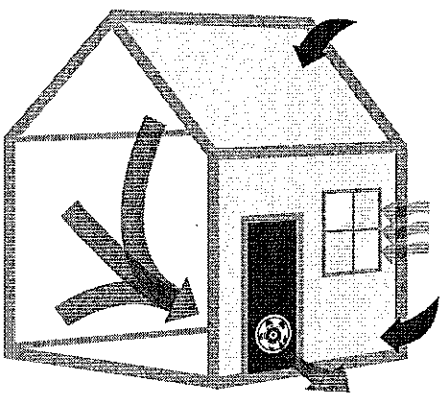
- Sealing ZIP System® Sheathing with ZIP System® Tape creates a continuous rigid air barrier system that properly seals the building envelope and provides greater air barrier performance than traditional building wrap assemblies.
- Unlike building wrap, ZIP System Wall Sheathing is not susceptible to air leaks due to rips, tears or fastener penetrations.
- By taping panel seams with ZIP System Tape, ZIP System Wall Sheathing effectively seals the wall system, decreasing unwanted air leakage into and out of the walls. This helps protect the R-value of insulation, thereby contributing to overall occupant comfort and energy efficiency of a project.



Superior Air Protection

Blower Door Testing

ZIP System® Panels Help You Ensure a Lower ACH or a Tighter Home



Air Barrier

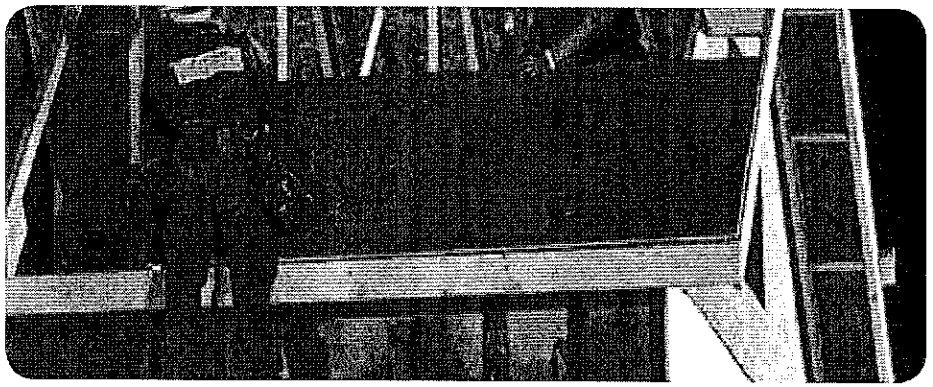
ASTM
E 2178-03
<0.02L(s•m²)
@ 75 Pa

ASTM
E 2357-05
<0.2 L(s•m²)
@ 75 Pa

ZIP System® Roof & Wall Sheathing Benefits

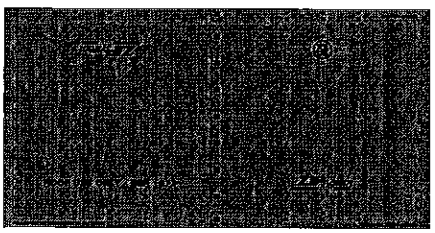
Simplicity and Ease of Installation

- ZIP System® Sheathing requires fewer steps to properly seal rough openings, such as windows and doors. This simplified process reduces the chance of installation errors and unwanted air or moisture penetration.
- With ZIP System Sheathing, the moisture barrier is integrated onto the surface of the panel, which eliminates the rework and repair common to ripped or blown-off building wrap and felt.
- ZIP System panels are supplied with fastening and tape guides pre-printed on the surface of the panel for ease of installation and simplified quality control.
- ZIP System Sheathing installs up to 40% faster than traditional systems, providing faster dry-in and improving the cycle time of projects!

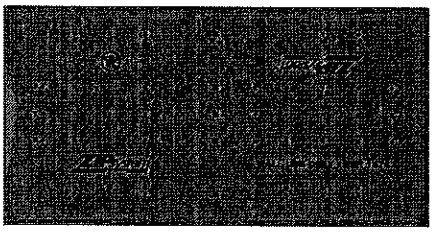


Simplicity and Ease of Installation

Pre-printed Fastening and Tape Guides
for Ease of Installation



ZIP System® Roof Sheathing
with Built-in Moisture Barrier



ZIP System® Wall Sheathing
with Built-in Moisture Barrier

ZIP System Sheathing is backed with an industry-leading 30-year limited warranty[2]

ZIP System® Tape

Unlike Any Tape You've Used

ZIP System® Tape transforms our sheathing panels into a seamless protective barrier for the outside of your building. Its advanced acrylic adhesive is proven to deliver a superior airtight and watertight seal that resists harsh elements. That's why acrylic is trusted for some of the most demanding applications in the world. ZIP System Tape can save you time and money on the job, and you can leave the site with confidence it will deliver lifelong performance.

Advanced Adhesive Science

The result of advanced physical and chemical building science, ZIP System Tape is specially engineered to bond with ZIP System® panels. It creates a magnetic-like attraction on the molecular level, forming a permanent seal.

Strong Within

ZIP System Tape has both robust adhesion and cohesion, meaning it's internally strong. Intertwined polymer chains provide excellent internal strength, adding to the overall reliability of its seal.

Adapts with a Building

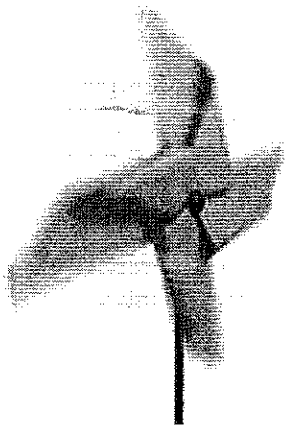
ZIP System Tape can even adjust with a building over its lifetime. It flexes and **stretches up to 800%** to accommodate the normal contraction and expansion of walls.

STOP AIR LEAKAGE AND MAXIMIZE ENERGY EFFICIENCY.

Air leakage is one of the most significant causes of energy loss, because it works against expensive heating and cooling equipment by disrupting inside temperature. By forming a continuous, rigid air barrier, ZIP System® sheathing & tape reduce air leakage, while outperforming traditional sealing methods involving housewrap.

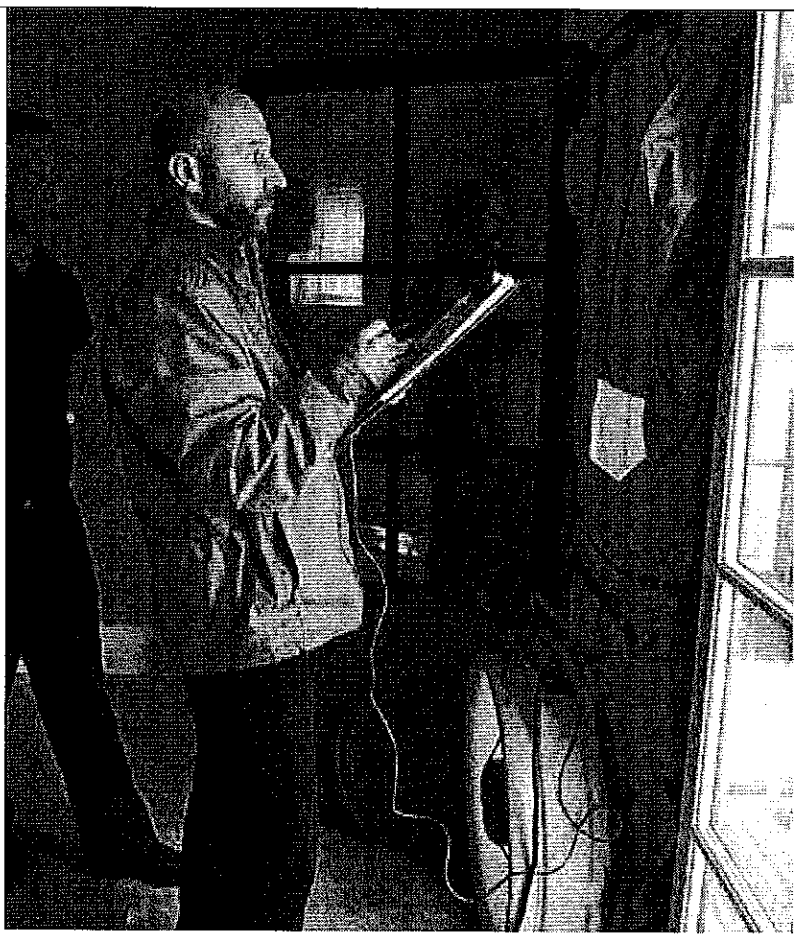
Why ZIP System® Sheathing

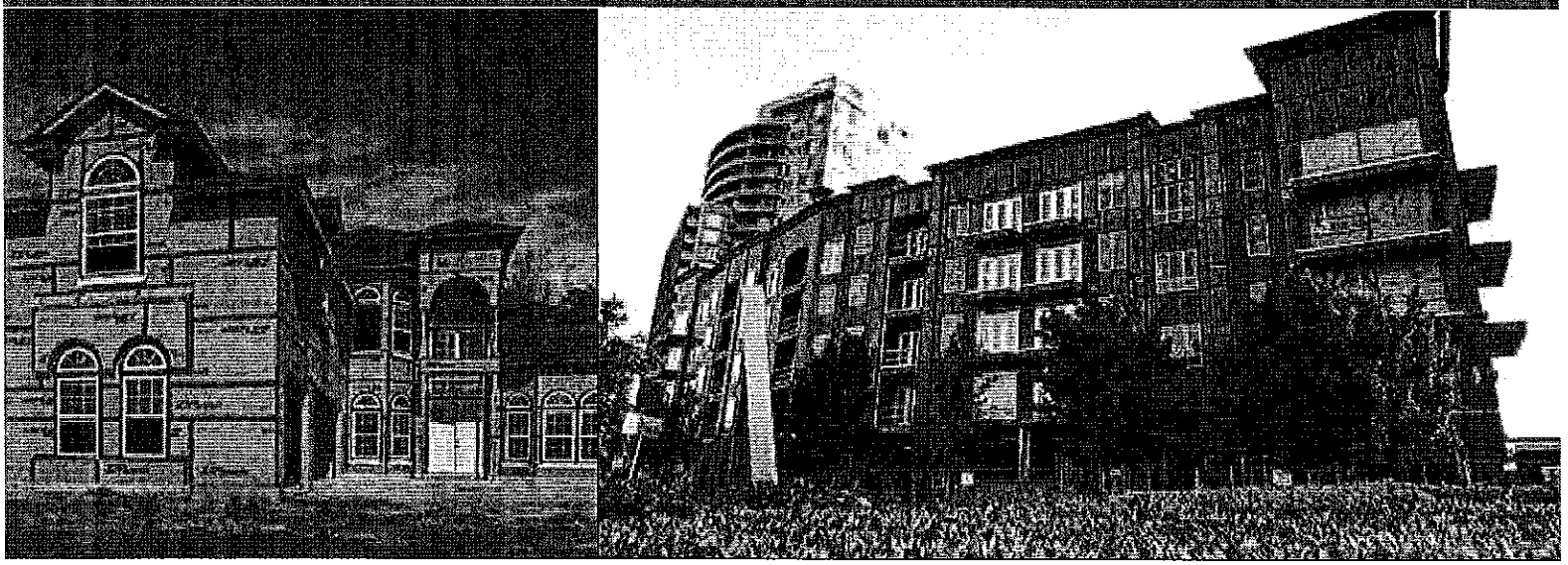
By simply taping the panel seams with ZIP System™ tape, the system effectively seals the building envelope, decreasing unwanted air leakage into and out of the home. ZIP System® panels are structural PS-2 rated panels with permanently integrated protective barriers. They're engineered to withstand the demands of the jobsite and provide long-term performance within the building structure. That's superior performance we ensure through extreme tests.



A Tighter Seal That Protects R-Value

Air leakage lessens the ability of insulation to resist heat flow, reducing its effective thermal resistance (R-Value). By eliminating gaps in the building envelope for a tighter seal, ZIP System® sheathing better protects the wall system and prevents air leakage from degrading R-Value.

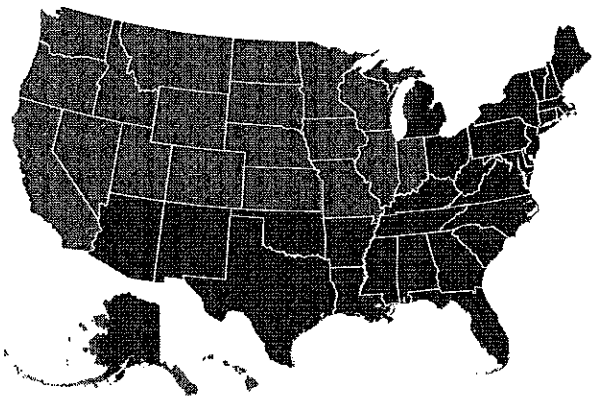




See What You Could Save

Less energy consumption and lower utility bills are key factors in today's housing market. ZIP System® sheathing & tape can play a key role in achieving both. Visit our online map to see estimated annual energy savings in a city near you.

ZIPsystem.com/energyefficiency



City	Average Annual Savings on Heating and Cooling Costs	Annual ZIP System Wall Savings ($ Savings)
Boise	13%	$189
Chicago	12%	$194
Denver	11%	$156
Fargo	16%	$306
Madison	13%	$275
Milwaukee	14%	$282
Minneapolis	14%	$252
Omaha	12%	$177
Portland	10%	$166
Salt Lake City	11%	$155
Seattle	11%	$175
St. Louis	11%	$191
Wichita	10%	$177

City	Average Annual Savings on Heating and Cooling Costs	Annual ZIP System Wall Savings ($ Savings)
New Orleans	5.8%	$74
Dallas	6.7%	$125
Little Rock	7.2%	$136
Oklahoma City	9.4%	$136
Omaha	11.6%	$177

City	Average Annual Savings on Heating and Cooling Costs	Annual ZIP System Wall Savings ($ Savings)
Orlando	3.8%	$58
Atlanta	7.5%	$165
Charlotte	7.5%	$151
Nashville	9.1%	$130

City	Average Annual Savings on Heating and Cooling Costs	Annual ZIP System Wall Savings ($ Savings)
Washington	9.1%	$187
Philadelphia	10.5%	$225
Boston	13%	$353
Detroit	12.5%	$242
Syracuse	12%	$318
Portland	13.7%	$380

ZIPsystem™ SHEATHING & TAPE

Calculations are estimated, based on a 2 story, 3,200 sq./ft home on slab foundation with gas heat and central air. Based on the following average utility prices: Electricity; 0.0750 $/kWh Gas: 10.67 $/mcf

ENGINEERED WOODS

The all-in-one solution for roof and wall sheathing.

ZIP SYSTEM® ROOF AND WALL SHEATHING

MANUFACTURER
Huber Engineered Woods LLC
10925 David Taylor Drive, Suite 300, Charlotte, NC 28262
800.933.9220 • Technical Service: 800.933.9220 x2716
ZIPSystem.com • HuberArchitectLibrary.com

BASIC USE AND APPLICATIONS

ZIP System Roof and Wall Sheathing panels are oriented strand board (OSB) structural panels with built-in protective overlays that eliminate the need for building wrap or roofing felt. Install the panels, tape the seams with Huber's ZIP System tape, and the building is rough dried-in. A wide range of roof coverings and wall claddings can be installed directly over ZIP System Sheathing.

When used on a wall, ZIP System Sheathing functions as a combination wall sheathing, code-recognized water-resistive and air barrier. The sheathing panel seams are sealed with ZIP System tape, protecting the wall from water intrusion.

When Huber's ZIP System Sheathing is utilized for roof applications, felt underlayments are not required. In wall and roof coverings systems requiring multiple layers of water-resistive barriers or underlayments, ZIP System is intended to replace only the first layer.

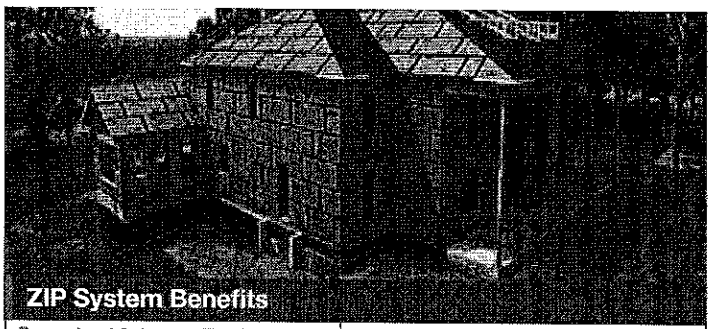
ZIP System Sheathing uses a tough, phenolic resign-impregnated overlay to provide permanent weather resistance, in concert with a proprietary seam tape that has been extensively tested for long-term adhesion and flexibility. This combination meets performance requirements for Grade D weather-resistive barriers in accordance with ICC Acceptance Criteria AC38.

ZIP System Sheathing may be used for roofs and walls in Type V construction, in Type III construction as roof sheathing only, and other construction permitted under the International Residential Code.

AVAILABLE SIZES

ZIP System Roof and Wall Sheathing panels are available in 4' x 8' sheets with self-spacing edge profiles and tongue and groove edge profile (5/8 only). ZIP System panels are Exposure 1 rated and are available in the following span ratings and performance categories:

- 24/16, Rated Sheathing, 7/16 PERF CAT (4' x 8')
- 24/16, Structural 1, 7/16 PERF CAT (4' x 9' and 4' x 10' only)



ZIP System Benefits

Superior Moisture Resistance	Continuous vapor permeable moisture barrier that blocks out liquid water but still allows walls to dry out.
Ease of Installation	No more delays because of felt or building wraps blowing off.
Energy Efficiency	Code-recognized built-in weather and air barrier.

- 32/16, Structural 1, 1/2 PERF CAT
- 40/20, Structural 1, 5/8 PERF CAT

Longer length panels are available for wall applications. Third party independent testing of ZIP System Roof and Wall Sheathing by Timberco, Inc. (TECO).

LIMITATIONS

When used as roof sheathing, ZIP System sheathing is limited to roofs with slopes of 2:12 (16.67 percent) or greater. Felt underlayment is not required on the roof. In roof covering systems requiring multiple layers of underlayment, ZIP System is intended to replace only the first layer. In wall covering systems requiring multiple layers of water-resistive barriers, ZIP System is intended to replace only the first layer.

ZIP System Sheathing should not be used with adhesively-attached EIFS, but can be used with mechanically attached EIF systems. Avoid exposing ZIP System Sheathing for more than 180 days.

SUSTAINABLE DESIGN CONTRIBUTIONS

- Low-Emitting Material: No added urea formaldehyde
- Sustainable Forestry Initiative Certified Wood: Harvested, transported, manufactured and distributed utilizing sustainable practices
- Renewable Forest Resources: Composed of primarily young growth bio-based resources
- Regional Materials: Made in the United States at one of our 4 regional manufacturing facilities.

POTENTIAL LEED CREDIT CONTRIBUTIONS

- IEQ 4.4 Low-Emitting Materials, Composite Wood and Agrifiber: ZIP System Roof and Wall Sheathing contains no added urea formaldehyde
- MR 5.1 or 5.2 Regional Materials: Materials harvested, processed and manufactured within 500 miles of site
- MR 2.2 Environmentally Preferable Products - Local Production (LEED for Homes)
- EA 3 Air Infiltration - Meet air leakage requirements

APPLICATION

SUBSTRATE

Before beginning installation, verifying framing is properly spaced and aligned to support panels.

PANEL INSTALLATION

Install ZIP System Roof and Wall Sheathing in accordance with the following:

- ZIP System Sheathing Installation Manual
- ICC-ES ESR-1473
- ICC-ES ESR-1474
- Requirements of authorities having jurisdiction

When used as roof sheathing, install panels with moisture barrier surface facing out, with long edge perpendicular to framing members, spanning at least three framing members, and with short edges fully supported. Stagger short edge seams. Long edges are self-spacing; 4-foot panel edges should be manually spaced apx. 1/8 inch (3 mm) apart.

When used as wall sheathing, install panels positioned with the water-resistive barrier facing out. The panels may be installed with the long side of the panel oriented either horizontally or vertically to the framing members. Walls that are designed to resist lateral shear forces and sheathed with wood structural panels typically require solid framing or blocking behind all panel edges. Long edges are self-spacing; 4-foot panel edges should be manually spaced apx. 1/8 inch (3 mm) apart.

Fasteners:
Install fasteners approved by applicable building code. Install fasteners 3/8 inch (9.5 mm) from panel edges. Space fasteners 6-inches (152 mm) on centers on supported panel ends and 12-inches (305 mm) on centers at intermediate supports unless otherwise specified. ZIP System panels have a printed fastening guide for 16-inch (406 mm) and 24-inch (610 mm) on center fastener locations.

Tape Installation:
Install ZIP System tape in accordance with manufacturer's written instructions at seams, openings and penetrations. Install windows and window flashing in accordance with window manufacturer's written instructions. Details of installation recommendations are available in AutoCAD and .pdf formats at ZIPSystem.com and HuberArchitectLibrary.com.

STORAGE AND HANDLING

Store and handle products according to manufacturer's written recommendations. Support panel bundles off the ground. Cover stored panels with weatherproof protective material; allow sides of protective material to remain loose to assure adequate air circulation. In high-moisture conditions, cut bundle banding to prevent edge damage to panels.

AVAILABILITY

Huber Engineered Wood's ZIP System Roof and Wall panels are manufactured at multiple locations in the U.S. and are available through distributors nationwide; visit ZIPSystem.com or contact Huber Engineered Woods for a retailer near you.

WARRANTY

ZIP System Roof and Wall Sheathing is furnished with a 30-year system warranty as well as a 30-year warranty against manufacturing defects. Visit ZIPSystem.com for limitations and restrictions.

NOTES AND LIMITATIONS

- Do not use on roof with slopes less than 2:12.
- Do not install ZIP System tape in temperatures less than 20° F.
- Roof panels edge clips are only required with 7/16 inch thick ZIP System sheathing on supports spaced more than 16-inches oc. Panel edge clips approved to be used with ZIP System Sheathing are: Simpson Strong-Tie,® PSCA, PSCL and Tamlyn™ PCS models.

TECHNICAL SERVICES

Detailed information including specifications, product literature, test reports, installation instructions and special applications is available through Huber Engineered Woods. Please visit ZIPSystem.com or call 800.933.9220 x2716 to speak to a technical representative.

AVAILABLE RESOURCES

Section 06 16 00 SHEATHING guide specifications for ZIP System Roof and Wall Sheathing products in CSI 3-part format are available in MasterSpec,® ARCAT.com, BSD SpecLink,® ZIPSystem.com and HuberArchitectLibrary.com.

ZIP System Benefits		
Exposure Durability Classification	DOC PS 2	Exposure 1
Panel Grade	DOC PS 2	Structural 1 (except 4' x 8' 7/16 PERF CAT)
Moisture Barrier	AC38	Grade D WRB
Water Penetration	ASTM E331	Passed
Vapor Transmission	ASTM E96-B (panel overlay)	12-16 perms
Air Barrier Assembly	ASTM E2357	0.037 L/(s*m2)
Air Barrier Material	ASTM E2178	0.0016 L/(s*m2) @300 Pa
Wind Driven Rain	TAS 100 (at 100 mph)	Passed

Technical Tip

Spray Foam Insulation with ZIP System® Sheathing

There are two types of spray-in foam insulation used in today's construction industry, low density foam (open cell) and high density foam (closed cell). Both of these types are available in a variety of derivatives such as polyurethane, soy, polyisocyanurate, icynene, etc.

Low Density Foam (Open Cell)

Low density foam is not completely closed, which allows for air to fill the open voids in the insulation during installation. During installation, low density foam expands about 100 times its liquid volume. Low density foam typically weighs 0.5 pound per cubic foot and carries an average insulation value of R-3.5 per inch of thickness. Low density foam is an air barrier, but does not perform as a vapor barrier.

High Density Foam (Closed Cell)

High density foam packs and fills the tiny air bubbles with a gas which in turn allows the foam to rise and expand. During installation, high density foam expands from 30 to 50 times its liquid volume. High density foam typically weighs 2.0 pounds per cubic foot and carries an average insulation value of R-6.6 per inch of thickness. High density foam is an air barrier as well as a vapor barrier.

Any spray-foam insulation that is code recognized to be used on OSB products in roof and wall applications may be used on the underside of ZIP System® sheathing and ZIP System® R-Sheathing[1]. Icynene, soy, polyisocyanurate, and polyurethane all work well. Use of these products will not void the ZIP System warranty. Prior to installation, ensure the ZIP System panels are dry and free of debris as not to deter the adhesion of the spray-in foam.

If high density foam is installed behind ZIP System sheathing, we recommend back venting the finished wall covering. Back venting is a best construction practice and can be defined as incorporating a minimum gap between the structural sheathing and finished wall covering to allow air flow, which will in turn help dry any moisture that may occur. Back venting can be achieved by incorporating a minimum 1/8" air gap between the ZIP System sheathing and all exterior veneer types except vinyl siding. Vinyl siding inherently allows for adequate air movement without additional back venting. The use of any spray-in foam insulation in direct contact with the under side of ZIP System sheathing installed on a roof assumes the attic space will be designed in strict accordance with the 2009 International Residential Code, section R806, *Roof Ventilation*[2].

[1] ZIP System R-Sheathing is manufactured with a closed-cell polyisocyanurate foam integrally bonded to inorganic coated glass facers. The glass facer prevents compatibility issues between the cavity insulation and the rigid polyisocyanurate layer.

[2] ZIP System R-Sheathing panels must be installed over wood-framed walls and are not currently code-recognized or warranted for roof applications.

Please visit www.zipsystem.com or contact our technical services department at 800-933-9220 with any questions or comments.

Huber Engineered Woods, LLC, 10925 David Taylor Drive, Suite 300, Charlotte, NC 28262
Tel: 800-933-9220, Fax: 704-547-0739, www.zipsystem.com

Window Quilt®

Winter, Summer. . .Window Quilt Delivers Energy Savings Year Round!

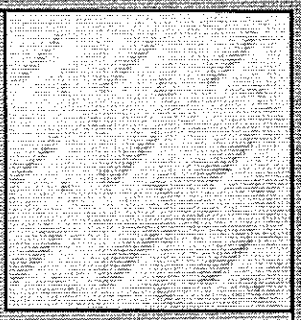
Product Descriptions

Shades

Self contained, fully retractable, sealed on all four sides. Available in Room Darkening or Light Filtering configurations. Optional matching valance.

400 Series: Surface mount on the window casing with side sealing tracks. Smooth operating, low profile design. Available space above the window is a consideration.

100 Series: Same mounting system, but best choice when space above the window is limited.



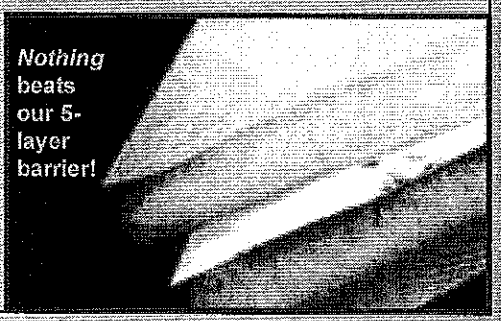
Newport pattern in ecru. (color may not be exact due to screen variations)

Pattern: Unidirectional, Newport

Color: Ecru (off-white)

Sizes: Up to 24" to 104" wide in 1" increments. Length up to 144".

Installation: See page 2 for installation requirements, clearances, and component diagram.



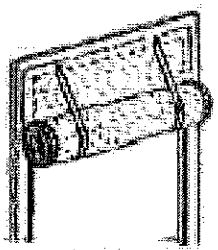
Panel Quilts

Moveable insulation, velcro secured on all sides, manual roll-up. A less expensive, but just as effective option. Available in Room Darkening or Light Filtering configurations.

Pattern: Unidirectional, Newport

Color: Ecru (off-white)

Sizes: Up to 24" to 104" wide in 1" increments. Unlimited length.



Panel Quilt

Parts

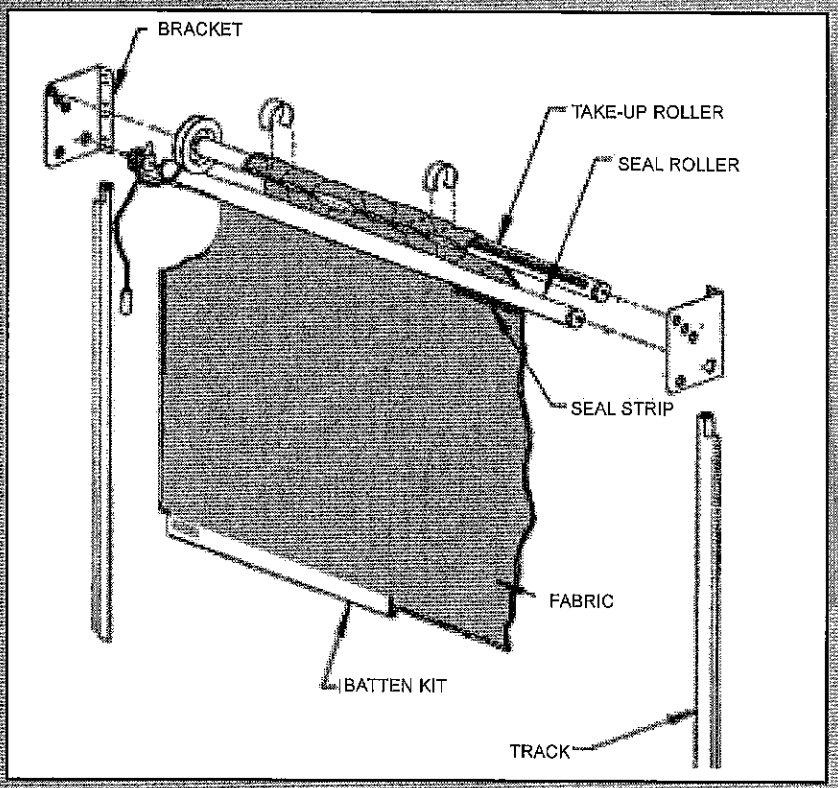
Maintenance parts, including many discontinued items.

Legacy quilts, some limited stock of discontinued colors and patterns

Great for Sliders and Bay Windows of All Kinds!

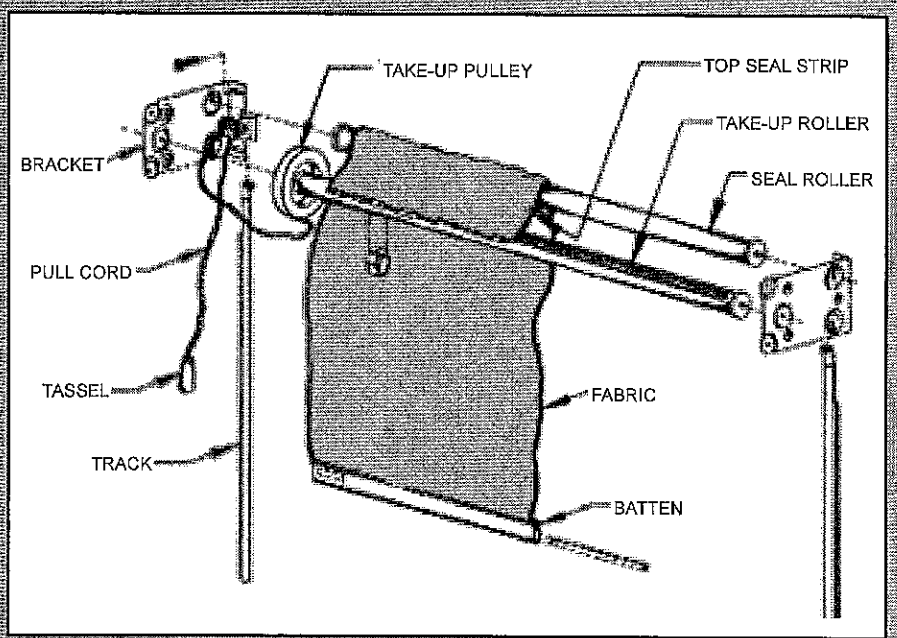
Window Quilt®

- Installation
- Clearances
- Components



400 Series

Window Height (up to)	Mounting bracket to ceiling clearance required	Projection into room
48"	1/2"	5-1/4"
72"	1-1/2"	5-3/4"
84"	1-3/4"	6"
120"	2-3/4"	6-3/4"
144"	3-1/4"	7-1/4"



100 Series

Window Height (up to)	Mounting bracket to ceiling clearance required	Projection into room
48"	1/2"	6-3/4"
72"	1-1/2"	6-3/4"
84"	1-3/4"	7"
120"	1"	8-1/4"
144"	1"	8-1/2"

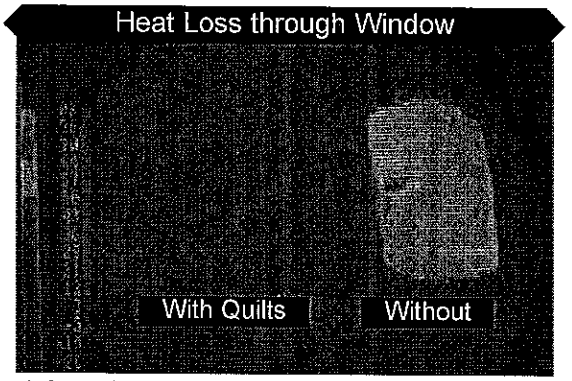
Window Quilt

High Performance Insulated Shades

(Performance and Technical data on pages 3 and 4)

Warm in Winter and Cool in Summer. Window Quilt Delivers Comfort and Savings Year Round!

A Picture is Worth a Thousand Words.
Which Window is Yours?



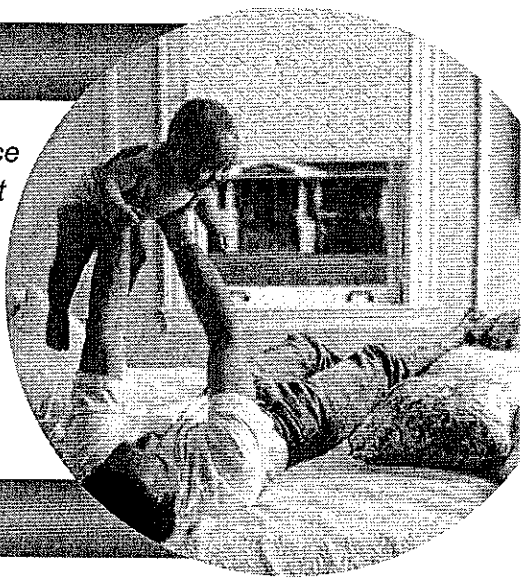
infra-red photography graphically illustrates Window Quilt's effectiveness.

Comfort You Can Feel

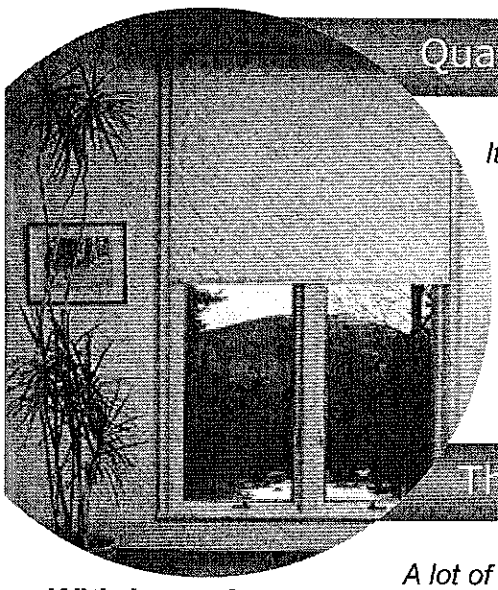
- **Eliminates drafts**
- **Dramatically reduces heat loss/gain**
- **Feel more comfortable at lower temperatures**
- **Blocks outside noise**

To get the most benefit of space in the bedroom, the boys must sleep under cold windows. I'm amazed how the Quilt stops these drafts completely.

Susan, Reston, VA



Quality You Can See

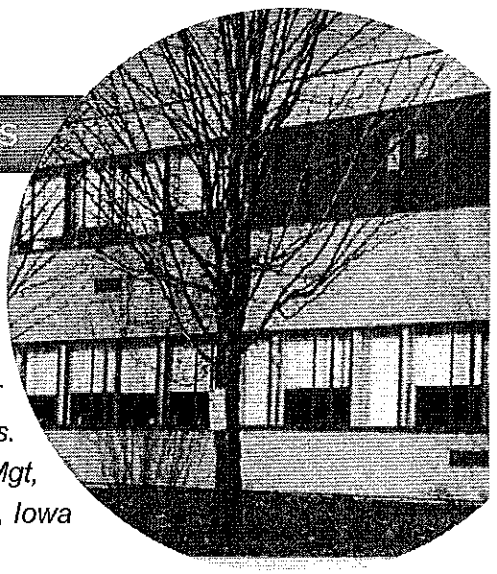


It's great to buy such a super American made product. Your packaging is excellent and every quilt was perfect. The increased efficiency is better than we hoped for!

Richard, St. Peters, MO

Proudly crafted in America

The Choice of Professionals



With legendary performance and rapid pay back, Window Quilt is the choice of facilities managers nationwide.

A lot of people pay lip service to energy conservation, but then say it is too expensive. I feel good when I do good things for the environment, but everything I do is economically motivated, as well. So far, I've installed over 6,000 in my projects.

Keith Denner, Owner, Professional Property Mgt, West Des Moines, Iowa

Sometimes our customer's *enthusiasm* surprises even us!

I saw your Window Quilts and knew they were the answer to our sun porch problem. I love them. They are fantastic. They make the porch very draft free and comfortable all winter.....John Snell Boonton, NJ

Superb product! We have three other types of movable insulation in our solar home--Window Quilt technology is the best!.....Jeanne, Highland UT

This is our third Window Quilt house. I doubt I would ever be content to live without them!.....James, Pittsford, NY

My Victorian house is now amazingly draft free. I am truly impressed! .....Patty, Medfield, MA

Key Benefits/Features

- Eliminates air infiltration and drafts
- Retains inside heat in winter
- Blocks 99% of solar radiation and resulting heat gain in summer
- Eliminates window condensation
- Advanced green technology saves you money -- and natural resources
- Independently certified efficiency
- Cuts outside noise by third.
- Over 600,000 commercial and residential Installations
- Outperforms other window options
- **Lower Heating and Cooling Bills!**

Who Uses Window Quilts?

Hotels Schools Colleges National Parks Offices Hospitals Churches Libraries Municipalities Restaurants	Apartments Museums Public Housing Military Residences Condo Assoc. Historic Bldgs	Window Quilts enjoy a large installed base, and are battle tested in a wide array of commercial applications. They're so durable, many are still functioning perfectly over 25 years later! **Fact:** There Are Over 600,000 Window Quilts installed Worldwide!

FAQ's

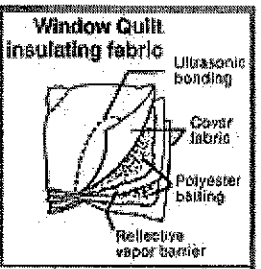
How does Window Quilt compare with installing new windows?
Window Quilt requires no reconstruction or modification of your home. They are much less expensive and easier to install, and provide a much higher total efficiency return. Window Quilt also provides a choice of full view or complete privacy. When fully raised, it does not reduce light transmission and solar gain. When fully lowered, their unique properties reflect summer sun or seal out winter cold. Compared to installing storm windows, Window Quilt provides easy ventilation with existing windows and superior insulating properties.

What's so special about the four way seal?
Our cord-in-track seal dramatically cuts airflow around the shade's sides while pressure seals close off the top and bottom. This is vitally important in blocking infiltration of warm or cold air. Conventional shades and draperies, even so-called insulating shades, do not approach the effectiveness of Window Quilt.

Can I use your Window Quilt system with my existing window treatments?
Yes. Usually Window Quilt can be mounted without changing your existing drapery or curtain installation.

Are Window Quilts Washable?
Yes. We recommend occasional vacuuming. If necessary, Window Quilt may be hand washed or professionally cleaned in place.

Window Quilt's exclusive advanced technology fabric consists of 5 layers that are ultrasonically bonded to avoid any physical penetration of the fabric -- maximizing it's amazing capability to stop air and temperature infiltration. Combined with our 4-seal mounting system, Window Quilt is the ultimate in window insulation.



Window Quilt Delivers a High Performance, No Compromise Solution for Today's Energy Needs

The Savings Start from Day One. . . And Last for Years

Advanced Technology Delivers Year Round Performance

Window Quilt performs equally well in summer and winter by countering all four heat transfer mechanisms. Think of them as moveable insulation for windows.

Conduction. Glass is an excellent conductor of heat. That's why your windows feel much colder than your walls in winter. It's also why moisture condenses on your windows in winter, causing those unsightly water stains and promoting premature rot.

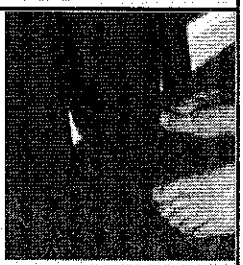
Convection. Because warm air rises and cold air falls, windows, especially those with conventional window treatments, can actually set up a flow of cold air in your room. Window Quilts block these drafts completely, because they seal the window on all four sides and contain an air tight inner layer.

Infiltration. Window Quilt's four way seal stops all air passing through leaky or ill-fitting windows.

Radiation. This is the loss of warmth to the outside in winter, and what is known as solar gain in the summer. Solar radiation is the main contributor to warming your house in summer months. Window Quilts block this energy from escaping in the winter and entering in the summer.

Take the "Cold Feet" Test!

Think your insulated draperies work as well as Window Quilts? Try this simple test!



On a cold day, close your drapes. Remove your shoes and socks and stand next to the window. Feel the chill? It's the cold air falling off your window. It's known as the "reverse chimney effect". All unsealed window treatments actually work as an air baffle that promotes the movement of cold air downward across your cold window glass by streamlining the airflow while drawing in heated air from above. That draft is robbing your house of the warmth and "coziness" you want!

Technical Specifications

Description
5-layer composite, tracked and completely sealed movable insulating shade

Insulation Properties (R-value)

Single pane window	.87
with Window Quilt	5.88
Heat Loss Reduction	85%
Double pane window	1.86
with Window Quilt	6.90
Heat Loss Reduction	73%
Double pane, Low -e Glazing	3.45
with Window Quilt	7.14
Heat Loss Reduction	52%
Air Exchange Reduction (avg)	63.0%
Noise Reduction	35%

Shading Coefficient (Summer)

Low-e Glazing	.82
Improvement	7%
w/Light filtering Window Quilt:	.23
Improvement	74%
w/Room darkening Window Quilt:	.14
Improvement	82%

Light Reduction

Room darkening:	99.5%
Light filtering:	72%

Test Method: ASTM C-236 Test

Independently certified results. All results based on whole window testing.

R-Value: A material's resistance to heat flow. Higher is better.

Shading Coefficient: Ability to block solar heat gain. Lower is better.

Other Benefits

Light Control
Window Quilt offers a room darkening shade that cuts 99.5% of the light entering the room through its windows. This is useful in bedrooms, classrooms, labs, audio/visual centers, etc.

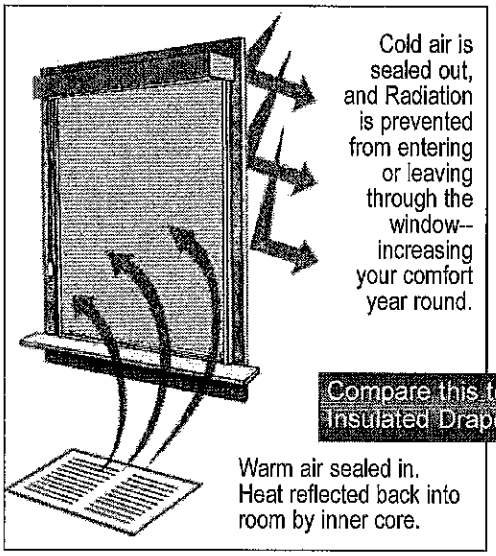
Noise Suppression
Another Window Quilt benefit is its inherent noise reduction capability. It cuts outside noise by over 1/3rd.

