Thermal Energy Audit

September 20 2019

Sponsored by

EVERSOURCE ENERGY

Plainfield Fire Department

1260 NH 12A

Plainfield, NH

Audit Prepared by

BUILDING STRATEGIES FOR AN AFFORDABLE FUTURE
S.E.E.D.S.
SUSTAINABLE ENERGY EDUCATION DEMONSTRATION SERVICES
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DESIGN DAY MECHANICALS INC

Table of Contents

Introduction

This Energy Audit has been paid for by Eversource as part of their energy efficiency program. Funding may also be available to help reduce electric energy usage through weatherization efforts.

The purpose of an energy audit is to identify energy saving measures (ESM) in a building. Computer simulated and other energy models were developed for this project using multiple strategies and software. The models estimate predicted future energy consumption based on the local climate conditions, physical dimensions and characteristics of a building, mechanical systems, presumed lighting, equipment, and occupancy patterns, in addition to a number of other variables.

With the building modeled in existing conditions, energy savings can be estimated for improvements to the thermal envelope. The cost of those measures can then be analyzed in terms of predicted energy saved. The primary objective of an energy audit is to evaluate the level of investment warranted by energy and dollars saved from those specific measures. In many cases, improving the envelope can be expected to improve occupant comfort and reduce or eliminate ice dams. These non-energy saving benefits can reduce maintenance costs while also addressing health and safety concerns.

This audit has been prepared with the best of intentions to assist the Town of Plainfield make informed decisions regarding improvements to their Fire Station. We do not make any warranty, expressed or implied, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product or process disclosed.

Executive Summary

The Plainfield Fire Station (PFS) is located at 12 NH12A in Plainfield, NH. It is in cold climate zone 6 climate with an approximate average 7480 heating degree days (from weather data for Lebanon, NH). The building is at an approximate elevation of 493 feet above sea level.

The one story, slab on grade, steel framed building has three truck bays, a 30x43 meeting room, fully equipped kitchen, two offices, two restrooms with showers, server room, laundry and storage areas. As often the case with steel framed buildings, the wall purlins and roof structure are wrapped with fiberglass batts. A suspended ceiling hangs over all but the truck bays. It is heated by hydronic baseboards and (3) Modine units, from a twenty year old oil fired Weil McLean boiler.

The site visit for this Study occurred on June 12, 2019 and included a blower door test and thermographic scans, though the temperature difference between inside and outside was minimal for good IR imaging.

The six recommended ESM are presented in a chart on the next page. In summary: investing $4,345 in energy saving measures could be expected to save $507 annually in energy costs based on 2018 prices and 22.3 MMBTUs of site energy each year.. Over the life of the measures, this would result in an investment gain of $4,781 and an annualized return on investment (ROI) of 4.2% per year for an averaged 18 years. Envelope improvements would also reduce the heating load which could reduce costs for installing air source heat pumps.

It is possible that the energy savings will pass the threshold for an Eversource rebate, in which case up to $2,173 in rebates could be available after the project is completed as described.

Summary of Energy Saving Envelope Measures

#	Energy Saving Measures	Cost Of Measure	Annual $ Savings	Gal Oil Saved	MMBtu Energy Savings	Simple Payback Years	Life of Measure	LofM Savings	Invest-ment Gain	ROI	Annual ROI
1	Weather-strip Ext doors	$115	$11	4	0.6	10.5	12	$132	$17	14.8%	1.2%
2	Damper on Vent Hood	$165	$45	17	2.3	3.7	25	$1,125	$960	581.8%	8.0%
3	Insulate HW pipes in Bays	$365	$36	14	1.9	10.1	25	$900	$535	146.6%	3.7%
4	Replace Refrigerator	$600	$73	0	1.4	8.2	12	$876	$276	46.0%	3.2%
5	Air Seal all wall gaps	$1,150	$145	55	7.5	7.9	25	$3,625	$2,475	215.2%	4.7%
6	Seal Overhead Doors	$1,950	$197	74	10.3	9.9	12	$2,364	$414	21.2%	1.6%
	TESM Totals	$4,345	$507	163	22.6	8.6	18	$9,022	$4,781	110.0%	4.2%
1-6	All Six ESMs With Eversource Rebate, IF APPROVED!	$2,173	$507	163	22.6	4.3	18	$9,022	$5,715	263.0%	7.4%