Only Window Quilt Deals Effectively with ALL Forms of Energy Loss

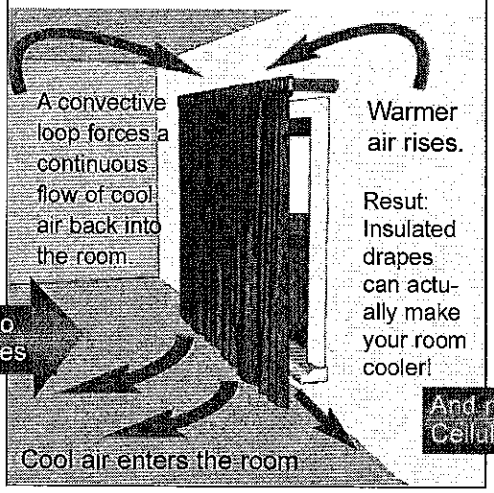
There are many so-called "insulated shades" available, and many make impressive claims. But the fact remains that NONE come close to the overall performance of the Window Quilt system. Why?

- Window Quilts are sealed on *all four sides*. This is a *critical* requirement for any window insulation to maximize efficiency. WQ's fully sealed, impenetrable design stops heat, cold, wind, drafts, and damaging condensation--completely.
- Window Quilt's unique perimeter seal magnifies it's superiority over other forms of window shades when used over leaky windows.
- An advanced 5-layer barrier that insulates, reflects radiation and acts as a vapor barrier.
- All layers are ultrasonically welded -- the fabric is never penetrated, so that air has nowhere to go

When you compare-- there's no comparison!



Cool air trapped between the window and the drape falls to the floor. Warm air enters from above the window, cools, and travels down the cold window and out the bottom & sides.

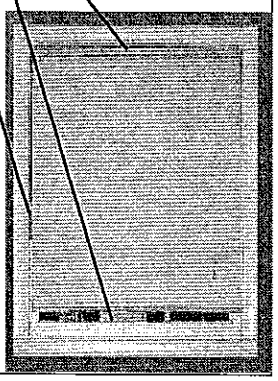


Compare this to Insulated Drapes

Top, sides, and bottom are not sealed againt the window frame

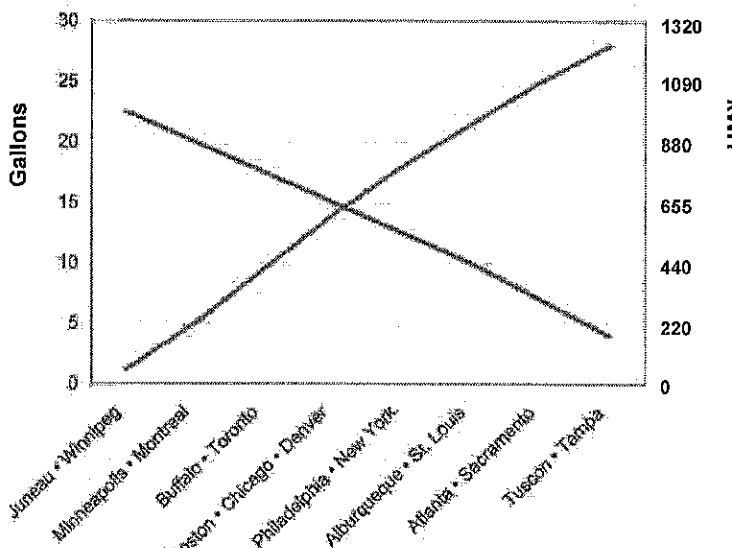
Air infiltration, heat loss, and convection are not addresssed as effectively as WQ's total solution approach.

Cellular shades have no effective seal and no vapor barrier, so they can't begin to approach Window Quilt's effectiveness



And now to Cellular Shades

Typical Annual Energy Savings Savings per 3' X 5' Window



Assumptions:

2100 sq ft wooden frame, residence, minimul shade, single glazed windows. Multiply heating reductions by .55 for double glazed. Savings increase for windy areas.

*Conversions: 1 gallon of fuel oil = 43.7kWH, 145.18 cu ft natural gas

Window Quilt saves you money in winter *and* in summer. The graph at left clearly illustrates your potential savings no matter where you live!

Also Consider:
Calculations do not take into account any potential state and/or utility rebates and incentives.

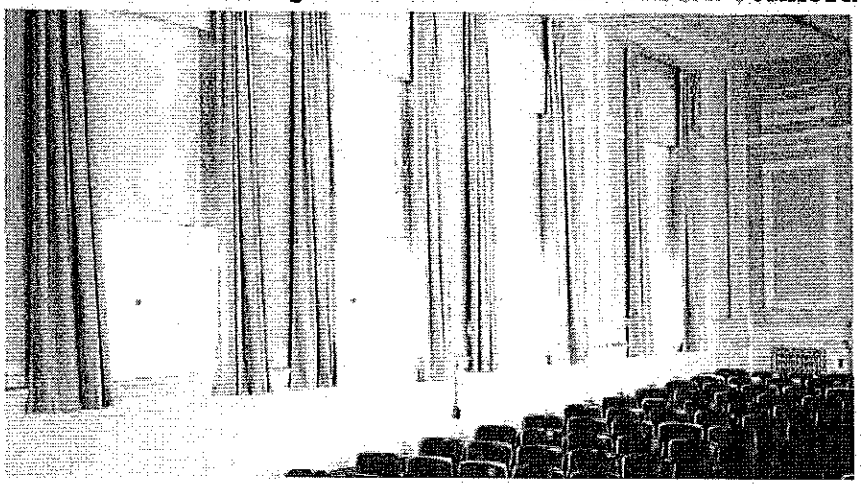
Don't forget the increased resale value of your home due to it's lower fuel bills!

Window Shade Systems

Insulating ■ Shading ■ Screening

Window Quilt®

Movable insulating shades for increased room comfort.



ATC shade products are the only effective window insulation that roll up completely out of the way when not in use, for an unobstructed view. When the shade is fully lowered, a tight perimeter seal, one key to the shades effectiveness, is formed by the corded edges of the fabric running inside two guide tracks. This seal serves four necessary functions for increased room comfort:

1. Prevents insulated air from escaping.
2. Greatly reduces infiltration of outside air.
3. Reduces moisture condensation on windowglass.
4. Blocks the heat of the direct sun. Thus, warming or cooling problem rooms by balancing heating and cooling systems is efficient and cost-effective.

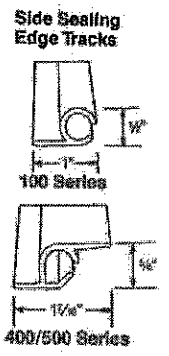
CUSTOM DESIGNED FOR A CUSTOM FIT.
All ATC products are made at the factory according to customer's specifications for smooth operation and flawless appearance.

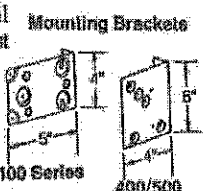
SELECT A FASHIONABLE COLOR — OR USE YOUR OWN MATERIAL.
Product styles are available in a wide range of colors and a choice of pattern. Window Showcase offers the unique ability to apply a material of ones own choosing as a cover over the Window Quilt insulating layer.

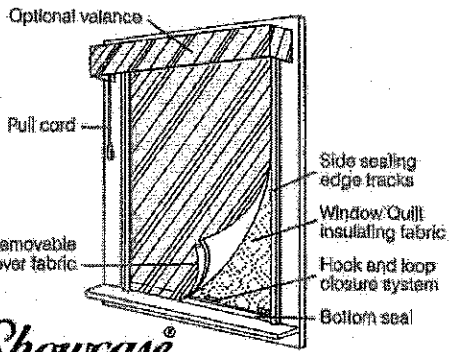
TROUBLE-FREE OPERATION:
All ATC products in this catalog have been engineered and tested for a minimum of 11,000 cycles equal to 10 years of use at 3 up/down cycles per day and have been extensively proven in actual installations.

Window Quilt is the original insulating window shade, perfected and proven coast-to-coast. Independent tests have proven that a Window Quilt shade mounted next to a single-paned window (with 15 mph wind blowing on window exterior) insulates to as much as R4.88. This means a reduction in window heat loss up to 81%. Even when mounted 5-inches away from the glass, a reduction of 77% has been obtained. Air infiltration (or exfiltration) on an ASHRAE "average" window is reduced by 68%.

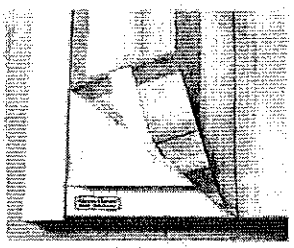
Window Showcase allows an easily removable attachment of decorator fabrics over the Window Quilt insulating layer. Decorative covers can be selected from most closely woven medium weight fabric, giving designers and building owners almost infinite decorating options. Panel Quilt is the simpler version of the Window Quilt system easily installed and just as easily removed. Panel Quilt is held firmly in position with a Velcro seal along all four sides. The panel can be rolled up to any desired height then secured with adjustable nylon straps. Without need of rollers or brackets, Panel Quilt is the ideal and economical choice for north facing windows. ATC also provides an institutional Panel Quilt which meets the most stringent health and safety code requirements.





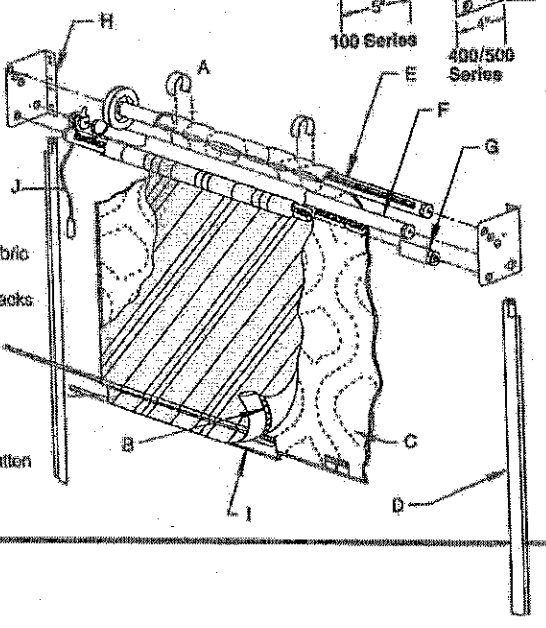


Window Showcase®



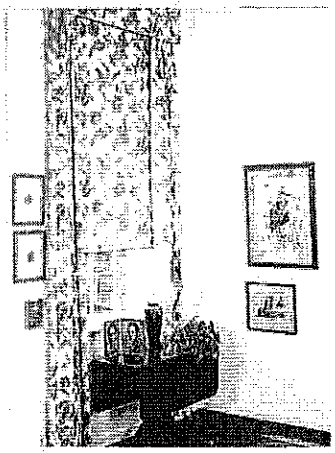
Front cover for style 430. Window Showcase is easily removed or changed.

See back cover for General Information Section 1.01-1.07.



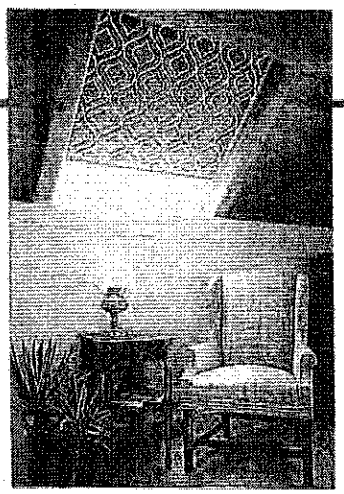
Window Quilt
a) Quilt fastening clip
b) Removable cover fabric
c) Quilted material
d) Side sealing edge tracks (¼" flange)
e) Quilt take-up roller
f) Seal roller
g) Showcase® Cover fabric roller
h) Mounting bracket
i) Weighted bottom batten
j) Pull cord

D. PRODUCT: Style 100 Window Quilt® insulating shades.
1. Operation: Manual pullcord with jam roller locking mechanism. Edge cords sewn onto material operate in side tracks (or channels).
2. Controls: Pullcord, motorized.
3. Mounting: Outside mounting on flat surface, window molding, or on special molding trim kit.
4. Shade Size: 105" wide by 144" long maximum. 20" minimum width.
5. Options: High Light™ valances. Motor control options include:
Maintained or momentary switches, Sunsensor, Timer, Remote control.



E. PRODUCT: Style 410 Window Showcase® insulating shades.
1. Operation: Manual pullcord with jam roller locking mechanism or spring roller cordless insulating shade. Edge cords sewn onto shade material operate in side tracks. Spring-driven roller for removeable decorative front cover operation.
2. Controls: Pullcord, cordless, motorized.
3. Mounting: Outside mounting on flat surface, window molding, or on special molding trim kit.
4. Shade Size: 105" wide by 144" long maximum. 20" minimum width.
5. Options: High Light™ Valances
Style 430 — Additional hardware to allow for removable attachment of customer's own material as front cover over the Window Quilt insulating layer. Sizes: 54" wide by 144" long max. 20" minimum width. Motor control options include:
Maintained or momentary switches, Sunsensor, Timer, Remote control.

F. PRODUCT: Style 200 Panel Quilt™ insulating shades.
1. Operation: Manual roll up with nylon strap. Velcro material seals shade on all four sides.
2. Mounting: Outside or inside mounting on flat surface.
3. Shade Size: 105" wide by 144" long maximum. 8" minimum width.
4. Options: Customization available.



G. PRODUCT: Style 500 — Manual Skylight Quilt insulating shade.
1. Operation: (Edge cords sewn onto material operate in side tracks).
a. Gravity pull down for 45 degree horizontal slant or greater, utilizing manual pullcord (left or right) with jam roller locking mechanism.
b. Wand assist for less than 45 degree horizontal slant, utilizing manual pullcord (left or right) with jam roller locking mechanism to raise the shade and wand to lower the shade.
2. Shade Size: 52" wide by 144" long maximum. 20" minimum width.
3. Mounting: Outside/ceiling mounted on flat surface or window molding.
4. Controls: Pullcord (gravity) or wand assist.
5. Options: High Light valances.

H. PRODUCT: Style 505 — Manual Skylight Quilt insulating shade with *Powersil®.
1. Operation: (Edge cords sewn onto material operate in side tracks).
a. Manual pullcord with jam roller locking mechanism. Powersil constant tension system pulls the shade down. Can be utilized at any angle (0 degrees to 90 degrees).
2. Shade Size: 52" wide by 108" long maximum. 20" minimum width. Maximum width varies with length. Check with manufacturer before specifying.
3. Mounting: Outside/ceiling mounted on flat surface or window molding.
4. Controls: Pullcord with Powersil assist.
5. Options: High Light Valance.

I. PRODUCT: Style 505M — Motorized Skylight Quilt insulating shade with Powersil.
1. Operation: (Edge cords sewn onto material operate in side tracks).
a. Motorized by switch or wireless remote control.
b. Power requirement: 120V, 60Hz, 1-2A.
2. Shade Size: 52" wide by 144" long maximum. 20" minimum width.
3. Mounting: Outside/ceiling mounted on flat surface or window molding.
4. Controls: Electrical switches or wireless remote control as specified. See motor and control specifications provided by the manufacturer.
5. Options: High Light Valance.

2.03 FABRIC:

A. INSULATING FABRIC MATERIAL: Window Quilt®, Window Showcase®, Panel Quilt™, Skylight Quilt®, and Solarius® (Window Quilt). Five (5) layer ultrasonically bonded material containing front and back layers of blended polyester and cotton between which are two (2) layers of polyester fiberfill and a central mylar vapor barrier.
1. Room Darkening: Central vapor barrier is aluminized mylar.
2. Light Filtering: Central vapor barrier is clear mylar.
3. Fire Retardancy: Where required, fabric shall be Window Quilt FR passing NFPA 701 and CA 1273.3.
B. PATTERN: To be selected by Architect from manufacturer's standard selection; Aspen or Newport.
C. COLORS: To be selected by Architect from manufacturer's standard selection; Essential Selection Color Card.
D. SHOWCASE FRONT COVER MATERIAL (C.O.M.): As specified by Architect, any closely woven, pre-shrunk, cotton or cotton blend fabric material weighing between 2.5 and 7.0 ozs. per square yard.
E. SOFT-VU™ SUNSCREEN (Solarius Shade System):
a. Vinyl-coated fiberglass and vinyl-coated polyester woven into a 63 x 15 mesh configuration. Fabrics hung internally.
b. Colors: To be selected by Architect from manufacturer's standard selection.
c. Fire Retardancy: Passes NFPA 701, Calif. Flame Test, Title 19, Sect. 1273.3 Med. Scale.

2.04 FABRIC CONSTRUCTION:

A. ULTRASONICALLY BONDED FIVE (5) LAYER INSULATING SHADE MATERIAL (Window Quilt):
1. Front and back fabric: 35% cotton, 65% polyester blend
a. Light fastness: Achieves a class 4 rating in accordance with AATCC 16A (60 hour carbon arc color-fastness to light test).
b. Tensile strength: Loss will not exceed 6% in the warp and 9% in the filling direction in accordance with ASTM D-1682.
2. Polyester fiberfill: PVC coated on room darkening, acrylic coated on light filtering.
3. Mylar center: Aluminized mylar on room darkening, clear mylar on light filtering.
B. SOFT-VU SUNSCREEN:
1. 63 x 15 mesh.
2. Openness factor: approx. 14-24% range.
3. Weight: 14.9 ozs. sq. yd.
4. Thickness: .027 of an inch.
C. SIDE CORD EDGE: White multi-filament polyester cord, .187" diameter, sewn onto insulated material with nylon thread.
D. PULLCORD: Braided polyester fibers at least .122" diameter with tensile strength of at least 270 lbs.

2.05 HARDWARE:

A. BRACKETS: 16 gauge galvanized steel.
B. SIDE TRACKS: Extruded PVC, white or bronze, with matte finish, adhered to molding or flat surface with pressure sensitive adhesive, tensile strength of 3.5 lbs. per square inch. Nails (1") supplied for fastening tracks.
1. Skylight and Solarius Tracks: Lexan polycarbonate, white or bronze, able to withstand temperatures exceeding 200 degrees F. without warping or softening. Ultraviolet light resistant, UL94-V-O rating in fire retardancy test.
C. BATTEN: Extruded white PVC (weighted) with U.V. resistant foam strip on underside to form seal at sill.
1. Skylight and Solarius Batten: Lexan polycarbonate, white or bronze, able to withstand temperatures exceeding 200 degrees F. without warping or softening. Ultraviolet light resistant, UL94-V-O rating in fire retardancy test.
D. LOCKING MECHANISM: Molded ABS plastic jam roller.
E. ROLLERS:
1. Take-up and Seal roller: Rust resistant steel with attached friction strip on take-up roller, end plugs shall be molded polypropylene plastic with rust resistant steel end pins.
2. Spring Tension rollers: Spring tension rollers (Window Showcase — style 430 and Window Showcase Cordless) are rust resistant steel with attached friction strips; end plugs shall be molded ABS plastic with rust resistant steel end pins.
F. PULLEY: Take-up pulley molded from ABS plastic, white or bronze, factory attached to take-up roller.
G. VALANCE: 7" or 9" drop — prime-coated steel, mounts on bracket. Fabric covered to match insulating shade or Window Showcase Front Cover. 11" drop for Solarius Shade System valance.

GENERAL INFORMATION

Interior Window Treatment

1.01 RELATED REQUIREMENTS:

A. The General Conditions, Supplementary Conditions, and General Requirements of the Contract, apply to the work specified in this section.
B. Federal Specifications (Fed. Spec.). If appropriate, select product category.
C. Wood Blocking: Rough carpentry section 06100
D. Motorized Shades Electrical Supply: See division 16
E. Flame Retardant Fabrics shall meet or exceed the requirements of the National Fire Protection Association (NFPA) as required herein.

1.02 QUALITY ASSURANCE:

A. Mock-up: Provide a full size mock-up of each type of shade required on the project mounted as specified by the Architect. Approved mock-up should be included in the final project.
B. Substitutions: Refer to the substitution provisions of Division 1.

1.03 SUBMITTALS:

A. Shop Drawings: Submit shop drawings showing field measured dimensions of window openings and methods of attachment. Provide sections and details at head, jamb and sill between shade units and corners for each mounting condition.
B. Product Data: Submit manufacturer's specifications indicating materials, finishes, constructions, and installation instructions. Include methods of installation for each type of opening and supporting structure. Provide any maintenance and cleaning instructions.
C. Samples: Submit one complete small size operating unit representing product to be installed. Submit manufacturer's color charts showing full range of colors available.

1.04 DELIVERY, STORAGE, AND HANDLING:

A. Deliver shades to project site in manufacturer's original packaging materials to prevent damage to any components.
B. Handle shade to prevent damage to materials and operating mechanisms. Store materials in a clean, dry area.

1.05 INSPECTION:

A. Examine substrate and conditions under which shades are to be installed. Have the installer notify the contractor in writing, with a copy to the Architect, if substrate is unsatisfactory. Do not begin work until unsatisfactory conditions have been corrected in a manner acceptable to installer. Initiation of work indicates acceptance of substrate as satisfactory by the installer.

1.06 INSTALLATION:

A. Install window treatment units in a manner indicated to comply with manufacturer's instructions and in accordance with approved shop drawings.
B. Position window treatments level, plumb, secure, at indicated height and location relative to adjoining window units and other related work.
C. Window treatment units shall be in smooth, uniform working order upon completion of installation.

1.07 PRODUCT WARRANTY:

A. Provide manufacturer's standard one (1) year warranty against defects in materials and workmanship. Details available on request.

CALL TOLL FREE
1-800-257-4501

PRODUCT TECHNICAL CHART

BRAND NAME(S):	**WINDOW QUILT®** **SKYLIGHT QUILT®** **WINDOW SHOWCASE®** **SOLARIUS® SHADE SYSTEM**
PRODUCT DESCRIPTION:	8-layer composite, tracked movable insulating shade with 4-way seal—for windows, sliding glass doors, skylights. Solarius is excellent for curved & straight eaved sunrooms
MOUNTING:	SURFACE
TEST METHOD:	ASTM C-236 Test:[1]
ADDITIVE R-VALUE:	3.71
SINGLE GLAZING: COMBINED U-VALUE COMBINED R-VALUE BASE WINDOW R-VALUE % SAVINGS	Calculated .22 4.56 .87 81%
DOUBLE GLAZING: COMBINED U-VALUE COMBINED R-VALUE BASE WINDOW R-VALUE % SAVINGS	Tested .17 5.88 3.17 63%
HIGH R DOUBLE GLAZING OR TRIPLE GLAZING: COMBINED U-VALUE COMBINED R-VALUE BASE WINDOW R-VALUE % SAVINGS	Calculated .14 7.11 3.4 52%
AVERAGE AIR EXCHANGE REDUCTION:	63%
SHADING COEFFICIENT: Room Darkening Quilt Light Filtering Quilt Solarius Sunscreen	 .14 .23 Inquire—depends on material
LIGHT REDUCTION: Room Darkening Light Filtering	 99.5% 85%
NOISE REDUCTION:	.36

[1] **Testing Method:**

The ASTM (C-236) test uses the insulating shade mounted 2½" from the glass. The window is double glazed and mounted within a wooden frame, double hung sash.

The test was performed with "inside" temperatures of 68 degrees F and "outside" temperatures of 18 degrees F, with sealed, vertical window glass, and a 15 mph "outside" wind blowing against the glass.

Introducing The New

Ultra

Series 3

Ultra Efficient Condensing Gas Boiler

Ratings - 6 sizes
80 MBH
105 MBH
155 MBH
230 MBH
299 MBH
399 MBH

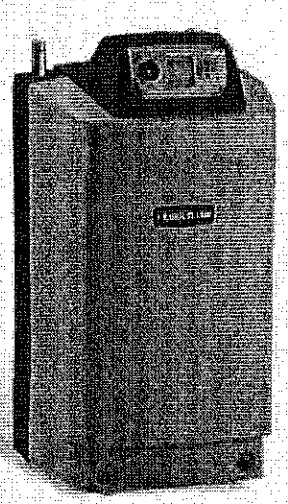
UP TO
96.4%
EFFICIENT

ENERGY STAR

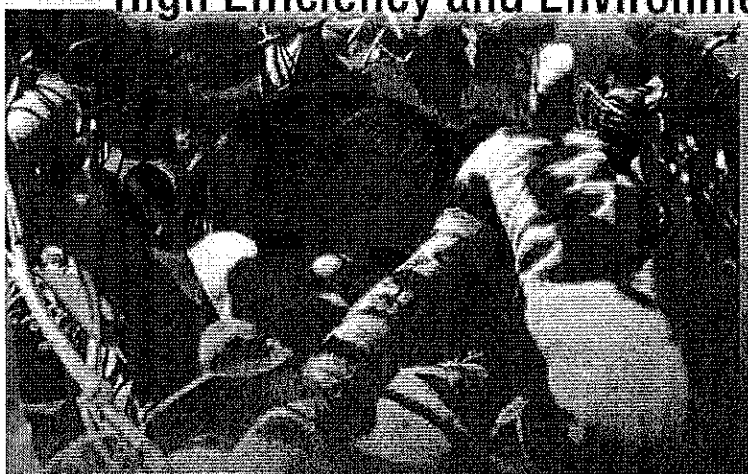
WEIL-McLAIN

Ultra Series 3

Since its unveiling in 2002, the Ultra condensing boiler has set the industry standard for innovation, design, ease of installation, reliability and efficiency. Now, Weil-McLain is taking the industry standard to a new level with the introduction of the Ultra Series 3. The Ultra Series 3 delivers peace of mind, unmatched comfort, and immediate payback in energy savings for homeowners.



High Efficiency and Environmentally Friendly



As fuel costs soar, home heating efficiency is on the mind of virtually every homeowner.

All Ultra boilers feature AFUE efficiencies in the range of 95.2-96.4%. These are some of the highest efficiencies in the industry, and when the Ultra is used in low-temperature applications such as radiant heating, it can achieve efficiencies up to 98%.

The Ultra boiler is designed to be environmentally friendly and exceeds the highest North American environmental air-quality standards. In fact, it provides cleaner combustion for low-NOx applications allowing for a reduction in green house gases.

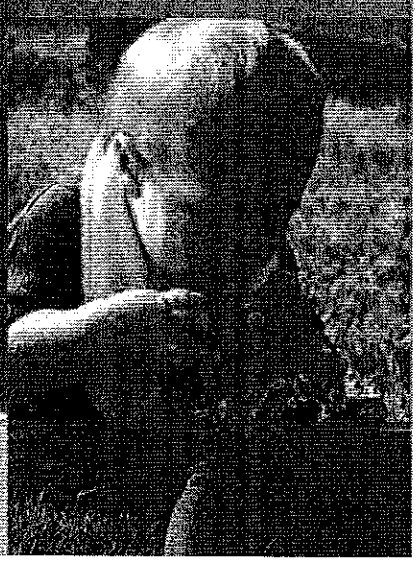
While fuel efficiency and the environment are highly important factors, here's another-the Ultra system comes from Weil-McLain, America's acknowledged leader in boiler quality and reliability.

98%
Efficiency in low-temperature applications such as radiant heating

95%
Standard Department Of Energy AFUE Efficiency Rating

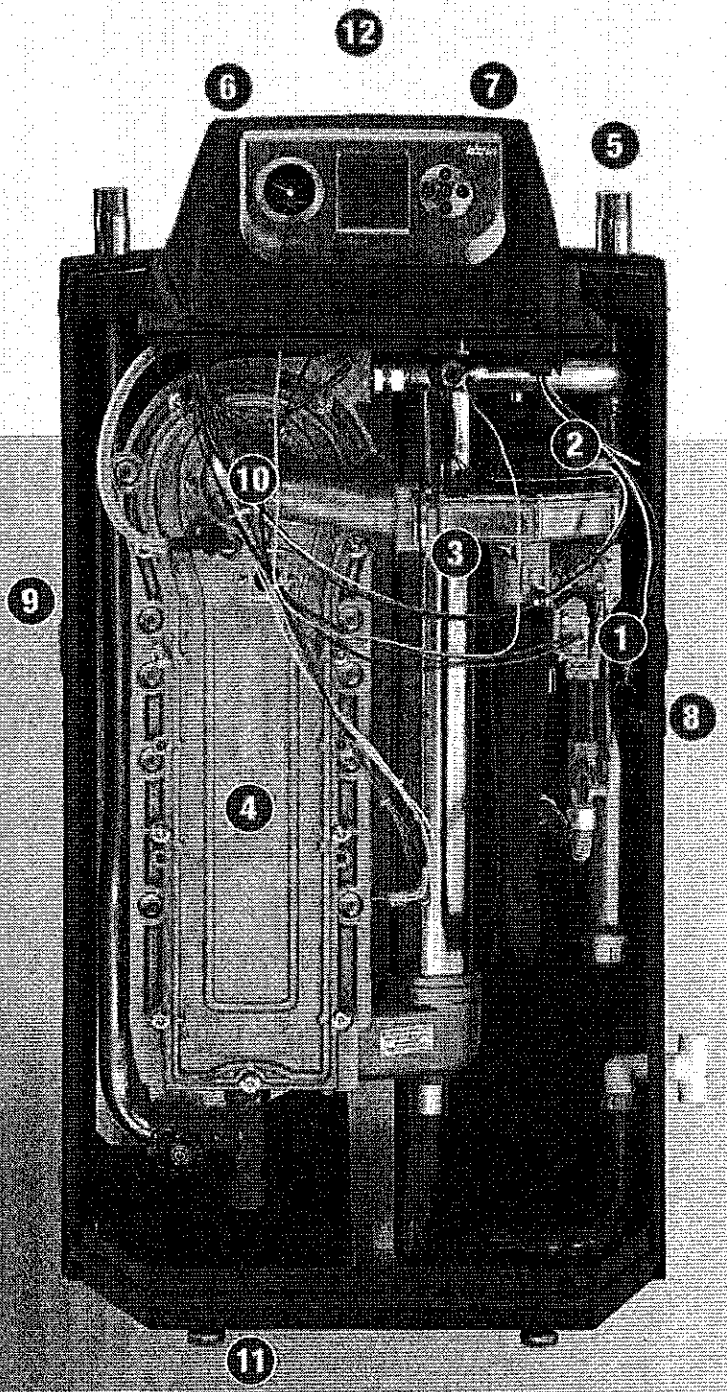
For well over a century, Weil-McLain has been single-minded in its pursuit of continual breakthrough innovation, backed by a solid commitment to provide the best customer service and support.

The new Weil-McLain Ultra, coupled with the industry's greatest reputation for quality, provides today's most comforting combination. By far.



Ultra Gas Series 3 components

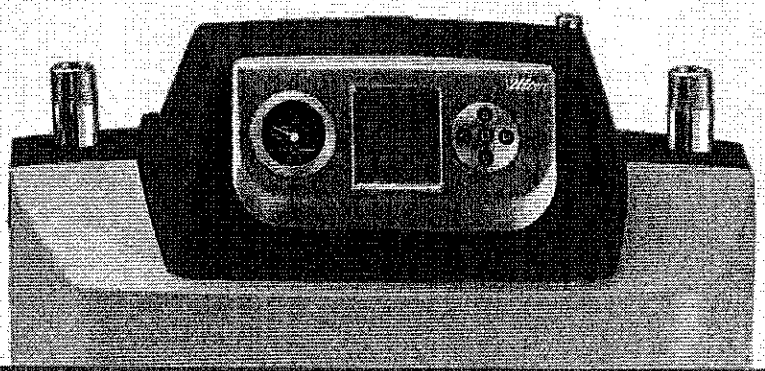
Designed to optimize operation resulting in significant fuel savings.



1. A negative regulated gas valve that precisely delivers gas to the boiler for optimal performance.
2. A variable speed motor that constantly matches combustion output to your heating needs.
3. A venturi mixing body that precisely mixes air and gas providing higher efficiency.
4. A cast aluminum mono block heats faster – aluminum provides **10 times better** heat transfer than stainless steel.
5. Water and gas piping placement are designed for quick and easy connection at the top or bottom of the boiler.
6. Conveniently located for simple installation and servicing, the electrical components have been pre-wired and are connected to the U-Control Module with color-coded terminal block plugs.
7. Simplified venting with PVC or CPVC for both exhaust and combustion air. Slide the pipe into the top outlet flue pipe adaptors and tighten the restraining ring, without messy sealants. Achieve vent runs up to 100 feet.
8. Side mounted service receptacle on a separate circuit for use with a condensate pump, service equipment or service light.
9. Side jacket handles for easy handling.
10. High grade stainless steel burner with woven steel fiber mesh that uses pre-mixed air and gas providing for a 20% to 100% modulating firing rate. The burner is designed for long life and whisper quiet operation.
11. Four adjustable boiler feet for easy placement and leveling.
12. The Ultra is lightweight compared to conventional boiler, requires minimal clearance and floor space, and can be used in floor standing or wall hung applications.

Ultra 3 Series

Featuring UControl flexibility



How high heating costs fall to Ultra technology.

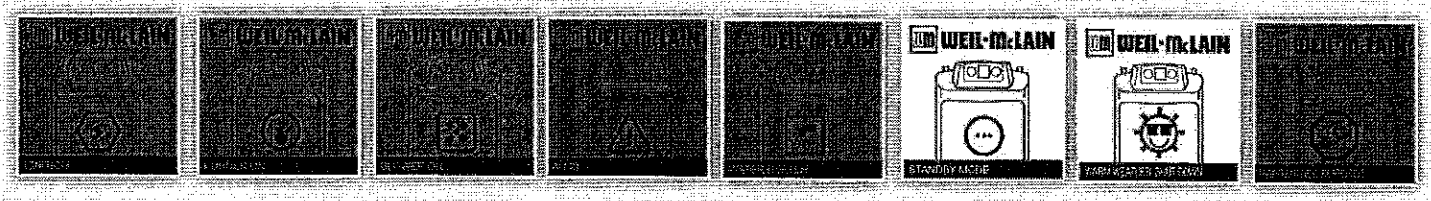
For gas-fired applications, Ultra boilers employ an advanced mono-block aluminum heat exchanger that transfers heat faster than conventional materials.

Ultra's unique electronic sensor and control system allows key functions like the modulation of firing rates up or down, as conditions both inside and outside the home fluctuate.

Unlike most other systems that merely turn off or on at a single preset indoor temperature, Ultra senses precisely how much heat needs to be produced at any given instant and adjusts itself accordingly.

The result? Far greater fuel efficiency and far less wear and tear on critical internal parts.

User friendly display screens.



The back-lit LCD display and simple programming buttons make entering and receiving information easy. It allows homeowners the ability to view current boiler status, check water and outdoor temperatures, review boiler maintenance schedule and view installing contractor contact information.

AQUA Plus
Models Available: 35, 45, 65, 85, 105

Endless hot water.

When matched with a Weil-McLain indirect-fired water heater, you will experience virtually limitless hot water for bathing, laundry, dishwashing and cooking at a lower operating cost compared to most other alternatives. Our indirect-fired water heaters provide twice the peak flow of a tankless coil, 50% more than a comparable sized direct-fired gas water heater, and three times as much as an electric unit.

Heating perfection – and long-term protection.

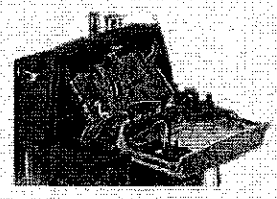
Weil-McLain offers all its Ultra residential boiler customers an exclusive Homeowner Protection Plan.

FREE ULTRA
5 YEAR WARRANTY
PARTS & LABOR

The warranty covers parts and labor charges for 5 years from the date of installation as outlined in the Plan.

And the cost of this plan to you is...nothing. Just register your new Ultra boiler with us on line at www.weil-mclain.com within 30 days of installation, and you are covered. That's it. When you pause to consider all of that, is it really any wonder we call it Ultra?

The All New Ultra Gas Series 3 WEIL-McLAIN



Featuring Ucontrol flexibility

The Exclusive U-Control Module Makes Boiler Set Up and Operation Easy

- SET UP OPTIONS
  -Simple or as elaborate as you want
- ZONE TYPES
  -Choose predetermined settings or customize
- SYSTEM SENSING
  -Sense boiler, system and outdoor temperatures
- TEMPERATURE MANAGEMENT
  -From 1 to 3 different setpoints for single or multiple zone type management
- MULTIPLE BOILERS
  -Capable of controlling additional boilers or heating appliances
- SERVICE ALERTS
  -Use the standard screen message or customize with contractor information

Standard Equipment

Boiler

- Cast Aluminum Block
- 30 PSI ASME Relief Valve
- Drain Valve
- Stainless Steel Burner (80, 105) with woven steel fiber mesh (155, 230, 299 & 399)
- Direct Spark Ignition
- Variable Speed Blower Assembly
- Venturi mixing system with Air Silencer
- Negative Pressure Regulated Gas Valve
- 50 VA Transformer
- Dual Scale Temp. & Pressure Gauge
- Outlet Water Temp. Sensor
- Inlet Water Temp. Sensor
- Flue Gas Temp. Sensor
- Outdoor Temp. Sensor
- System Water Temp. Sensors

Boiler Circulators

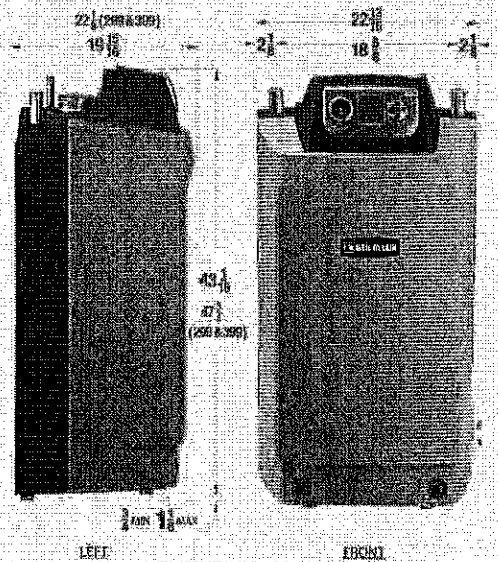
1" Flanges (80 & 105) Taco 007
1" & 1-1/4" Flanges (155 & 230) Taco 0014
1-1/4" & 1-1/2" Flanges (299) Taco 0014
1-1/4" & 1-1/2" Flanges (399) Taco 0013

Complete Jacket Assembly with

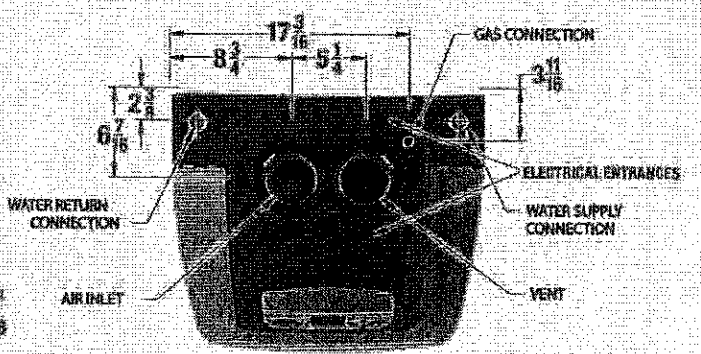
- Fully Removable Jacket Front
- Adjustable Boiler Legs
- Sidewall Vent/Air Termination Kit
- On/Off Power Switch
- Line Voltage Service Receptacle
- Condensate Trap with Drain Tee Assembly
- Propane Conversion Orifice (All except Model 80)

Ucontrol Module

- 3.5" LCD Display
- Three boiler priorities with multiple preset system configurations
- Color-coded removable terminal blocks
- Multiple boiler functionality
- Alarm control functionality
- Ignition Control
- High Limit & Modulating Temp. Control
- Low Water Protection
- Outdoor Reset
- Ability to control any combination of 3 circulators



Ultra boilers are low NOx Certified by the South Coast Air Quality Management District (Rule 1146.2).