Notes:

1. Efforts have been made to air seal both exterior doors, however both could benefit from robust and professional installed weather-stripping gaskets.
2. The range hood fan is rarely used and represents a large and ever-present hole in the wall. Several models of hoods or enclosed dampers are available on line with an average cost of $165.
3. This measure is most relevant with the existing heat system as primary or secondary heating.
4. Rebates may be available to replace the existing refrigerator with a new Energy Star model.
5. Costs for labor comprehensive air sealing at all gaps and cracks between sheetrock and where steel framing penetrates the sheetrock have been estimated based on previous projects by air sealing specialists. Please understand that these efforts are often omitted from proposals in order to offer a low bid and yet it is the lack of a continuous air barrier which results in ice formations and a significant factor in high energy consumption.
6. Large gaps around the perimeter of the overhead doors result in significant heat loss. While the doors are opened throughout the day, the amount of time they are closed far exceeds the time they are open, so reducing air leakage when they are closed is a top priority. Robust weather-stripping is available from American Garage Door Supply. To prevent damage to the tracks when wide plows drive in and out, install four foot high angle irons—also available from AGDS—on the exterior of the door track on any vulnerable bay door.

An additional outcome for completing all six ESM would be a reduced building heating load of 13,675 Btus per hour at design load. While this reduction would likely not impact the selection (or cost) of a new boiler, it could result in a smaller heat pump, by as much as one ton.

Summary of Energy Saving HVAC Options

Design Day Mechanicals (DDM inc) has developed three Options to replace the oil fired boiler with electric powered heat pumps. All three options would include summer cooling. A full Scope of Work to solicit Design Build Proposals is included at the end of this report.

The three system options, with estimated equipment only costs, can be summarized as:

1. 1. High Efficiency Air Source Heat Pumps (HE-ASHP) with Second Stage Electric Resistance Heat. Budget $21,000 for equipment.
2. 2. Code Minimum Air Source Heat Pumps (ASHP) with Second Stage Electric Resistance Heat. Budget $13,000 for equipment.
3. 3. Water Source Heat Pump System (AKA Ground Source Heat Pump or GSHP or Geothermal) Budget $17,000 for equipment and $37,000 for Geothermal Borehole. No second stage is required.

The predicted estimate for future heating costs and savings from existing annual heating costs is summarized below. All costs are based on current energy prices.

	Annual Heating Costs	Annual Savings from Existing Heating Costs
Existing	$3,783.00	n/a
Improved Envelope	$3,276.00	$507.00
HE ASHP	$2,809.00	$974.00
Code Min ASHP	$3,107.00	$676.00
GSHP	$2,086.00	$1,697.00

Eversource rebates, as a per ton dollar sum, may be available for both the HE ASHP and GSHP, due to their higher efficiencies.

A cost benefit analysis cannot be offered since installed costs are not known at this time.

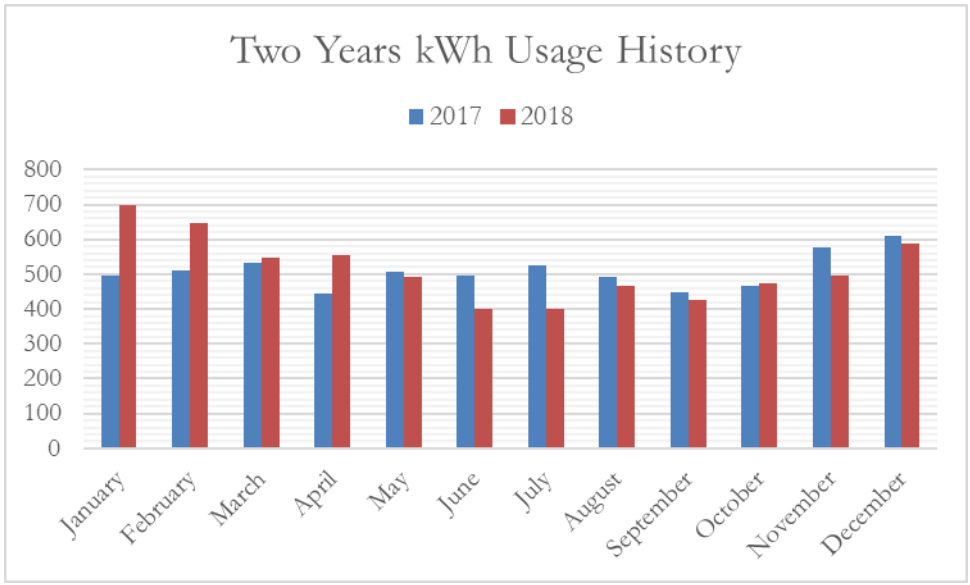
Existing Energy Use Analysis

The energy analysis below reflects a two calendar year average (2017 and 2018) based energy data provided for

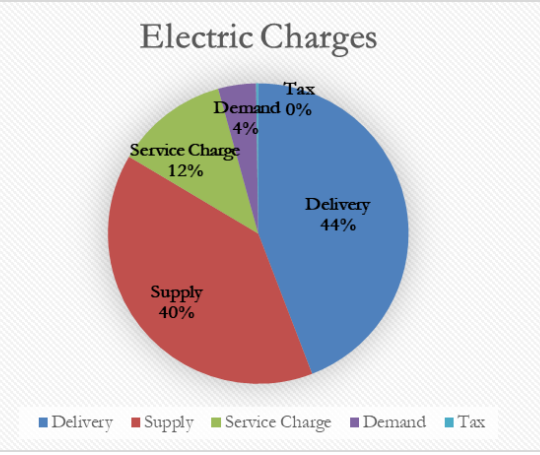
Energy	Units	Site Btus	Source Btus	$Cost
Electric kWh	6,149	20,980,388	69,858,789	$1,470
#2 Oil	1,397	193,484,500	222,507,175	$3,716
Totals		214,464,888	292,365,964	$5,186
EUI KBtu/FT2	4624	46.4	63.2	$1.12

The Energy Utilization Index (EUI) offers a simple snapshot analysis of a building's energy use by looking at total amount of energy input (converted to Btu's) divided by the floor area of conditioned space. "Site Energy" refers to units of energy delivered to a site. Source energy includes transmission and some allowance for off site generation and other considerations. Source energy is used to equal the playing field when comparing electrical consumption with on site combustion fuel energy and to better reflect GHG emissions when considering off site generation.