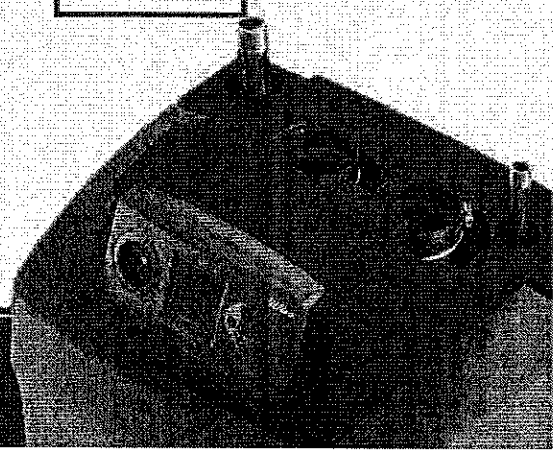
Ultra Efficient Condensing Gas Boiler

Initial Manufacturer AFUE Rating

Ultra Series 3

Models	Ultra 80	Ultra 105	Ultra 155	Ultra 230	Ultra 299	Ultra 399
Packaged Boiler	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
Natural Gas	383-500-700	383-500-702	383-500-703	383-500-704	383-500-705	383-500-706
Propane Gas	383-500-701	383-500-702*	383-500-703*	383-500-704*	383-500-705*	383-500-706*
Taco Pump	007	007	0014	0014	0014	0013
*Natural Gas field convertible to LP as standard equipment except for the Ultra 80						
Optional Equipment						
Wall Mounting Kit	389-900-180	389-900-180	389-900-180	389-900-180	389-900-180	389-900-180
LWCO (w/harness & test button)	511-100-005	511-100-005	511-100-005	511-100-005	511-100-005	511-100-005
Concentric Vent Kit (3")	383-500-350	383-500-350	383-500-350	383-500-350	383-500-350	-
Indirect-Fired Water Heaters	Matching Aqua Plus 35, 45, 55, 85 and 105 Water Heaters are available					
Ratings						
CSA Input (Maximum)	80 MBH	105 MBH	155 MBH	230 MBH	299 MBH	399 MBH
CSA Input (Minimum)	16 MBH	21 MBH	31 MBH	46 MBH	62 MBH	80 MBH
DOE Heating Cap.	71 MBH	94 MBH	139 MBH	207 MBH	270 MBH	*365 MBH
Net I=B=R	62 MBH	81 MBH	123 MBH	183 MBH	234 MBH	317 MBH
DOE AFUE	**95.2%**	**95.3%**	**95.6%**	**95.4%**	**96.4%**	***91.7%**
*Combustion Efficiency						
Data						
Vent Size	2" or 3"	2" or 3"	3"	3" or 4"	4"	4"
Vent Material	PVC/CPVC	PVC/CPVC	PVC/CPVC	PVC/CPVC	PVC/CPVC	PVC/CPVC
Combustion Air Size	2" or 3"	2" or 3"	3"	3" or 4"	4"	4"
Water Volume	.69 Gal.	.82 Gal.	1.17 Gal.	1.57 Gal.	2.1 Gal.	2.1 Gal.
Approx. Ship. Weight	199 lbs.	207 lbs.	234 lbs.	246 lbs.	297 lbs.	297 lbs.
Dimensions						
Min. Recommended Pipe Size	1"	1"	1-1/4"	1-1/4"	1-1/2"	1-1/2"
Supply Tappings	1"	1"	1"	1"	1-1/4"	1-1/4"
Return Tappings	1"	1"	1"	1"	1-1/4"	1-1/4"
Gas Connection Size	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"

AHRI CERTIFIED · DOE · MADE IN THE USA



WEIL-McLAIN

500 Blaine Street, Michigan City, IN 46360-2388 | www.weil-mclain.com

C-1113 R3 (1011)

Ultra™
Series 3 CT

Ultra Efficient Condensing Gas Boiler
80 | 105 | 155 | 230 | 299 | 399 MBH

Submittal Sheet

JOB NAME _____

LOCATION _____

ARCH./ENGR. _____

WHOLESALER _____

MECH. CONTRACTOR _____

MODEL NO. UG 299 GAS TYPE Natural Gas

BTU/HR INPUT _____ BTU/HR OUTPUT _____

NOTES _____

Standard Equipment

Boiler
- Cast Aluminum Block
- 30 PSI ASME Relief Valve
- Drain Valve
- Stainless Steel Burner (80, 105) with woven steel fiber mesh (155, 230, 299 & 399)
- Direct Spark Ignition
- Variable Speed Blower Assembly
- Venturi mixing system with Air Silencer
- Negative Pressure Regulated Gas Valve
- 50 VA Transformer
- Dual Scale Temperature & Pressure Gauge
- Outlet Water Temperature Sensor
- Inlet Water Temperature Sensor
- Flue Gas Temperature Sensor
- Outdoor Temperature Sensor
- System Water Temperature Sensors

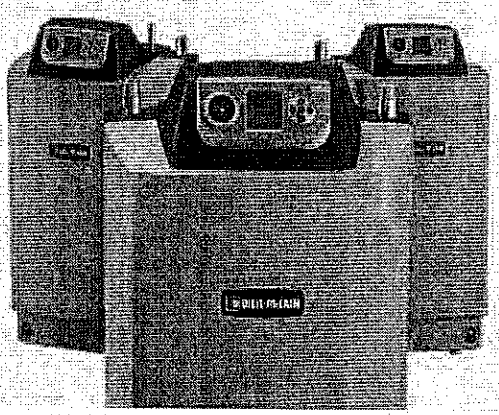
Boiler Circulators
1" Flanges (80 & 105) Taco 007
1" & 1-1/4" Flanges (155 & 230) Taco 0014
1-1/4" & 1-1/2" Flanges (299) Taco 0014
1-1/4" & 1-1/2" Flanges (399) Taco 0013

Complete Jacket Assembly with
- Fully Removable Jacket Front
- Adjustable Boiler Legs
- Sidewall Vent/Air Termination Kit
- On/Off Power Switch
- Line Voltage Service Receptacle
- Condensate Trap with Drain Tee Assembly
- Propane Conversion Orifice (All except Model 80)

Optional Equipment/Venting Options
- ☐ Wall Mounting Kit
- ☐ LWCO (w/ Harness and Test Button)
- ☐ Concentric Vent Kit (3")

Ucontrol™ Module
- 3.5" Liquid Crystal Display Screen
- Three boiler priorities with multiple preset system configurations
- Color-coded removable terminal blocks
- Multiple boiler functionality
- Alarm control functionality
- Ignition Control
- High Limit & Modulating Temperature Control
- Low Water Protection
- Outdoor Reset
- Ability to control any combination of 3 circulators
- 0-10 VDC Input
- 0-10 VDC Output

Featuring Ucontrol™ Flexibility



ENERGY STAR

WEIL-McLAIN®
www.weil-mclain.com

SIMPLIFIED SOLUTIONS FOR OUR COMPLEX WORLD.™

Re-rated Manufacturer AFUE Rating

nensions

Models	Ultra 80 CT	Ultra 105 CT	Ultra 155 CT	Ultra 230 CT	Ultra 299 CT	Ultra 399 CT
Packaged Boiler	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
Natural Gas	383-500-720	383-500-722	383-500-723	383-500-724	383-500-725	383-500-726
Propane Gas	383-500-721	383-500-722*	383-500-723*	383-500-724*	383-500-725*	383-500-726*
Taco Pump	007	007	0014	0014	0014	0013

*Natural Gas field convertible to LP as standard equipment except for the Ultra 80

Optional Equipment

Wall Mounting Kit	389-900-180	389-900-180	389-900-180	389-900-180	389-900-180	389-900-180
LWCO (w/harness & test button)	511-100-005	511-100-005	511-100-005	511-100-005	511-100-005	511-100-005
Concentric Vent Kit (3")	383-500-350	383-500-350	383-500-350	383-500-350	383-500-350	-
Indirect-Fired Water Heaters	Matching Aqua Plus 35, 45, 55, 85 and 105 Water Heaters are available					

Ratings

CSA Input (Maximum)	80 MBH	105 MBH	155 MBH	230 MBH	299 MBH	399 MBH
CSA Input (Minimum)	16 MBH	21 MBH	31 MBH	46 MBH	62 MBH	80 MBH
DOE Heating Cap.	71 MBH	94 MBH	139 MBH	207 MBH	270 MBH	*365 MBH
Net I=B=R	62 MBH	81 MBH	123 MBH	183 MBH	234 MBH	317 MBH
DOE AFUE	**93.5%**	**94.0%**	**94.0%**	**94.1%**	**92.5%**	**91.7%***

*Combustion Efficiency

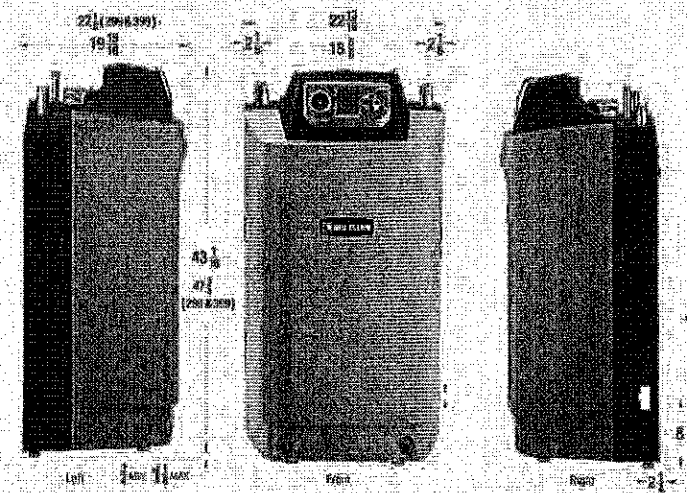
Data

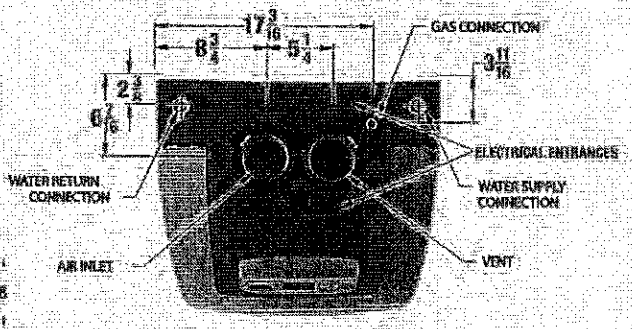
Vent Size	2" or 3"	2" or 3"	3"	3" or 4"	4"	4"
Vent Material	PVC/CPVC/SS	PVC/CPVC/SS	PVC/CPVC/SS	PVC/CPVC/SS	PVC/CPVC/SS	PVC/CPVC/SS
Combustion Air Size	2" or 3"	2" or 3"	3"	3" or 4"	4"	4"
Water Volume	.69 gal.	.82 gal.	1.17 gal.	1.57 gal.	2.1 gal.	2.1 gal.
Approx. Ship Weight	199 lbs.	207 lbs.	234 lbs.	246 lbs.	297 lbs.	297 lbs.

Dimensions

Min. Recommended Pipe Size	1"	1"	1-1/4"	1-1/4"	1-1/2"	1-1/2"
Supply Tappings	1"	1"	1"	1"	1-1/4"	1-1/4"
Return Tappings	1"	1"	1"	1"	1-1/4"	1-1/4"
Gas Connection Size	1/2"	1/2"	1/2"	1/2"	3/4"	3/4"

Gas Pressures (w.c.): Natural Gas: All Sizes (Except Model 299) – 4.0" min. – 13.0" Max/ Model 299 – 5.0" - 13.0"
L/P Gas: All Sizes – 4.0" Min. – 13.0" Max





In the interest of continual improvements in product and performance, Weil-McLain reserves the right to change specifications without notice.
For reference use only. See product manual for detailed information.

TriangleTube

"Tank-in-Tank" Technology

THE SMART CHOICE

in Domestic Hot Water

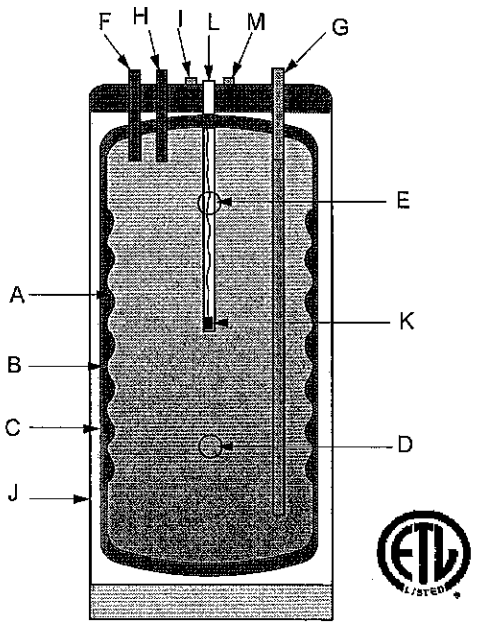
Smart Series

Stainless Steel Indirect Fired Water Heaters

- Exclusive "Tank-in-Tank" Technology
- Abundant Domestic Hot Water at the Lowest Possible Cost
- A Limited Residential Lifetime Warranty
- 2" of Polyurethane Foam Insulation
- Self Cleaning/Self Descaling Heat Exchanger
- Lowest Pressure Drop in the Industry
- 7 Sizes to Choose From

Construction Specifications

SMART Series



A. Inner stainless steel tank
B. Outer steel tank
C. 2" Polyurethane insulation
D. Boiler water connection
E. Boiler water connection
F. Hot water outlet
G. Cold water inlet
H. Auxiliary connection
I. Thermostat control
J. Plastic jacket
K. Thermostat remote sensing bulb
L. Air vent connection
M. Electrical wiring plug

Smart Series is tested in accordance with the standard (ANSI/UL-174) (CAN/CSA-C22.2 NO. 110-M90) and is certified by ETL.

Superior Design "Tank-in-Tank" Technology

Superior Heat Exchange Surface Area

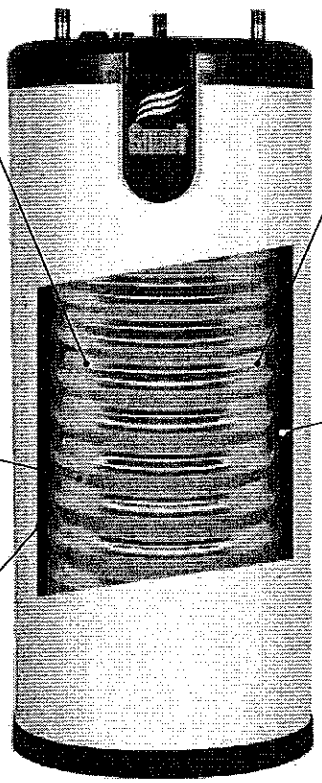
The domestic storage tank is constructed of stainless steel and is surrounded by boiler water in the outer tank, resulting in a full "wrap around" heat exchanger.
It's superior heat exchange surface (typically 1.5 to 2.5 times larger than a traditional coil) produces a larger volume of hot water in a short period of time. Thanks to this fast recovery, the storage capacity can be reduced, resulting in a reduced thermal loss.

Stainless Steel Tank Construction

The inner domestic storage tank is constructed of durable, corrosion resistant stainless steel.

Optimal Insulation

SMART Series, is insulated with 2" of injected polyurethane foam, resulting in a stand by heat loss of less than 1°/Hr.



Self Cleaning / Self - descaling

The inner, domestic tank is suspended within the outer tank so it is free to expand and contract as the pressure varies during hot water draws. Moreover, its corrugations amplify the movement and prevents the lime build up on the heat exchanger; thus maintaining its performance during the SMART Series life span.

Anti-Bacteria Growth / Maintenance Free

The "Tank-in-Tank" design allows us to store domestic water at higher temperatures preventing bacteria growth.
Additionally, contructed of high quality stainless steel, SMART Series does not require a protective anode.

Product Specifications

Model No.	Dimension	Height	Boiler Supply / Return	Domestic Inlet/Outlet	3rd Domestic Connection*	Domestic Capacity (gal.)	Heating Water Capacity (gal.)	Heat Surface (sq.ft.)	Empty Weight (lbs.)
Smart 30	22" dia.	38"	1"	3/4"	3/4"	28	5	13	115
Smart 40	22" dia.	46"	1"	3/4"	3/4"	36	6	16	135
Smart 50	22" dia.	57"	1 1/4"	3/4"	3/4"	46	8	20	165
Smart 60	22" dia.	66"	1 1/4"	3/4"	3/4"	56	8	24	190
Smart 80	26" dia.	61"	1 1/2"	1 1/2"	1 1/2"	70	14	28	271
Smart 100	26" dia.	78"	1 1/2"	1 1/2"	1 1/2"	95	25	36	362
Smart 120	32" dia.	72"	2"	1 1/2"	1 1/2"	119	43	42	479

(*) This fitting can be used as a return connection if circulated domestic water is required or can be used as a connection for the T&P Relief Valve.

Performance

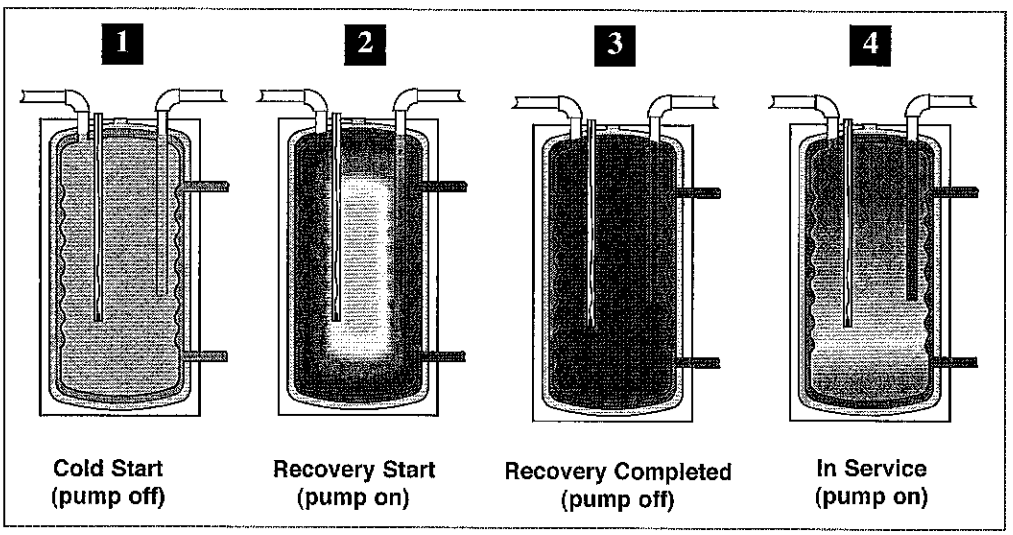
Model No.	Boiler Output Btu/hr.	1st Hour Recovery (gal.)	Continuous Flow (gal.)	Peak Flow Gal/10 min.
Smart 30	87,000	140	115	40
Smart 40	112,000	180	150	50
Smart 50	140,000	220	185	65
Smart 60	270,000	410	360	100
Smart 80	300,000	460	400	125
Smart 100	337,000	525	450	150
Smart 120	420,000	650	560	190

Conditions:

- 200° boiler water supply
- 90° temperature rise

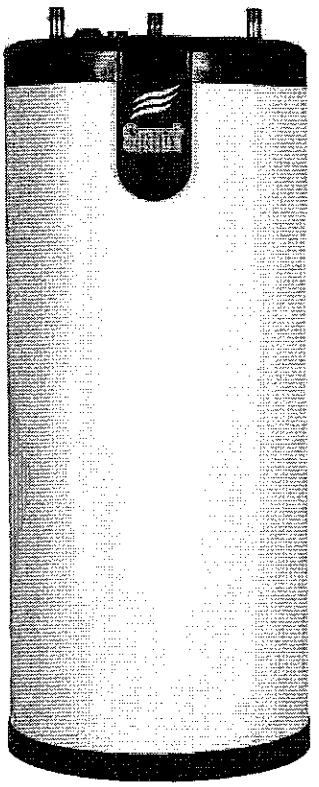
How it Works

Smart Series operating cycle



When the thermostat in the inner tank calls for heat, the boiler and circulator start. Boiler water is circulated around the outer tank and heats the domestic water in the inner tank. After transferring its heat, boiler water is returned to the boiler to be re-heated. When the thermostat in the inner tank reaches its pre-set mark, the boiler and circulator shut off.

Energy Efficiency

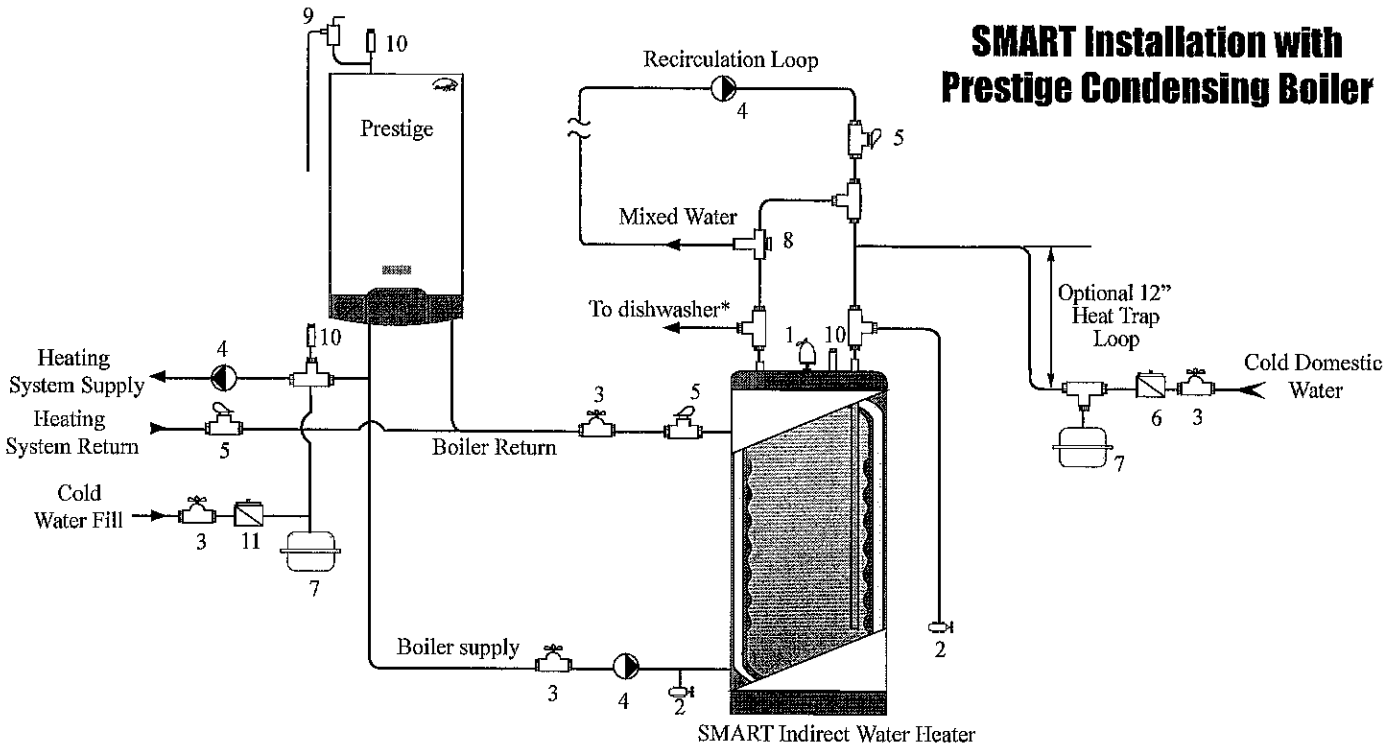


The Stainless Steel Indirect Fired Water Heater is heated by the hot water from your boiler. As your home is being heated, your domestic hot water is being heated at the same time, thereby, consuming less fuel and conserving energy. Combine this with a recovery rate that is up to **three times faster** than conventional gas or electric water heaters, and The SMART Series Indirect Fired Water Heater heats more hot water with less fuel for the energy conscious consumer.

Long Term Dependability

The average life span of a SMART Series Indirect Fired Water Heater exceeds 20 years! That is two or three times the average life of a conventional gas, oil or electric water heater.

Installation



(*) Optional devices may be required by local codes.

1. Temperature & Pressure Relief Valve	5. Flow Check Valve	9. Pressure Relief Valve
2. Drain	6. Backflow preventer or pressure reducing valve(*)	10. Air Vent
3. Shut -off Valves	7. Expansion Tank	11. Automatic Fill Valve
4. Circulator	8. Mixing Valve	

TriangleTube

One Triangle Lane • Blackwood NJ 08012

p 856.228.8881 f 856.228.3584 www.triangletube.com

Member of ACV Group

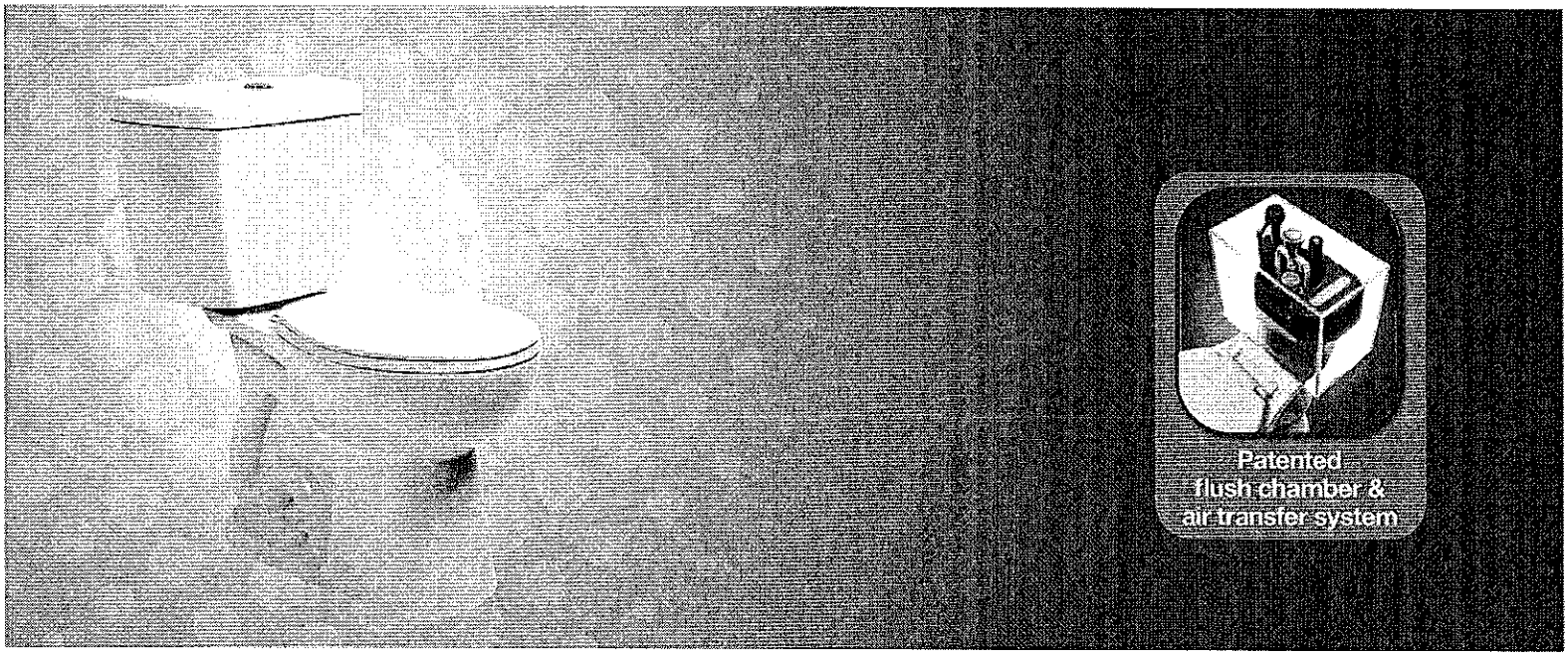
Stealth™ Toilet

Vacuum-Assist Flush

0.8 GPF (3.0 LPF)

WATER

NIAGARA CONSERVATION



Stealth™ Toilet

0.8 GPF (3.0 LPF)

Vacuum-Assist Flush

The Stealth is an ultra high-efficiency toilet that goes a step beyond the standard water-saving toilets available on the market. With its low-profile body, breakthrough patented hydraulic technology, and the quietest flush on the planet, Stealth's unique design has revolutionized the toilet market.

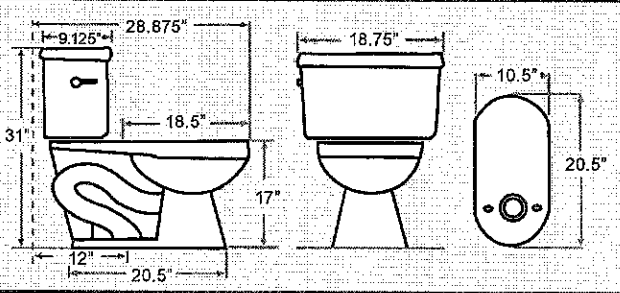
As water fills the tank, energy is harnessed and a patented air transfer system exerts pressure in the bowl's trapway. Activated by simply pressing the flush button, all the waste in the bowl is cleared with a single, powerful and quiet flush.

- 0.8 gallon per flush (3.0 LPF)
- Vacuum-assist flush
- Tank with patented Stealth™ Technology
- MaP Score: 600g
- 12" Rough-in
- Floor mounted, floor outlet
- Fully glazed trapway, 2" (51 mm)
- Large water area, 8" x6"
- ADA Chair height - 17" with seat
- 10-year limited warranty on Niagara parts

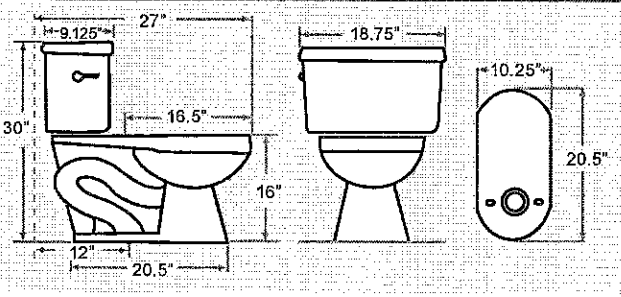
Certification:

ASME A112.19.2 / CSA B45.1, Watersense Certified

N7717 Elongated Bowl Specs



N7716 Round Bowl Specs



WaterSense
Meets EPA Criteria
Certified by IAPMO R&T

Visit www.StealthToilets.com

NIAGARA CONSERVATION®

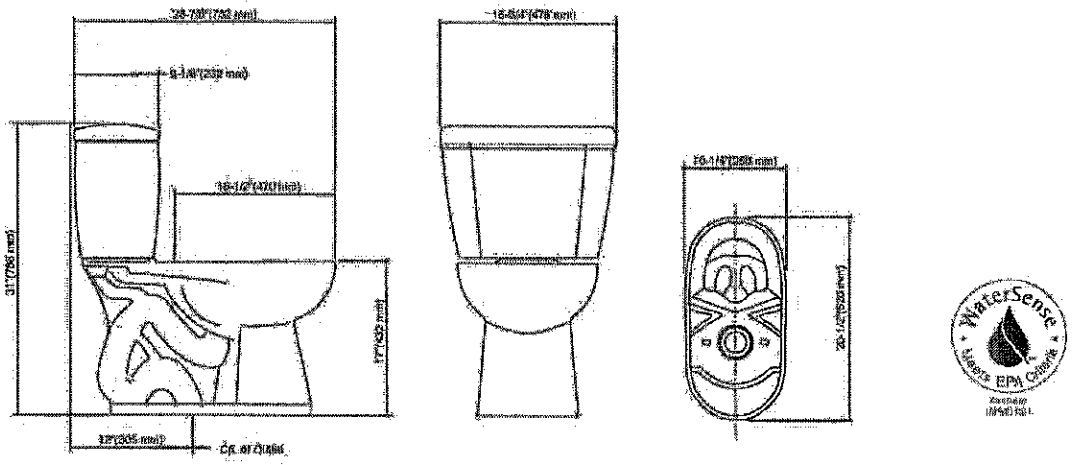
45 Horsehill Road
Cedar Knolls, NJ 07927
800.831.8383

For more information please visit
www.NiagaraConservation.com

#N7717

Stealth™ UHET Toilet, 0.8 GPF (3 LPM)

Elongated Front, Floor Outlet, White



ASSEMBLED DIMENSIONS

28.875" x 18.75" x 31" (732 mm x 476 mm x 788 mm)

ROUGH-IN

(12") 305 mm

PACKAGING

Close-Coupled, Two-Piece Toilet (Bowl Model: N7717; Tank Model: N7714)

MATERIALS

Vitreous China – White Finish

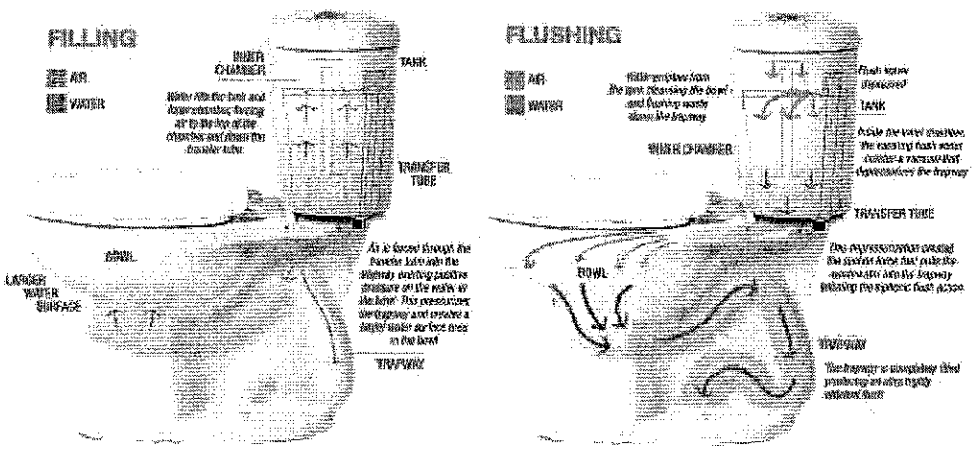
PRODUCT SPECIFICATIONS

- Ultra high-efficiency 0.8 gallons (3 Litres) of water per flush
- Elongated, 17" (432 mm) high bowl
- Floor mounted, floor outlet
- Fully glazed trapway, 2" (51 mm)
- MaP Score: 600g
- Large water area, 8" x6" (203 mm x 152 mm)
- Large foot print, 20.5" x 10.25" (520 mm x 260 mm)
- Polished chrome top-mount flush actuator

CERTIFICATION(S)

Toilet meets or exceeds the following: ASME A112.19.2 / CSA B45.1, IAPMO R&T, WaterSense Certified

STEALTH FLUSH TECHNOLOGY



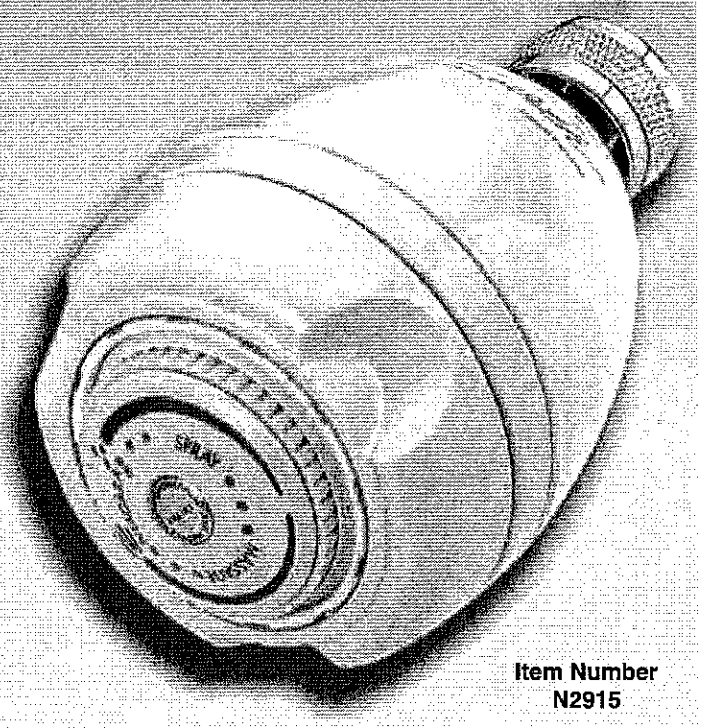
Conservation Warehouse International
PO Box 1376 • Easton, PA 18044 • Phone: 800-875-2955 Fax: 484-944-1590 • www.conservationwarehouse.com

1.5 GPM Earth™ Massage Showerhead

A MEMBER OF THE water smart™ FAMILY OF PRODUCTS

Flow Control Technology: Greater force at Low Pressure

- Conserves water and saves money while enhancing pressure, performance, appearance and luxury!
- 9-Jet Turbo Massage is adjustable: gentle needle spray to forceful jet
- Consistent flow rate regardless of water pressure
- Saves 40% more energy and water*
- Non-removable flow compensator
- Non-aerating spray means less temperature loss with maximum energy savings
- Self-cleaning and maintenance free
- Installs easily, by hand and without tools
- Corrosion resistant high-impact ABS thermoplastic body
- Meets or exceeds ANSI specifications
- 10-year guarantee



Item Number N2915

Pack	Qty	Weight	Dimensions	Cube
Case	50	17.9 lbs.	13 5/8" x 13 5/8" x 8 5/8"	0.93 cu. ft.

Savings Using the 1.5 GPM Earth™ Massage Showerhead

	Water Savings (gallons)	Electric Savings (kWh)	Gas Savings (therms)	Annual Dollar Savings
Total Annual Savings for Electric Water Heat	*7,300*	*949*		*$143*
Total Annual Savings for Gas Water Heat	*7,300*		*52*	*$ 91*

** Water treatment costs calculated at $4/1,000 gallons (includes waste water.) Electric savings calculated at $0.12 per kWh. Energy and water savings based on DOE/FEMP calculator data. Niagara 1.5 gpm Earth™ Massage showerhead vs. standard 2.5 gpm showerhead.*

Conservation Warehouse International
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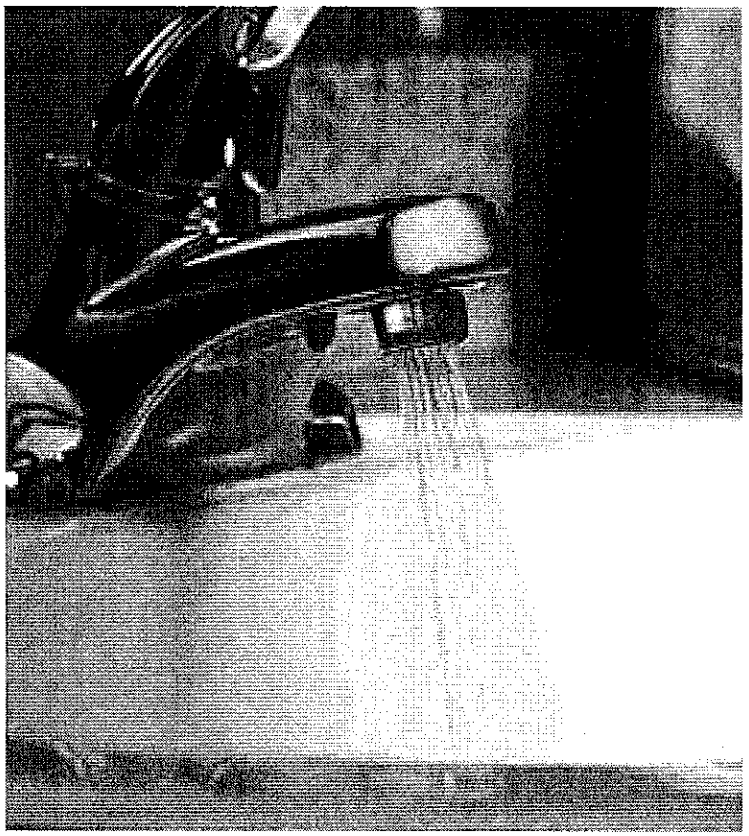
AM CONSERVATION GROUP INC.

Standard Laminar Flow Aerator



Model No. AMFAL5A

Featured is our **Laminar Flow Aerator** with a water efficient flow rate of **0.5 gpm**. These aerators feature a *non-aerating* water and energy efficient multiple stream spray. The laminar multiple steam spray *non-aerating* spray widens for efficient rinsing with less water and provides less heat loss and more energy savings than aerated single stream faucet aerators that mix air and water.

See table below for additional low flow aerators in more water efficient flow rates of *1.0, 1.5 and 2.0* gallons per minute (GPM).

Unit Price: $1.60

These standard style **Laminar Flow Faucet Aerators** are most suitable for public faucets and commercial applications. More spray velocity, less water used with great performance. All brass chrome plated body. *NSF* compliant, Meets ANSI A112.18.1. All faucet aerators offered on our website are *water efficient*, save water, money, the energy used to heat hot water, provide less stress on your septic and reduce cost associated with waste water treatment where applicable. An added benefit to water saving aerators *less* water from your faucet means *less* water sitting in your sink, a *plus* for those with slow draining sinks that back up. Best of all, water efficient aerators are great for the environment!

Model No.	Gallons per Minute (GPM)	Threads	Type of Flow	Recommended Usage	Unit Price:
AMFAL1A	1.0 GPM	Dual	Laminar	Bathroom	$ 1.60
AMFAL15A	1.5 GPM	Dual	Laminar	Kitchen or Bathroom	$ 1.60
AMFAL22A	2.2 GPM	Dual	Laminar	Kitchen or Bathroom	$ 1.60

Sun Prairie Apartments Water Reduction Retrofit:

All Kitchen Sinks retrofitted with new 1.0 GPM Laminar Flow faucet aerator replacing a 1.5 GPM aerator.
All Bathroom Sinks retrofitted with new 0.5 GPM Laminar Flow aerator replacing 1.0 and 1.5 GPM aerators.

BELL BROTHERS
HEATING AND AIR CONDITIONING, INC.

HEATING AND AIR CONDITIONING, INC
2822 6TH Ave. • DES MOINES, IOWA 50313 • 515-244-8911 • (FAX) 515-244-0344
www.bellbrothers.com

Erickson Balmer Construction, LLC
2453 106th Street
Urbandale, Iowa 50322
(515) 252-1510

SUBMITTALS FOR

Altoona Tower Apartments
Building A: 1414 Adventureland Drive
Building B: 1616 Adventureland Drive
Altoona, Iowa 50009

Mechanical Submittals

TRUST THE EXPERTS

BELL BROTHERS
HEATING AND AIR CONDITIONING, INC.

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Ducted Split Heat Pumps

TRUST THE EXPERTS

AOU9RLFC, ARU9RLF
Compact Duct

Halcyon HFI Hybrid Flex Inverter

FUJITSU

Job Name:_____ Approval:_____ Date:_____

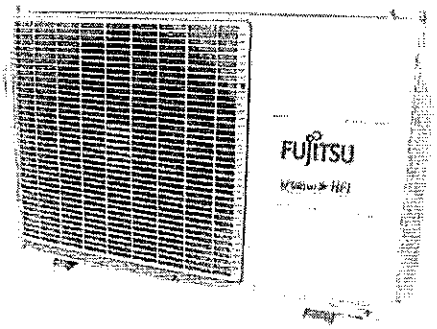
Location:_____ Construction:_____

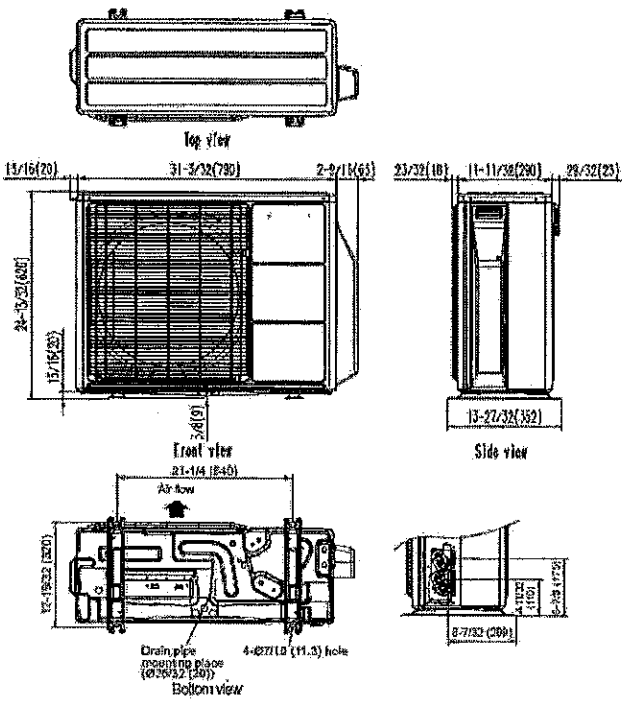
Engineer:_____ Unit #:_____

Submitted to:_____ Drawing #:_____

Submitted by:_____ Reference:_____

Outdoor Unit Power		208-230VAC-1Ph-60Hz
Available Voltage Range		187-253VAC
Fuse Size, Max.		15A
MCA		13.4A
Compressor		Inverter Driven Variable Speed DC Rotary
No. used		1
Output		850W
Lubrican Oil		POE (RB68)
Fan type		Propeller
Motor Output		115W
Airflow Rate	Cooling/Heating (High)	794 / 989CFM
Refrigerant		410A
Outdoor Unit		2lbs 10oz
Control		Electronic Expansion Valve
O.D. Discharge	(in)	1/4"(Flare)
O.D Suction	(in)	3/8"(Flare)
Dimensions		H x W x D
Uncrated	(in)	24-1/2 x 31-3/32 x 11-11/32
	(mm)	(620 x 790 x 290)
Crated	(in)	28-1/16 x 37-7/32 x 15-9/16
	(mm)	(713 x 945 x 395)
Weight		Outdoor
Net		84lbs (38kg)
Gross Shipping		93lbs (42kg)
Cooling		
Rated Capacity		9,000BTU/h
Min-Max Capacity		3,100~12,000BTU/h
Rated Power Input		0.62kw
Max. Power Input		1.40kw
SEER		21.5
Outdoor Sound Rating		48dB
Heating		
Rated Capacity		12,000BTU/h
Min-Max Capacity		3,100~18,000BTU/h
Rated Power Input		0.85kw
Max. Power Input		1.80kw
HSPF		12.2
Outdoor Sound Rating		49dB
Piping Lengths		
Max. Piping Length (Total)		66ft
Max. Pipe Height Difference		49ft
Connection method		(Flared)
Operating Range		
Cooling		14°F~115°F DB
Heating		-5°F~75°F DB





Fujitsu General America, Inc.
Fairfield, NJ 07004
Toll Free: 1-888-888-3424
Fax: (973) 836-0447
www.fujitsugeneral.com

Fujitsu products are subject to continuous improvements. Fujitsu reserves the right to modify product design, specifications and information in this data sheet without notice and without incurring any obligations.

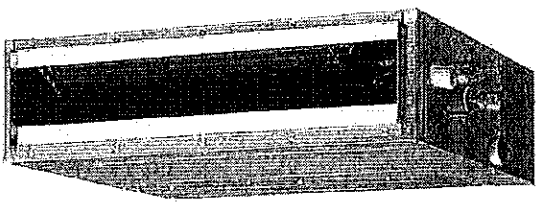
7 Year Compressor 5 Year Parts WARRANTY

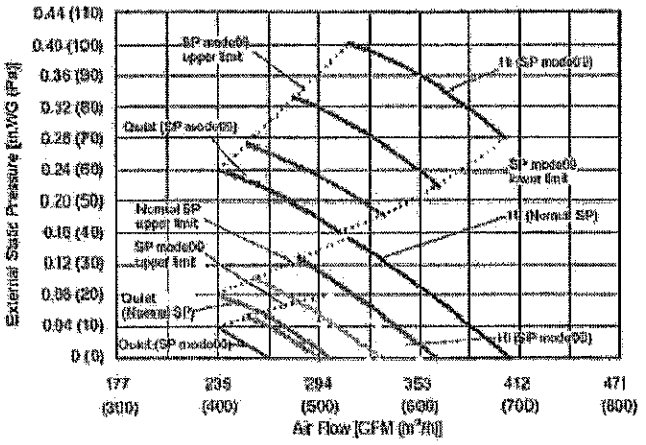
Power	V/Hz/P	230/60/1
Fan type		Sirocco
No. Motors	(W)	2 (81)
CFM [.10 in.WG]	(Hi,Me,Lo,Qu)	353/324/294/265
Sound Pressure Level	db (Hi,Me,Lo,Qu)	28/27/26/25
F.L.A.	(A)	.32
Refrigerant		410A
O.D. Discharge	in (mm)	Ø1/4" (6.35)
O.D. Suction	in (mm)	Ø3/8" (9.52)
Dimensions		H x W x D
Uncrated	(in)	7-25/32 x 27-9/16 x 24-13/32
	(mm)	(198 x 700 x 620)
Crated	(in)	10-7/8 x 38-1/8 x 29-3/4
	(mm)	(276 x 968 x 756)
Weight		
Net	lbs. (kg)	41 (19)
Gross Shipping	lbs. (kg)	55 (25)

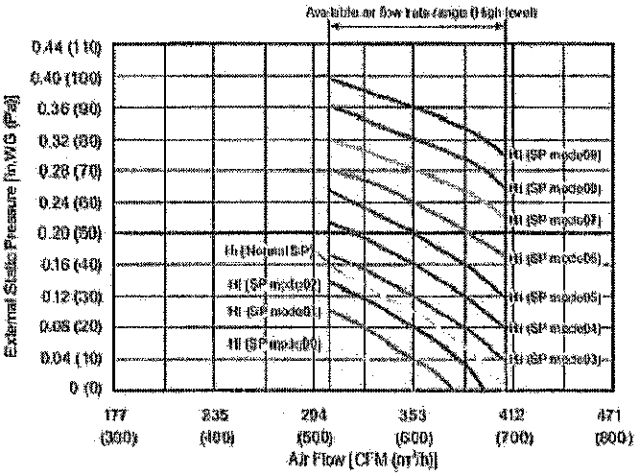
Cooling Capacity	(BTU/h)	9,000
Moisture Removal	pt/h (l/h)	1.5 (0.7)
Heating Capacity	(BTU/h)	12,000
Temperature Setting Range		
Cooling	°F(°C)	64~90 (18~32)
Heating	°F(°C)	60~86 (16~31)
Drain Pipe Size**	OD in	Ø1-1/16
	ID in	Ø3/4
Remote Control Type		Wired
Electrical Connection*	AWG	14/3 with ground

*Power and communication are fed from the outdoor unit.