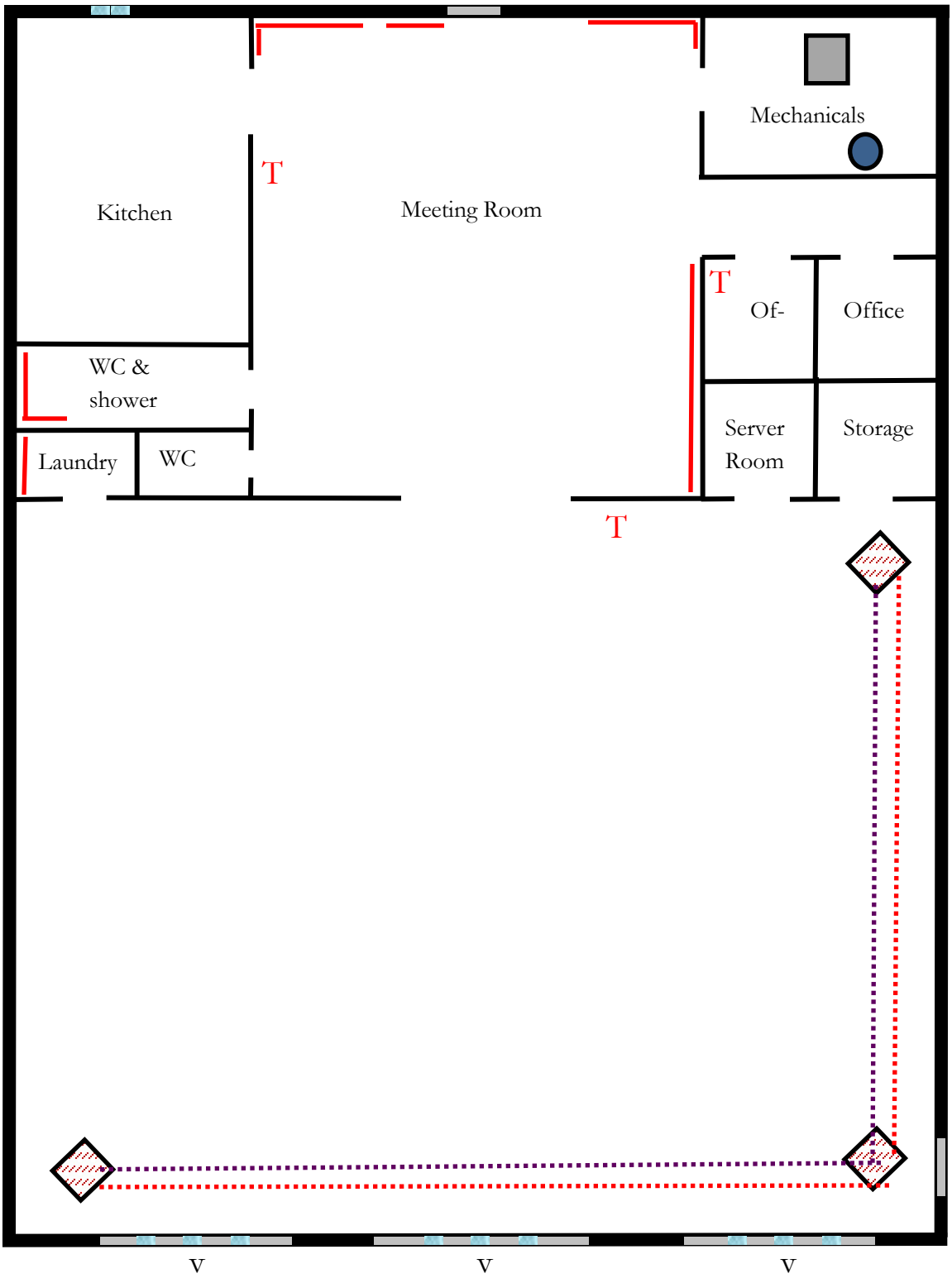
Based on the information provided, the PFS EUI is 46.4 KBtu/ft2 at a cost of $1.12per sq ft in 2018 energy prices.



Charge	2 Yr Avg
Delivery	$649.00
Supply	$578.74
Service Charge	$178.68
Demand	$59.75
Tax	$3.38
	$1,470

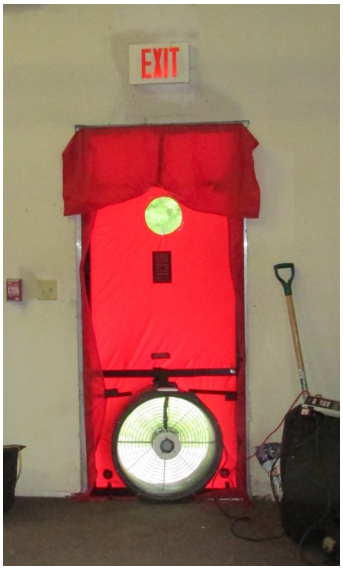


Schematic Floor Plan



Air Leakage and Blower Door Tests

Uncontrolled air infiltration—and exfiltration—can account for up to 35% of a building's heat loss and heating bill and is often the cause of discomfort. (Think drafty old buildings or new windows!) Since air can carry a lot of water vapor with it, air leakage through the exterior of a building can also contribute to moisture problems such as mold and rot in walls and roofs or ceilings. Fiberglass batts in particular are vulnerable to air movement which can diminish its insulating properties by 50-75%. Finally, icicles and ice dams are most often the result of warm, conditioned air rising up though gaps in the ceiling and warming the under side of a roof and melting the snow from below. Melt water then runs down to the edge of the roof where it freezes when exposed to air. For all these reasons, limiting air infiltration is often at the top of the list to conserve energy, improve comfort, and reduce roof damage and other moisture problems.



The 'blower door' (far left) consists of an adjustable frame which mounts in an exterior doorway, a nylon "skirt" that is stretched over the frame to stop air except for a hole at the bottom in which a fan is placed. The fan is capable of moving up to about 6,000 cubic feet of air per minute. Plastic tubes are used as "pressure taps" and are attached to the pressure gauge (left) to measure both the amount of air pulled through the fan and the pressure difference between inside and outside.

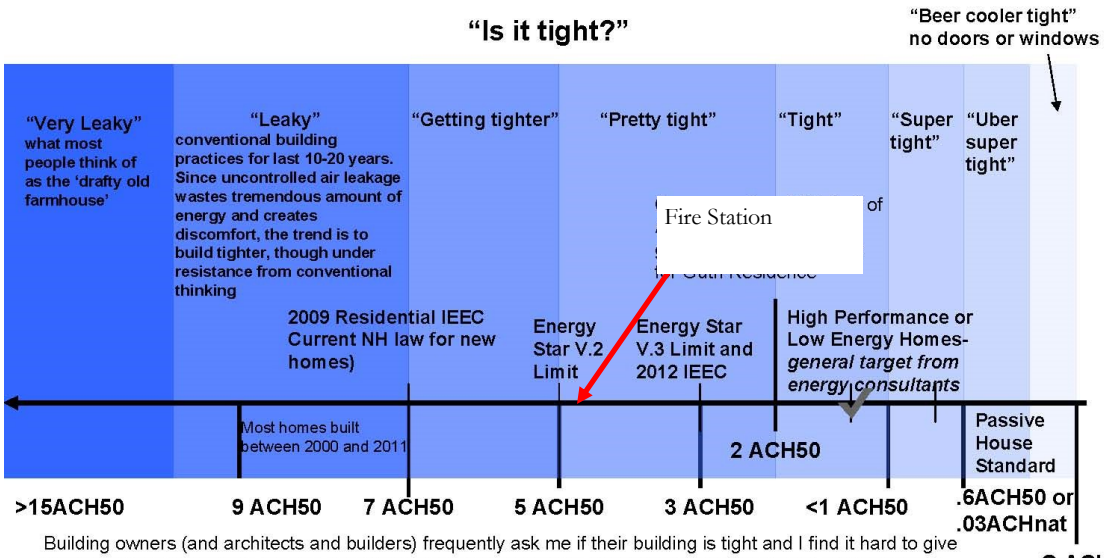
Make it Tight, Ventilate Right.

Blower Door Test Results for the Fire Station: 6568 CFM50 Estimated
The results are estimated because the fan could not achieve a –50 pascal pressure differential between inside and outside. The actual test result was 5330CFM35, which is not a standardized result, so math was used to estimate the "CFM50" ie cubic feet of air per minute at –50 pascals.