**Adapter to 3/4" PVC included with unit.







Note:
Specifications are based on the following conditions.
Power source of specifications : 230V
Cooling: Indoor temperature of 80°F(26.67°C)DB / 67°F(19.44°C)WB, and outdoor temperature of 95°F(35°C)DB/75°F(23.89°C)WB.
Heating: Indoor temperature of 70°F(21.11°C)DB / 60°F(15.56°C)WB, and outdoor temperature of 47°F(8.33°C)DB/43°F(6.11°C)WB.
Standard Static Pressure: 0.10in.WG (25Pa)
Pipe length : 16.4ft. (5m) [Outdoor unit - Branch box], 9.8ft. (3m) [Branch box - Indoor unit]
Height difference : 0 ft.(0m) [Outdoor unit - Indoor unit]

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Fairfield, NJ 07004
Toll Free: 1-888-888-3424
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7 Year Compressor 5 Year Parts WARRANTY

System 12RLFCD Horizontal

Halcyon HFI Hybrid Flex Inverter

FUJITSU

AOU12RLFC, ARU12RLF
Compact Duct

Job Name:_____ Approval:_____ Date:_____

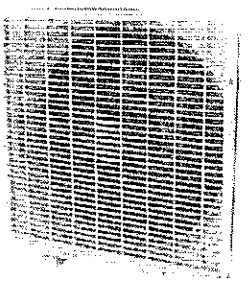
Location:_____ Construction:_____

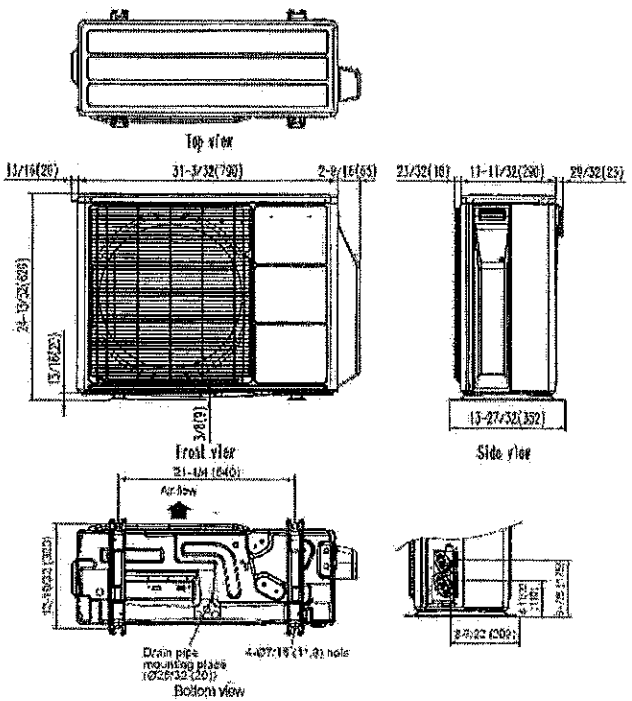
Engineer:_____ Unit #:_____

Submitted to:_____ Drawing #:_____

Submitted by:_____ Reference:_____

Outdoor Unit Power		208-230/VAC-1Ph-60Hz
Available Voltage Range		187-253VAC
Fuse Size, Max.		15A
MCA		13.4A
Compressor	Inverter Driven Variable Speed DC Rotary	
No. used		1
Output		850W
Lubrican Oil		POE (RB68)
Fan type		Propeller
Motor Output		115W
Airflow Rate	Cooling/Heating (High)	1206 / 1083CFM
Refrigerant		410A
Outdoor Unit		2lbs 10oz
Control		Electronic Expansion Valve
O.D. Discharge	(in)	1/4"(Flare)
O.D Suction	(in)	3/8"(Flare)
Dimensions		H x W x D
Uncrated	(in)	24-1/2 x 31-3/32 x 11-11/32
	(mm)	(620 x 790 x 290)
Crated	(in)	28-1/16 x 37-7/32 x 15-9/16
	(mm)	(713 x 945 x 395)
Weight		Outdoor
Net		84lbs (38kg)
Gross Shipping		93lbs (42kg)
Cooling		
Rated Capacity		12,000BTU/h
Min-Max Capacity		3,100~13,600BTU/h
Rated Power Input		0.94kw
Max. Power Input		1.45kw
SEER		20.0
Outdoor Sound Rating		49dB
Heating		
Rated Capacity		16,000BTU/h
Min-Max Capacity		3,100~19,400BTU/h
Rated Power Input		1.30kw
Max. Power Input		2.00kw
HSPF		11.5
Outdoor Sound Rating		50dB
Piping Lengths		
Max. Piping Length (Total)		66ft
Max. Pipe Height Difference		49ft
Connection method		(Flared)
Operating Range		
Cooling		14°F~115°F DB
Heating		-5°F~75°F DB





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Fax: (973) 836-0447
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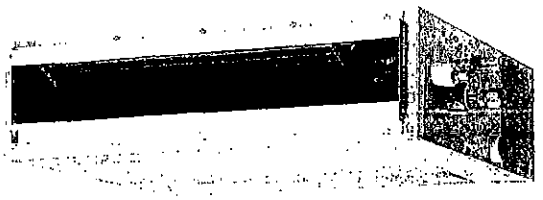
7 Year Compressor 5 Year Parts WARRANTY

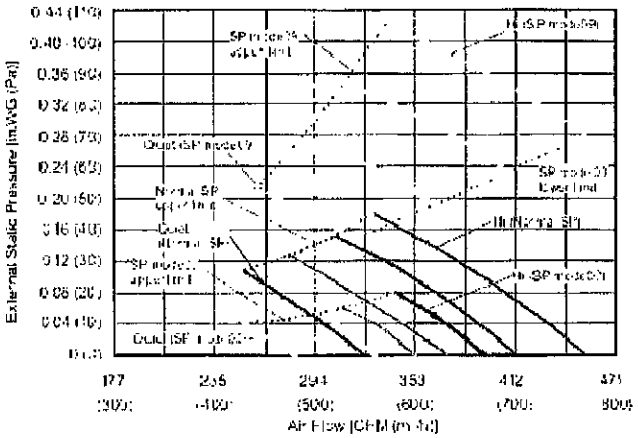
Power	V/Hz/P	230/60/1
Fan type		Sirocco
No. Motors	(W)	2 (81)
CFM [.10 in.WG]	(Hi,Me,Lo,Qu)	383/353/324/283
Sound Pressure Level	db (Hi,Me,Lo,Qu)	29/28/27/26
F.L. A.	(A)	.37
Refrigerant		410A
O.D. Discharge	in (mm)	Ø1/4" (6.35)
O.D. Suction	in (mm)	Ø3/8" (9.52)
Dimensions		H x W x D
Uncrated	(in)	7-25/32 x 27-9/16 x 24-13/32
	(mm)	(198 x 700 x 620)
Crated	(in)	10-7/8 x 38-1/8 x 29-3/4
	(mm)	(276 x 968 x 756)
Weight		
Net	lbs. (kg)	41 (19)
Gross Shipping	lbs. (kg)	55 (25)

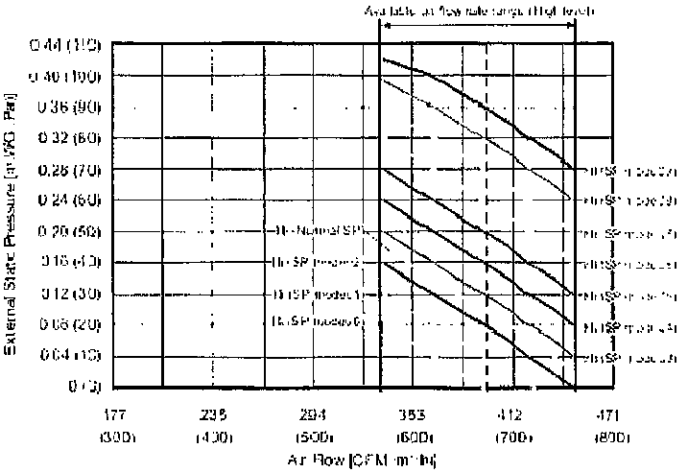
Cooling Capacity	(BTU/h)	12,000
Moisture Removal	pt/h (l/h)	2.7 (1.3)
Heating Capacity	(BTU/h)	13,500
Temperature Setting Range		
Cooling	°F(°C)	64~90 (18~32)
Heating	°F(°C)	60~88 (16~31)
Drain Pipe Size**	OD in	Ø1-1/16
	ID in	Ø3/4
Remote Control Type		Wired
Electrical Connection*	AWG	14/3 with ground

*Power and communication are fed from the outdoor unit.

**Adapter to 3/4" PVC included with unit.







Note:
Specifications are based on the following conditions.
Power source of specifications : 230V
Cooling: Indoor temperature of 80°F(26.67°C)DB / 67°F(19.44°C)WB, and outdoor temperature of 95°F(35°C)DB/75°F(23.89°C)WB.
Heating: Indoor temperature of 70°F(21.11°C)DB / 60°F(15.56°C)WB, and outdoor temperature of 47°F(8.33°C)DB/43°F(6.11°C)WB.
Standard Static Pressure: 0.10in.WG (25Pa)
Pipe length : 16.4ft. (5m) [Outdoor unit - Branch box], 9.8ft. (3m) [Branch box - Indoor unit]
Height difference : 0 ft.(0m) [Outdoor unit - Indoor unit]

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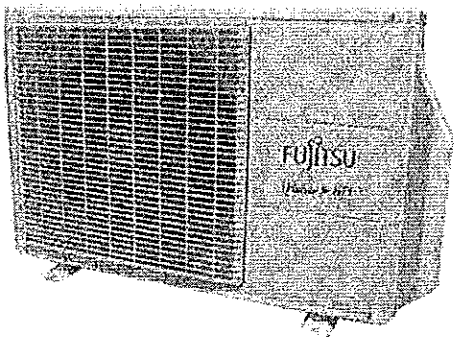
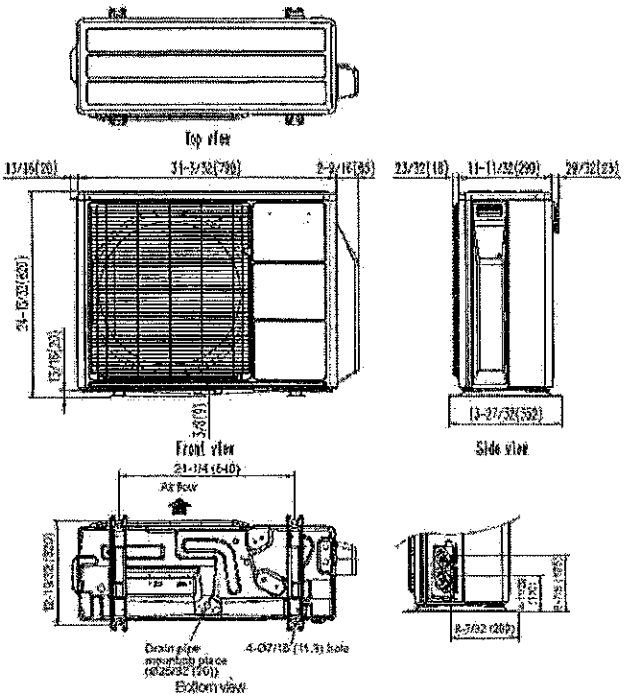
System 18RLFCD Submittal

AOU18RLFC, ARU18RLF
Compact Duct

Job Name:_____ Approval:_____ Date:_____
Location:_____ Construction:_____
Engineer:_____ Unit #:_____
Submitted to:_____ Drawing #:_____
Submitted by:_____ Reference:_____

Outdoor Unit Power		208-230/VAC-1Ph-60Hz
Available Voltage Range		187-253VAC
Fuse Size, Max.		20A
MCA		17.3 A
Compressor		Inverter Driven Variable Speed DC Rotary
No. used		1
Output		1000W
Lubrican Oil		POE (RB68)
Fan type		Propeller
Motor Output		115W
Airflow Rate	Cooling/Heating (High)	1457 / 1407CFM
Refrigerant		410A
Outdoor Unit		2lbs 14oz
Control		Electronic Expansion Valve
O.D. Discharge	(in)	1/4"(Flare)
O.D Suction	(in)	1/2"(Flare)
Dimensions		H x W x D
Uncrated	(in)	24-1/2 x 31-3/32 x 11-11/32
	(mm)	(620 x 790 x 290)
Crated	(in)	28-1/16 x 37-7/32 x 15-9/16
	(mm)	(713 x 945 x 395)
Weight		Outdoor
Net		86lbs (39kg)
Gross Shipping		93lbs (42kg)
Cooling		
Rated Capacity		18,000BTU/h
Min-Max Capacity		3,100~20,100BTU/h
Rated Power Input		1.50kw
Max. Power Input		2.15kw
SEER		19.7
Outdoor Sound Rating		54dB
Heating		
Rated Capacity		21,600BTU/h
Min-Max Capacity		3,100~25,600BTU/h
Rated Power Input		1.67kw
Max. Power Input		2.60kw
HSPF		11.3
Outdoor Sound Rating		55dB
Piping Lengths		
Max. Piping Length (Total)		66ft
Max. Pipe Height Difference		49ft
Connection method		(Flared)
Operating Range		
Cooling		14°F~115°F DB
Heating		-5°F~75°F DB





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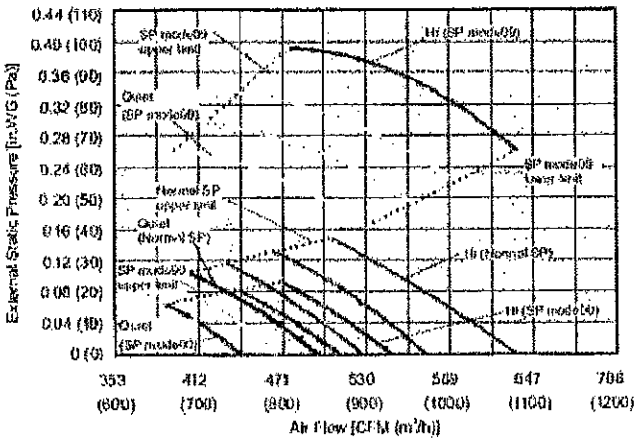
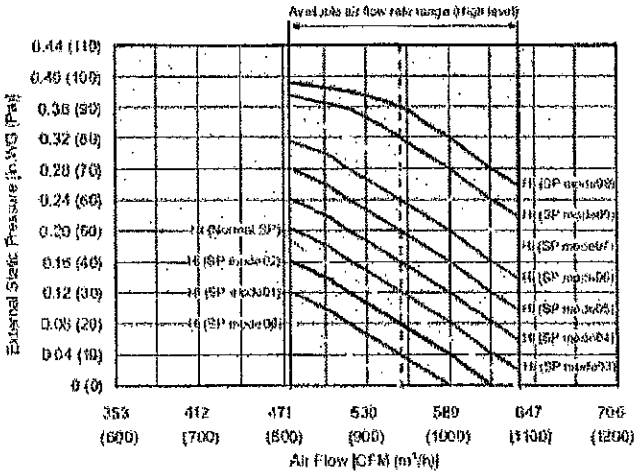
Power	V/Hz/P	230/60/1
Fan type		Sirocco
No. Motors	(W)	3 (96)
CFM [.10 in.WG]	(Hi,Me,Lo,Qu)	554/518/483/442
Sound Pressure Level	db (Hi,Me,Lo,Qu)	32/31/30/29
F.L. A.	(A)	.47
Refrigerant		410A
O.D. Discharge	in (mm)	Ø1/4" (6.35)
O.D. Suction	in (mm)	Ø1/2" (12.7)
Dimensions		H x W x D
Uncrated	(in)	7-25/32 × 35-7/16 × 24-13/32
	(mm)	(198 × 900 × 620)
Crated	(in)	10-7/8 × 46 × 29-3/4
	(mm)	(276 x 1168 × 756)
Weight		
Net	lbs. (kg)	50 (23)
Gross Shipping	lbs. (kg)	63 (29)

Cooling Capacity	(BTU/h)	18,000
Moisture Removal	pt/h (l/h)	4.2 (2.0)
Heating Capacity	(BTU/h)	20,000
Temperature Setting Range		
Cooling	°F(°C)	64~90 (18~32)
Heating	°F(°C)	60~88 (16~31)
Drain Pipe Size**	OD in	Ø1-1/16
	ID in	Ø3/4
Remote Control Type		Wired
Electrical Connection*	AWG	14/3 with ground

*Power and communication are fed from the outdoor unit.
**Adapter to 3/4" PVC included with unit.





Note:
Specifications are based on the following conditions.
Power source of specifications : 230V
Cooling: Indoor temperature of 80°F(26.67°C)DB / 67°F(19.44°C)WB, and outdoor temperature of 95°F(35°C)DB/75°F(23.89°C)WB.
Heating: Indoor temperature of 70°F(21.11°C)DB / 60°F(15.56°C)WB, and outdoor temperature of 47°F(8.33°C)DB/43°F(6.11°C)WB.
Standard Static Pressure: 0.10in.WG (25Pa)
Pipe length : 16.4ft. (5m) [Outdoor unit - Branch box], 9.8ft. (3m) [Branch box - Indoor unit]
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Health Club Heat Pumps

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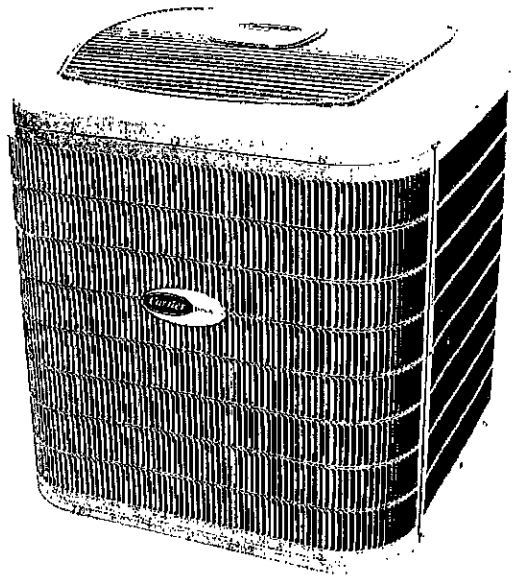
25HNB6
Infinity® 2–Stage Heat Pump with Puron® Refrigerant 2 to 5 Nominal Tons

Carrier
turn to the experts

Product Data



INFINITY SERIES

Carrier's heat pumps with Puron® refrigerant provide a collection of features unmatched by any other family of equipment. The 25HNB6 has been designed utilizing Carrier's Puron refrigerant. The environmentally sound refrigerant allows consumers to make a responsible decision in the protection of the earth's ozone layer.

This product has been designed and manufactured to meet Energy Star® criteria for energy efficiency when matched with appropriate coil components. Refer to the combination ratings in the Product Data for system combinations that meet Energy Star® guidelines.

NOTE: **Ratings contained in this document are subject to change at any time. Always refer to the AHRI directory (www.ahridirectory.org) for the most up-to-date ratings information.**

INDUSTRY LEADING FEATURES / BENEFITS

Energy Efficiency
- 13.7 - 17.2 SEER/11.2 - 13.3 EER/8.0 - 9.5 HSPF
- Microtube Technology™ refrigeration system
- Indoor air quality accessories available

Sound
- Sound level as low as 67 dBA
- Quiet mount split post compressor grommets
- Forward-swept condenser fan blade
- Compressor sound hood
- Laminated steel compressor mounting plate
- 8 pole PSC ball bearing outdoor condenser fan motor

Comfort
- System supports Infinity Control™ or standard 2-stage thermostat controls

Reliability
- Puron® refrigerant - environmentally sound, won't deplete the ozone layer and low lifetime service cost.
- Front-seating service valves
- 2-stage scroll compressor
- Internal pressure relief valve
- Internal thermal overload
- High pressure switch
- Loss of charge switch
- Filter drier
- Balanced refrigeration system for maximum reliability
- Crankcase heater standard

Durability
WeatherArmor Ultra™ protection package:
- Solid, Durable sheet metal construction
- Steel louver coil guard
- Baked-on, complete outer coverage, powder paint

Controls and Diagnostics
- Infinity™ Control or Thermostat
- 2 control wires to outdoor unit with Infinity Control (serial numbers 3112E and newer).
- Utility Interface Connection
- Enhanced diagnostics capability with Infinity™ Control

Applications
- Long-line - up to 250 feet (76.2 m) total equivalent length, up to 200 feet (60.96 m) condenser above evaporator, or up to 80 ft. (24.38 m) evaporator above condenser (See Longline Guide for more information.)
- Low ambient cooling (down to 0°F / -17.8°C) with approved low ambient accessory kits or complete Infinity system.

MODEL NUMBER NOMENCLATURE

1	2	3	4	5	6	7	8	9	10	11	12	13
N	N	A	A	A/N	N	N	N	A/N	A/N	A/N	N	N
2	5	H	N	B	6	3	6	A	0	0	3	0
Product Series		Product Family	Tier	Major Series	SEER	Cooling Capacity		Variations	Open	Open	Voltage	Minor Series
25 = HP		H = RES HP	N = Infinity Series	B = Puron	6=16 SEER	1,000 Btuh (nominal)		A = Standard	0=Not Defined	0=Not Defined	3=208/230-1	0, 1, 2...

Puron
the environmentally sound refrigerant

AHRI CERTIFIED
www.ahridirectory.org

Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program For verification of certification for individual products, go to www.ahridirectory.org.

Certified System TM

ISO 9001
QMI-SAI Global

c UL us

ENERGY STAR

This product has been designed and manufactured to meet Energy Star® criteria for energy efficiency when matched with appropriate coil components. However, proper refrigerant charge and proper air flow are critical to achieve rated capacity and efficiency. Installation of this product should follow all manufacturing refrigerant charging and air flow instructions. **Failure to confirm proper charge and air flow may reduce energy efficiency and shorten equipment life.**

IdealHumidity

Comfort
HEAT PUMP SYSTEM

STANDARD FEATURES

FEATURES	Unit Size – Voltage, Series			
	24–32	36–31	48–31	60–32
Puron Refrigerant	X	X	X	X
2 control wires to outdoor unit with Infinity Control (serial numbers 3112E and newer).	X	X	X	X
Maximum SEER Rating*	17.2	17.0	16.5	16.0
2–Stage Scroll Compressor	X	X	X	X
Louvered Coil Guard	X	X	X	X
Field Installed Filter Drier	X	X	X	X
Front Seating Service Valves	X	X	X	X
Internal Pressure Relief Valve	X	X	X	X
Long Line capability	X	X	X	X
Loss of Charge Switch	X	X	X	X
High Pressure Switch	X	X	X	X
Crankcase Heater	X	X	X	X
Low ambient cooling down to 0°F capability with Infinity Control or Approved Kits	X	X	X	X
Utility Interface Connections	X	X	X	X
Enhanced Diagnostics with Infinity Control	X	X	X	X
Sound Blanket	X	X	X	X

X = Standard
* With approved combinations

PHYSICAL DATA

UNIT SIZE SERIES	24-32	36-31	48-31	60-32
Operating Weight lb (kg)	275 (125)	296 (134)	328 (149)	350 (159)
Shipping Weight lb (kg)	318 (144)	339 (154)	371 (168)	395 (179)
Compressor Type	Ultratech® Scroll			
REFRIGERANT	Puron® (R-410A)			
Control	TXV (Puron Hard Shutoff)			
Charge lb (kg)	13.07 (5.93)	13.70 (6.21)	13.73 (6.23)	14.78 (6.70)
Outdoor Htg Piston #	46	55	61	67
COND FAN	Propeller Type, Direct Drive			
Air Discharge	Vertical			
Air Qty (CFM)	3200	3200	4350	5000
Motor HP	1/12	1/12	1/4	1/4
Motor RPM	800	800	825	825
COND COIL				
Face Area (Sq ft)	25.2	25.2	25.2	30.18
Fins per In.	20	20	20	20
Rows	2	2	2	2
Circuits	8	8	8	10
VALVE CONNECT. (In. ID)				
Vapor	3/4	7/8	7/8	7/8
Liquid	3/8			
REFRIGERANT TUBES (In. OD)				
Rated Vapor*	3/4	7/8	1-1/8	1-1/8
Max Liquid Line	3/8			

* Units are rated with 25 ft (7.6 m) of lineset length. See Vapor Line Sizing and Cooling Capacity Loss table when using other sizes and lengths of lineset.

Note: See unit installation instruction for proper installation.

25HNB6

VAPOR LINE SIZING AND COOLING CAPACITY LOSS

Acceptable vapor line diameters provide adequate oil return to the compressor while avoiding excessive capacity loss. The suction line diameters shown in the chart below are acceptable for AC systems with Puron refrigerant:

Unit Nominal Size (Btuh)	Maximum Liquid Line Diameters (In. OD)	Vapor Line Diameters (In.) OD	Cooling Capacity Loss (%) Total Equivalent Line Length ft. (m)								
			Standard Application		Long Line Application Requires Accessories						
			26-50 (7.9-15.2)	51-80 (15.5-24.4)	81-100 (24.7-30.5)	101-125 (30.8-38.1)	126-150 (38.4-45.7)	151-175 (46.0-53.3)	176-200 (53.6-60.0)	201-225 (61.3-68.6)	226-250 (68.9-76.2)
24,000 2-Stage HP with Puron	3/8	5/8	0	1	1	2	3	3	4	4	5
		3/4	0	1	1	1	1	1	2	2	3
36,000 2-Stage HP with Puron	3/8	5/8	1	2	4	5	6	7	9	10	11
		3/4	0	0	1	1	2	2	3	3	4
		7/8	0	0	—	—	—	—	—	—	—
48,000 2-Stage HP with Puron	3/8	3/4	1	2	3	3	4	5	6	7	7
		7/8	0	1	1	2	2	2	3	3	4
		1-1/8	0	0	—	—	—	—	—	—	—
60,000 2-Stage HP with Puron	3/8	3/4	1	2	4	5	6	8	9	10	11
		7/8	0	1	2	2	3	4	4	5	5
		1-1/8	0	0	—	—	—	—	—	—	—

Standard Length = 80 ft. (24.4 m) or less total equivalent length

Applications in this area are long line. Accessories are required as shown recommended on Long Line Application Guidelines

Applications in this area may have height restrictions that limit allowable total equivalent length, when outdoor unit is below indoor unit.

— Applications in this area are not recommended due to insufficient oil return.

REFRIGERANT PIPING LENGTH LIMITATIONS

Maximum Line Lengths:

The maximum allowable total equivalent length for heat pumps varies depending on the vertical separation. See the tables below for allowable lengths depending on whether the outdoor unit is on the same level, above or below the outdoor unit.

Maximum Line Lengths for Heat Pump Applications

	MAXIMUM ACTUAL LENGTH ft (m)	MAXIMUM EQUIVALENT LENGTH† ft (m)	MAXIMUM VERTICAL SEPARATION ft (m)
Units on equal level	200 (61)	250 (76.2)	N/A
Outdoor unit ABOVE indoor unit	200 (61)	250 (76.2)	200 (61)
Outdoor unit BELOW indoor unit	See Table *'Maximum Total Equivalent Length; Outdoor Unit BELOW Indoor Unit'*		

† Total equivalent length accounts for losses due to elbows or fitting. See the Long Line Guideline for details.

25HNB6

Maximum Total Equivalent Length† - Outdoor Unit BELOW Indoor Unit

Size	Liquid Line Diameter w/ TXV	HP with Puron® Refrigerant – Maximum Total Equivalent Length† Vertical Separation ft (m) Outdoor unit BELOW Indoor unit;						
		0–20 (0 – 6.1)	21–30 (6.4 – 9.1)	31–40 (9.4 – 12.2)	41–50 (12.5 – 15.2)	51–60 (15.6 – 18.3)	61–70 (18.6 – 21.3)	71–80 (21.6 – 24.4)
024 HP with Puron	3/8	250*	250*	250*	250*	250*	250*	250*
036 HP with Puron	3/8	250*	250*	250*	250*	250*	250*	250*
048 HP with Puron	3/8	250*	250*	250*	250*	230	160	--
060 HP with Puron	3/8	250*	225*	190	150	110	--	--

* Maximum actual length not to exceed 200 ft (61 m)

† Total equivalent length accounts for losses due to elbows or fitting. See the Long Line Guideline for details.

-- = outside acceptable range

LONG LINE APPLICATIONS

An application is considered Long Line when the refrigerant level in the system requires the use of accessories to maintain acceptable refrigerant management for systems reliability. Defining a system as long line depends on the liquid line diameter, actual length of the tubing, and vertical separation between the indoor and outdoor units.

For Heat Pump systems, the chart below shows when an application is considered Long Line. Beyond these lengths, long line accessories are required:

HP WITH PURON® REFRIGERANT LONG LINE DESCRIPTION ft (m)
Beyond these lengths, long line accessories are required

Liquid Line Size	Units On Same Level	Outdoor Below Indoor	Outdoor Above Indoor
3/8	80 (24.4)	20 (6.1) vertical or 80 (24.4) total	80 (24.4)

Note: See Long Line Guideline for details

ACCESSORIES

KIT NUMBER	KIT NAME	24–32	36–31	48–31	60–32
KHALS0401LLS	SOLENOID VALVE	X	X	X	X
KHASS0606MPK*	SNOW STAND	X	X	X	X
KSAHS2501AAA†	HARD START KIT	X	X		
KSAHS2801AAA†	HARD START KIT			X	X
KSASF0101AAA	SUPPORT FEET	X	X	X	X
KAAFT0101AAA	FREEZE THERMOSTAT	X	X	X	X
KSALA0301410	LOW AMBIENT PRESSURE SWITCH	X	X	X	X
KHAIR0201AAA	ISOLATION RELAY	X	X	X	X

x = Accessory S = Standard

* Available from RCD

† Not backward compatible to previous series.

ACCESSORY CONTROLS

PART NO.	DESCRIPTION
SYSTXCCITN01	Infinity Touch Control (non–Wi–Fi)
SYSTXCCITW01	Infinity Touch Control with Wi–Fi & Wireless Access Point
SYSTXCCUID01-V	Infinity Control Deluxe 7-Day Programmable (Wall-mounted system control.)
SYSTXCCUIZ01-V	Infinity Control Deluxe Zoning 7-Day Programmable (Wall-mounted control for a multi-zone system.)
SYSTXCC4ZC01	Infinity 4-Zone Damper Control Module (Wall-mounted control for a four-zone system.)
SYSTXCCSMS01	Infinity Smart Sensor (Optional wall control used to monitor temperature and/or fan control in an individual zone.)
SYSTXCCRRS01	Infinity Remote Room Sensor (Monitors temperature in an individual zone.)
SYSTXCCRCT01 or SYSTXCCRWF01	Infinity System Access Module (Hardware for wireless access and control via internet.)
SYSTXCCNIM01	Infinity Network Interface Module (Connects Heat Recovery and Energy Recovery Ventilators on Non-zoning applications.)
SYSTXXXBPU01	Decorative Back Plate for Infinity Control (Decorative wall plate.)

ACCESSORY USAGE GUIDELINE

Accessory	Required for Low Ambient Cooling Applications Utilizing 2-Stage Thermostat on 18 SEER Models Only (Below 55° F / 12.8° C)	Required for Low Ambient Cooling Applications Utilizing UI (Below 55° F / 12.8° C)	Required for Long Line Applications*	Required for Sea Coast Applications (within 2 miles/3.2 km)
Compressor Start Assist Capacitor and Relay	No	No	No	No
Crankcase Heater	Yes (standard on some units)	Yes (standard on some units)	Yes (standard on some units)	No
Evaporator Freeze Thermostat	Yes (kit required)	Standard with Infinity Control (no kit required)	No	No
Isolation Relay	Yes (kit required)	Standard with Infinity Control (no kit required)	No	No
Liquid Line Solenoid Valve	No	No	No	No
Low-Ambient Pressure Switch	Yes (kit required)	Standard with Infinity Control (no kit required)	See Residential Piping and Long Line Guideline	No
Puron Refrigerant Balance Port Hard Shutoff TXV	Yes (standard w/factory approved indoor unit)	Yes (standard w/factory approved indoor unit)	Yes (standard w/factory approved indoor unit)	Yes (standard w/factory approved indoor unit)
Support Feet	Recommended	Recommended	No	Recommended

* For tubing set lengths between 80 and 200 ft. (24.38 and 60.96 m) horizontal or 20 ft. (6.10 m) vertical differential (total equivalent length), refer to the Residential Piping and Long Line Guideline

Accessory Description and Usage (Listed Alphabetically)

1. Compressor Start Assist - Capacitor and Relay

Start capacitor and relay gives a "hard" boost to compressor motor at each start up.

Usage Guideline:

Not required on this unit since compressor always starts unloaded.

Available if required by local codes.

2. Crankcase Heater

An electric resistance heater which mounts to the base of the compressor to keep the lubricant warm during off cycles. Improves compressor lubrication on restart and minimizes the chance of liquid slugging.

Usage Guideline:

Required in low ambient cooling applications.

Required in long line applications.

3. Evaporator Freeze Thermostat

An SPST temperature-actuated switch that stops unit operation when evaporator reaches freeze-up conditions.

Usage Guideline:

Required when low ambient kit has been added.

4. Isolation Relay

An SPDT relay which switches the low ambient controller out of the outdoor fan motor circuit when the heat pump switches to heating mode.

Usage Guideline:

Required in all heat pumps where low ambient kit has been added.

5. Low-Ambient Pressure Switch

A long life pressure switch which is mounted to outdoor unit service valve. It is designed to cycle the outdoor fan motor in order to maintain head pressure within normal operating limits. The control will maintain working head pressure at low-ambient temperatures down to 0°F (-17.8°C) when properly installed.

Usage Guideline:

A Low-Ambient Pressure Switch must be used when cooling operation is used at outdoor temperatures below 55°F (12.8°C).

Suggested in all commercial applications.

6. Liquid-Line Solenoid Valve (LLS)

An electrically operated shutoff valve which stops and starts refrigerant liquid flow in response to compressor operation. It is to be installed at the outdoor unit to control refrigerant off cycle migration in the heating mode.

Usage Guideline:

An LLS is required in all long line heat pump applications to control refrigerant off cycle migration in the heating mode. See Long Line Guideline.

Suggested for all commercial applications.

7. Outdoor Air Temperature Sensor

Designed for use with Carrier Thermostats listed in this publication. This device enables the thermostat to display the outdoor temperature. This device also is required to enable special thermostat features such as auxiliary heat lock out.

Usage Guideline:

Suggested for all Carrier thermostats listed in this publication.

8. Snow Stand

Coated wire rack which supports unit 18 in. (457.2 mm) above mounting pad to allow for drainage from unit base.

Usage Guideline:

Suggested in the following applications:

Heat pump installations in heavy snowfall areas.

Heat pump installations in snow drift locations.

Heat pump installations in areas of prolonged subfreezing temperatures.

All commercial installations.

9. Thermostatic Expansion Valve (TXV) Bi-Flow

A modulating flow-control valve which meters refrigerant liquid flow rate into the evaporator in response to the superheat of the refrigerant gas leaving the evaporator.

Usage Guideline:

Accessory required to meet AHRI rating and system reliability, where indoor not equipped.

Required in all heat pump applications designed with Puron refrigerant.

ELECTRICAL DATA

UNIT SIZE–VOLTAGE, SERIES	V/PH	OPER VOLTS*		COMPR		FAN	MCA	MIN WIRE SIZE†	MIN WIRE SIZE†	MAX LENGTH ft (m)‡	MAX LENGTH ft (m)‡	MAX FUSE** or CKT BRK AMPS
		MAX	MIN	LRA	RLA	FLA		60°C	75°C	60°C	75°C	
24–32	208–230/1	253	197	58.3	12.5	0.6	16.2	14	14	48 (14.8)	46 (14.1)	25
36–31				83.0	18.5	0.6	23.7	12	12	52 (16.0)	50 (15.3)	40
48–31				104.0	22.8	1.3	29.8	10	10	67 (20.4)	63 (19.4)	50
60–32				152.9	26.8	1.5	37.5	8	8	82 (25.2)	78 (24.0)	60

* Permissible limits of the voltage range at which the unit will operate satisfactorily

† If wire is applied at ambient greater than 30°C, consult table 310–16 of the NEC (NFPA 70). The ampacity of non–metallic–sheathed cable (NM), trade name ROMEX, shall be that of 60°C conditions, per the NEC (NFPA 70) Article 336–26. If other than uncoated (no–plated), 60 or 75°C insulation, copper wire (solid wire for 10 AWG or smaller, stranded wire for larger than 10 AWG) is used, consult applicable tables of the NEC (NFPA 70).

‡ Length shown is as measured 1 way along wire path between unit and service panel for voltage drop not to exceed 2%.

** Time–Delay fuse.

FLA – Full Load Amps

LRA – Locked Rotor Amps

MCA – Minimum Circuit Amps

RLA – Rated Load Amps

NOTE: Control circuit is 24–V on all units and requires external power source. Copper wire must be used from service disconnect to unit.

All motors/compressors contain internal overload protection.

Complies with 2010 requirements of ASHRAE Standards 90.1

25HNB6

SOUND POWER LEVEL (dBA)

Unit Size – Voltage, Series	Standard Rating dBA	TYPICAL OCTAVE BAND SPECTRUM (dBA, without tone adjustment)						
		125	250	500	1000	2000	4000	8000
24–32	68 – High Stage	50.5	56.0	60.0	62.5	60.0	58.0	51.0
	67 – Low Stage	50.0	56.5	61.0	61.5	60.0	56.5	49.0
36–31	70 – High Stage	50.5	56.0	60.0	66.0	60.0	56.5	50.0
	68 – Low Stage	51.5	56.5	59.5	63.0	59.5	57.0	49.0
48–31	70 – High Stage	52.0	58.5	63.5	65.0	59.5	56.5	49.5
	69 – Low Stage	53.0	60.5	63.5	63.5	59.0	56.5	50.0
60–32	71 – High Stage	49.5	59.0	63.0	63.5	59.5	58.0	54.5
	71 – Low Stage	51.5	60.0	63.5	65.5	59.5	59.5	55.0

NOTE: Tested in compliance with AHRI 270–2008 but not listed with AHRI.