This means that the fan would pull 6568 cubic feet of air per minute to achieve –50 pascals pressure difference between inside and outside. Based on a building volume estimate of **82,240 cubic feet**, 6568CFM50 means that at –50 pascals, the indoor air would exchange with outdoor air **4.79times per hour**, referred to as **4.79ACH50**. Since the blower door assembly creates an unnatural condition, we can only estimate the average air infiltration rate under varying but normal conditions. In your case, it is estimated that the air exchanges an average of **0.5 times an hour in the winter.**

Estimated summer infiltration is 0.32ACH under natural conditions, with an annual estimated average of 0.38ACH. While these estimates have limited value in terms of adequate outside air exchange, it does suggest that large groups of people for more than an hour or so may find it getting quite stuffy,

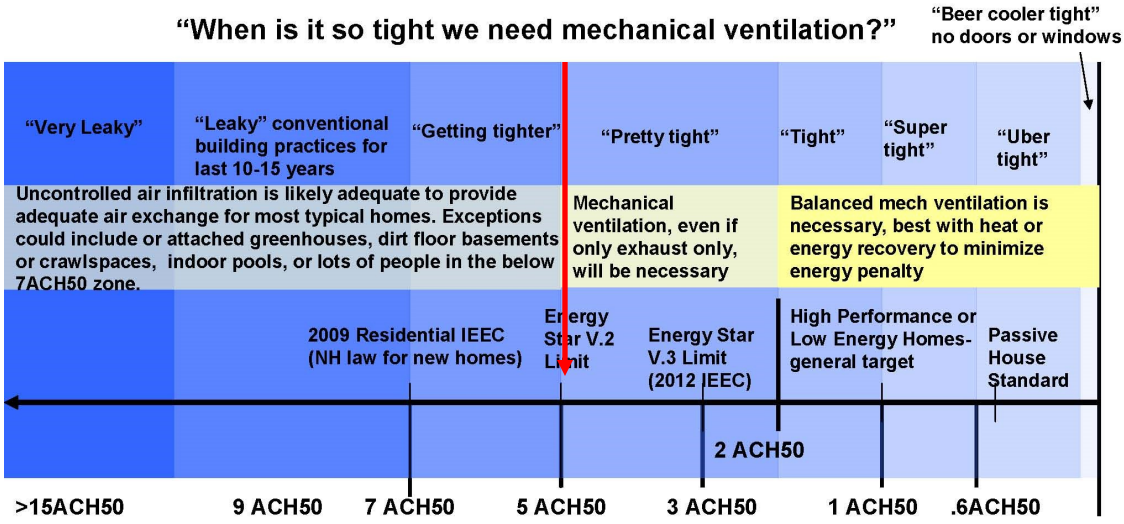
The next two pages attempt to compare building air tightness levels—or put tightness into the context of the existing building inventory and where we are headed.



Building owners (and architects and builders) frequently ask me if their building is tight and I find it hard to give them a satisfying answer. In truth, air tightness is relative and the mathematical description of a building's air barrier or level of tightness has little meaning at best – and can be incredibly boring at worst. I once attempted humor with "well, if it were a submarine, everyone would drown" but, while accurate, proved less than helpful. So this graphic has been developed in an attempt to explain the spectrum of tightness in terms of existing buildings and the direction we're headed in terms of codes and standards. The tighter the building, the less air infiltration, and therefore heat loss, in the winter – which means less energy needed to run your equipment.

"ACH50" or Air Changes per Hour at -50 pascals, means the number of times the indoor conditioned air will exchange with outdoor air within one hour when the building is under -50 pascals of pressure. This is a standardized testing condition, using a blower door fan assembly. One can ***estimate*** the air exchange rate under natural conditions by dividing by 15. Colored boxes above are generalized zones for this discussion only.

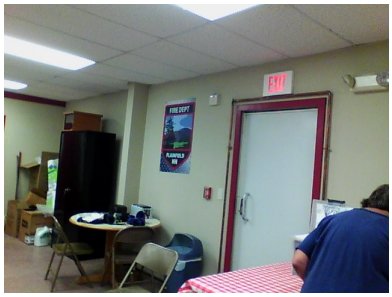
1



A common response to the 'tightness' discussion is that "buildings can be too tight: they need to breathe". The truth is that people need to breathe – buildings just need to be able to dry. Very high air leakage allowed buildings (wall and roof assemblies, etc.) to dry out if they got wet. But it takes tremendous amounts of energy to maintain comfortable indoor temperatures with so much air leakage. So the answer is: buildings *cannot be too tight*, and in fact must become as tight as we can make them, as long as they are designed to be able to dry out and as long as we provide mechanical ventilation when necessary so that people have enough fresh (or filtered) air to breathe. The various yellow shaded boxes above categorizes, in very general terms, when mechanical ventilation might be needed. There are a number of factors to consider when determining specific ventilation requirements – either by code or specific occupancy realties.

2

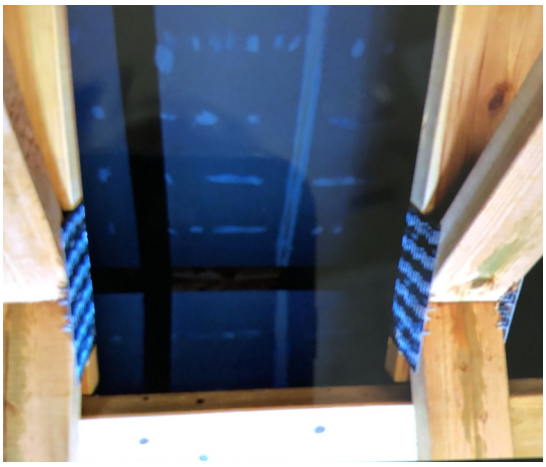
Contrast for IR images isn't ideal, but horizontal lines along the wall indicate the metal purlins of the metal structure. Dark 'coolth' along the door edges show air leakage, despite valiant efforts for foam strip weather-strips.



Air sealing all gaps and cracks along the wall and wall/ceiling transition is included in the ESM #

Roof and Wall Thermal Barriers

The photos below (courtesy of Brad) show taped and spackled sheetrock under the roof decking—and potentially above the steel framing. This suggests a potentially effective air barrier in contact with the fiberglass typically draping steel building framing.

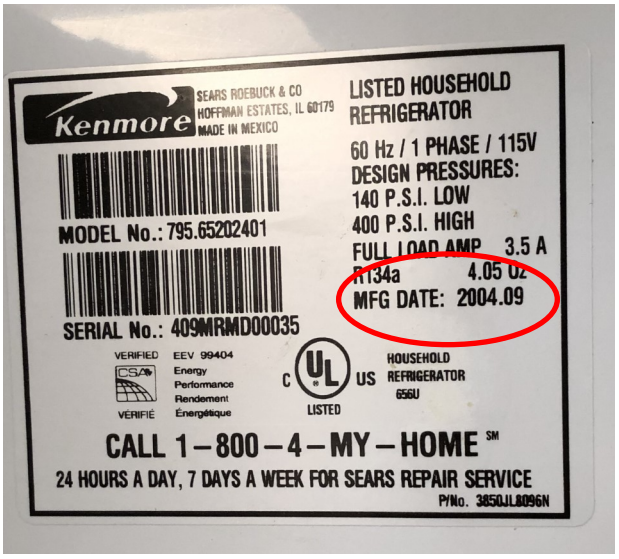


An effective thermal envelope—ie the control layers which separate inside conditioned space with the outside weather and climate— has a continuous air barrier in direct contact with the insulation layers. Again, for insulation to slow heat transfer as intended, it must be in contact with an air barrier on all six sides. So the taped sheet rock defines the thermal barrier and if it is properly sealed as the above image suggests, then it is located exactly where it is supposed to be!

The walls, however, have a number of large gaps where air movement happens, causing convection within the thermal layer, as well as vapor migration to the outside cold metal.

There are good reasons to also effect a continuous air barrier where the wall and the ceiling plane meet (below).

A simple $20 damper may be adequate for immediate use, however replacing the hood is a more effective long term measure to reduce heat loss.