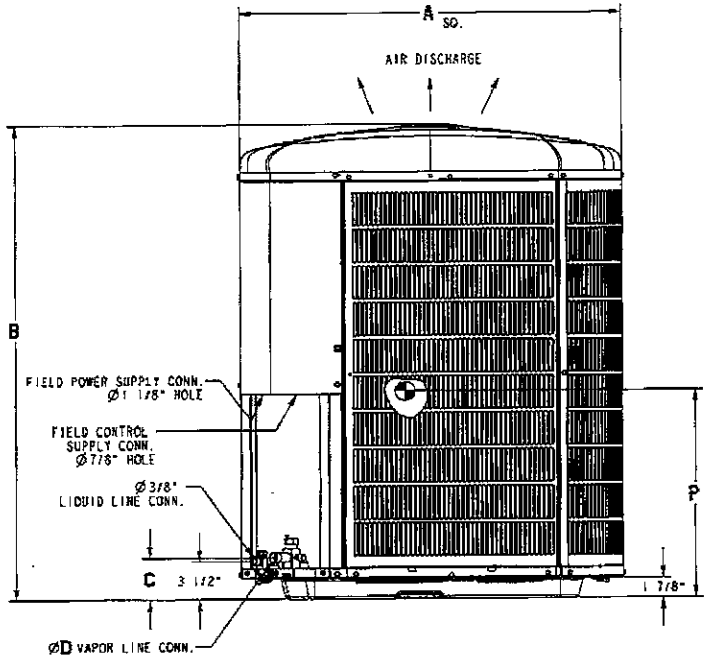
CHARGING SUBCOOLING (TXV-TYPE EXPANSION DEVICE)

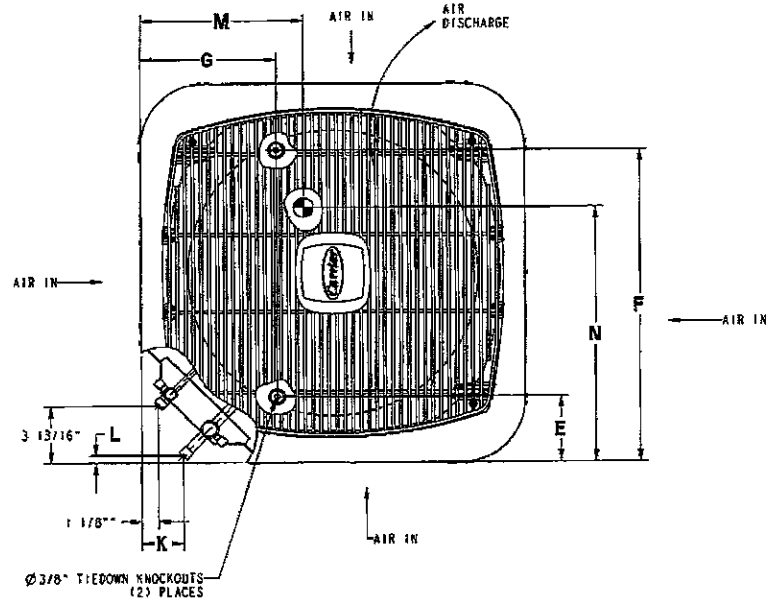
UNIT SIZE–VOLTAGE, SERIES	REQUIRED SUBCOOLING °F (°C)
24–32	10 (5.6)
36–31	13 (7.2)
48–31	12 (6.7)
60–32	11 (6.1)

DIMENSIONS - ENGLISH

UNIT	SERIES	ELECTRICAL CHARACTERISTICS				A	B	C	D	E	F	G	K	L	M	N	P	OPERATING WEIGHT (lbs)	SHIPPING WEIGHT (lbs)	SHIPPING DIMENSIONS (L x W x H)
25HNB624A	-	X	O	O	O	35"	40 5/8"	3 3/4"	3/4"	6 9/16"	28 7/16"	9 1/8"	2 13/16"	1/2"	17 1/4"	18"	18"	275	316	36 1/8" X 39 1/4" X 46 1/8"
25HNB636A	-	X	O	O	O	35"	40 5/8"	3 7/8"	7/8"	6 9/16"	28 7/16"	9 1/8"	2 15/16"	5/8"	17"	18 1/2"	18 3/4"	296	339	36 1/8" X 39 1/4" X 46 1/8"
25HNB648A	-	X	O	O	O	35"	40 5/8"	3 7/8"	7/8"	6 9/16"	28 7/16"	9 1/8"	2 15/16"	5/8"	17 1/2"	18 1/4"	20"	328	371	36 1/8" X 39 1/4" X 46 1/8"
25HNB660A	-	X	O	O	O	35"	47 7/16"	3 7/8"	7/8"	6 9/16"	28 7/16"	9 1/8"	2 15/16"	5/8"	16 1/2"	17 1/8"	21"	350	395	36 1/8" X 39 1/4" X 51 13/16"
		208-230-1-60	208/230-3-60	460-3-60	575-3-60															

X = YES
O = NO



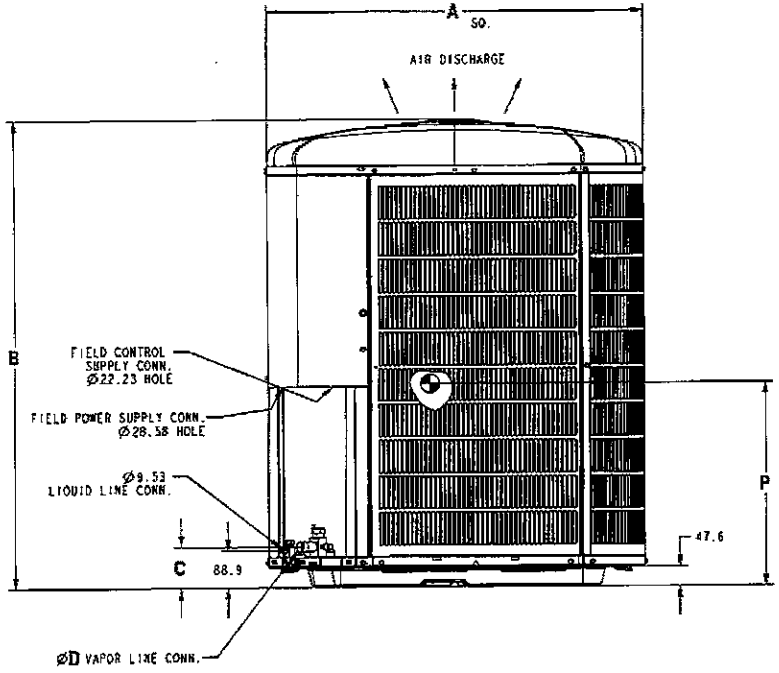


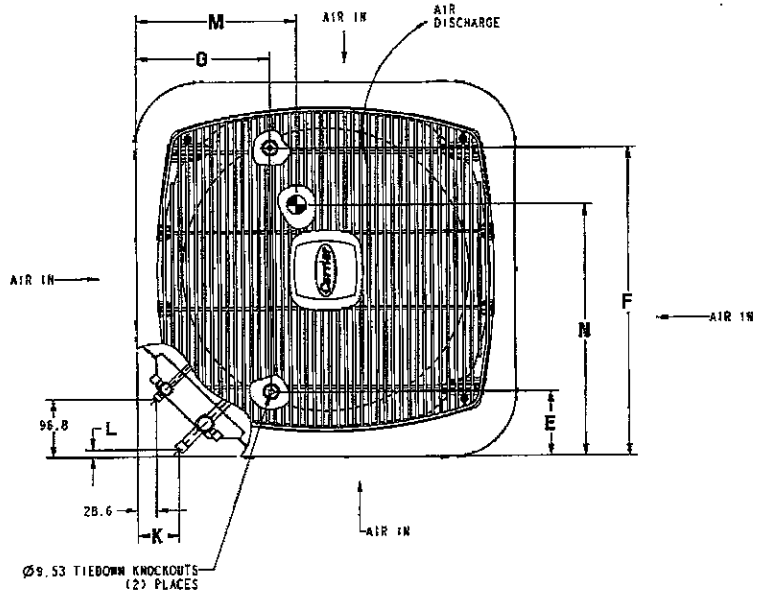
UNIT SIZE	MINIMUM MOUNTING PAD DIMENSIONS
-	31 1/2" X 31 1/2"
24,36,48,60	35" X 35"

DIMENSIONS - SI

UNIT	SERIES	ELECTRICAL CHARACTERISTICS				A	B	C	D	E	F	G	K	L	M	N	P	OPERATING WEIGHT (Kgs)	SHIPPING WEIGHT (Kgs)	SHIPPING DIMENSIONS (L x W x H)
25HNB624A		X	O	O	O	889.0	1032.6	95.6	19.1	166.1	722.8	231.3	70.9	12.8	438.2	457.2	457.2	124.7	144.2	917.7 X 997.7 X 1172.2
25HNB636A		X	O	O	O	889.0	1032.6	97.9	22.2	166.1	722.8	231.3	74.5	16.3	431.8	469.9	476.3	134.3	153.8	917.7 X 997.7 X 1172.2
25HNB648A		X	O	O	O	889.0	1032.6	97.9	22.2	166.1	722.8	231.3	74.5	16.3	444.5	463.6	508.0	148.8	168.3	917.7 X 997.7 X 1172.2
25HNB660A		X	O	O	O	889.0	1205.4	97.9	22.2	166.1	722.8	231.3	74.5	16.3	419.1	435.0	533.4	158.8	179.2	917.7 X 997.7 X 1315.7
		208-230-1-60	208/230-3-60	460-3-60	575-3-60															

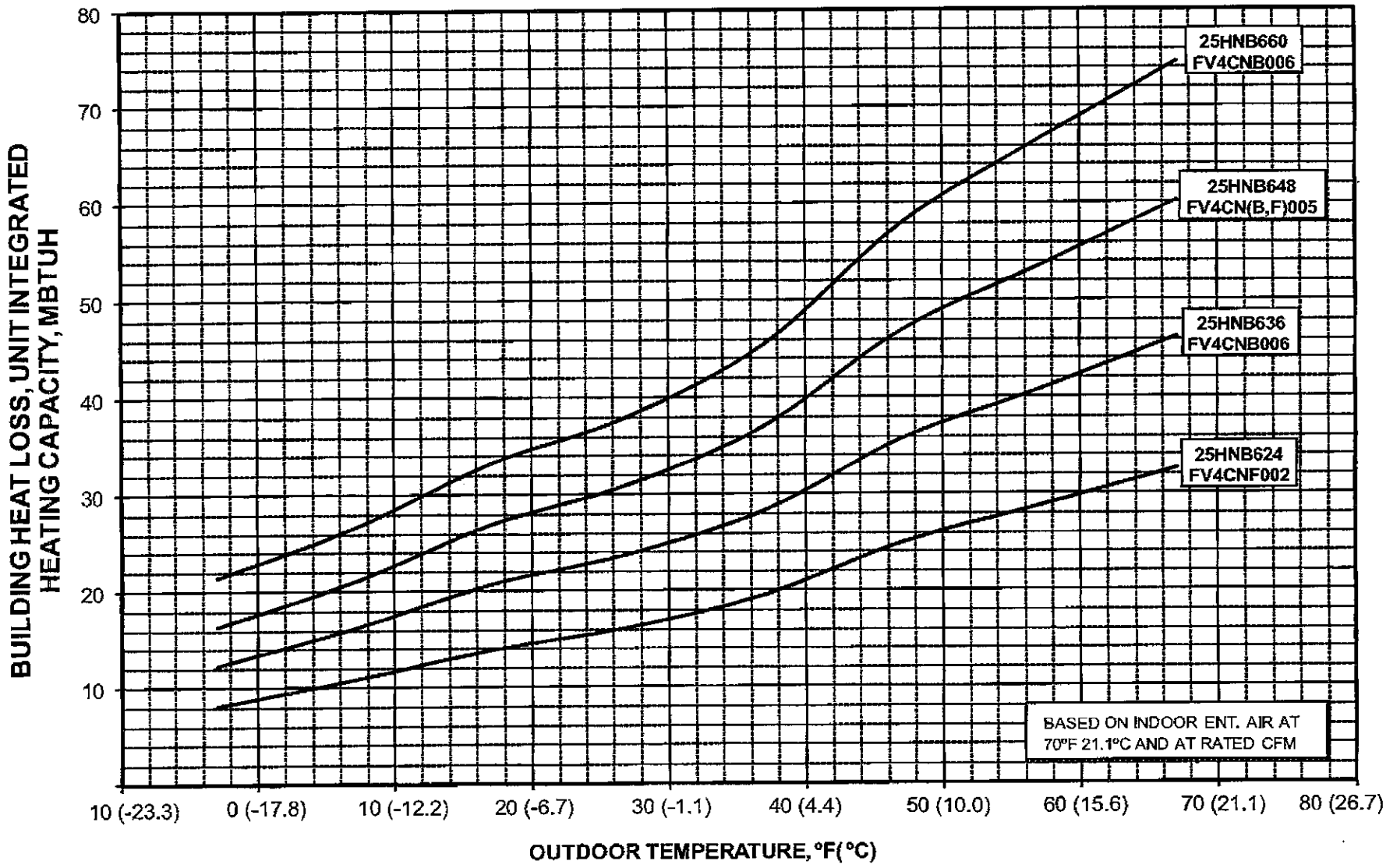
X = YES
O = NO



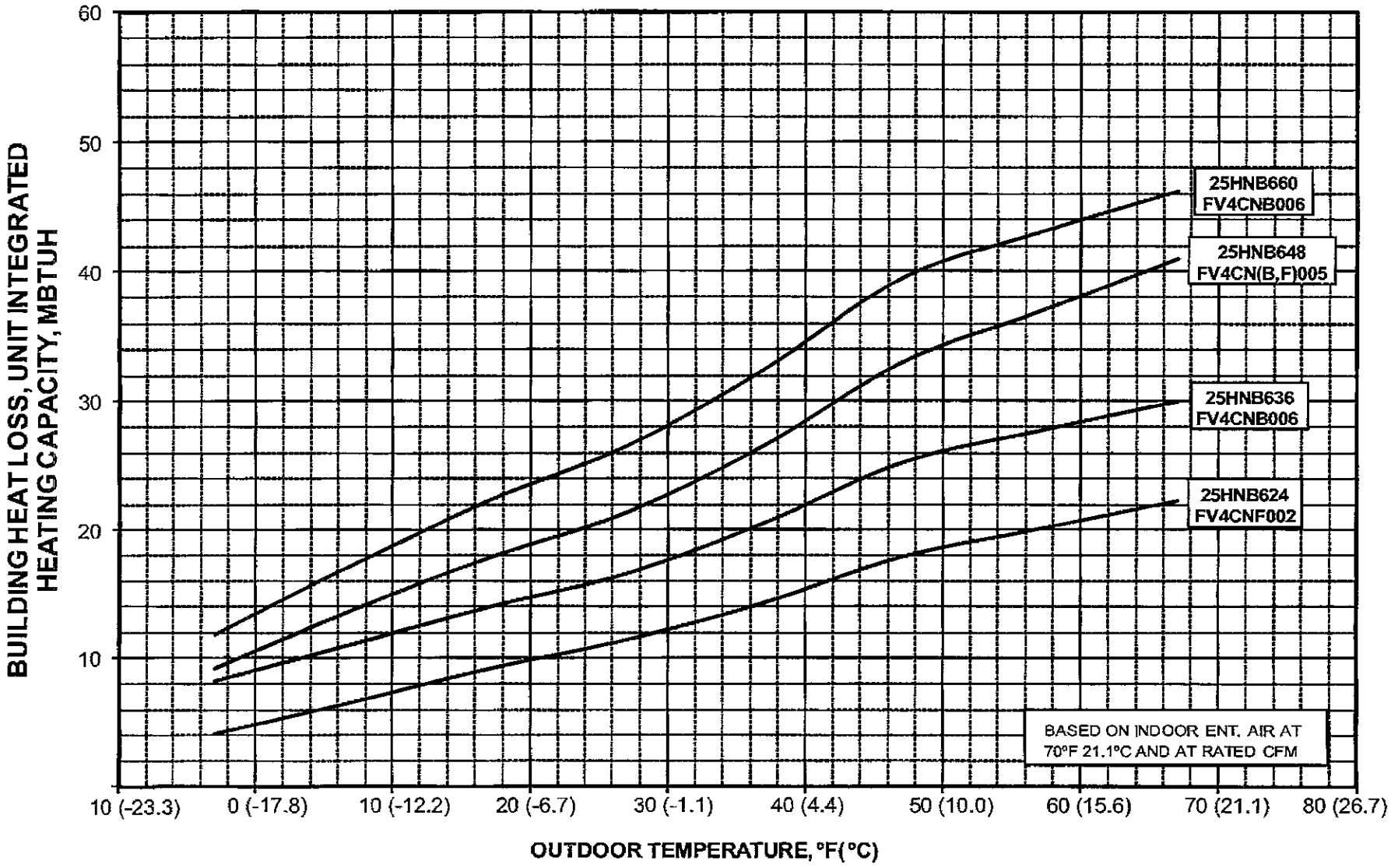


UNIT SIZE	MINIMUM MOUNTING PAD DIMENSIONS
-	800.1 X 800.1
24,36,48,60	889.0 X 889.0

25HNB6 BALANCE POINT WORKSHEET - HIGH STAGE

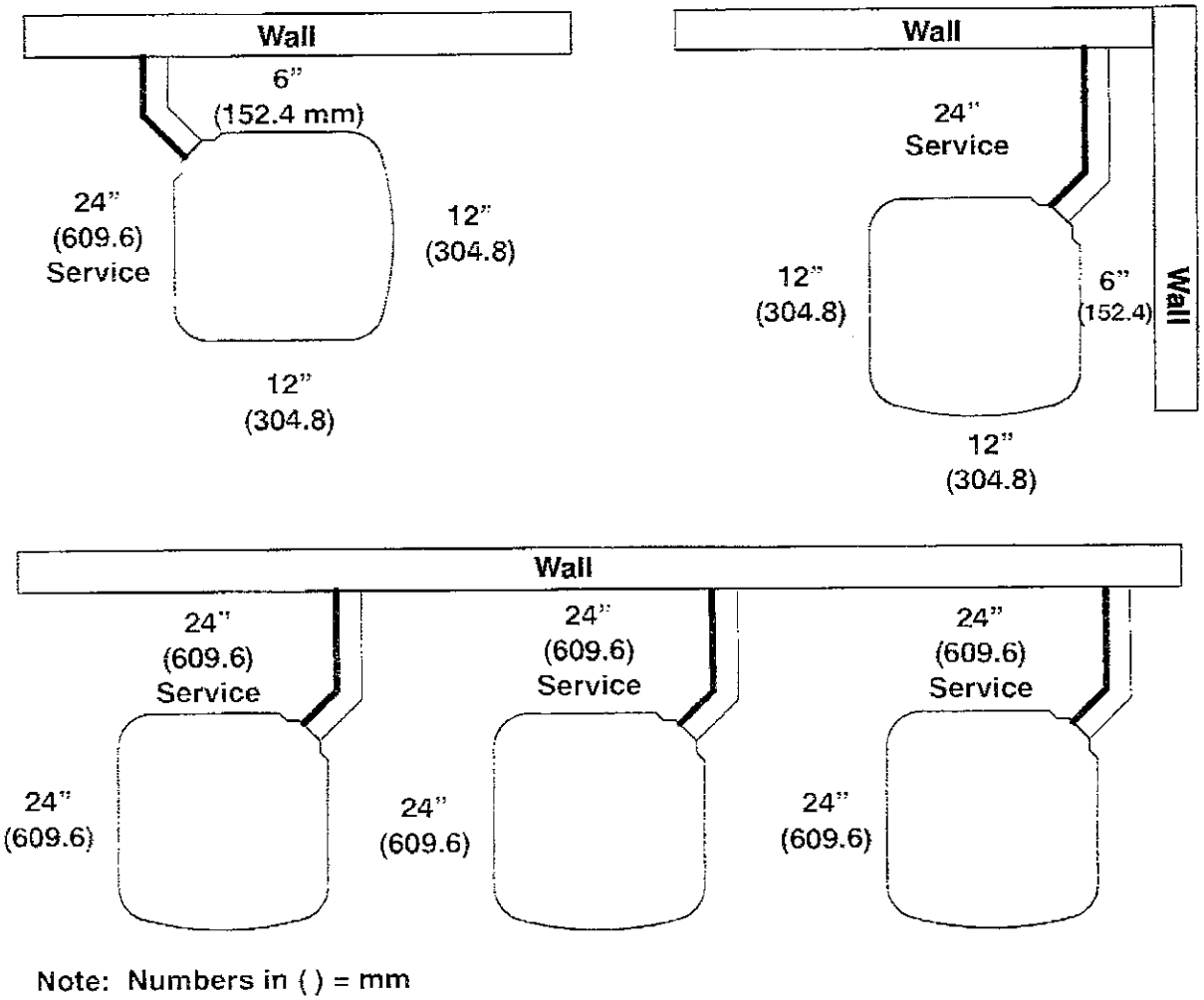


25HNB6 BALANCE POINT WORKSHEET - LOW STAGE



CLEARANCES

Clearances (various examples)



Note: Numbers in ( ) = mm

IMPORTANT: When installing multiple units in an alcove, roof well, or partially enclosed area, ensure there is adequate ventilation to prevent re-circulation of discharge air.

A07833

TESTED AHRI COMBINATION RATINGS*

NOTE: Ratings contained in this document are subject to change at any time.

For AHRI ratings certificates, please refer to the AHRI directory www.ahridirectory.org

Additional ratings and system combinations can be accessed via the Carrier database at: www.MyCarrierRatings.com

For performance data at specific application &/or design conditions with various indoor unit combinations, the equipment performance calculator can be accessed at : http://rpmob.wrightsoft.com/

AHRI Ref. No.	Model Number	Coil Model Number	Furnace Model Number	Cooling Capacity	Cooling				Heating				
					EER	SEER	ID CFM		High Temp		HSPF	Low Temp	
							High	Low	Capacity 47°F (8°C)	COP		Capacity 17°F (−8°C)	COP
5476377	25HNB624A**32	FV4CNF002		24,000	13.0	17.0	700	560	25,000	3.90	9.0	15,300	2.74
5477252	25HNB636A**31	FV4CNB006		36,400	13.3	17.0	1050	840	35,800	4.06	9.5	22,600	3.00
5479354	25HNB648A**31	FV4CN(B,F)005		47,000	12.5	16.0	1400	1120	47,000	3.66	9.0	29,200	2.72
5481104	25HNB660A**32	FV4CNB006		56,500	12.5	16.0	1750	1400	58,000	3.72	9.0	36,000	2.76

* Ratings are net values reflecting the effects of circulating fan heat. Supplemental electric heat is not included. Ratings are based on:
Cooling Standard: 80°F (27°C) db 67°F (19°C) wb indoor entering air temperature and 95°F (35°C) db air entering outdoor unit.
High−Temp Heating Standard: 70°F (21°C) db indoor entering air temperature and 47°F (8°C) db 43°F (6°C) wb air entering outdoor unit.
Low−Temp Heating Standard: 70°F (21°C) db indoor entering air temperature and 17°F (−8°C) db 15°F (−9°C) wb air entering outdoor unit.
EER—Energy Efficiency Ratio
SEER — Seasonal Energy Efficiency Ratio
COP — Coefficient of Performance
HSPF — Heating Seasonal Performance Factor

DETAILED COOLING CAPACITIES#

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																	
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
25HNB624A**32 Outdoor Section With FV4CNF002 Indoor Section – HIGH																			
600	57 (13.9)	22.47	22.47	1.42	21.26	21.26	1.60	20.00	20.00	1.81	18.69	18.69	2.06	17.34	17.34	2.35	15.96	15.96	2.72
	62 (16.7)	24.04	20.32	1.43	22.54	19.39	1.61	20.99	18.43	1.82	19.39	17.45	2.06	17.77	16.44	2.36	16.14	15.39	2.72
	63 (17.2)††	24.52	16.88	1.43	22.99	16.03	1.61	21.40	15.16	1.82	19.77	14.27	2.06	18.10	13.37	2.36	16.39	12.47	2.72
	67 (19.4)	26.60	17.58	1.44	24.94	16.71	1.62	23.23	15.82	1.83	21.47	14.92	2.07	19.68	14.02	2.37	17.86	13.10	2.73
	72 (22.2)	29.45	14.67	1.46	27.62	13.88	1.64	25.73	13.07	1.84	23.80	12.26	2.09	21.84	11.45	2.38	19.84	10.63	2.74
650	57 (13.9)	23.20	23.20	1.43	21.94	21.94	1.61	20.62	20.62	1.82	19.26	19.26	2.07	17.86	17.86	2.36	16.42	16.42	2.73
	62 (16.7)	24.52	21.24	1.44	22.98	20.27	1.62	21.39	19.27	1.82	19.75	18.25	2.07	18.11	17.18	2.37	16.46	16.46	2.73
	63 (17.2)††	25.01	17.53	1.44	23.43	16.65	1.62	21.79	15.76	1.83	20.11	14.85	2.07	18.40	13.93	2.37	16.65	13.00	2.73
	67 (19.4)	27.11	18.28	1.45	25.41	17.38	1.63	23.64	16.47	1.84	21.83	15.54	2.08	20.00	14.61	2.38	18.13	13.67	2.74
	72 (22.2)	30.01	15.16	1.47	28.12	14.35	1.65	26.17	13.52	1.85	24.19	12.70	2.10	22.17	11.86	2.39	20.13	11.01	2.74
700	57 (13.9)	23.88	23.88	1.44	22.56	22.56	1.62	21.20	21.20	1.83	19.76	19.76	2.08	18.33	18.33	2.37	16.84	16.84	2.74
	62 (16.7)	24.95	22.13	1.45	23.38	21.12	1.63	21.74	20.08	1.83	20.08	19.01	2.08	18.42	18.27	2.37	16.87	16.87	2.74
	63 (17.2)††	25.44	18.16	1.45	23.82	17.27	1.63	22.14	16.35	1.84	20.41	15.41	2.08	18.65	14.47	2.38	16.87	13.52	2.74
	67 (19.4)	27.57	18.95	1.46	25.81	18.03	1.64	24.00	17.09	1.85	22.15	16.14	2.09	20.27	15.19	2.39	18.36	14.23	2.74
	72 (22.2)	30.50	15.64	1.48	28.55	14.80	1.65	26.55	13.96	1.86	24.52	13.11	2.10	22.46	12.24	2.40	20.38	11.37	2.75
800	57 (13.9)	25.06	25.06	1.46	23.66	23.66	1.64	22.20	22.20	1.85	20.69	20.69	2.09	19.15	19.15	2.39	17.57	17.57	2.75
	62 (16.7)	25.69	23.81	1.46	24.06	22.72	1.64	22.38	21.57	1.85	20.73	20.73	2.10	19.18	19.18	2.39	17.60	17.60	2.75
	63 (17.2)††	26.15	19.37	1.47	24.45	18.44	1.65	22.69	17.47	1.85	20.90	16.49	2.10	19.08	15.51	2.39	17.23	14.51	2.75
	67 (19.4)	28.31	20.24	1.48	26.48	19.28	1.66	24.59	18.30	1.86	22.66	17.31	2.11	20.71	16.31	2.40	18.74	15.30	2.76
	72 (22.2)	31.29	16.52	1.49	29.26	15.64	1.67	27.18	14.75	1.87	25.06	13.85	2.12	22.94	12.95	2.41	20.79	12.04	2.77
25HNB624A**32 Outdoor Section With FV4CNF002 Indoor Section – LOW																			
480	57 (13.9)	17.40	17.40	1.02	16.19	16.19	1.19	14.92	14.92	1.39	13.64	13.64	1.62	12.37	12.37	1.89	11.13	11.13	2.20
	62 (16.7)	18.34	16.19	1.02	16.89	15.05	1.19	15.38	13.92	1.39	13.87	12.77	1.62	12.43	12.34	1.89	11.15	11.15	2.20
	63 (17.2)††	18.71	13.35	1.01	17.22	12.36	1.18	15.67	11.36	1.38	14.11	10.38	1.62	12.58	9.42	1.89	11.11	8.51	2.20
	67 (19.4)	20.36	13.94	1.00	18.74	12.92	1.17	17.07	11.90	1.37	15.40	10.90	1.60	13.77	9.91	1.88	12.20	8.98	2.19
	72 (22.2)	22.60	11.57	0.98	20.80	10.66	1.15	18.96	9.76	1.35	17.13	8.69	1.59	15.35	8.03	1.86	13.64	7.21	2.19
520	57 (13.9)	17.97	17.97	1.02	16.71	16.71	1.19	15.39	15.39	1.39	14.05	14.05	1.62	12.74	12.74	1.89	11.45	11.45	2.20
	62 (16.7)	18.72	16.93	1.02	17.22	15.75	1.19	15.68	14.56	1.39	14.15	13.34	1.62	12.76	12.76	1.89	11.47	11.47	2.20
	63 (17.2)††	19.08	13.89	1.01	17.54	12.86	1.19	15.95	11.83	1.39	14.35	10.82	1.62	12.79	9.83	1.89	11.28	8.88	2.20
	67 (19.4)	20.75	14.52	1.00	19.07	13.46	1.17	17.36	12.41	1.37	15.65	11.37	1.61	13.98	10.37	1.88	12.37	9.39	2.20
	72 (22.2)	23.02	11.97	0.98	21.16	11.04	1.15	19.27	10.11	1.35	17.40	9.21	1.59	15.58	8.32	1.87	13.83	7.48	2.19
560	57 (13.9)	18.49	18.49	1.02	17.17	17.17	1.19	15.81	15.81	1.39	14.43	14.43	1.62	13.07	13.07	1.89	11.74	11.74	2.21
	62 (16.7)	19.05	17.65	1.02	17.51	16.42	1.19	15.96	15.15	1.39	14.46	14.46	1.62	13.09	13.09	1.89	11.76	11.76	2.21
	63 (17.2)††	19.40	14.41	1.02	17.81	13.35	1.19	16.19	12.29	1.39	14.55	11.24	1.62	12.96	10.23	1.89	11.43	9.24	2.21
	67 (19.4)	21.08	15.07	1.00	19.37	13.99	1.17	17.61	12.90	1.37	15.87	11.83	1.61	14.16	10.80	1.88	12.52	9.80	2.20
	72 (22.2)	23.38	12.35	0.98	21.47	11.41	1.15	19.54	10.45	1.35	17.63	9.50	1.59	15.78	8.60	1.87	14.00	7.73	2.20
640	57 (13.9)	19.40	19.40	1.03	18.00	18.00	1.20	16.55	16.55	1.40	15.08	15.08	1.63	13.64	13.64	1.90	12.24	12.24	2.22
	62 (16.7)	19.63	18.98	1.03	18.07	17.96	1.20	16.57	16.57	1.40	15.11	15.11	1.63	13.67	13.67	1.90	12.26	12.26	2.22
	63 (17.2)††	19.92	15.40	1.03	18.26	14.29	1.20	16.56	13.16	1.40	14.89	12.06	1.63	13.25	10.97	1.91	11.57	9.93	2.22
	67 (19.4)	21.63	16.14	1.01	19.84	14.99	1.18	18.02	13.84	1.38	16.21	12.71	1.62	14.45	11.51	1.90	12.77	10.55	2.22
	72 (22.2)	23.96	13.07	0.99	21.88	12.06	1.16	19.98	11.05	1.36	18.01	10.06	1.60	16.09	9.12	1.88	14.25	8.22	2.21

See notes on pg. 17

DETAILED COOLING CAPACITIES# CONTINUED

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
25HNB636A**31 Outdoor Section With FV4CNB006 Indoor Section – HIGH																		
900	57 (13.9)	33.59	33.59	2.10	32.13	32.13	2.36	30.60	30.60	2.67	28.98	28.98	3.03	27.24	27.24	3.44	25.34	25.34	3.90
	62 (16.7)	35.79	30.52	2.13	33.92	29.55	2.38	31.98	28.55	2.68	29.95	27.51	3.03	27.78	26.41	3.44	25.47	25.23	3.91
	63 (17.2)††	36.56	25.27	2.13	34.65	24.34	2.39	32.68	23.39	2.69	30.59	22.40	3.04	28.37	21.35	3.44	25.95	20.24	3.91
	67 (19.4)	39.56	26.24	2.16	37.50	25.30	2.41	35.38	24.34	2.71	33.12	23.34	3.06	30.72	22.28	3.47	28.13	21.16	3.93
	72 (22.2)	43.66	21.88	2.21	41.43	20.94	2.45	39.09	20.03	2.74	36.62	19.09	3.09	34.00	18.05	3.50	31.17	16.98	3.96
975	57 (13.9)	34.66	34.66	2.12	33.12	33.12	2.38	31.53	31.53	2.69	29.83	29.83	3.04	28.02	28.02	3.45	26.04	26.04	3.92
	62 (16.7)	36.45	31.93	2.14	34.52	30.93	2.39	32.54	29.91	2.69	30.44	28.83	3.05	28.25	27.68	3.45	26.06	26.06	3.92
	63 (17.2)††	37.23	25.25	2.15	35.26	25.31	2.40	33.22	24.33	2.70	31.07	23.32	3.05	28.78	22.25	3.46	26.30	21.12	3.92
	67 (19.4)	40.24	27.28	2.18	38.13	26.33	2.43	35.92	25.34	2.72	33.61	24.32	3.07	31.14	23.24	3.48	28.48	22.10	3.95
	72 (22.2)	44.40	22.51	2.22	42.08	21.60	2.46	39.68	20.67	2.76	37.15	19.70	3.10	34.44	18.66	3.51	31.56	17.58	3.98
1050	57 (13.9)	35.64	35.64	2.14	34.03	34.03	2.40	32.38	32.38	2.70	30.61	30.61	3.06	28.73	28.73	3.47	26.66	26.66	3.94
	62 (16.7)	37.04	33.31	2.16	35.06	32.28	2.41	33.03	31.22	2.71	30.91	30.11	3.06	28.77	28.77	3.47	26.70	26.70	3.94
	63 (17.2)††	37.80	27.21	2.16	35.78	26.24	2.41	33.69	25.26	2.71	31.48	24.22	3.07	29.19	23.13	3.47	26.60	21.97	3.94
	67 (19.4)	40.84	28.30	2.20	38.65	27.32	2.44	36.40	26.32	2.74	34.03	25.28	3.09	31.49	24.18	3.49	28.79	23.03	3.95
	72 (22.2)	45.03	23.16	2.24	42.65	22.24	2.48	40.20	21.29	2.77	37.60	20.30	3.12	34.83	19.26	3.52	31.88	18.16	3.99
1200	57 (13.9)	37.35	37.35	2.18	35.63	35.63	2.43	33.86	33.86	2.74	31.97	31.97	3.09	29.94	29.94	3.50	27.74	27.74	3.97
	62 (16.7)	38.04	35.95	2.19	36.01	34.85	2.44	33.95	33.86	2.74	32.02	32.02	3.09	29.98	29.98	3.50	27.78	27.78	3.97
	63 (17.2)††	38.75	29.06	2.19	36.63	28.06	2.44	34.43	27.03	2.74	32.13	25.96	3.09	29.69	24.84	3.50	27.07	23.64	3.96
	67 (19.4)	41.80	30.27	2.23	39.53	29.26	2.47	37.17	28.23	2.76	34.71	27.15	3.11	32.08	26.02	3.52	29.28	24.82	3.99
	72 (22.2)	46.06	24.41	2.27	43.58	23.47	2.51	41.01	22.49	2.80	38.32	21.48	3.15	35.44	20.41	3.55	32.39	19.28	4.02
25HNB636A**31 Outdoor Section With FV4CNB006 Indoor Section – LOW																			
720	57 (13.9)	25.97	25.97	1.44	24.13	24.13	1.73	22.32	22.32	2.06	20.47	20.47	2.46	18.58	18.58	2.93	16.64	16.64	3.49
	62 (16.7)	27.04	24.32	1.44	24.89	22.65	1.72	22.77	21.00	2.06	20.65	19.36	2.46	18.62	18.62	2.93	16.67	16.67	3.49
	63 (17.2)††	27.62	19.90	1.43	25.41	18.43	1.72	23.23	17.00	2.05	21.04	15.58	2.46	18.80	14.16	2.93	16.53	12.76	3.49
	67 (19.4)	30.03	20.80	1.41	27.65	19.26	1.70	25.29	17.79	2.04	22.92	16.32	2.44	20.50	14.87	2.91	18.05	13.43	3.47
	72 (22.2)	33.45	17.17	1.38	30.80	15.82	1.67	28.18	14.50	2.01	25.56	13.21	2.41	22.91	11.93	2.88	20.21	10.66	3.44
780	57 (13.9)	26.78	26.78	1.44	24.87	24.87	1.72	22.96	22.96	2.06	21.07	21.07	2.46	19.11	19.11	2.93	17.10	17.10	3.49
	62 (16.7)	27.53	25.51	1.44	25.33	23.77	1.72	23.13	22.04	2.06	21.11	21.11	2.46	19.14	19.14	2.93	17.13	17.13	3.49
	63 (17.2)††	28.09	20.73	1.43	25.83	19.21	1.72	23.59	17.73	2.06	21.34	16.26	2.46	19.06	14.80	2.94	16.73	13.35	3.50
	67 (19.4)	30.55	21.66	1.41	28.10	20.10	1.70	25.67	18.57	2.04	23.25	17.06	2.44	20.78	15.56	2.91	18.26	14.07	3.47
	72 (22.2)	34.02	17.75	1.39	31.29	16.36	1.68	28.60	15.01	2.02	25.92	13.69	2.42	23.21	12.37	2.89	20.45	11.08	3.44
840	57 (13.9)	27.53	27.53	1.44	25.56	25.56	1.72	23.60	23.60	2.06	21.61	21.61	2.46	19.59	19.59	2.93	17.51	17.51	3.49
	62 (16.7)	27.98	26.67	1.44	25.76	24.84	1.72	23.64	23.64	2.06	21.65	21.65	2.46	19.63	19.63	2.93	17.54	17.54	3.49
	63 (17.2)††	28.51	21.54	1.43	26.20	19.98	1.72	23.91	18.45	2.06	21.61	18.93	2.46	19.29	15.43	2.94	16.92	13.93	3.50
	67 (19.4)	31.00	22.53	1.41	28.48	20.92	1.70	26.01	19.34	2.04	23.53	17.78	2.44	21.02	16.24	2.92	18.47	14.70	3.47
	72 (22.2)	34.49	18.31	1.39	31.71	16.89	1.68	28.96	15.51	2.02	26.22	14.15	2.42	23.45	12.81	2.89	20.65	11.48	3.44
960	57 (13.9)	28.86	28.86	1.44	26.76	26.76	1.73	24.68	24.68	2.06	22.57	22.57	2.46	20.43	20.43	2.94	18.24	18.24	3.49
	62 (16.7)	28.91	28.91	1.44	26.80	26.80	1.73	24.72	24.72	2.06	22.61	22.61	2.46	20.47	20.47	2.94	18.27	18.27	3.49
	63 (17.2)††	29.20	23.11	1.44	26.80	21.46	1.73	24.44	19.85	2.07	22.06	18.24	2.47	19.67	16.85	2.95	17.25	15.06	3.51
	67 (19.4)	31.73	24.22	1.42	29.12	22.52	1.71	26.56	20.85	2.05	23.99	19.19	2.45	21.42	17.56	2.92	18.80	15.93	3.48
	72 (22.2)	35.28	19.40	1.39	32.39	17.92	1.69	29.55	16.47	2.02	26.71	15.05	2.42	23.87	13.65	2.90	20.98	12.26	3.45

See notes on pg. 17

DETAILED COOLING CAPACITIES# CONTINUED

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																	
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
25HNB648A**31 Outdoor Section With FV4CN(B,F)005 Indoor Section – HIGH																			
1200	57 (13.9)	42.70	42.70	2.91	41.39	41.39	3.26	39.86	39.86	3.66	38.17	38.17	4.13	36.35	36.35	4.69	34.44	34.44	5.34
	62 (16.7)	45.46	39.41	2.92	43.68	38.56	3.27	41.63	37.58	3.67	39.40	36.53	4.14	37.07	35.41	4.69	34.69	34.21	5.35
	63 (17.2)††	46.41	32.56	2.93	44.59	31.70	3.28	42.46	30.72	3.68	40.16	29.67	4.15	37.76	28.58	4.70	35.25	27.48	5.35
	67 (19.4)	50.09	33.77	2.95	48.12	32.90	3.30	45.85	31.92	3.70	43.40	30.88	4.18	40.80	29.80	4.74	38.11	28.70	5.40
	72 (22.2)	55.10	27.96	2.98	52.90	27.06	3.33	50.43	26.08	3.74	47.76	25.04	4.22	44.93	23.95	4.78	41.99	22.85	5.45
1300	57 (13.9)	43.94	43.94	2.94	42.57	42.57	3.29	40.96	40.96	3.69	39.18	39.18	4.16	37.28	37.28	4.72	35.28	35.28	5.38
	62 (16.7)	46.21	41.13	2.95	44.38	40.25	3.30	42.26	39.25	3.70	39.98	38.15	4.17	37.61	36.96	4.72	35.34	35.34	5.38
	63 (17.2)††	47.15	33.75	2.96	45.26	32.87	3.31	43.09	31.87	3.71	40.71	30.81	4.18	38.22	29.71	4.73	35.64	28.59	5.38
	67 (19.4)	50.86	35.03	2.98	48.81	34.14	3.35	46.48	33.15	3.73	43.94	32.10	4.21	41.27	31.01	4.77	38.51	29.90	5.43
	72 (22.2)	55.89	28.74	3.00	53.62	27.94	3.36	51.07	26.84	3.77	48.32	25.79	4.25	45.41	24.70	4.81	42.39	23.58	5.48
1400	57 (13.9)	45.06	45.06	2.97	43.63	43.63	3.32	41.94	41.94	3.72	40.09	40.09	4.19	38.12	38.12	4.75	36.04	36.04	5.42
	62 (16.7)	46.88	42.78	2.98	44.98	41.87	3.33	42.83	40.84	3.73	40.51	39.67	4.20	38.18	38.18	4.75	36.09	36.09	5.42
	63 (17.2)††	47.79	34.89	2.98	45.84	34.00	3.33	43.60	32.99	3.73	41.16	31.92	4.20	38.61	30.81	4.76	35.98	29.67	5.41
	67 (19.4)	51.52	36.24	3.00	49.40	35.35	3.35	47.00	34.35	3.76	44.39	33.28	4.23	41.67	32.19	4.79	38.84	31.06	5.46
	72 (22.2)	56.57	29.50	3.03	54.24	28.58	3.38	51.61	27.59	3.79	48.79	26.52	4.27	45.81	25.41	4.84	42.73	24.30	5.51
1600	57 (13.9)	47.01	47.01	3.02	45.45	45.45	3.38	43.64	43.64	3.78	41.65	41.65	4.26	39.54	39.54	4.82	37.32	37.32	5.48
	62 (16.7)	48.00	45.88	3.03	46.04	44.90	3.38	43.86	43.45	3.78	41.71	41.71	4.26	39.60	39.60	4.82	37.36	37.36	5.49
	63 (17.2)††	48.82	37.09	3.03	46.76	36.17	3.38	44.42	35.15	3.79	41.88	34.05	4.26	39.24	32.91	4.81	36.51	31.74	5.47
	67 (19.4)	52.57	38.56	3.05	50.34	37.67	3.41	47.82	36.66	3.81	45.12	35.57	4.29	42.28	34.45	4.85	39.37	33.30	5.51
	72 (22.2)	57.65	30.93	3.09	55.20	30.01	3.43	52.47	28.99	3.85	49.53	27.91	4.33	46.44	26.80	4.90	43.25	25.67	5.57
25HNB648A**31 Outdoor Section With FV4CN(B,F)005 Indoor Section – LOW																			
960	57 (13.9)	33.65	33.65	1.99	30.83	30.83	2.34	27.95	27.95	2.75	25.05	25.05	3.21	22.16	22.16	3.75	19.33	19.33	4.36
	62 (16.7)	35.08	31.64	1.98	31.83	29.19	2.33	28.52	26.72	2.74	25.24	24.22	3.21	22.20	22.20	3.74	19.36	19.36	4.36
	63 (17.2)††	35.83	25.87	1.98	32.50	23.75	2.33	29.09	21.61	2.74	25.67	19.49	3.20	22.29	17.41	3.74	18.99	15.39	4.37
	67 (19.4)	38.99	27.02	1.95	35.42	24.85	2.30	31.77	22.66	2.71	28.12	20.50	3.18	24.49	18.37	3.72	20.96	16.30	4.34
	72 (22.2)	43.33	22.27	1.92	39.42	20.37	2.27	35.44	18.46	2.68	31.46	16.57	3.15	27.50	14.72	3.69	23.63	12.93	4.31
1040	57 (13.9)	34.67	34.67	2.00	31.75	31.75	2.35	28.77	28.77	2.75	25.77	25.77	3.21	22.79	22.79	3.75	19.87	19.87	4.37
	62 (16.7)	35.69	33.12	1.99	32.38	30.56	2.34	29.03	27.96	2.75	25.82	25.82	3.21	22.83	22.83	3.75	19.90	19.90	4.37
	63 (17.2)††	36.41	26.91	1.96	33.00	24.72	2.34	29.53	22.52	2.74	26.04	20.33	3.21	22.60	18.19	3.75	19.24	16.10	4.38
	67 (19.4)	39.61	28.13	1.96	35.95	25.86	2.31	32.23	23.63	2.72	28.49	21.39	3.19	24.81	19.20	3.73	21.21	17.07	4.35
	72 (22.2)	44.00	22.98	1.93	40.00	21.03	2.28	35.94	19.08	2.69	31.87	17.14	3.16	27.85	15.25	3.70	23.90	13.41	4.32
1120	57 (13.9)	35.59	35.59	2.00	32.58	32.58	2.35	29.51	29.51	2.75	26.43	26.43	3.22	23.36	23.36	3.76	20.35	20.35	4.38
	62 (16.7)	36.25	34.53	2.00	32.90	31.86	2.35	29.57	29.57	2.75	26.47	26.47	3.22	23.40	23.40	3.76	20.38	20.38	4.37
	63 (17.2)††	36.91	27.91	1.99	33.44	25.66	2.35	29.91	23.39	2.75	26.37	21.15	3.22	22.86	18.93	3.76	19.46	16.78	4.39
	67 (19.4)	40.13	29.21	1.97	36.41	26.89	2.32	32.62	24.57	2.73	28.82	22.27	3.20	25.09	20.01	3.74	21.43	17.81	4.36
	72 (22.2)	44.57	23.67	1.93	40.50	21.67	2.29	36.36	19.67	2.70	32.23	17.70	3.17	28.14	15.76	3.71	24.13	13.88	4.33
1280	57 (13.9)	37.21	37.21	2.01	34.04	34.04	2.36	30.81	30.81	2.77	27.57	27.57	3.23	24.35	24.35	3.77	21.18	21.18	4.39
	62 (16.7)	37.28	37.28	2.01	34.09	34.09	2.36	30.86	30.86	2.77	27.62	27.62	3.23	24.38	24.38	3.77	21.21	21.21	4.39
	63 (17.2)††	37.74	29.85	2.01	34.16	27.47	2.36	30.54	25.09	2.77	26.89	22.71	3.24	23.31	20.37	3.78	19.84	19.07	4.41
	67 (19.4)	40.98	31.28	1.98	37.14	28.84	2.34	33.25	26.39	2.75	29.36	23.96	3.22	25.52	21.56	3.76	21.80	19.22	4.38
	72 (22.2)	45.50	24.98	1.95	41.30	22.90	2.31	37.06	20.82	2.72	32.80	18.76	3.19	28.59	16.75	3.73	24.49	14.79	4.35

See notes on pg. 17

DETAILED COOLING CAPACITIES# CONTINUED

EVAPORATOR AIR		CONDENSER ENTERING AIR TEMPERATURES °F (°C)																
		75 (23.9)			85 (29.4)			95 (35)			105 (40.6)			115 (46.1)			125 (51.7)		
CFM	EWB °F (°C)	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**	Capacity MBtuh†		Total System KW**
		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡		Total	Sens‡	
25HNB660A**32 Outdoor Section With FV4CNB006 Indoor Section – HIGH																		
1500	57 (13.9)	51.61	51.61	3.56	49.90	49.90	3.94	48.10	48.10	4.37	46.09	46.09	4.87	43.74	43.74	5.44	40.97	40.97	6.09
	62 (16.7)	54.77	49.03	3.59	52.50	47.37	3.96	50.12	45.69	4.39	47.51	43.92	4.88	44.55	42.00	5.45	41.19	39.81	6.09
	63 (17.2)††	55.96	40.39	3.60	53.60	38.83	3.97	51.15	37.26	4.40	48.45	35.61	4.89	45.37	33.84	5.48	41.83	31.92	6.10
	67 (19.4)	60.55	41.97	3.65	57.92	40.35	4.01	55.18	38.71	4.44	52.16	37.01	4.93	48.79	35.19	5.50	44.94	33.24	6.14
	72 (22.2)	66.85	34.72	3.71	63.83	33.13	4.07	60.69	31.53	4.49	57.28	29.87	4.99	53.46	28.12	5.55	49.17	26.24	6.19
1625	57 (13.9)	53.11	53.11	3.61	51.30	51.30	3.98	49.40	49.40	4.41	47.27	47.27	4.91	44.79	44.79	5.49	41.89	41.89	6.14
	62 (16.7)	55.69	51.18	3.64	53.31	49.45	4.00	50.66	47.70	4.43	48.17	45.86	4.92	45.16	43.80	5.49	41.95	41.95	6.14
	63 (17.2)††	56.85	41.87	3.65	54.40	40.27	4.01	51.85	38.66	4.44	49.04	36.96	4.93	45.87	35.16	5.50	42.23	33.19	6.14
	67 (19.4)	61.48	43.55	3.69	58.74	41.88	4.05	55.90	40.20	4.48	52.79	38.46	4.97	49.30	36.60	5.54	45.33	34.61	6.18
	72 (22.2)	67.83	35.71	3.75	64.70	34.08	4.11	61.44	32.45	4.54	57.91	30.76	5.03	53.96	28.97	5.59	49.57	27.06	5.23
1750	57 (13.9)	54.46	54.46	3.66	52.57	52.57	4.03	50.56	50.56	4.46	48.32	48.32	4.96	45.73	45.73	5.53	42.70	42.70	6.18
	62 (16.7)	56.48	53.25	3.68	54.04	51.45	4.04	51.52	49.63	4.47	48.77	47.65	4.96	45.90	45.80	5.53	42.76	42.76	6.19
	63 (17.2)††	57.62	43.31	3.69	55.08	41.67	4.05	52.43	40.01	4.48	49.55	38.28	4.97	46.29	36.43	5.54	42.57	34.43	6.18
	67 (19.4)	62.27	45.06	3.73	59.45	43.37	4.10	56.50	41.65	4.52	53.30	39.87	5.01	49.72	37.98	5.58	45.66	35.94	6.22
	72 (22.2)	68.68	36.66	3.80	65.44	35.01	4.16	62.06	33.34	4.58	58.44	31.62	5.07	54.40	29.80	5.63	49.90	27.87	6.27
2000	57 (13.9)	56.83	56.83	3.75	54.75	54.75	4.12	52.55	52.55	4.55	50.11	50.11	5.05	47.32	47.32	5.62	44.06	44.06	6.27
	62 (16.7)	57.84	57.13	3.76	55.90	55.14	4.12	52.69	52.60	4.55	50.18	50.18	5.05	47.37	47.37	5.62	44.11	44.11	6.27
	63 (17.2)††	58.85	46.05	3.77	56.15	44.33	4.13	53.37	42.61	4.56	50.34	40.81	5.05	46.95	38.68	5.62	43.11	36.80	6.26
	67 (19.4)	63.55	48.03	3.81	60.55	46.24	4.18	57.46	44.45	4.60	54.09	42.59	5.09	50.35	40.62	5.66	46.16	38.50	6.30
	72 (22.2)	70.02	38.47	3.88	66.60	36.76	4.24	63.06	35.04	4.66	59.25	33.26	5.15	55.05	31.39	5.71	50.39	29.42	6.35
25HNB660A**32 Outdoor Section With FV4CNB006 Indoor Section – LOW																			
1200	57 (13.9)	41.27	41.27	2.45	39.79	39.79	2.83	32.29	32.29	3.27	27.97	27.87	3.78	23.62	23.62	4.35	19.59	19.59	5.01
	62 (16.7)	42.97	39.35	2.43	37.92	36.10	2.82	32.87	32.62	3.27	28.01	27.79	3.78	23.66	23.66	4.35	19.62	19.62	5.01
	63 (17.2)††	43.88	32.14	2.43	38.70	29.32	2.82	33.52	26.49	3.26	28.48	23.70	3.77	23.68	21.00	4.35	19.20	19.40	5.02
	67 (19.4)	47.49	33.46	2.40	41.89	30.56	2.79	36.33	27.67	3.24	30.92	24.82	3.75	25.76	22.04	4.33	20.94	19.38	4.99
	72 (22.2)	52.45	27.41	2.36	46.29	24.87	2.75	40.20	22.34	3.20	34.27	19.86	3.71	28.63	17.46	4.29	23.33	15.17	4.95
1300	57 (13.9)	42.46	42.46	2.45	37.83	37.83	2.84	33.17	33.17	3.28	28.61	28.61	3.79	24.22	24.22	4.36	20.06	20.06	5.02
	62 (16.7)	43.67	41.17	2.45	38.51	37.77	2.84	33.41	34.32	3.28	28.66	28.66	3.79	24.26	24.26	4.36	20.09	20.09	5.02
	63 (17.2)††	44.54	33.40	2.44	39.25	30.50	2.83	33.97	27.58	3.28	28.84	24.71	3.79	23.96	21.92	4.37	19.40	19.23	5.03
	67 (19.4)	48.17	34.81	2.41	42.46	31.82	2.80	36.79	28.84	3.25	31.28	25.89	3.76	26.04	23.03	4.34	21.15	20.28	5.00
	72 (22.2)	53.17	28.25	2.37	46.90	25.56	2.76	40.68	23.07	3.21	34.65	20.53	3.72	28.91	18.07	4.30	23.53	15.72	4.97
1400	57 (13.9)	43.54	43.54	2.46	38.76	38.76	2.85	33.97	33.97	3.29	29.28	29.28	3.80	24.76	24.76	4.38	20.49	20.49	5.03
	62 (16.7)	44.29	42.90	2.46	39.07	39.35	2.85	34.02	34.02	3.29	29.32	29.32	3.80	24.80	24.80	4.38	20.52	20.52	5.03
	63 (17.2)††	45.11	34.63	2.45	39.72	31.64	2.84	34.35	28.64	3.29	29.15	25.69	3.80	24.19	22.80	4.38	19.59	20.03	5.05
	67 (19.4)	48.75	36.12	2.42	42.95	33.05	2.81	37.18	29.97	3.26	31.59	26.94	3.77	26.28	24.00	4.36	21.33	21.15	5.02
	72 (22.2)	53.79	29.08	2.38	47.41	26.42	2.77	41.08	23.77	3.22	34.97	21.16	3.74	29.15	18.67	4.32	23.71	16.27	4.96
1600	57 (13.9)	45.41	45.41	2.48	40.37	40.37	2.87	35.34	35.34	3.31	30.42	30.42	3.82	25.69	25.69	4.40	21.22	21.22	5.06
	62 (16.7)	45.49	45.49	2.48	40.43	40.43	2.87	35.39	35.39	3.31	30.46	30.46	3.82	25.72	25.72	4.40	21.24	21.24	5.06
	63 (17.2)††	46.03	37.00	2.48	40.48	33.85	2.87	34.98	30.69	3.32	29.64	27.56	3.83	24.58	24.51	4.42	19.90	21.53	5.08
	67 (19.4)	49.70	38.66	2.45	43.72	35.42	2.84	37.82	32.17	3.29	32.09	28.97	3.80	26.67	25.85	4.39	21.63	22.81	5.05
	72 (22.2)	54.77	30.65	2.41	48.21	27.89	2.80	41.73	25.13	3.25	35.47	22.44	3.76	29.52	19.83	4.35	23.96	17.33	5.01

† Total and sensible capacities are net capacities. Blower motor heat has been subtracted.

‡ Sensible capacities shown are based on 80°F (27°C) entering air at the indoor coil. For sensible capacities at other than 80°F (27°C), deduct 835 Btuh (245 kW) per 1000 CFM (480 L/S) of indoor coil air for each degree below 80°F (27°C), or add 835 Btuh (245 kW) per 1000 CFM (480 L/S) of indoor coil air per degree above 80°F (27°C).

** System kw is total of indoor and outdoor unit kilowatts.

†† At TVA rating indoor condition (75°F edb/63°F ewb). All other indoor air temperatures are at 80°F edb.

Detailed cooling capacities are based on indoor and outdoor unit at the same elevation per AHRI standard 210/240–08. If additional tubing length and/or indoor unit is located above outdoor unit, a slight variation in capacity may occur.

NOTE: When the required data falls between the published data, interpolation may be performed. Extrapolation is not an acceptable practice.

EWB — Entering Wet Bulb

HEAT PUMP HEATING PERFORMANCE

INDOOR AIR		OUTDOOR COIL ENTERING AIR TEMPERATURES °F (°C)																					
		−3 (−19.4)			7 (−13.9)			17 (−8.3)			27 (−2.8)			37 (2.8)			47 (8.3)			57 (13.9)			67 (19.4)		
EDB °F (°C)	CFM	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total System KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†
		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*	
25HNB624A**32 Outdoor Section With FV4CNF002 Indoor Section – HIGH																							
65 (18.3)	600	9.13	8.40	1.36	12.06	11.06	1.47	15.38	14.02	1.60	18.36	16.30	1.73	21.55	19.61	1.85	24.98	24.98	2.06	28.66	28.66	2.27	32.46	32.46	2.53
	650	9.21	8.47	1.36	12.17	11.18	1.46	15.50	14.13	1.58	18.52	16.45	1.71	21.78	19.82	1.86	25.25	25.25	2.03	28.99	28.99	2.23	32.87	32.87	2.47
	700	9.29	8.54	1.35	12.28	11.29	1.45	15.61	14.23	1.57	18.67	16.58	1.69	21.97	19.99	1.83	25.50	25.50	2.00	29.29	29.29	2.19	33.22	33.22	2.43
	800	9.42	8.67	1.35	12.47	11.46	1.44	15.79	14.40	1.55	18.92	16.80	1.67	22.30	20.29	1.80	25.92	25.92	1.95	29.78	29.78	2.14	33.75	33.75	2.36
70 (21.1)	600	8.73	8.03	1.43	11.61	10.67	1.54	15.05	13.72	1.67	17.97	15.96	1.81	21.11	19.21	1.96	24.49	24.49	2.15	28.12	28.12	2.37	31.91	31.91	2.64
	650	8.81	8.10	1.43	11.73	10.78	1.53	15.18	13.84	1.66	18.14	16.11	1.79	21.33	19.41	1.94	24.76	24.76	2.11	28.44	28.44	2.32	32.28	32.28	2.57
	700	8.89	8.18	1.42	11.85	10.89	1.52	15.29	13.94	1.64	18.29	16.24	1.77	21.53	19.59	1.91	25.00	25.00	2.08	28.74	28.74	2.28	32.62	32.62	2.53
	800	9.04	8.32	1.42	12.04	11.06	1.51	15.48	14.11	1.62	18.54	16.46	1.74	21.86	19.85	1.88	25.40	25.40	2.04	29.21	29.21	2.22	33.15	33.15	2.46
75 (23.9)	600	8.26	7.60	1.50	11.14	10.23	1.61	14.66	13.37	1.75	17.59	15.62	1.89	20.68	18.81	2.05	24.01	24.01	2.24	27.59	27.59	2.45	31.35	31.35	2.75
	650	8.34	7.67	1.49	11.25	10.34	1.60	14.81	13.50	1.73	17.75	15.76	1.86	20.89	19.01	2.02	24.27	24.27	2.20	27.90	27.90	2.41	31.71	31.71	2.68
	700	8.43	7.76	1.49	11.37	10.45	1.59	14.93	13.61	1.72	17.90	15.89	1.85	21.07	19.16	1.99	24.50	24.50	2.17	28.19	28.19	2.37	32.03	32.03	2.63
	800	8.59	7.90	1.49	11.57	10.63	1.58	15.14	13.80	1.70	18.14	16.11	1.82	21.39	19.47	1.96	24.89	24.89	2.12	28.66	28.66	2.31	32.55	32.55	2.58
25HNB624A**32 Outdoor Section With FV4CNF002 Indoor Section – LOW																							
65 (18.3)	480	4.29	3.94	1.03	7.46	6.85	1.14	10.33	9.42	1.23	13.01	11.56	1.31	15.75	14.33	1.39	17.90	17.90	1.47	20.02	20.02	1.55	22.13	22.13	1.66
	520	4.33	3.98	1.03	7.54	6.93	1.13	10.48	9.55	1.22	13.24	11.76	1.29	15.95	14.52	1.37	18.14	18.14	1.44	20.30	20.30	1.51	22.48	22.46	1.61
	560	4.38	4.03	1.03	7.66	7.04	1.13	10.61	9.67	1.21	13.47	11.96	1.28	16.13	14.68	1.35	18.36	18.36	1.41	20.57	20.57	1.48	22.77	22.77	1.57
	640	4.48	4.12	1.04	7.82	7.15	1.13	10.81	9.86	1.20	14.03	12.46	1.27	16.42	14.94	1.32	18.73	18.73	1.38	21.02	21.02	1.44	23.29	23.29	1.51
70 (21.1)	480	4.36	4.01	1.11	6.96	6.40	1.20	9.80	8.94	1.29	12.46	11.07	1.37	15.34	13.96	1.46	17.45	17.45	1.54	19.56	19.56	1.63	21.66	21.66	1.74
	520	4.41	4.06	1.11	7.07	6.50	1.20	9.96	9.08	1.28	12.66	11.25	1.36	15.53	14.13	1.44	17.69	17.69	1.51	19.84	19.84	1.59	21.98	21.98	1.69
	560	4.47	4.12	1.11	7.17	6.59	1.19	10.10	9.21	1.27	12.84	11.41	1.35	15.69	14.28	1.42	17.90	17.90	1.48	20.09	20.09	1.56	22.27	22.27	1.65
	640	4.59	4.22	1.12	7.35	6.75	1.19	10.34	9.43	1.27	13.16	11.69	1.33	16.00	14.56	1.40	18.27	18.27	1.45	20.52	20.52	1.51	22.77	22.77	1.59
75 (23.9)	480	4.10	3.77	1.18	6.39	5.87	1.26	9.23	8.41	1.35	11.89	10.56	1.44	14.87	13.53	1.53	17.02	17.02	1.61	19.10	19.10	1.71	21.20	21.20	1.83
	520	4.17	3.84	1.18	6.49	5.96	1.26	9.39	8.56	1.35	12.09	10.73	1.42	15.08	13.72	1.51	17.24	17.24	1.58	19.37	19.37	1.67	21.50	21.50	1.78
	560	4.24	3.90	1.18	6.59	6.06	1.26	9.53	8.69	1.34	12.26	10.89	1.41	15.27	13.89	1.49	17.44	17.44	1.56	19.61	19.61	1.64	21.78	21.78	1.74
	640	4.37	4.02	1.19	6.78	6.23	1.26	9.76	8.90	1.33	12.60	11.19	1.40	15.56	14.16	1.47	17.80	17.80	1.52	20.03	20.03	1.59	22.26	22.26	1.68

See notes on pg. 21

HEAT PUMP HEATING PERFORMANCE CONTINUED

INDOOR AIR		OUTDOOR COIL ENTERING AIR TEMPERATURES °F (°C)																					
		-3 (-19.4)			7 (-13.9)			17 (-8.3)			27 (-2.8)			37 (2.8)			47 (8.3)			57 (13.9)			67 (19.4)		
EDB °F (°C)	CFM	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys-tem KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†
		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*	
25HNB636A**31 Outdoor Section With FV4CNB006 Indoor Section – HIGH																							
65 (18.3)	900	13.75	12.65	1.90	17.91	16.46	2.01	22.88	20.87	2.15	26.93	23.92	2.26	31.23	28.42	2.42	35.79	35.79	2.60	40.74	40.74	2.81	46.22	46.22	3.03
	975	13.88	12.77	1.90	18.06	16.60	2.00	23.03	21.00	2.13	27.11	24.08	2.25	31.46	28.63	2.36	36.10	36.10	2.55	41.16	41.16	2.75	46.68	46.68	2.94
	1050	13.99	12.87	1.90	18.20	16.72	1.99	23.16	21.12	2.11	27.27	24.22	2.22	31.66	28.81	2.35	36.37	36.37	2.51	41.52	41.52	2.71	46.97	46.97	2.88
	1200	14.18	13.05	1.89	18.44	16.94	1.98	23.36	21.30	2.09	27.54	24.46	2.19	32.02	29.14	2.31	36.81	36.81	2.46	42.09	42.09	2.61	47.10	47.10	2.79
70 (21.1)	900	13.21	12.15	2.00	17.36	15.97	2.11	21.98	20.04	2.25	26.55	23.58	2.39	30.75	27.99	2.54	35.23	35.23	2.72	40.04	40.04	2.93	45.39	45.39	3.16
	975	13.33	12.26	1.99	17.52	16.10	2.10	22.62	20.63	2.24	26.72	23.73	2.36	30.96	28.19	2.50	35.54	35.54	2.67	40.45	40.45	2.87	45.96	45.96	3.08
	1050	13.44	12.35	1.99	17.66	16.23	2.09	22.76	20.75	2.22	26.87	23.86	2.34	31.16	28.38	2.47	35.80	35.80	2.63	40.80	40.80	2.83	46.28	46.28	3.01
	1200	13.63	12.54	1.99	17.89	16.44	2.08	22.99	20.96	2.20	27.13	24.09	2.30	31.52	28.69	2.42	36.23	36.23	2.57	41.36	41.36	2.73	46.54	46.54	2.92
75 (23.9)	900	12.66	11.65	2.10	16.83	15.47	2.22	21.26	19.36	2.35	25.16	23.24	2.52	30.29	27.56	2.67	34.68	34.68	2.85	39.35	39.35	3.07	44.58	44.58	3.33
	975	12.77	11.75	2.09	16.96	15.60	2.21	21.45	19.56	2.33	26.31	23.37	2.48	30.51	27.76	2.63	34.98	34.98	2.80	39.75	39.75	3.01	45.14	45.14	3.22
	1050	12.88	11.85	2.09	17.11	15.72	2.20	21.63	19.72	2.32	26.48	23.50	2.46	30.70	27.94	2.59	35.24	35.24	2.76	40.09	40.09	2.96	45.55	45.55	3.15
	1200	13.05	12.01	2.09	17.31	15.91	2.19	21.92	19.98	2.30	26.72	23.73	2.42	31.04	28.24	2.55	35.66	35.66	2.70	40.65	40.65	2.88	45.91	45.91	3.05
25HNB636A**31 Outdoor Section With FV4CNB006 Indoor Section – LOW																							
65 (18.3)	720	9.56	8.80	1.68	12.50	11.49	1.68	15.65	14.27	1.69	18.68	16.77	1.70	22.67	20.69	1.75	25.24	25.24	1.79	27.66	27.66	1.83	29.86	29.86	1.90
	780	9.69	8.91	1.68	12.65	11.62	1.67	15.82	14.42	1.67	19.06	16.95	1.69	22.85	20.80	1.73	25.45	25.45	1.75	27.93	27.93	1.79	30.18	30.18	1.84
	840	9.80	9.01	1.68	12.78	11.74	1.67	15.97	14.56	1.66	19.26	17.11	1.67	23.02	20.95	1.70	25.64	25.64	1.72	28.16	28.16	1.75	30.46	30.46	1.80
	960	9.97	9.17	1.68	13.00	11.94	1.66	16.23	14.80	1.65	19.57	17.38	1.65	23.26	21.19	1.67	25.95	25.95	1.67	28.55	28.55	1.69	30.92	30.92	1.72
70 (21.1)	720	8.75	8.05	1.75	11.78	10.83	1.75	14.99	13.67	1.76	18.26	16.22	1.79	21.73	19.77	1.83	24.82	24.82	1.88	27.20	27.20	1.94	29.37	29.37	2.00
	780	8.86	8.15	1.75	11.92	10.96	1.74	15.16	13.82	1.75	18.47	16.41	1.77	22.39	20.36	1.82	25.02	25.02	1.85	27.46	27.46	1.89	29.68	29.68	1.95
	840	8.96	8.25	1.75	12.05	11.07	1.74	15.30	13.95	1.74	18.65	16.56	1.75	22.56	20.53	1.79	25.20	25.20	1.81	27.69	27.69	1.85	29.95	29.95	1.90
	960	9.14	8.41	1.75	12.26	11.27	1.73	15.56	14.18	1.73	18.93	16.81	1.73	22.84	20.79	1.76	25.51	25.51	1.77	28.07	28.07	1.79	30.41	30.41	1.82
75 (23.9)	720	7.89	7.26	1.82	11.03	10.14	1.83	14.31	13.05	1.84	17.64	15.67	1.87	20.94	19.06	1.92	24.42	24.42	1.98	26.74	26.74	2.04	28.85	28.85	2.11
	780	7.99	7.35	1.82	11.17	10.26	1.82	14.47	13.20	1.83	17.84	15.84	1.86	21.19	19.29	1.89	24.62	24.62	1.95	26.99	26.99	1.99	29.17	29.17	2.05
	840	8.09	7.44	1.82	11.29	10.37	1.82	14.62	13.33	1.82	18.01	16.00	1.84	21.44	19.51	1.87	24.79	24.79	1.92	27.22	27.22	1.95	29.44	29.44	2.00
	960	8.25	7.59	1.82	11.44	10.51	1.81	14.82	13.51	1.81	18.25	16.21	1.82	21.76	19.80	1.83	25.07	25.07	1.86	27.59	27.59	1.89	29.89	29.89	1.93

See notes on pg. 21

HEAT PUMP HEATING PERFORMANCE CONTINUED

INDOOR AIR		OUTDOOR COIL ENTERING AIR TEMPERATURES °F (°C)																					
		−3 (−19.4)			7 (−13.9)			17 (−8.3)			27 (−2.8)			37 (2.8)			47 (8.3)			57 (13.9)			67 (19.4)		
EDB °F (°C)	CFM	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total System KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†
		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*		Total	Integ*	
25HNB648A**31 Outdoor Section With FV4CN(B,F)005 Indoor Section — HIGH																							
65 (18.3)	1200	17.97	16.53	2.66	23.15	21.27	2.64	29.65	27.03	3.08	35.05	31.13	3.29	40.66	37.19	3.54	47.00	47.00	3.82	53.46	53.46	4.15	60.50	60.50	4.46
	1300	18.06	16.61	2.65	23.28	21.39	2.83	29.83	27.19	3.06	35.29	31.35	3.27	41.21	37.50	3.50	47.42	47.42	3.77	54.04	54.04	4.07	60.92	60.92	4.37
	1400	18.16	16.70	2.65	23.41	21.51	2.83	29.97	27.33	3.04	35.51	31.53	3.25	41.51	37.77	3.48	47.81	47.81	3.74	54.58	54.58	4.01	61.21	61.21	4.31
	1600	18.34	16.89	2.66	23.67	21.75	2.83	30.22	27.56	3.03	35.87	31.86	3.22	42.01	38.23	3.46	48.45	48.45	3.69	55.23	55.23	3.92	61.47	61.47	4.22
70 (21.1)	1200	17.65	16.24	2.82	22.65	20.81	3.00	29.20	26.63	3.23	34.52	30.66	3.45	40.17	36.58	3.69	46.20	46.20	3.98	52.55	52.55	4.32	59.63	59.63	4.65
	1300	17.75	16.33	2.82	22.80	20.95	2.99	29.41	26.81	3.21	34.77	30.88	3.42	40.52	36.87	3.66	46.62	46.62	3.93	53.08	53.06	4.25	60.01	60.01	4.56
	1400	17.87	16.44	2.82	22.97	21.10	2.99	29.59	26.98	3.20	34.99	31.08	3.40	40.82	37.15	3.63	47.00	47.00	3.90	53.59	53.59	4.18	60.34	60.34	4.49
	1600	18.11	16.66	2.83	23.27	21.38	2.99	29.91	27.27	3.19	35.36	31.42	3.38	41.34	37.62	3.60	47.64	47.64	3.85	54.36	54.36	4.09	60.66	60.66	4.39
75 (23.9)	1200	17.13	15.76	2.99	22.03	20.25	3.16	27.68	25.23	3.36	33.94	30.15	3.61	39.46	35.93	3.86	45.41	45.41	4.16	51.70	51.70	4.51	58.75	58.75	4.85
	1300	17.26	15.88	2.99	22.20	20.40	3.15	27.91	25.45	3.34	34.20	30.37	3.58	39.82	36.23	3.82	45.82	45.82	4.11	52.16	52.16	4.44	59.15	59.15	4.75
	1400	17.40	16.01	2.99	22.36	20.57	3.14	28.16	25.67	3.33	34.43	30.58	3.56	40.12	36.51	3.79	46.19	46.19	4.07	52.61	52.61	4.37	59.46	59.46	4.68
	1600	17.67	16.25	3.00	22.71	20.67	3.15	28.66	26.13	3.33	34.84	30.94	3.54	40.64	36.98	3.76	46.82	46.82	4.01	53.46	53.46	4.27	59.84	59.84	4.58
25HNB648A**31 Outdoor Section With FV4CN(B,F)005 Indoor Section — LOW																							
65 (18.3)	960	10.75	9.89	2.21	15.52	14.27	2.28	20.06	18.29	2.35	24.42	21.69	2.42	29.36	26.71	2.53	33.07	33.07	2.61	36.89	36.89	2.72	40.84	40.84	2.87
	1040	10.91	10.03	2.22	15.72	14.45	2.28	20.30	18.50	2.34	24.72	21.96	2.40	29.61	26.94	2.49	33.39	33.39	2.57	37.30	37.30	2.67	41.32	41.32	2.80
	1120	11.03	10.15	2.22	15.89	14.60	2.28	20.50	18.69	2.33	24.98	22.18	2.39	29.85	27.16	2.47	33.67	33.67	2.53	37.64	37.64	2.62	41.76	41.76	2.73
	1280	11.25	10.36	2.23	16.19	14.88	2.28	20.85	19.01	2.32	25.43	22.56	2.36	30.22	27.59	2.43	34.15	34.15	2.48	38.21	38.21	2.55	42.41	42.41	2.62
70 (21.1)	960	9.82	9.03	2.31	14.51	13.43	2.39	19.16	17.47	2.45	23.53	20.89	2.54	28.66	26.08	2.66	32.39	32.39	2.75	36.17	36.17	2.87	40.06	40.06	3.02
	1040	9.96	9.16	2.31	14.79	13.59	2.38	19.39	17.68	2.45	23.82	21.16	2.52	28.96	26.35	2.62	32.72	32.72	2.71	36.57	36.57	2.81	40.53	40.53	2.95
	1120	10.08	9.26	2.32	14.97	13.75	2.38	19.61	17.88	2.44	24.08	21.39	2.50	29.21	26.58	2.60	33.00	33.00	2.67	36.91	36.91	2.76	40.95	40.95	2.89
	1280	10.31	9.45	2.33	15.26	14.02	2.39	19.97	18.21	2.43	24.53	21.78	2.48	29.61	26.95	2.56	33.48	33.48	2.61	37.49	37.49	2.69	41.68	41.68	2.77
75 (23.9)	960	9.86	9.07	2.43	13.59	12.49	2.49	18.18	16.58	2.57	22.58	20.06	2.65	27.03	24.60	2.76	31.72	31.72	2.89	35.43	35.43	3.01	39.26	39.26	3.17
	1040	9.99	9.19	2.44	13.77	12.66	2.49	18.41	16.78	2.56	22.85	20.32	2.64	27.47	25.00	2.73	32.04	32.04	2.85	35.82	35.82	2.96	39.74	39.74	3.10
	1120	9.77	8.99	2.44	13.94	12.81	2.49	18.63	16.99	2.56	23.13	20.55	2.62	27.91	25.40	2.71	32.32	32.32	2.81	36.17	36.17	2.91	40.16	40.16	3.04
	1280	9.98	9.18	2.45	14.24	13.06	2.50	18.99	17.32	2.56	23.58	20.94	2.60	28.92	26.32	2.69	32.79	32.79	2.76	36.74	36.74	2.84	40.87	40.87	2.94

See notes on pg. 21

HEAT PUMP HEATING PERFORMANCE CONTINUED

INDOOR AIR		OUTDOOR COIL ENTERING AIR TEMPERATURES °F (°C)																					
		−3 (−19.4)			7 (−13.9)			17 (−8.3)			27 (−2.8)			37 (2.8)			47 (8.3)			57 (13.9)			67 (19.4)		
EDB °F (°C)	CFM	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys-tem KW†	Capacity MBtuh		Total Sys. KW†	Capacity MBtuh		Total Sys. KW†
		Total	Integ‡		Total	Integ‡		Total	Integ‡		Total	Integ‡		Total	Integ‡		Total	Integ‡		Total	Integ‡		Total	Integ‡	
25HNB660A**32 Outdoor Section With FV4CNB006 Indoor Section — HIGH																							
65 (18.3)	1500	23.79	21.88	3.26	29.29	26.92	3.46	36.45	33.23	3.72	42.61	38.02	3.97	50.01	45.51	4.27	57.93	57.93	4.63	66.85	66.85	4.96	75.37	75.37	5.43
	1625	24.02	22.09	3.27	29.54	27.14	3.46	36.69	33.45	3.71	43.07	38.25	3.95	50.33	45.80	4.24	58.31	58.31	4.58	67.16	67.16	4.91	75.53	75.53	5.33
	1750	24.26	22.32	3.28	29.79	27.38	3.47	36.89	33.63	3.70	43.31	38.47	3.94	50.62	46.07	4.22	58.70	58.70	4.53	67.40	67.40	4.86	75.47	75.47	5.25
	2000	24.72	22.74	3.32	30.26	27.80	3.49	37.26	33.97	3.71	43.75	38.86	3.93	51.14	46.53	4.20	59.34	59.34	4.47	67.57	67.57	4.79	72.61	72.61	5.06
70 (21.1)	1500	22.84	21.01	3.40	28.50	26.19	3.61	36.04	32.86	3.88	42.34	37.61	4.15	49.45	45.00	4.46	57.25	57.25	4.83	66.02	66.02	5.19	74.43	74.43	5.56
	1625	23.07	21.22	3.41	28.74	26.41	3.61	36.27	33.07	3.87	42.61	37.84	4.13	49.77	45.29	4.43	57.63	57.63	4.78	66.38	66.38	5.11	74.67	74.67	5.55
	1750	23.30	21.44	3.42	28.99	26.64	3.62	36.48	33.26	3.87	42.85	38.06	4.11	50.06	45.55	4.40	58.00	58.00	4.74	66.64	66.64	5.06	74.68	74.68	5.47
	2000	23.75	21.85	3.46	29.44	27.06	3.64	36.85	33.60	3.88	43.26	38.44	4.11	50.57	46.02	4.38	58.68	58.68	4.67	66.90	66.90	4.99	72.84	72.84	5.30
75 (23.9)	1500	21.87	20.12	3.54	27.71	25.46	3.76	34.56	31.51	4.03	41.69	37.21	4.34	48.89	44.49	4.66	56.55	56.55	5.03	65.15	65.16	5.40	73.45	73.45	5.88
	1625	22.08	20.32	3.55	27.94	25.67	3.77	34.84	31.75	4.02	42.15	37.43	4.31	49.21	44.78	4.62	56.94	56.94	4.98	65.56	65.56	5.33	73.74	73.74	5.78
	1750	22.32	20.53	3.57	28.18	25.90	3.77	35.20	32.09	4.02	42.39	37.65	4.30	49.50	45.05	4.60	57.30	57.30	4.94	65.85	65.85	5.27	73.83	73.83	5.70
	2000	22.75	20.93	3.60	28.63	26.31	3.80	35.40	33.19	4.05	42.82	38.03	4.29	50.01	45.51	4.57	57.99	57.99	4.87	66.19	66.19	5.20	72.85	72.85	5.55
25HNB660A**32 Outdoor Section With FV4CNB006 Indoor Section — LOW																							
65 (18.3)	1200	13.69	12.59	2.67	19.50	17.92	2.75	25.04	22.83	2.84	30.30	26.91	2.94	35.80	32.58	3.07	39.55	39.55	3.18	42.98	42.98	3.30	46.15	46.15	3.40
	1300	13.81	12.71	2.68	19.67	18.08	2.75	25.29	23.05	2.83	30.62	27.19	2.92	36.10	32.85	3.04	39.97	39.97	3.13	43.47	43.47	3.24	46.62	46.62	3.32
	1400	13.95	12.83	2.69	19.87	18.28	2.75	25.53	23.27	2.83	30.92	27.46	2.90	36.39	33.11	3.01	40.32	40.32	3.09	43.89	43.89	3.19	47.03	47.03	3.26
	1600	14.22	13.08	2.71	20.21	18.57	2.77	25.94	23.65	2.82	31.45	27.93	2.89	36.86	33.54	2.97	40.89	40.89	3.04	44.64	44.64	3.10	47.54	47.64	3.18
70 (21.1)	1200	12.56	11.56	2.79	18.42	16.93	2.87	23.96	21.87	2.97	29.23	25.96	3.07	35.00	31.85	3.22	38.74	38.74	3.33	42.09	42.09	3.46	45.24	45.24	3.57
	1300	12.73	11.72	2.80	18.60	17.09	2.87	24.24	22.10	2.96	29.55	26.25	3.06	35.38	32.17	3.19	39.13	39.13	3.29	42.58	42.58	3.40	45.78	45.78	3.49
	1400	12.89	11.86	2.81	18.80	17.28	2.88	24.50	22.33	2.96	29.87	26.53	3.04	35.67	32.46	3.16	39.50	39.50	3.25	43.01	43.01	3.35	46.18	46.18	3.43
	1600	13.13	12.08	2.83	19.16	17.61	2.89	24.93	22.73	2.95	30.41	27.01	3.02	36.13	32.88	3.12	40.09	40.09	3.20	43.75	43.75	3.27	46.81	46.81	3.34
75 (23.9)	1200	12.10	11.14	2.92	17.17	15.78	3.00	22.60	20.79	3.10	28.07	24.93	3.21	33.24	30.25	3.34	37.87	37.87	3.50	41.18	41.18	3.63	44.31	44.31	3.75
	1300	12.26	11.30	2.93	17.37	15.96	3.00	23.05	21.02	3.09	28.41	25.23	3.19	33.69	30.66	3.31	38.28	38.28	3.45	41.66	41.66	3.57	44.86	44.86	3.66
	1400	12.44	11.44	2.94	17.58	16.15	3.00	23.32	21.26	3.09	28.73	25.51	3.18	34.38	31.28	3.30	38.63	38.63	3.41	42.08	42.08	3.52	45.31	45.31	3.60
	1600	11.89	10.94	2.95	17.95	16.50	3.02	23.79	21.69	3.09	29.27	25.99	3.16	35.34	32.16	3.26	39.23	39.23	3.36	42.79	42.79	3.45	45.96	45.96	3.51

NOTE: When the required data falls between the published data, interpolation may be performed. Extrapolation is not an acceptable practice.

‡ The Btuh heating capacity values shown are net integrated values from which the defrost effect has been subtracted. The Btuh heating from supplement heaters should be added to those values to obtain total system capacity.

† The kW values include the compressor, outdoor fan motor, and indoor blower motor. The kW from supplement heaters should be added to these values to obtain total system kilowatts.

EDB — Entering Dry Bulb

GUIDE SPECIFICATIONS
GENERAL

System Description

Outdoor-mounted, air-cooled, split-system heat pump unit suitable for ground or rooftop installation. Unit consists of a hermetic compressor, an air-cooled coil, forward-swept blade propeller-type condenser fan, and a control box. Unit will discharge supply air upward as shown on contract drawings. Unit will be used in a refrigeration circuit to match up to a packaged fan coil or coil unit.

Quality Assurance

- Unit will be rated in accordance with the latest edition of AHRI Standard 240.
- Unit will be certified for capacity and efficiency, and listed in the latest AHRI directory.
- Unit construction will comply with latest edition of ASHRAE and with NEC.
- Unit will be constructed in accordance with UL standards and will carry the UL label of approval. Unit will have C-UL approval.
- Unit cabinet will be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500-hr salt spray test.
- Air-cooled condenser coils are pressure tested and the outdoor units are leak tested.
- Unit constructed in ISO9001 approved facility.

Delivery, Storage, and Handling

- Unit will be shipped as single package only and is stored and handled per unit manufacturer's recommendations.

Warranty (for inclusion by specifying engineer)

- U.S. and Canada only.

PRODUCTS

Equipment

- Factory-assembled, single-piece, air-cooled heat pump unit. Contained within the unit enclosure is all factory wiring, piping, controls, compressor, refrigerant charge Puron® (R-410A) refrigerant, and special features required prior to field start-up.

Unit Cabinet

- Unit cabinet will be constructed of galvanized steel, bonderized, and coated with a powder coat paint.

Fans

- Condenser fan will be direct-drive propeller type, forward swept blade, discharging air upward.
- Condenser fan motors will be totally enclosed, 1-phase type with class B insulation and permanently lubricated.
- Shafts will be corrosion resistant.
- Fan blades will be statically and dynamically balanced.
- Condenser fan openings will be equipped with coated steel wire safety guards.

Compressor

- Compressor will be hermetically sealed.
- Compressor will be mounted on rubber vibration isolators.
- Compressor will be covered with a sound absorbing blanket.

Condenser Coil

- Condenser coil will be air cooled.
- Coil will be constructed of aluminum fins mechanically bonded to copper tubes which are then cleaned, dehydrated, and sealed.

Refrigeration Components

- Refrigeration circuit components will include liquid-line front-seating shutoff valve with sweat connections, vapor-line back-seating shutoff valve with sweat connections, system charge of Puron® (R-410A) refrigerant, POE compressor oil, accumulator, and reversing valve.
- Unit will be equipped with high-pressure switch, loss-of-charge switch, and filter drier for Puron® refrigerant.

Operating Characteristics

- The capacity of the unit will meet or exceed _____ Btuh at a suction temperature of _____ °F (°C). The power consumption at full load will not exceed _____ kW.
- Combination of the unit and the evaporator or fan coil unit will have a total net cooling capacity of _____ Btuh or greater at conditions of _____ CFM entering air temperature at the evaporator at _____ °F (°C) wet bulb and _____ °F (°C) dry bulb, and air entering the unit at _____ °F (°C).
- The system will have a SEER of _____ Btuh/watt or greater at DOE conditions.

Electrical Requirements

- Nominal unit electrical characteristics will be _____ v, single phase, 60 hz. The unit will be capable of satisfactory operation within voltage limits of _____ v to _____ v.
- Unit electrical power will be single point connection.
- Control circuit will be 24v.

Special Features

- Refer to section of this literature identifying accessories and descriptions for specific features and available enhancements.

SYSTEM DESIGN SUMMARY

1. Intended for outdoor installation with free air inlet and outlet. Outdoor fan external static pressure available is less than 0.01-in. wc.
2. Minimum outdoor operating air temperature without low-ambient operation accessory is 55°F (12.8°C).
3. The maximum outdoor operating ambient in cooling mode is 125°F (51.67°C) when operating voltage is 230v. For 208v applications, the maximum outdoor ambient is 120°F (48.9°C).
4. Minimum outdoor operating air temperature for heating mode is –20°F (–28.9°C).
5. Maximum outdoor operating air temperature for heating mode is 66°F (18.9°C).
6. For reliable operation, unit should be level in all horizontal planes.
7. For interconnecting refrigerant tube lengths greater than 80 ft (23.4 m) and/or elevation differences between indoor and outdoor units greater than 20 ft (6.1 m), consult Residential Piping and Longline Guideline and Service Manual available from equipment distributor.
8. If any refrigerant tubing is buried, provide a 6 in. (152.4 mm) vertical rise to the valve connections at the unit. Refrigerant tubing lengths up to 36 in. (914.4 mm) may be buried without further consideration. Do not bury refrigerant lines longer than 36 in. (914.4 mm).
9. Use only copper wire for electric connection at unit. Aluminum and clad aluminum are not acceptable for the type of connector provided.
10. Do not apply capillary tube indoor coils to these units.
11. Factory-supplied filter drier must be installed.

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Edition Date: 04/13

Catalog No: 25HNB6-7PD

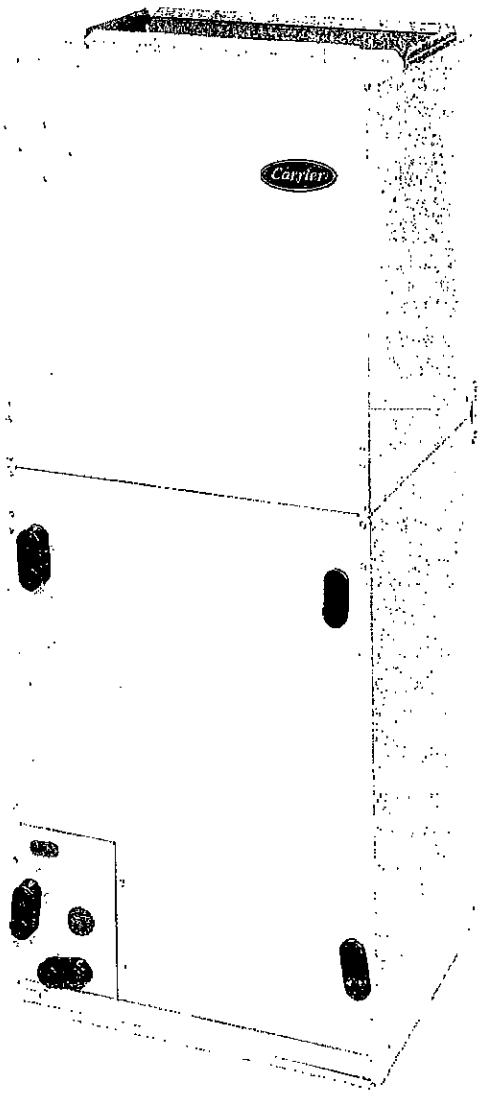
Manufacturer reserves the right to change, at any time, specifications and designs without notice and without obligations.

Replaces: 25HNB6-6PD

FV4C
Performance™ Series Fan Coil
Sizes 002 Thru 006

Carrier
turn to the experts

Product Data



PREMIUM ENVIRONMENTALLY SOUND FAN COIL

The FV4C is the premium air handler combining the proven technology of Carrier fan coils with environmentally sound Puron® refrigerant. The FV4C achieves an operational advantage when the ECM (Electronically Commutated Motor) is combined with a Carrier Performance™ heat pump with Puron® refrigerant.

With attention to quiet, efficient, and comfortable operation, Carrier has developed a new benchmark for superior indoor comfort and control.

Carrier's heat pump and air conditioning systems now feature Puron® refrigerant (R-410A), the chlorine-free refrigerant that is the future for the residential heating and cooling industry. The FV4C using Puron® refrigerant maximizes performance for environmentally sound systems. In addition to environmental safety, these systems are 30 to 40% more efficient than standard heating and cooling systems, thereby combining excellence in efficiency and environmental safety.

The FV4C provides these benefits due to Carrier's command of ECM technology. These motors are extremely efficient at all speeds, and enable the FV4C to operate at the correct speed to deliver airflow precisely, ensuring proper performance across a wide range of duct static pressures. This adaptive efficiency also makes installation quality easier to achieve for today's demanding homeowner.

Carrier's command of ECM technology may be most evident in the comfort advantages that ECM can deliver. Operation set up steps on the Easy Select™ Board provide the installing technician with alternatives to maximize comfort and efficiency. For true indoor comfort, the homeowner can achieve command of both temperature and humidity in cooling and heating modes.

Another feature which sets the FV4C apart is the factory-installed TXV, which enhances efficiency and provides compressor protecting operation at all recommended conditions. Grooved tubing, louvered aluminum fins, and the large face areas of the FV4C refrigerant coils also provide superior efficiency, for high SEER and HSPF performance. Carrier leads the way in condensate control, a hallmark of these multipoise fan coils. All of these featured components are protected within a rugged, prepainted metal cabinet lined with super thick, high density insulation. For neat, high quality installations the unit exterior features sweat refrigerant connections for simple leak free performance, and multiple electrical entry for both high and low voltage service.

For superior technology and unmatched comfort, the environmentally sound and efficient FV4C can't be beat.

FEATURES

Environmentally Sound Refrigerant Technology

- Puron®, chlorine-free, non-ozone depleting refrigerant
- Thermostatic Expansion Valve (TXV) designed to maximize performance with Puron® refrigerant

Energy Efficient Operation

- Electronically Commutating Motor (ECM) operates efficiently at all speeds
- Maximizes efficiency of heating and cooling systems
- Ultra low power consumption during fan only operation

Indoor Weather Control

- Warm, comfortable heating air temperatures
- Unmatched humidity control, especially with Carrier's thermostat with relative humidity controls

Airflow and Sound Technology

- Diffuser air discharge section for high airflow efficiency and quiet, smooth operation
- High duct static capability
- Unique cabinet design that meets new stringent regulations for air leakage. Meets requirements of a 2% cabinet leakage rate when tested at 1.0 inches of static pressure

Condensate Control and Disposal Technology

- Minimal standing waterless microbial growth for improved IAQ and reduced condensate line clogging and related condensate leakage
- Condensate fittings relocated away from turbulent airflow patterns at the blower entrance for improved condensate control performance
- Overflow feature for slope coil units allows condensate to exit the unit without damage to product under clogged primary and secondary line conditions
- Tested for condensate disposal at conditions much more severe than those required by AHRI
- Primary and secondary drain connections to comply with HUD
- All pans constructed of an injection molded glass-filled polycarbonate engineered resin material, with brass drain connections.
- High density, super thick cabinetry insulation with vapor barrier
- Pre-painted galvanized sheet metal cabinet

Heat Transfer Technology

- Grooved tubing
- Lanced sine wave aluminum fins
- Discreet refined counter-flow refrigerant circuitry
- Bi-flow hard shut-off TXV metering device

Quality Assisting, Ease of Installation and Service Features

- All units multipoise
- Provision made for suspending from roof or ceiling joints
- Modular cabinet on 003 thru 006 units
- Sweat connections for leak free service
- Multiple electrical entry for application flexibility (high and low voltage)
- Low voltage terminal strip, to safely hold connections within the cabinet
- Cabinet construction features innovations designed to prevent cabinet sweating

Controls and Electrical Features

- Easy Select™ Board to maximize comfort, efficiency, and safe heater airflow operation
- Easy plug connection provided for quick installation of accessory heater packages
- 40VA 208/230v transformer
- Replaceable 5-amp blade-type auto fuse protects against transformer secondary short

Filter Features

- Factory supplied filter
- Cleanable polyester filter media
- Filter "springs" out for easy access - no tools required
- Newly improved filter rack area - filter door insulation added for an improved air seal

MODEL NUMBER NOMENCLATURE

1	2	3	4	5	6	7	8	9	10	11	12
F	V	4	C	N	B	0	0	3	0	0	0

Product
F = Fan Coil

Type
V = Puron® Refrigerant

Position
4 = Multipoise

Series
C

Electrical
N = 208/230v, 1ph–60 Hz

Cabinet/Insulation
B = Modular
F = Single piece

Capacity
002 = 18–36,000
003 = 24–42,000
005 = 30–48,000
006 = 30–60,000

Coil Type
T00 = Tin–plated
000 = Copper
L00 = Aluminum

FV4C

Puron
the environmentally sound refrigerant

AHRI CERTIFIED
Use of the AHRI Certified TM Mark indicates a manufacturer's participation in the program. For verification of certification for individual products, go to www.ahridirectory.org.

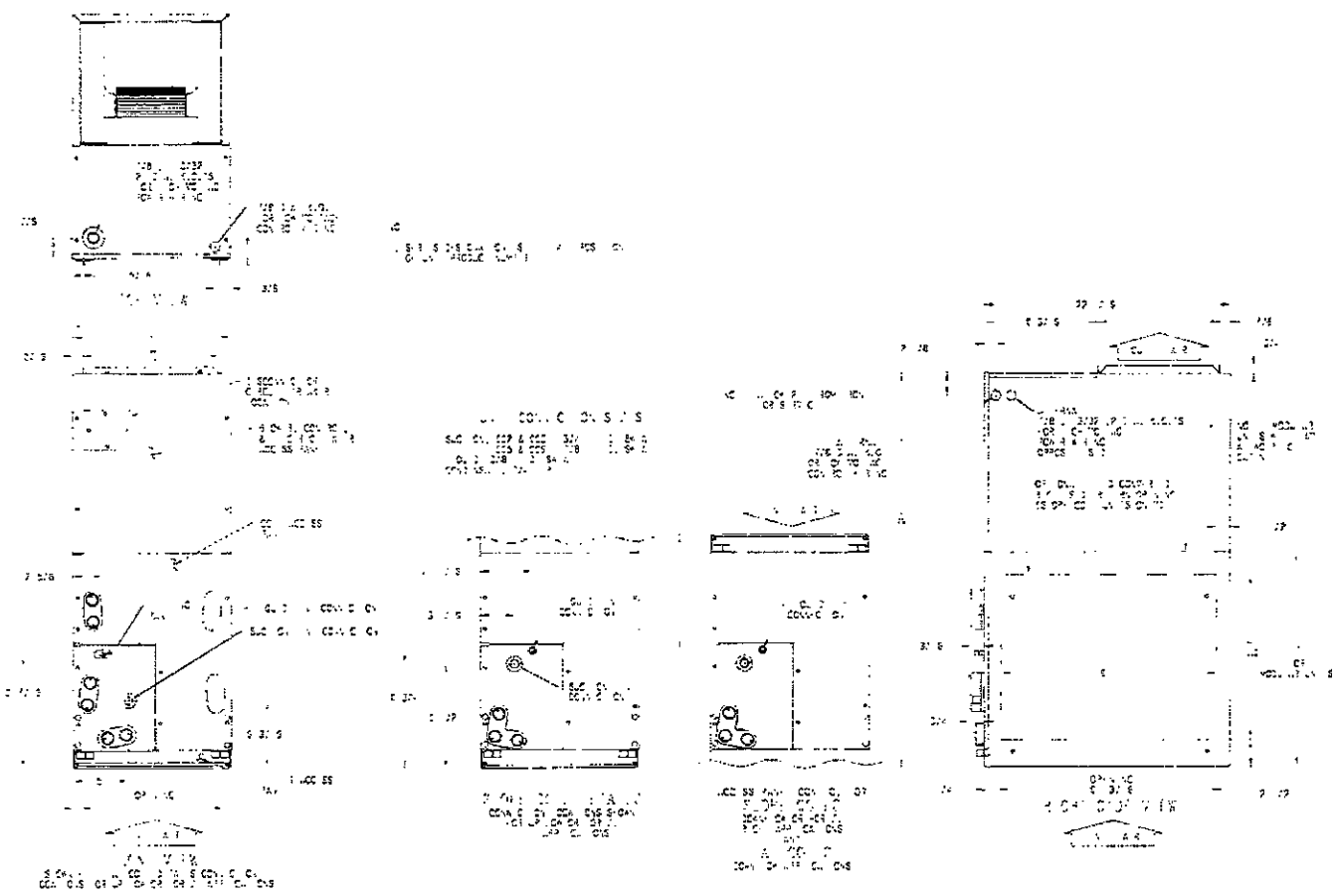
Certified System
ISO 9001

c UL us

ArmorTech

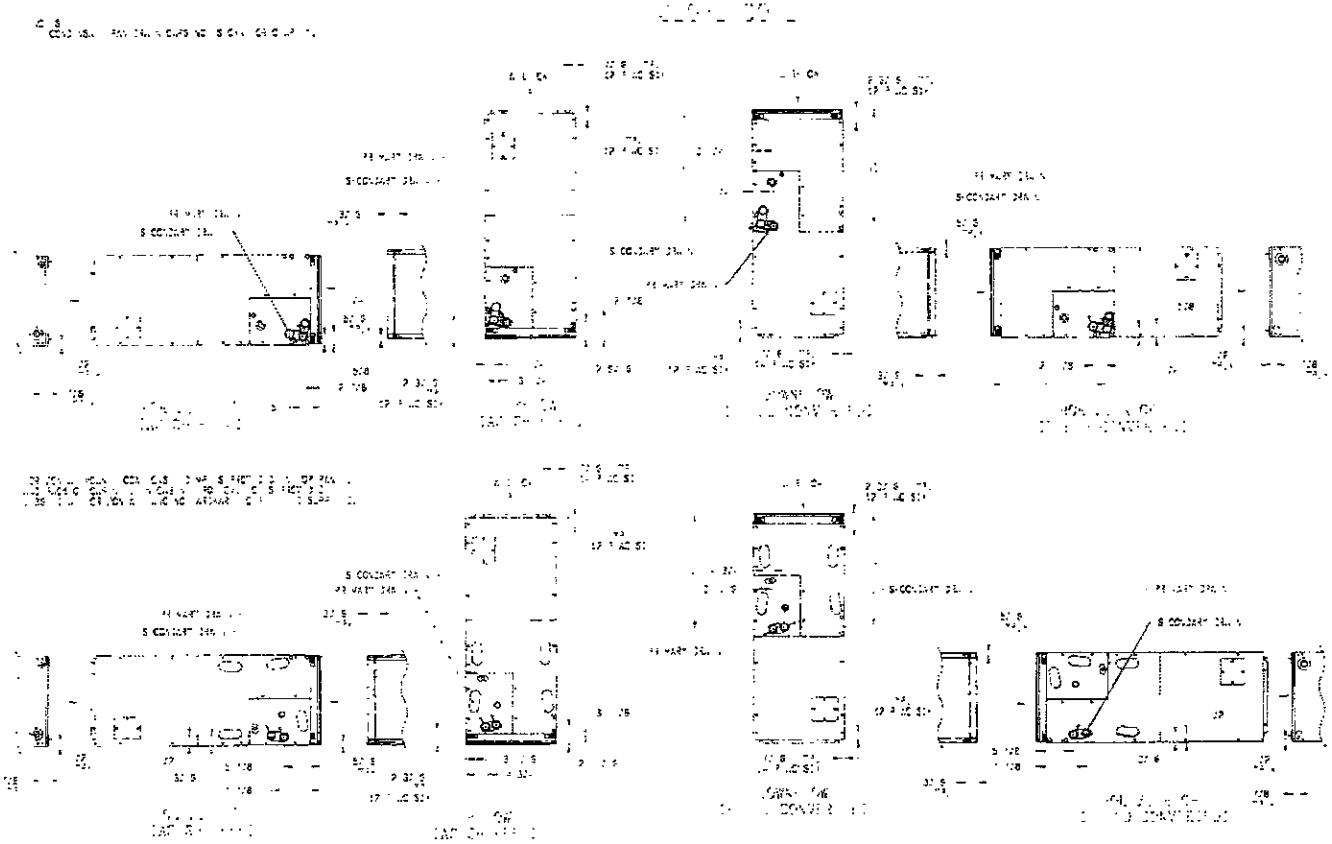
SPECIFICATIONS

MODEL FV4C	002	003	005	006
COIL				
Refrigerant Metering Device	Puron® Refrigerant (R–410A)			
TXV Size	2 Ton	3 Ton	4 Ton	5 Ton
Rows/Fins Per In.	3 / 14.5			
Face Area (Sq Ft)	3.46		5.93	7.42
Configuration	A	Slope	A	
BLOWER & MOTOR				
Air Discharge	Upflow, Downflow, Horizontal			
CFM (Nominal Clg/Htg)	525 / 470 700 / 630 875 / 785 1050 / 945	700 / 630 875 / 785 1050 / 945 1225 / 1100	875 / 785 1050 / 945 1225 / 1100 1400 / 1260	1050 / 945 1225 / 1100 1400 / 1260 1750 / 1575
Motor HP (ECM)	1/2			3/4
FILTER CLEANABLE				
21–1/2" (546 mm) by	16–3/8" (417 mm)	19–7/8" (505 mm)		23–5/16" (585 mm)
CABINET CONFIGURATION OPTIONS				
	1 Piece	1 Piece or Modular		Modular



DIMENSIONS

UNIT SIZE	A		B		C		D		E		H		J	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
FV4CNB003	53–7/16	1357	21–1/8	537	19–1/4	489	19–1/8	486	19–3/16	487	28–5/16	735	19	483
FV4CNB005	53–7/16	1357	21–1/8	537	19–1/4	489	19–1/8	486	19–3/16	487	28–5/16	735	—	—
FV4CNB006	59–3/16	1503	24–11/16	627	22–3/4	578	22–11/16	576	25–1/4	642	34–1/16	865	—	—
FV4CNF002	42–11/16	1084	17–5/8	448	15–3/4	400	15–5/8	397	10–3/4	273	—	—	—	—
FV4CNF003	53–7/16	1357	21–1/8	537	19–1/4	489	19–1/8	486	19–3/16	487	—	—	19	483
FV4CNF005	53–7/16	1357	21–1/8	537	19–1/4	489	19–1/8	486	19–1/2	495	—	—	—	—



DIMENSIONS

UNIT SIZE	F		G		COIL TYPE	SHIPPING WEIGHT	
	in	mm	in	mm		lb	kg
FV4CNB003	26–15/16	684	27–1/2	699	SLOPE	150	68
FV4CNB005	26–15/16	684	27–1/2	699	A	172	78
FV4CNB006	32–15/16	837	32–5/8	829	A	207	94
FV4CNF002	18–9/16	471	18–1/4	464	A	135	61
FV4CNF003	26–15/16	684	27–1/2	699	SLOPE	150	68
FV4CNF005	27–1/4	692	26–15/16	684	A	172	78

PERFORMANCE DATA

FV4C ADVANCED FAN COIL AIRFLOW DELIVERY CHART (CFM)

UNIT SIZE	OUTDOOR UNIT CAPACITY	SINGLE—SPEED APPLICATION		TWO—SPEED APPLICATION				FAN ONLY		
				High Speed		Low Speed				
		Nominal A/C Cooling	A/C Cooling Dehumidify	Nominal A/C Cooling	A/C Cooling Dehumidify	Nominal A/C Cooling	A/C Cooling Dehumidify	Lo	Med	High
002	018	525	420	—	—	—	—	350	420	525
	024	700	560	700	560	560	450	350	560	700
	030	875	700	—	—	—	—	440	700	875
	036	1050	840	1050	840	840	670	525	840	1050
003	024	700	560	700	560	560	450	415	560	700
	030	875	700	—	—	—	—	440	700	875
	036	1050	840	1050	840	840	670	525	840	1050
	042	1225	980	—	—	—	—	610	980	1225
005	030	875	700	—	—	—	—	440	700	875
	036	1050	840	1050	840	840	670	525	840	1050
	042	1225	980	—	—	—	—	610	980	1225
	048	1400	1120	1400	1120	1120	895	700	1120	1400
006	036	1050	840	1050	840	840	670	540	840	1050
	042	1225	980	—	—	—	—	610	980	1225
	048	1400	1120	1400	1120	1120	895	700	1120	1400
	060	1750	1400	1750	1400	1400	1120	875	1400	1750

NOTES:

1. The above airflows result with the AC, HP CFM ADJUST select jumper set on NOM.
2. Air flow can be adjusted +15% or −10% by selecting HI or LO respectively for all modes except fan only.
3. Dry coil at 230 volts and with 10kW heater and filter installed.
4. Airflows shown are at standard air conditions.

*Consult ARI ratings before matching outdoor unit with FV4C fan coil.

FV4C ADVANCED FAN COIL AIRFLOW DELIVERY CHART (CFM)

UNIT SIZE	OUTDOOR UNIT CAPACITY	SINGLE—SPEED APPLICATION		TWO—SPEED APPLICATION				FAN ONLY		
				High Speed		Low Speed				
		Heat Pump Comfort	Heat Pump Efficiency	Heat Pump Comfort	Heat Pump Efficiency	Heat Pump Comfort	Heat Pump Efficiency	Lo	Med	High
002	018	470	525	—	—	—	—	350	380	470
	024	630	700	630	700	505	560	350	505	630
	030	785	875	—	—	—	—	390	630	785
	036	945	1050	945	1050	755	840	470	755	945
003	024	630	700	630	700	415	560	415	505	630
	030	785	875	—	—	—	—	415	630	785
	036	945	1050	945	1050	755	840	470	755	945
	042	1100	1225	—	—	—	—	550	880	1100
005	030	785	875	—	—	—	—	425	630	785
	036	945	1050	945	1050	755	840	470	755	945
	042	1100	1225	—	—	—	—	550	880	1100
	048	1260	1400	1260	1400	1010	1120	630	1010	1260
006	036	945	1050	945	1050	755	840	540	755	945
	042	1100	1225	—	—	—	—	550	880	1100
	048	1260	1400	1260	1400	1010	1120	630	1010	1260
	060	1575	1750	1575	1750	1260	1400	785	1260	1575

NOTES:

1. The above airflows result with the AC, HP CFM ADJUST select jumper set on NOM.
2. Air flow can be adjusted +15% or −10% by selecting HI or LO respectively for all modes except fan only.
3. Dry coil at 230 volts and with 10kW heater and filter installed.
4. Airflows shown are at standard air conditions.

PERFORMANCE DATA (cont)

AIRFLOW DELIVERY CHART (CFM) — ELECTRIC HEATING MODES

FAN UNIT SIZE	OUTDOOR UNIT CAPACITY BTUH	ELECTRIC HEATER kW RANGE											
		0–5			0–10			0–15			0–20		
		Lo	Nom	High	Lo	Nom	High	Lo	Nom	High	Lo	Nom	High
002	18,000	625	625	625	675	675	–	–	–	–	–	–	–
	24,000	650	725	835	–	725	835	875	875	875	–	–	–
	30,000	815	905	1040	–	905	1040	900	900	1040	1100	1100	1100
	36,000	980	1085	1250	980	1085	1250	980	1085	1250	1100	1100	1250
003	24,000	675	725	835	875	875	–	–	–	–	–	–	–
	30,000	815	905	1040	875	905	1040	1100	1100	1100	–	–	–
	36,000	980	1085	1250	980	1085	1250	1100	1100	1250	1225	1225	1250
	42,000	1140	1270	1460	1140	1270	1460	1140	1270	1460	1225	1270	1460
FAN UNIT SIZE	OUTDOOR UNIT CAPACITY BTUH	ELECTRIC HEATER kW RANGE											
		0–10			0–15			0–20			0–30		
		Lo	Nom	High	Lo	Nom	High	Lo	Nom	High	Lo	Nom	High
005	30,000	975	975	1040	1100	1100	1100	–	–	–	–	–	–
	36,000	980	1085	1250	1100	1100	1250	1250	1250	1250	–	–	–
	42,000	1140	1270	1460	1140	1270	1460	1250	1270	1460	–	–	–
	48,000	1305	1450	1665	1305	1450	1665	1305	1450	1665	1500	1500	1665
006	36,000	1100	1100	1250	1350	1350	1350	–	–	–	–	–	–
	42,000	1140	1270	1460	1350	1350	1460	1525	1525	1525	–	–	–
	48,000	1305	1450	1665	1350	1450	1665	1525	1525	1665	1750	1750	1750
	60,000	1630	1810	2085	1630	1810	2085	1630	1810	2085	1750	1810	2085

NOTE: Lo, NOM, and HI refer to AC, HP CFM ADJUST selection.
– Airflow not recommended for heater/system size.

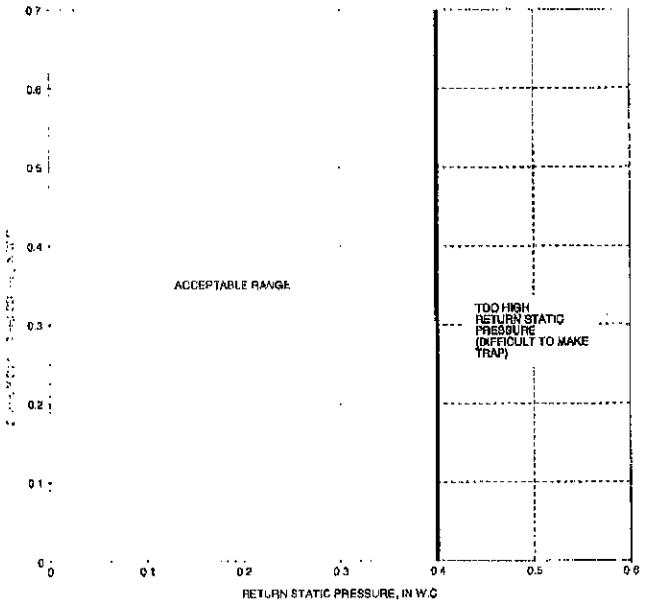
FV4C

MINIMUM CFM FOR ELECTRIC HEATER APPLICATION

FAN COIL UNIT	HEAT PUMP UNIT SIZE	CFM				
		HEATER SIZE kW				
		5	8, 9, 10	15	18, 20	24, 30
002	Heater Only	625	625	725	875	—
	018	625	625	—	—	—
	024	650	725	875	—	—
	030	800	875	875	1040	—
	036	970	970	970	1040	—
003	Heater Only	675	700	1050	1050	—
	024	675	875	—	—	—
	030	800	875	1100	—	—
	036	975	975	1100	1225	—
	042	1125	1125	1125	1225	—
005	Heater Only	675	700	1050	1050	1400
	018	800	875	1100	—	—
	036	975	975	1100	1225	—
	042	1125	1125	1125	1225	—
	048	1305	1305	1305	1305	1400
006	Heater Only	1050	1050	1050	1050	1750
	018	1100	1100	1350	1350	—
	042	1125	1125	1350	1350	—
	048	1300	1300	1350	1465	1750
	060	1625	1625	1625	1750	1750

NOTES:
1. Heater Only—Air conditioner with electric heater application.
2. These airflows are minimum acceptable airflows as UL listed. Actual airflow delivered will be per airflow delivery chart for Electric Heating Modes.

PERFORMANCE DATA (cont)



A02296

ACCEPTABLE DUCT CONDITIONS

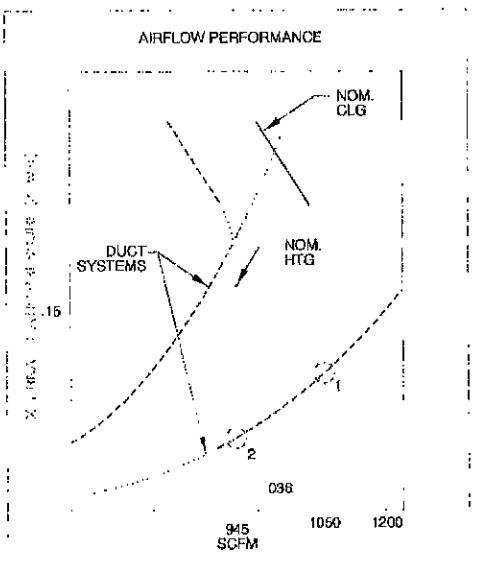
For satisfactory operation (specifically making dry secondary trap), subject fan coils must be installed with duct systems which fall within the "Acceptable Range" illustrated above.

The airflow performance charts for the FV4C fan coil depict nominal airflow delivery for heating and cooling mode operation versus duct system static pressure drop. Cooling mode operation is shown as solid vertical lines for all 4 system size selections. Heating mode operation for the 4 system size selections are shown as dashed vertical lines.

The dotted curved lines are static pressure drop characteristics for several fixed-duct systems. These lines can be used to predict the system static pressure drop at any airflow given the actual drop at 1 known point.

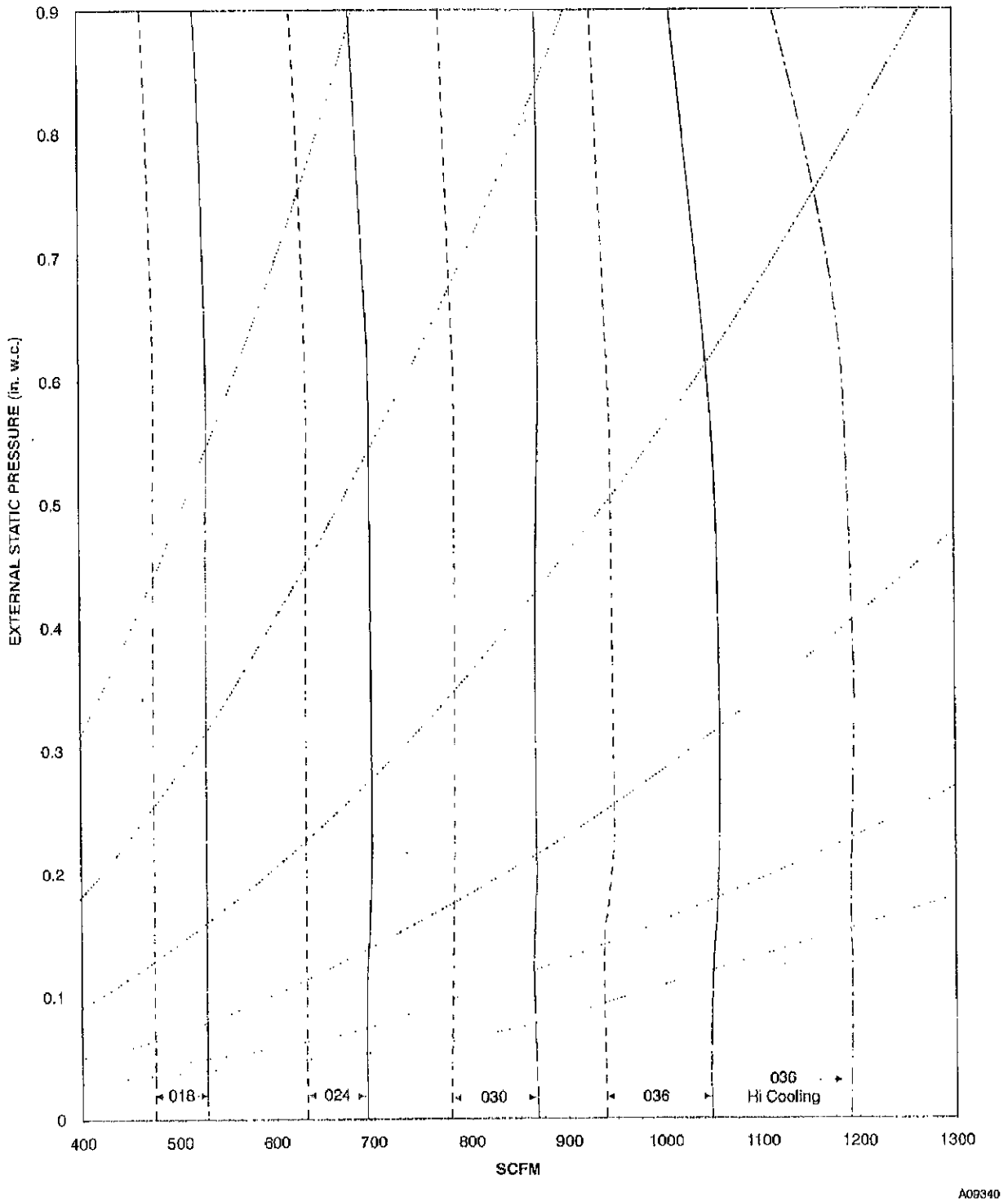
For example, a duct system is designed for 0.15 in. water column (in. w.c.) drop at 1200 CFM. The FV4CNF005 operating at nominal cooling airflow would deliver 1050 CFM with a duct system drop of 0.11 in. w.c.. (See point 1.) On the same duct system, the FV4CNF005 operating at nominal heating airflow would deliver 945 CFM with a duct system drop of 0.09 in. w.c. (See point 2.)

This example is but one of many possible duct system designs. The FV4CNF005 will deliver the above airflows against much higher static pressures.



A09339

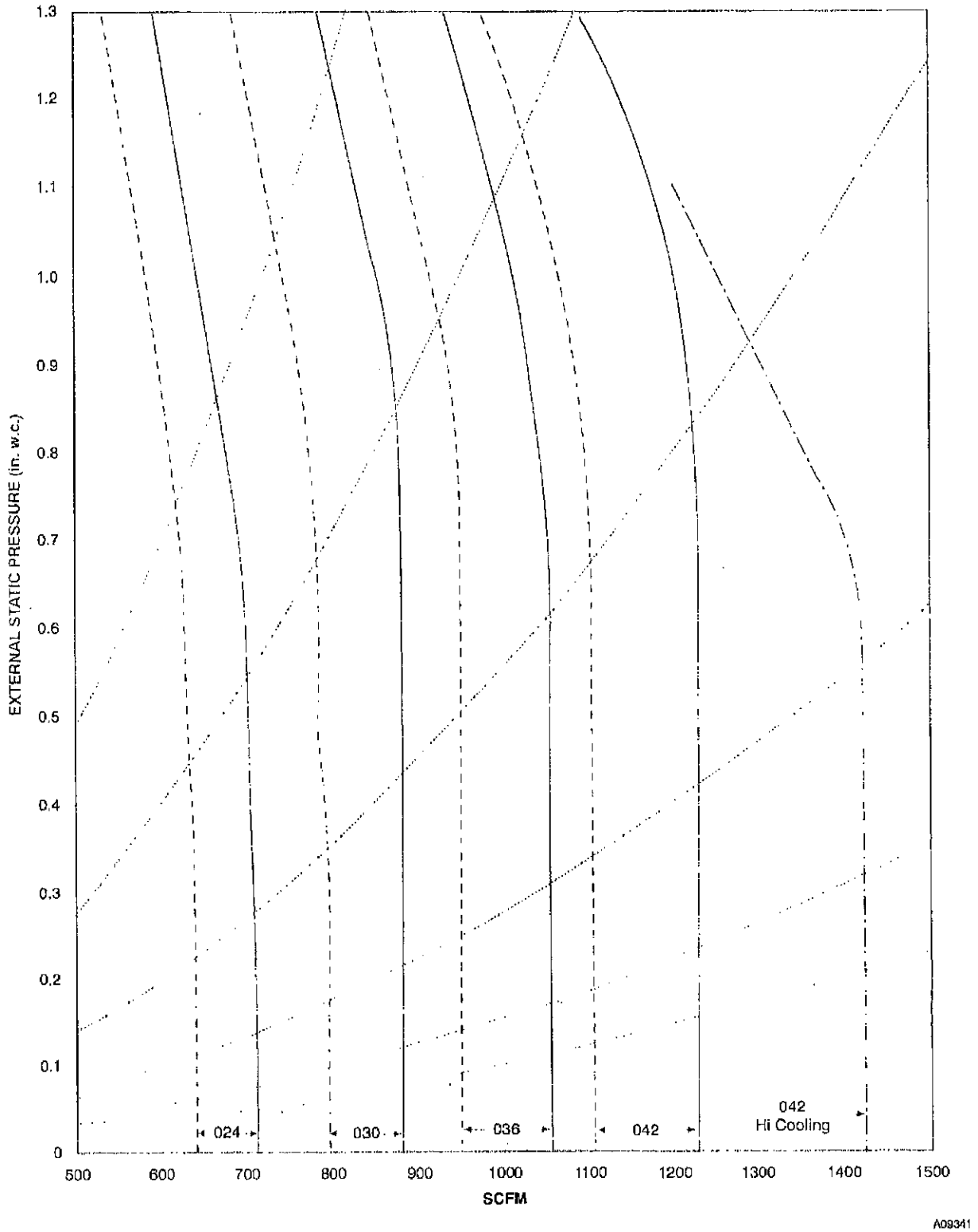
AIRFLOW PERFORMANCE



FV4CNF002

——— Nominal Cooling and Heat Pump Efficiency airflow for each size selection. Airflow can be adjusted +15% to −10%.
– – – – Nominal Heat Pump Comfort airflow for each size selection. Airflow can be adjusted +15% to −10%.
· – · – Maximum cooling airflow for largest size selection. Adjusted +15% from nominal.
····· Fixed Duct Systems (See description under Acceptable Duct Conditions.)

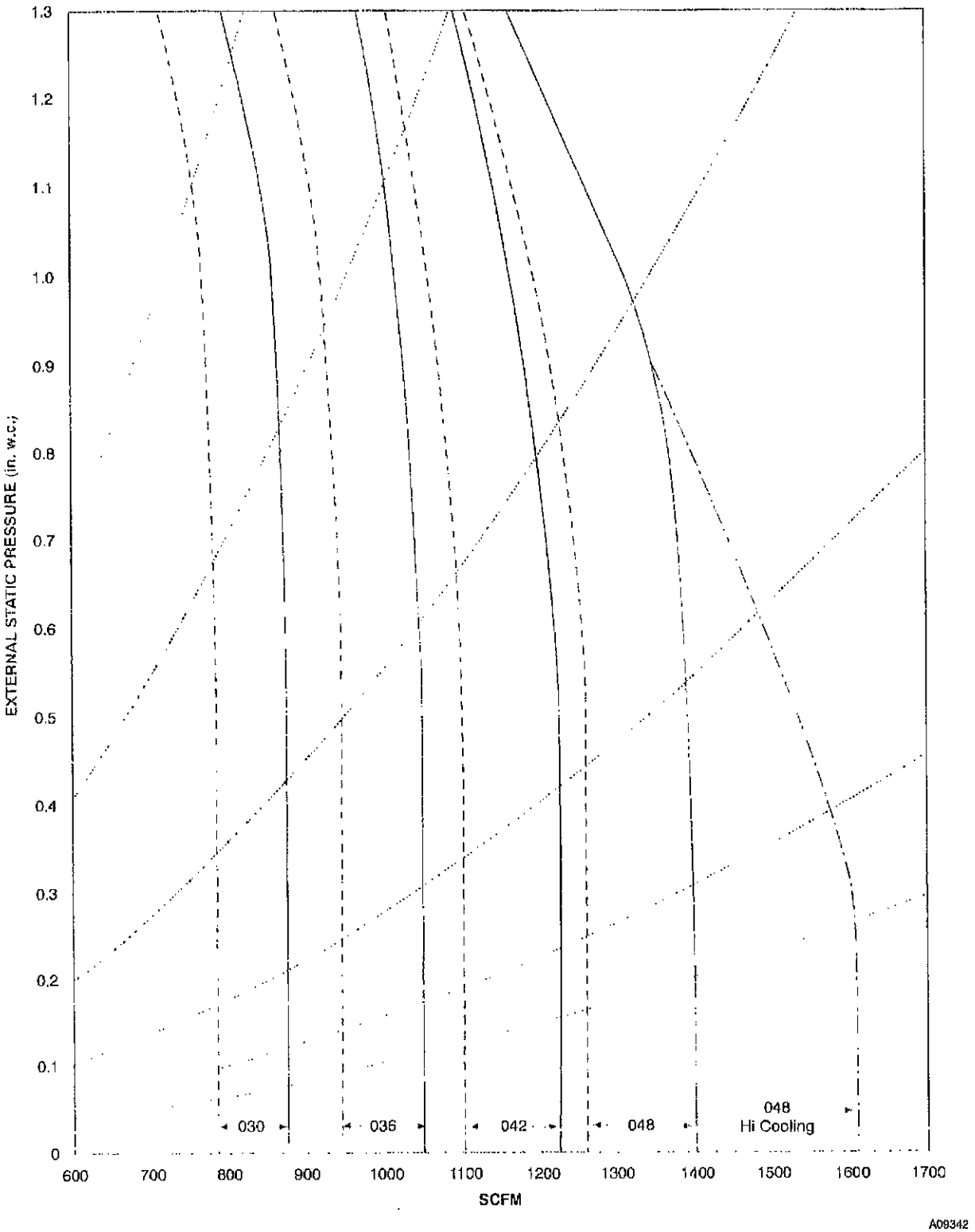
AIRFLOW PERFORMANCE



FV4CN(B,F)003

——— Nominal Cooling and Heat Pump Efficiency airflow for each size selection. Airflow can be adjusted +15% to −10%.
– – – – Nominal Heat Pump Comfort airflow for each size selection. Airflow can be adjusted +15% to −10%.
– · – · Maximum cooling airflow for largest size selection. Adjusted +15% from nominal.
····· Fixed Duct Systems (See description under Acceptable Duct Conditions.)

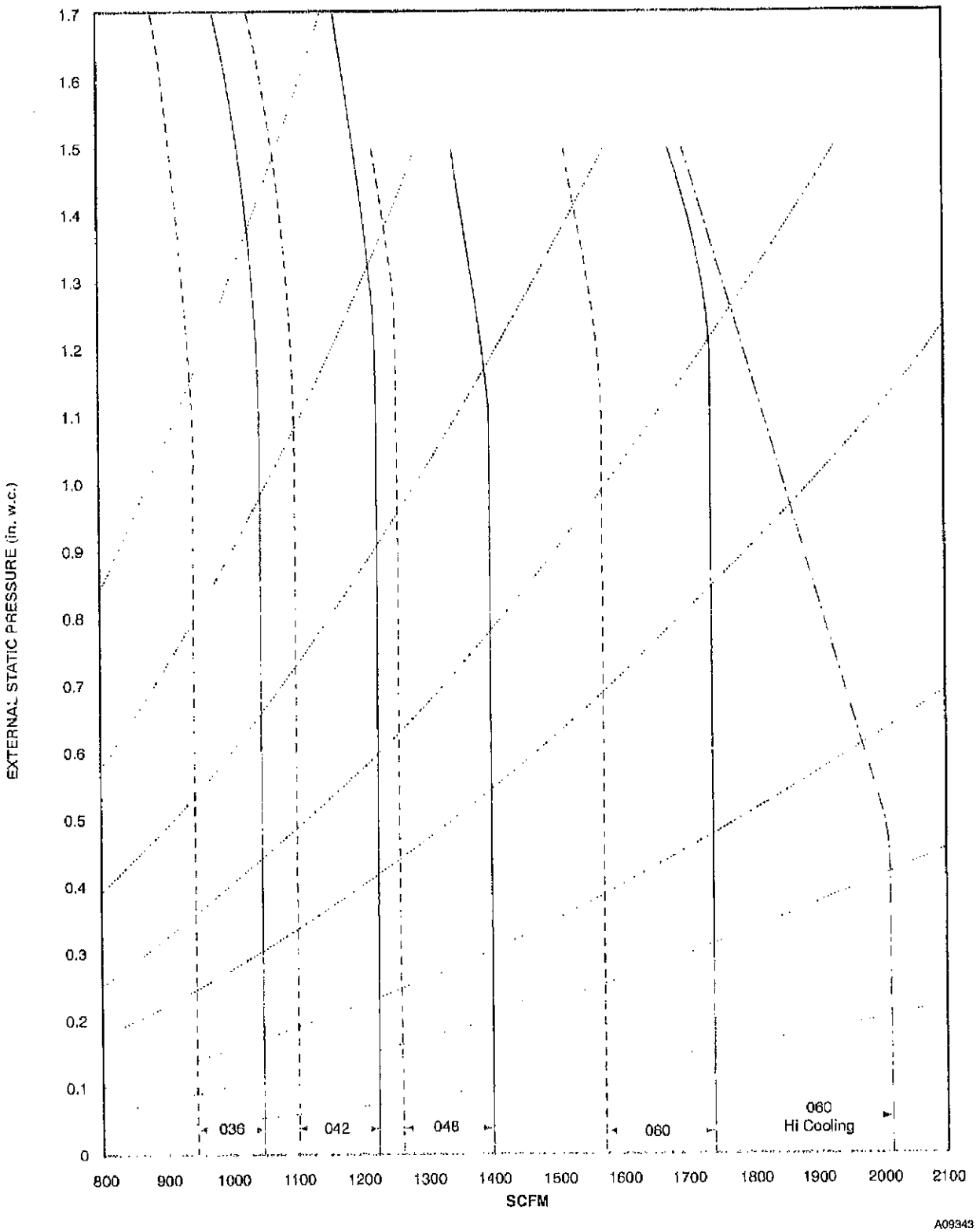
AIRFLOW PERFORMANCE



FV4CN(B,F)005

——— Nominal Cooling and Heat Pump Efficiency airflow for each size selection. Airflow can be adjusted +15% to −10%.
– – – – Nominal Heat Pump Comfort airflow for each size selection. Airflow can be adjusted +15% to −10%.
– · – · – Maximum cooling airflow for largest size selection. Adjusted +15% from nominal.
· · · · · · Fixed Duct Systems (See description under Acceptable Duct Conditions.)

AIRFLOW PERFORMANCE



FV4CNB006

——— Nominal Cooling and Heat Pump Efficiency airflow for each size selection. Airflow can be adjusted +15% to −10%.
– – – – Nominal Heat Pump Comfort airflow for each size selection. Airflow can be adjusted +15% to −10%.
– · – · Maximum cooling airflow for largest size selection. Adjusted +15% from nominal.
····· Fixed Duct Systems (See description under Acceptable Duct Conditions.)

PERFORMANCE DATA (cont)

COOLING CAPACITIES (MBtuh)

UNIT SIZE	EVAP COIL AIR Cfm / BF	SATURATED TEMPERATURE LEAVING EVAPORATOR (°F / °C)															
		35 / 2			40 / 4			45 / 7			50 / 10			55 / 13			
		Evaporator Air — Entering Wet-Bulb Temperature															
		72°F 22°C	67°F 19°C	62°F 17°C	72°F 22°C	67°F 19°C	62°F 17°C	72°F 22°C	67°F 19°C	62°F 17°C	72°F 22°C	67°F 19°C	62°F 17°C	72°F 22°C	67°F 19°C	62°F 17°C	
002	500	40	32	26	36	28	22	32	24	18	27	19	14	21	13	11	
	0.04	18	18	19	18	18	17	14	14	15	12	12	13	10	10	11	
	650	50	40	32	45	36	27	39	30	22	33	24	18	26	17	14	
	0.07	21	22	23	19	20	21	16	17	18	14	15	16	12	13	14	
	675	58	49	38	53	42	32	46	35	27	39	28	22	31	20	18	
	0.10	24	25	26	22	23	25	19	21	22	17	19	19	15	16	18	
	1000	62	51	41	56	45	35	50	38	29	42	30	24	33	22	20	
	0.11	26	26	27	23	24	25	21	23	25	18	20	21	16	18	20	
	1250	67	55	45	61	49	39	54	42	33	46	34	28	37	25	24	
	0.13	28	28	29	27	30	33	24	27	30	23	25	25	19	21	24	
003	800	59	48	38	53	42	32	46	35	24	39	27	20	30	18	18	
	0.20	26	26	27	25	27	28	22	23	24	19	20	20	15	16	16	
	1000	68	56	45	61	49	37	54	41	29	45	32	25	35	22	20	
	0.22	26	27	27	25	27	28	22	23	24	19	21	22	15	17	20	
	1200	75	62	49	68	54	42	60	45	34	50	36	29	40	25	23	
	0.25	25	26	27	23	25	28	20	23	26	18	20	23	14	16	21	
	1400	80	67	54	73	59	46	64	49	38	54	39	32	43	28	27	
	0.27	24	25	27	22	24	27	19	22	27	17	19	23	13	15	21	
005	750	61	48	39	55	43	33	48	37	27	41	29	20	33	21	17	
	0.04	27	27	28	24	25	26	21	22	23	18	18	18	13	15	16	
	950	74	60	48	67	53	40	59	45	33	50	35	25	39	24	21	
	0.06	26	27	28	25	26	27	22	23	25	19	20	23	13	14	19	
	1150	89	72	57	79	63	48	69	52	38	58	41	31	44	29	25	
	0.07	27	28	29	23	25	26	20	21	22	16	18	21	10	12	17	
	1500	103	84	66	92	73	56	81	61	46	67	48	39	52	34	31	
	0.10	25	26	26	22	24	24	20	22	23	17	19	23	10	12	17	
	1700	110	89	71	99	78	60	86	65	49	72	51	42	56	37	35	
	0.11	25	26	26	21	23	24	19	21	23	16	18	22	9	11	16	
006	1050	77	62	50	69	55	43	61	47	35	52	38	27	41	27	22	
	0.01	34	36	37	31	32	33	27	28	29	23	25	24	20	20	20	
	1300	100	82	65	90	71	55	79	60	45	66	47	37	49	32	27	
	0.02	32	33	34	27	30	32	23	25	27	20	21	22	13	16	21	
	1750	117	96	77	106	84	65	93	71	53	78	56	46	60	40	34	
	0.04	26	27	27	24	25	26	20	21	22	16	18	22	9	11	17	
	2050	126	103	83	114	91	71	99	76	59	84	60	50	65	44	39	
	0.05	26	26	26	23	23	24	19	20	21	15	17	21	8	10	15	
	2300	132	108	87	119	95	75	105	80	63	88	63	54	70	47	42	
	0.06	25	25	25	22	22	23	18	19	20	14	16	19	7	9	14	

BF – Bypass Factor

– Sensible Heat Capacity (1000 Btuh)

– Gross Cooling Capacity (1000 Btuh)

NOTES:

1. Contact manufacturer for cooling capacities at conditions other than shown in table.
2. Formulas:
   Leaving db = entering db $-\frac{\text{sensible heat cap.}}{1.09 \times \text{CFM}}$
   Leaving wb = wb corresponding to enthalpy of air leaving coil (h_{lwb})
   $h_{lwb} = h_{ewb} - \frac{\text{total capacity (Btuh)}}{4.5 \times \text{CFM}}$
   where h_{ewb} = enthalpy of air entering coil. Direct interpolation is permissible. Do not extrapolate.
3. SHC is based on 80°F db temperature of air entering coil. Below 80°F db, subtract (Correction Factor x CFM) from SHC. Above 80°F db, add (Correction Factor x CFM) to SHC.
4. Bypass Factor = 0 indicates no psychometric solution. Use bypass factor of next lower EWB for approximation.

Interpolation is permissible.
Correction Factor = 1.09 x (1 – BF) x (db – 80)

SHC CORRECTION FACTOR

BYPASS FACTOR	ENTERING AIR DRY-BULB TEMPERATURE °F (°C)					
	79 (26)	78 (26)	77 (25)	76 (24)	75 (24)	Under 75 (24)
	81 (27)	82 (28)	83 (28)	84 (29)	85 (29)	Over 85
	Correction Factor					
0.10	.098	1.96	2.94	3.92	4.91	Use formula shown below
0.20	0.87	1.74	2.62	3.49	4.36	
0.30	0.76	1.53	2.29	3.05	3.82	

PERFORMANCE DATA (cont)

ESTIMATED SOUND POWER LEVEL (dBA)*

UNIT SIZE	CONDITIONS		OCTAVE BAND CENTER FREQUENCY						
	CFM	ESP	63	125	250	500	1000	2000	4000
FV-002	400	0.25	63.0	59.0	55.0	52.0	50.0	48.0	44.0
	600	0.25	64.7	60.7	56.7	53.7	51.7	49.7	45.7
	800	0.25	66.0	62.0	58.0	55.0	53.0	51.0	47.0
	1000	0.25	67.0	63.0	59.0	56.0	54.0	52.0	48.0
	1200	0.25	67.8	63.8	59.8	56.8	54.8	52.8	48.8
	1400	0.25	68.4	64.4	60.4	57.4	55.4	53.4	49.4
FV-003	400	0.25	63.0	59.0	55.0	52.0	50.0	48.0	44.0
	600	0.25	64.7	60.7	56.7	53.7	51.7	49.7	45.7
	800	0.25	66.0	62.0	58.0	55.0	53.0	51.0	47.0
	1000	0.25	67.0	63.0	59.0	56.0	54.0	52.0	48.0
	1200	0.25	67.8	63.8	59.8	56.8	54.8	52.8	48.8
	1400	0.25	68.4	64.4	60.4	57.4	55.4	53.4	49.4
	636	0.25	65.0	61.0	57.0	54.0	52.0	50.0	46.0
FV-005	400	0.25	63.0	59.0	55.0	52.0	50.0	48.0	44.0
	600	0.25	64.7	60.7	56.7	53.7	51.7	49.7	45.7
	800	0.25	66.0	62.0	58.0	55.0	53.0	51.0	47.0
	1000	0.25	67.0	63.0	59.0	56.0	54.0	52.0	48.0
	1200	0.25	67.8	63.8	59.8	56.8	54.8	52.8	48.8
	1400	0.25	68.4	64.4	60.4	57.4	55.4	53.4	49.4
	1600	0.25	69.0	65.0	61.0	58.0	56.0	54.0	50.0
FV-006	600	0.25	64.7	60.7	56.7	53.7	51.7	49.7	45.7
	800	0.25	66.0	62.0	58.0	55.0	53.0	51.0	47.0
	1000	0.25	67.0	63.0	59.0	56.0	54.0	52.0	48.0
	1200	0.25	67.8	63.8	59.8	56.8	54.8	52.8	48.8
	1400	0.25	68.4	64.4	60.4	57.4	55.4	53.4	49.4
	1600	0.25	69.0	65.0	61.0	58.0	56.0	54.0	50.0
	1800	0.25	69.5	65.5	61.5	58.5	56.5	54.5	50.5
	2000	0.25	70.0	66.0	62.0	59.0	57.0	55.0	51.0
	2150	0.25	70.3	66.3	62.3	59.3	57.3	55.3	51.3

* Estimated sound power levels have been derived using the method described in the 1987 ASHRAE Systems & Applications Handbook, chapter 52, p. 52.7.

CFM – Cubic Ft Per Minute

ESP – External Static Pressure (in. w.c.)

RPM – Revolutions Per Minute

AIRFLOW PERFORMANCE CORRECTION FACTORS

HEATER kW	ELEMENTS	STATIC PRESSURE CORRECTION (in. wc)	
		Sizes 002–005	Size 006
0	0	+.02	+.03
5	1	+.01	+.02
8, 10	2	0	0
9, 15	3	–.02	–.03
20	4	–.04	–.06
18, 24, 30	6	–.06	–.10

The FV4C airflow performance table was developed using fan coils with 10–kW electric heaters (2 elements) in the units. For fan coils with heaters made up of a different number of elements, the external available static at a given CFM from the table may be corrected by adding or subtracting pressure. Use table for this correction.

FACTORY-INSTALLED FILTER STATIC PRESSURE DROP (in. wc)

UNIT SIZE	CFM								
	400	600	800	1000	1200	1400	1600	1800	2000
002	0.020	0.044	0.048	0.072	0.100	—	—	—	—
003	—	0.020	0.035	0.051	0.070	0.092	—	—	—
005	—	—	0.035	0.051	0.070	0.092	0.120	—	—
006	—	—	—	0.038	0.053	0.070	0.086	0.105	0.133

PERFORMANCE DATA (cont)

AIR DELIVERY PERFORMANCE CORRECTION COMPONENT PRESSURE DROP (IN. WC) AT INDICATED AIRFLOW (DRY TO WET COIL)

UNIT SIZE	CFM										
	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
002	0.012	0.016	0.022	0.028	0.034	0.040	0.049	—	—	—	—
003	—	0.026	0.034	0.042	0.052	0.063	0.075	0.083	0.091	0.098	0.110
005	—	0.006	0.008	0.010	0.012	0.015	0.017	0.020	0.023	0.027	0.030
	CFM										
	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100
006	0.013	0.016	0.018	0.020	0.023	0.027	0.030	0.034	0.039	0.044	0.048

UNITS WITHOUT ELECTRICAL HEAT

UNIT SIZE	VOLTS–PHASE	FLA	MIN CKT AMPS	BRANCH CIRCUIT	
				Min Wire Size Awg*	Fuse/Ckt Bkr Amps
002	208/230–1	4.3	5.4	14	15
003	208/230–1	4.3	5.4	14	15
005	208/230–1	4.3	5.4	14	15
006	208/230–1	6.8	8.5	14	15

* Use copper wire only to connect unit. If other than uncoated (non–plated) 75° C copper wire (solid wire for 10 AWG and smaller, stranded wire for larger than 10 AWG) is used consult applicable tables of the National Electric Code (ANSI/NFPA 70).

NOTE: If branch circuit wire length exceeds 100 ft, consult NEC 210–19a to determine maximum wire length. Use 2% voltage drop.

FLA — Full Load Amps

ELECTRIC HEATERS

HEATER PART NO.	kW @ 240V	VOLTS/ PHASE	STAGES (kW OPERATING)	INTERNAL CIRCUIT PROTECTION	FAN COIL SIZE USED WITH	HEATING CAP. @ 230V‡	INTELLIGENT HEAT CAPABLE†† (kW OPERATING)
KFCEH0501N05	5	230/1	5	None	All	15,700	—
KFCEH0801N08	8	230/1	8	None	All	25,100	—
KFCEH0901N10	10	230/1	10	None	All	31,400	—
KFCEH3001F15	15	230/1	5, 15	Fuses**	All	47,100	5, 10, 15
KFCEH3201F20	20	230/1	5, 20	Fuses**	All	62,800	5, 10, 15, 20
KFCEH2901N09	9	230/1*	3, 9	None	All	28,300	3, 6, 9
KFCEH1601315	15	230/3	5, 15	None	All	47,100	—
KFCEH2001318	18	230/3	6, 12, 18	None	All	56,500	—
KFCEH3401F24	24	230/3†	8, 16, 24	Fuses	005, 006	78,500	8, 16, 24
KFCEH3501F30	30	230/3†	10, 20, 30	Fuses	005, 006	94,200	10, 20, 30
KFCEH2401C05	5	230/1	5	Ckt Bkr	All	15,700	—
KFCEH2501C08	8	230/1	8	Ckt Bkr	All	25,100	—
KFCEH2601C10	10	230/1	10	Ckt Bkr	All	31,400	—
KFCEH3101C15	15	230/1	5, 15	Ckt Bkr	All	47,100	5, 10, 15
KFCEH3301C20	20	230/1	5, 20	Ckt Bkr	All	62,800	5, 10, 15, 20

* Field convertible to 3 phase.

† These heaters field convertible to single phase.

‡ Blower motor heat not included.

** Single point wiring kit required for these heaters in Canada.

†† Heaters designated with kW Operating Values are Intelligent Heat capable when used with compatible thermostat.

ELECTRIC HEATER INTERNAL PROTECTION

HEATER kW	FUSES QTY/SIZE	CKT BKR QTY/SIZE*
5	—	1/60
8	—	1/60
9	—	—
10	—	1/60
15	2/30, 2/60	2/60
15	—	—
18	—	—
20	4/60	2/60
24	6/60	—
30	6/60	—

* All circuit breakers are 2 pole.

ACCESSORY ELECTRIC HEATER ELECTRICAL DATA

HEATER PART NO.	kW		PHASE	INTERNAL CIRCUIT PROTECTION	HEATER AMPS 208/230V			BRANCH CIRCUIT														
								Min Ampacity 208/230V**			Min Wire Size (AWG) 208/230V††			Min Gnd Wire Size 208/230V			Max Fuse/Ckt Bkr Amps 208/230V			Max Wire Length 208/230V (ft)‡‡		
					Single Circuit	Dual Circuit		Single Circuit	Dual Circuit		Single Circuit	Dual Circuit		Single Circuit	Dual Circuit		Single Circuit	Dual Circuit		Single Circuit	Dual Circuit	
	240V	208V				L1,L2	L3,L4		L1,L2	L3,L4		L1,L2	L3,L4		L1,L2	L3,L4		L1,L2	L3,L4		L3,L2	L3,L4
KFCEH0501N05	5	3.8	1	None	18.1/20.0	—	—	31.2/33.5	—	—	8/8	—	—	10/10	—	—	35/35	—	—	85/86	—	—
KFCEH2401C05	5	3.8	1	Ckt Bkr	18.1/20.0	—	—	31.2/33.5	—	—	8/8	—	—	10/10	—	—	35/35	—	—	85/86	—	—
KFCEH0601N08	8	6.0	1	None	28.9/32.0	—	—	44.7/48.5	—	—	6/6	—	—	10/10	—	—	45/50	—	—	59/60	—	—
KFCEH2501C08	8	6.0	1	Ckt Bkr	28.9/32.0	—	—	44.7/48.5	—	—	6/6	—	—	10/10	—	—	45/50	—	—	59/60	—	—
KFCEH2901N09*	9	6.8	1	None	32.8/36.0	—	—	49.5/53.5	—	—	6/6	—	—	10/10	—	—	50/60	—	—	54/67	—	—
KFCEH2901N09*‡	9	6.8	3	None	18.8/20.8	—	—	32.0/34.5	—	—	8/8	—	—	10/10	—	—	35/35	—	—	83/85	—	—
KFCEH0901N10	10	7.5	1	None	36.2/40.0	—	—	53.8/58.5	—	—	6/6	—	—	10/10	—	—	60/60	—	—	78/80	—	—
KFCEH2901C10	10	7.5	1	Ckt Bkr	36.2/40.0	—	—	53.8/58.5	—	—	6/6	—	—	10/10	—	—	60/60	—	—	78/80	—	—
KFCEH3001F15*†	15	11.3	1	Fuse	54.2/59.9	36.2/40.0	18.1/20.0	76.3/83.4	53.8/58.5	22.7/25.0	4/4	6/6	10/10	8/8	10/10	10/10	80/90	60/60	25/25	88/89	78/80	75/76
KFCEH3101C15*†	15	11.3	1	Ckt Bkr	—	36.2/40.0	18.1/20.0	—	53.8/58.5	22.7/25.0	—	6/6	10/10	—	10/10	10/10	—	60/60	25/25	—	78/80	75/76
KFCEH1601315	15	11.3	3	None	31.3/34.6	—	—	47.7/51.8	—	—	8/8	—	—	10/10	—	—	50/60	—	—	58/60	—	—
KFCEH2001316	16	13.5	3	None	37.6/41.5	—	—	55.5/60.4	—	—	6/6	—	—	10/8	—	—	60/70	—	—	78/77	—	—
KFCEH3201F20*†	20	15.0	1	Fuse	72.3/79.9	36.2/40.0	36.2/40.0	98.9/108.4	53.8/58.5	45.3/50.0	3/2	6/6	6/6	8/8	10/10	10/10	100/110	60/60	50/50	85/109	78/80	59/59
KFCEH3301C20*†	20	15.0	1	Ckt Bkr	—	36.2/40.0	36.2/40.0	—	53.8/58.5	45.3/50.0	—	6/6	6/6	—	10/10	10/10	—	60/60	50/50	—	78/80	59/59
KFCEH3401F24*†	24	18.0	3	Fuse	50.1/55.4	—	—	71.2/77.6	—	—	4/4	—	—	8/8	—	—	80/80	—	—	94/95	—	—
	24	18.0	1	Fuse	86.7/95.5	—	—	116.6/127.9	—	—	1/1	—	—	6/6	—	—	125/150	—	—	115/116	—	—
KFCEH3501F30*‡	30	22.5	3	Fuse	62.6/69.2	—	—	86.8/95.6	—	—	3/3	—	—	8/8	—	—	90/100	—	—	97/98	—	—
	30	22.5	1	Fuse	109.0/120.0	—	—	144.8/158.5	—	—	0/00	—	—	6/6	—	—	150/175	—	—	117/150	—	—

FIELD MULTIPOINT WIRING OF 24- AND 30-kW SINGLE PHASE

HEATER PART NO.	kW		PHASE	HEATER AMPS 208/230V			MIN AMPACITY 208/230V**			MIN WIRE SIZE (AWG) 208/230V††			MIN GND WIRE SIZE 208/230V	MAX FUSE/CKT BKR AMPS 208/230V			MAX WIRE LENGTH 208/230V (FT)‡‡		
	240V	208V		L1,L2	L3,L4	L5,L6	L1,L2	L3,L4	L5,L6	L1,L2	L3,L4	L5,L6		L1,L2	L3,L4	L5,L6	L1,L2	L3,L4	L5,L6
KFCEH3401F24*†	24	18.0	1	28.9/32.0	28.9/32.0	28.9/32.0	44.7/48.5	36.2/40.0	36.2/40.0	6/6	8/8	8/8	10/10	45/50	40/40	40/40	59/60	75/73	73/73
KFCEH3501F30*†	30	22.5	1	36.2/40.0	36.2/40.0	36.2/40.0	53.8/58.5	45.3/50.0	45.3/50.0	6/6	8/8	8/8	10/10	60/60	50/50	50/50	78/80	59/59	59/59

* Heaters are Intelligent Heat capable when used with the FV fan coil and Comfort Zone II™ or Infinity Control™.

† Field convertible to 1 phase, single or multiple supply circuit.

‡ Field convertible to 3 phase.

** Includes blower motor amps of largest fan coil used with heater.

†† Copper wire must be used. If other than uncoated (non–plated), 75°C copper wire (solid wire for 10 AWG and smaller, stranded wire for larger than 10 AWG) is used, consult applicable tables of the National Electric Code (ANSI/NFPA 70).

‡‡ Length shown is as measured 1 way along wire path between unit and service panel for a voltage drop not to exceed 2%.

NOTES:

1. Single circuit application of F15 and F20 heaters requires single–point wiring kit accessory.

ACCESSORIES

	ITEM	ACCESSORY PART NO.*	FAN COIL SIZE USED WITH
1.	Disconnect Kit	KFADK0201DSC	Cooling controls and heaters 3- through 10-kW
2.	Downflow Base Kit	KFACB0201CFB	002
		KFACB0301CFB	003, 005
		KFACB0401CFB	006
3.	Downflow Conversion Kit	KFADC0201SLP	003
		KFADC0401ACL	002, 005, 006
4.	Single-Point Wiring Kit	KFASP0101SPK	Only with 15- and 20-kW Fused Heaters
5.	Filter Kit (12 Pack)	KFAFK0212MED	002
		KFAFK0312LRG	003, 005
		KFAFK0412XXL	006
6.	Fan Coil Filter Cabinet (Fan Coil Filter Media)	FNCCABCC0017 (FILCCFNC0017)	002
		FNCCABCC0021 (FILCCFNC0021)	003, 005
		FNCCABCC0024 (FILCCFNC0024)	006
7.	Infinity™ Air Purifier (Infinity™ Purifier Replacement Cartridge)	GAPABXCC1620 (GAPCCCAR1620)	002
		GAPABXCC2020 (GAPCCCAR2020)	003, 005
		GAPABXCC2420 (GAPCCCAR2420)	006
8.	PVC Condensate Trap Kit (50 pack)	KFAET0150ETK	All
9.	Air Cleaner 240-volt Conversion Kit	KEAVC0201240	All
10.	Downflow/Horizontal Conversion Gasket Kit	KFAHD0101SLP	All
11.	Airflow Sensor Kit (Air Cleaner)	KEAAC0101AAA	All
12.	ECM Motor Test	KFASD0301VSP	All
13.	Horizontal Water Management Kit (25 pack)	KFAHC0125AAA	All
14.	Standard Filter Rack Kit	KFAFR0101FRM	NA
		KFAFR0201FRM	002
		KFAFR0301FRM	003, 005
		KFAFR0401FRM	006

* Factory authorized and listed, field installed.

Accessory Kits Description Suggested and Required Use

1. **Disconnect Kit**
   The kit is used to disconnect electrical power to the fan coil so service or maintenance may be performed safely.
   SUGGESTED USE: Units for 3- through 10-kW electric resistance heaters and cooling controls.

2. **Downflow Base Kit**
   This kit is designed to provide a 1-in. (25MM) minimum clearance between unit discharge plenum, ductwork, and combustible materials. It also provides a gap-free seal with the floor.
   REQUIRED USE: This kit must be used whenever fan coils are used in downflow applications.

3. **Downflow Conversion Kit**
   Fan coils are shipped from the factory for upflow or horizontal-left applications. Downflow conversion kits provide proper condensate water drainage and support for the coil when used in downflow applications. Separate kits are available for slope coils and A-coils.
   REQUIRED USE: This kit must be used whenever fan coils are used in downflow applications.

4. **Single Point Wiring Kit**
   The single point wiring kit acts as a jumper between L1 and L3 lugs, and between the L2 and L4 lugs. This allows the installer to run 2 heavy-gauge, high-voltage wires into the fan coil rather than 4 light-gauge, high-voltage wires.
   SUGGESTED USE: Fan coils with 15- and 20-kW fused heaters only.

5. **Filter Kit (12 pack)**
   The kit consists of 12 fan coil framed filters. These filters collect large dust particles from the return air entering the fan coil and prevents them from collecting on the coil. This process helps to keep the coil clean, which increases heat transfer and, in turn, the efficiency of the system.
   SUGGESTED USE: To replace filters in fan coils.
   REQUIRED USE: All units unless a filter grille is used.

6. **Fan Coil Filter Cabinet**
   This cabinet is mounted to the fan coil on the return air end and designed to slip over the outer fan coil casing. The cabinets are insulated using the same insulation as production fan coils. They are designed for the removal of particulates from indoor air using FILCCFNC00(14, 17, 21, 24) media filter cartridges. These fan coil media filter cartridge kits are designed for the removal of particles from indoor air. The cartridge is installed in the return air duct next to the air handler or further upstream.
   SUGGESTED USE: All fan coils.

7. **Infinity™ Air Purifier**
   The Infinity Air Purifier wires directly to fan coil and requires no duct transitions with Carrier units. These purifiers both capture and kill airborne viruses, bacteria, mold spores, and allergens. It comes with an airflow sensor. Maintenance is limited to replacement of the purification cartridge, GAPCCAR (1620/2020 or 2420), and inspection/brush cleaning of the ionization array.
   SUGGESTED USE: All fan coils.

ACCESSORIES (cont)

8. **Condensate Drain Trap Kit**
   This kit consists of 50 PVC condensate traps. Each trap is pre-formed and ready for field installation. This deep trap helps the system make and hold proper condensate flow even during blower initiation.
   SUGGESTED USE: All fan coils.
9. **Air Cleaner 240-volt Conversion Kit**
   The AIRA electronic air cleaner comes ready for 115-v operation.
   REQUIRED USE: This kit is required when running 240-volt circuit to air cleaner.
10. **Downflow/Horizontal Conversion Gasket Kit**
    This kit provides the proper gasketing of units when applied in either a downflow (FE4A or FE5A) or horizontal (FE4A only) application.
    REQUIRED USE: Fan coils in either downflow or horizontal applications.
11. **Airflow Sensor Kit (Air Cleaner)**
    The AIRA electronic air cleaner comes ready for 115-v operation
    REQUIRED USE: This kit is required whenever an electronic air cleaner is used.
12. **ECM Motor Test Kit**
    Operates variable speed blower at several speeds independent of circuit board and wiring harness.
13. **Horizontal Water Management Kit**
    This kit provides proper installation of fan coils under conditions of high static pressure and high relative humidty.
    SUGGESTED USE: All fan coils.
14. **Standard Filter Rack Kit**
    This kit mounts in fan coil filter rack area and modifies the existing filter rack to support standard 1-in. filter sizes.
    SUGGESTED USE: Fan coils using standard filter sizes.

Copyright 20014 Carrier Corp. • 7310 W. Morris St. • Indianapolis, IN 46231 Edition Date: 02/14 U.S. Export Classification: EAR99. **Catalog No: FV4C-03PD**

Manufacturer reserves the right to change, at any time, specifications and designs without notice and without obligations. Replaces: FV4C-02PD

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HEATING AND AIR CONDITIONING, INC.

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www.bellbrothers.com

Electric Duct Heaters

TRUST THE EXPERTS

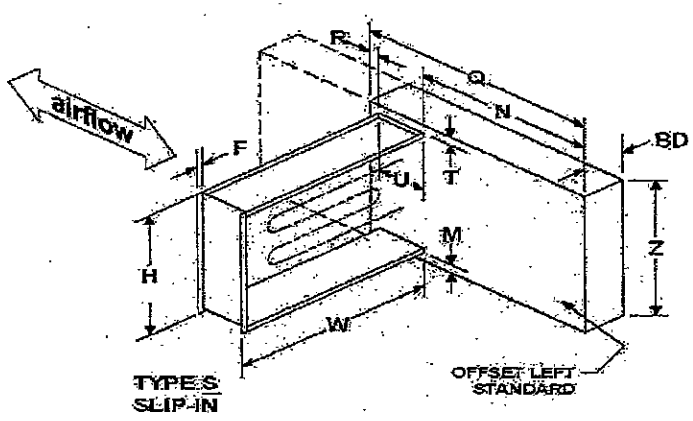
Electric Duct Heater Submittal

Open Coil

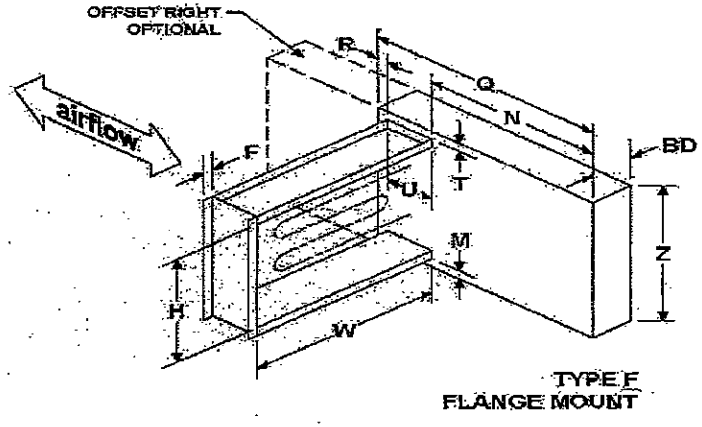
TUTCO, INC.
500 Gould Drive
Cookeville, TN 38506

Quote No: TQ00007954
Date Quoted: 10/01/2013
Expires: 12/30/2013
Project: Duct Heaters

Date: 10/1/2013



TYPE S
SLIP-IN



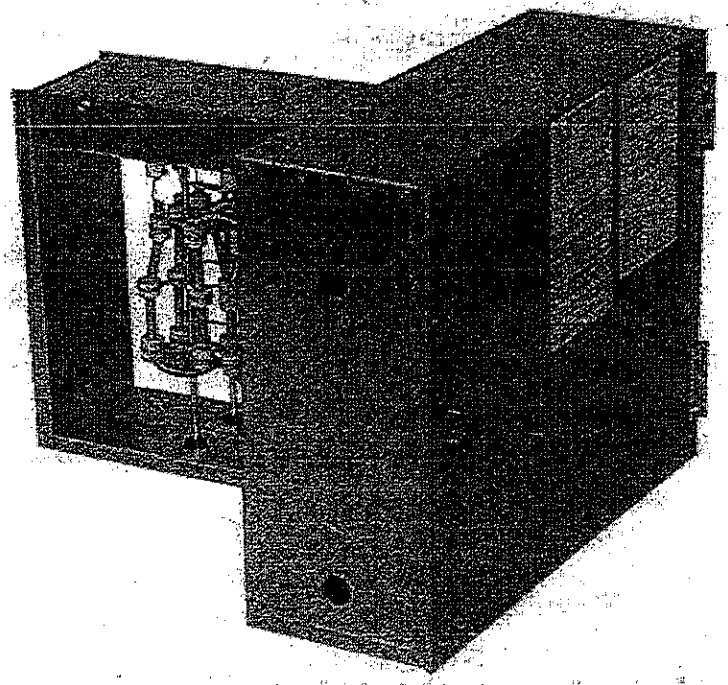
TYPE F
FLANGE MOUNT

																			CFM			FPM			
Item	Qty	Prod	KW	Volts	Stg	Ctl Vlt	S/F	KW/Stg	W*	H*	Q	Z	U	BD	F	R	N	T	M	<78	78-90	91-110	<78	78-90	91-110	Amps
001	65	DHC	2.00	208-1	1	024	F	2.00	26.00	6.00	27.50	10.00	4.88	4.50	1.00	1.50	21.13	0.00	2.00	215	290	410	195	265	375	9.60
003	34	DHC	3.00	208-1	1	024	S	3.00	34.00	6.00	27.50	10.06	4.88	4.50	0.56	1.50	21.13	0.00	4.06	300	400	555	210	280	390	14.40

Quote No: TQ00007954
Date Quoted: 10/01/2013
Expires: 12/30/2013
Project: Duct Heaters

Date: 10/1/2013

BASIC HEATER INFORMATION



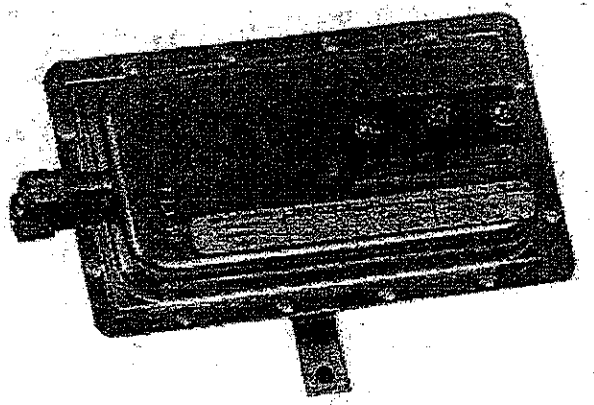
DHC & DC SERIES

BASIC HEATER INCLUDES

- A de-energizing magnetic control contactor per stage of each 48 AMP circuit within a stage
- 50 or 60 HZ design
- Fan interlock
- Power terminal board
- Control terminal board
- Grounding lugs
- Automatic limit switch for primary over temperature protection
- Manual reset limit switch for secondary over temperature protection
- Left hand offset control box

Quote No: TQ00007954
Date Quoted: 10/01/2013
Expires: 12/30/2013
Project: Duct Heaters

Date: 10/1/2013



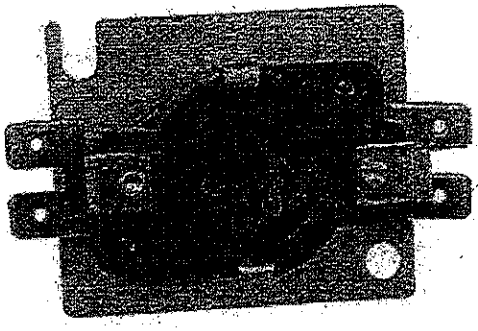
Air Flow Switch

AIR FLOW SWITCH

- Prevents heater from being energized when the fan is not on
- UL Required
- Non adjustable airflow switch (shown) requires a minimum of .07"WC pressure
- Adjustable airflow switch available with rating of .05" ± .02" WC to 12"WC

Quote No: TQ00007954
Date Quoted: 10/01/2013
Expires: 12/30/2013
Project: Duct Heaters

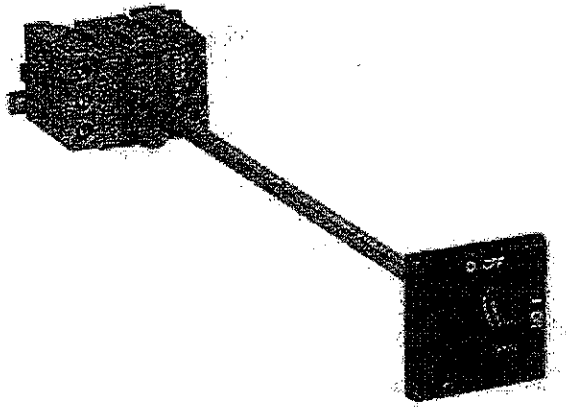
Date: 10/1/2013



Timed Delay Relay

TIME DELAY RELAY

- Relays provide a time delay of 30 to 60 seconds when energizing or de-energizing the circuit controlled
- Standard control voltages of 24 through 277



Disconnect Switch

DISCONNECT SWITCHES

- Available unfused door interlocking disconnect switch (max. 384 AMPS)

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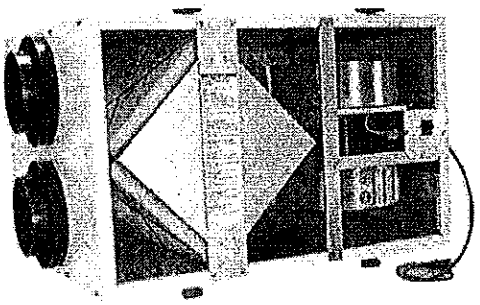
Energy Recovery Ventilator

TRUST THE EXPERTS

EV200

Indoor Unit



Specifications

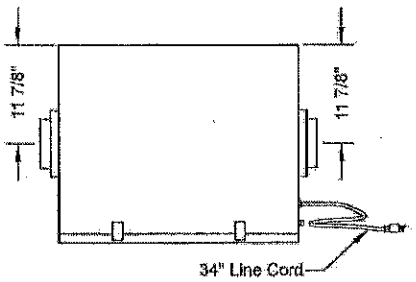
Ventilation Type: Static Plate, Heat and Humidity Transfer				
Typical Airflow Range: 100-200 CFM				
Number Motors: One double-shaft motor				
V	HZ	Phase	Input Watts	FLA
120	60	Single	157 @ 181 CFM	1.5
Control: On board 24 VAC transformer/relay package with switched dry contacts				
Filters: MERV 8, spun polyester media. 10-1/2" x 21-3/4" x 1"				
Weight: 70 lbs (unit), 82 lbs (in carton), 125 lbs (on pallet)				
Shipping Dimensions: 32"L x 21-1/2"W x 29"H (in carton) 44" L x 34" W x 34" H (on pallet)				
Controls: PTL – Percentage Timer Control FM – Percentage Timer Control with Furnace Interlock PBL – Push Button Point-of-Use Controls Accessories: Wall Caps Back Draft Dampers				

G5 Performance

Airflow CFM	ESP in H_2O	Temp EFF%	Total EFF% Winter/Summer*
122	0.70	81	77/84
149	0.60	79	75/81
168	0.50	78	73/59
176	0.40	78	72/59
186	0.30	77	72/58
192	0.20	77	71/57
207	0.10	76	70/56

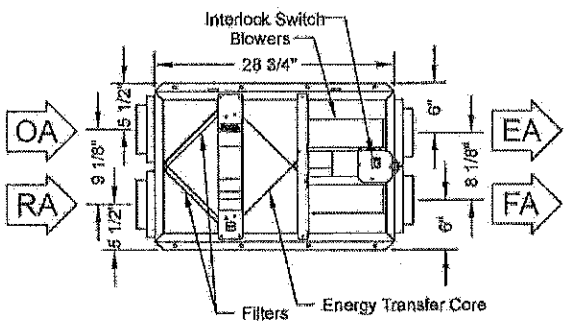
* (See HVI certification report on page 11 for complete certified rating).

Dimensions

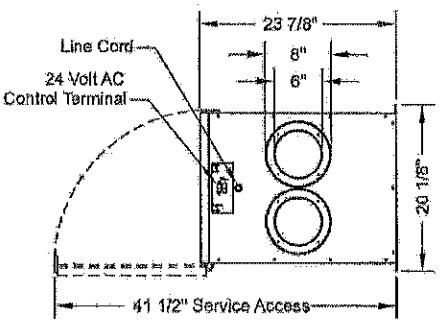


TOP VIEW

EA: Exhaust Air to outdoors
OA: Outdoor Air Intake
RA: Room Air to be exhausted
FA: Fresh Air to Inside



FRONT VIEW



RIGHT VIEW

RenewAire®
Energy Recovery Ventilation

RenewAire LLC
4510 Helgesen Drive
Madison, Wisconsin 53718
USA

608.221.4499 telephone
800.627.4499 toll free
608.221.2824 facsimile
www.renewaire.com

Guide Specifications for RenewAire BR70, BR130, EV90, EV90P, GR90, EV130, EV200, EV300 Series Energy Recovery Ventilators

Prepared for the guidance of architects, consulting engineers and mechanical contractors.

Part I - General

A. Product Specification

1. Energy Recovery Ventilator (ERV) shall be a packaged unit as manufactured by RenewAire and shall transfer both heat and humidity using static plate core technology.

B. Quality Assurance

1. The energy recovery ventilator shall be Certified by the Home Ventilating Institute (HVI) under CSA 439. Both a heating and a cooling test must be run to demonstrate year round energy recovery.

2. Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA 90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.

3. Unit shall be Listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers. The unit must pass commercial flammability requirements and shall not be labeled "For Residential Use Only".

4. The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of five years from the date of purchase.

Part II – Performance

A. Energy Transfer

The ERV shall be capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

B. Passive Frost Control

The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be allowed.

C. Continuous Ventilation

Unit shall have the capacity to operate continuously without the need for bypass, recirculation, pre-heaters, or defrost cycles under normal operating conditions.

D. Positive Airstream Separation

Water vapor transfer shall be through molecular transport by hydroscopic resin and shall not be accomplished by "porous plate" mechanisms. Exhaust and fresh airstreams shall travel at all times in separate passages, and airstreams shall not mix.

RenewAire LLC
4510 Helgesen Drive
Madison, Wisconsin 53718
USA

608.221.4499 telephone
800.627.4499 toll free
608.221.2824 facsimile
www.renewaire.com

E. Laminar Flow

Airflow through the ERV core shall be laminar over the products entire operating airflow range, avoiding deposition of particulates on the interior of the energy exchange plate material.

Part III – Product

A. Construction

1. The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.
2. No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.
3. The unit case shall be constructed of 24-gauge steel, with lapped corners and zinc plated screw fasteners. The case shall be finished with textured, powder coat paint (GR90 case shall be constructed of G90 galvanized steel.)
4. Access doors shall provide easy access to blowers, ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets.
5. Case walls and doors shall be fully insulated with 1 inch, expanded polystyrene foam insulation faced with a cleanable foil face on all exposed surfaces.
6. The ERV cores shall be protected by a MERV-8 rated, spun polyester, disposable filter in both airstreams.
7. The unit shall have a line-cord power connection and be supplied with an internal 24 VAC transformer and relay (G90 shall have hardwired line voltage connection and be controlled by line voltage controls provided by others.)
8. Standby power draw shall not exceed 1 Watt for the unit along with an optional automatic control.

B. Options (Select options based on application requirements)

1. For BR-Series: Through the wall kit and duct collar kit (automatic control is built into the unit standard).
2. For EV-Series (except GR90): Controls including proportional run time, push button and furnace interlock and a variety of weather hoods.
3. For GR90: Any switched line-voltage power supply.

Part IV – Installation

A. Unit Location

1. Locate and orient unit to provide the shortest and most straight duct connections. Provide service clearances as indicated on the plans. Locate units distant from sound critical occupancies.
2. Use integral mounting flange and hanging bar system to mount the unit to a structurally suitable surface. The units may be mounted in any orientation.

B. Vibration Isolation

1. Utilize factory supplied vibration isolation kit following instructions.
2. Provide flexible duct connections at unit duct flanges.

C. Duct Design

1. All ductwork shall be designed, constructed, supported and sealed in accordance with SMACNA HVAC Duct Construction Standards and pressure classifications.

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Madison, Wisconsin 53718
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2. At a minimum all duct runs to the outdoors shall be thermally insulated at levels appropriate to the local climate. A continuous vapor barrier shall also be provided on warm surface of the insulation.

D. Sound Control

1. To control sound radiated from the unit:
   a. Provide acoustic treatment in mechanical room walls and ceilings.

2. To control sound associated with the two blower outlets:
   a. Utilize insulated, flexible duct.

   b. In sound critical applications provide increased duct sizing and consider the use of sound attenuators.

E. Test and Balancing

1. Test and Balancing may not begin until 100% of the installation is complete and fully functional.

2. Follow National Comfort Institute (NCI) air test and balance procedures specific to Heat Recovery Ventilator Balancing Procedure including standard reports to the owner's representative.

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Bathroom Exhaust Fans

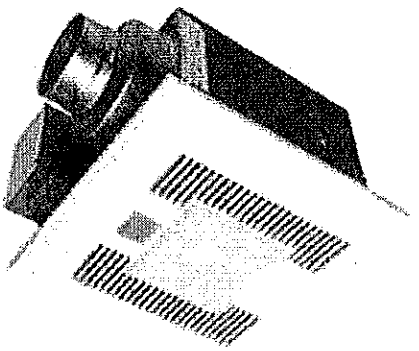
TRUST THE EXPERTS

Panasonic ideas for life

FV-08VKML4

WhisperGreen-Lite™ 80 CFM Ceiling Mounted Ventilation Fan with DC Motor, Variable Speed Controls, Motion Sensor and Light

See dealer for price



Architectural Specs
Operating Instruction

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overview | features | support & resources

Motor Type	DC
Type of Motor Bearing	Ball
Thermal Fuse Protection	Yes
Blower Wheel Type	Sirocco
Mounting Opening (inches sq.)	10 1/2"
Grille Size (inches sq.)	13"
SmartAction Motion Sensor	Yes
High/Low Delay Timer	No
CustomVent Variable Speed Control	No
SmartFlow Optimum CFM Technology	Yes
Lamp Watts	2x13W
Lamp Color Rendering Index	>80
Color Temperature (Kelvin)	3500K
Rated Life (Hours)	10,000
Lamp Model #	MLS13GU35
Night Light Lamp Watts	4 To be field replaced with .8 Watt LED lamp
Washington State VIAQ Code	Yes
Caltifornia Title 24 Compliant	Yes
Mfg in ISO 9001 Certified Facility	Yes
Duct Diameter (inches)	4" or 6"
Energy Star Qualified	Yes
Gross Weight (lbs.)	13.4

UL tub/Shower Enclosure	Yes
Dimensions (HxWxD)	12.0" x 14.25" x 17.0"
Weight (lbs)	13.4

Features, specifications & pricing subject to change without notice.

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Panasonic ideas for life

FV-08VKML4

WhisperGreen-Lite™ 80 CFM Ceiling Mounted Ventilation Fan with DC Motor, Variable Speed Controls, Motion Sensor and Light

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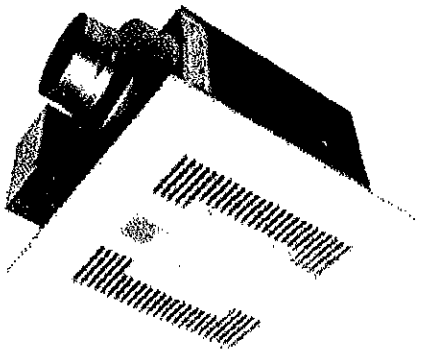

Architectural Specs
Operating Instruction

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Constant CFM Performance

This WhisperGreen-Lite™ model features built-in intelligence called SmartFlow™ Optimum CFM Technology. This unique "electronic-brain" lets the fan do what was once thought to be impossible: perform at a constant CFM regardless of elbows and other factors that might hinder performance. Basically, when a WhisperGreen ® fan faces static pressure, its speed is automatically increased to ensure that the desired CFM is actually achieved. This allows the fan to perform as rated and makes for easier sizing because the specifiers no longer has to worry as much about compromising the fan's performance.

SMARTACTION®

The built-in SmartAction motion sensor automatically activates when someone enters the room. Once the settings have been applied, the fan becomes truly automatic, making it ideal for people with disabilities and assisted living environments such as nursing homes and retirement communities.

Quiet Motor Means Quiet Operation

Panasonic is the first ventilation fan manufacturer to incorporate a DC motor in residential mechanical ventilation fans. The WhisperGreen® series incorporates an enclosed DC motor designed for extremely quiet, energy-efficient operation. The permanently lubricated motor is also engineered for trouble-free, continuous run for several years.

Quiet Operation at .25" Water Gauge Static Pressure (INSTALLED PERFORMANCE)

ASHRAE, ENERGY STAR®, LEED for Homes, and HVI have set the industry standard for performance measurement at .25" w.g. The new generation of WhisperGreen and WhisperGreen-Lite fans not only provide powerful CFM output at .25" w.g., but our sones have also been certified at .25" w.g. So they are

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Ductless Mini-Split

TRUST THE EXPERTS

Laundry Room

Refrigerant R410A

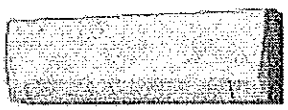
INVERTER

AIR CONDITIONER

Wall Mounted type

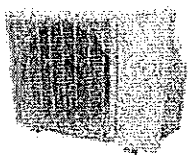
DESIGN & TECHNICAL MANUAL

INDOOR



ASU9RL2
ASU12RL2

OUTDOOR



AOU9RL2
AOU12RL2

FUJITSU GENERAL LIMITED

WALL MOUNTED TYPE
ASU9-12RL2

1. FEATURE

■ MODEL

ASU9RL2 / AOU9RL2
ASU12RL2 / AOU12RL2

■ FEATURES

● Energy Efficiency

	MODEL	
	ASU9RL2	ASU12RL2
Seasonal Energy Efficiency Ratio (SEER)	16	16
Heating Seasonal Performance Factor (HSPF)	9	9

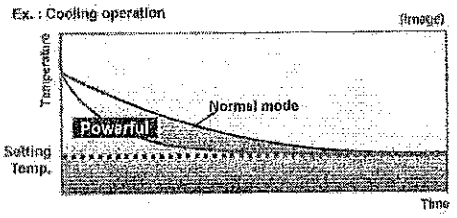
MEASUREMENT CONDITIONS
ANSI/ASHRAE STANDARD 37-1988

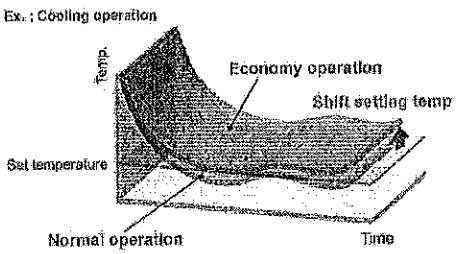
● Super quiet operation

Top class low noise operation by new airflow construction.
Our quiet operation makes the more comfortable environment in a bed room and a study room, etc.

● Powerful operation

Reach the setting temperature quickly.



● Economy operation

Setting temp. is shifted by 2°F (1°C) automatically.