Refrigerator efficiencies have improved greatly since 2004 even though, candidly, ever since warranty periods have been reduced from 10 years to 3 or 5, the compressors are built to last 15 years.

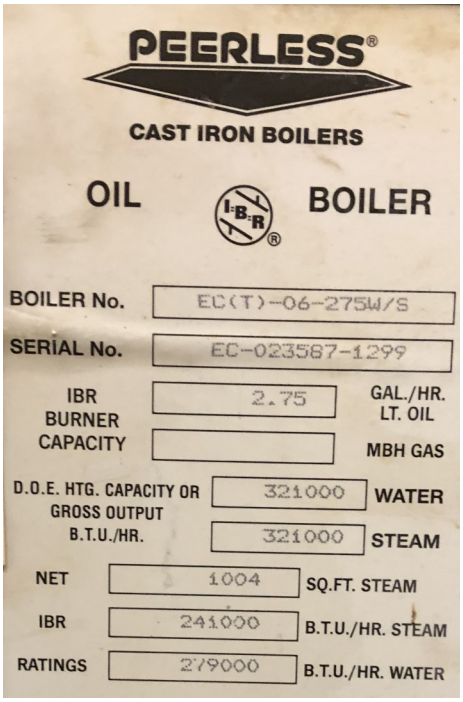
Daylight is evident around most of the overhead door edges.

Existing Boiler

Peerless Oil Boiler
Model EC(T)-06-275m/S

Manufactured December 1999

DOE Output 321KBtu/Hr
Net IBR 279KBtu/Hr



Domestic hot water for the bathrooms, kitchen, and laundry is provided by an indirect water heater off the boiler. If converting to heat pumps for heating and the boiler is removed, consider a smaller and super insulated electric hot water tank.

Plainfield Fire Station
Energy Cost Analysis

for

Eversource.Plainfield

Plainfield NH 03781

Elite Software
ENERGY AUDIT
Residential and Light Commercial Energy Analysis

Prepared By:

Margaret Dillon
S.E.E.D.S.

September 9, 2019

Project Summary

General Project Information

Project Title:	Plainfield Fire Station	Company Name:	S.E.E.D.S.
Project Date:	Thursday, August 15, 2019	Company Rep:	Margaret Dillon
Client Name:	Eversource.Plainfield	Company E-Mail	mdillon@myfairpoint.net
Client City:	Plainfield NH 03781	Address:	

Design Data

Building Area:	4,704 sq.ft.		
People:		Heating Load:	110,286 Btuh
Occupancy:		Loads Adj. Factor:	.51
		AC On Temp.:	°F
Actual City:	Lebanon, New Hampshire		
Weather Ref. City:	Concord, New Hampshire		
Summer Outdoor:	87 °F	Winter Outdoor:	-3 °F
Summer Indoor:	75 °F	Winter Indoor:	68 °F
Cooling Hours:	775	Degree Days:	6,500

Annual Operating Cost Estimate

System Description	Fuel Rates Set	Total Heating Cost	Total Cooling Cost	Annual Service Charges	Total Oper. Cost	Average Monthly Cost
Existing	1	$3,783	$	$	$3,783	$315
Envelope Improvements	1	$3,276	$	$	$3,276	$273
High Eff Air Source Heat Pumps	1	$2,809	$	$	$2,809	$234
Code Miniomum Air Source Heat Pumps	1	$3,107	$	$	$3,107	$259
Ground Source Heat Pumps	1	$2,086	$	$	$2,086	$174

Input Data - System 1 - Existing

		Estimated Cost
Cooling		
System Type:	Standard Air Conditioner	
Model:		
Efficiency:	.00	
Capacity:	Btuh	
Cooling Load:	Btuh	
Annual Cost (Spec Cooling Hours Method):		$.00
Heating		
System Type:	Fuel Oil Boiler	
Model:		
Efficiency:	85 AFUE	
Capacity:	321,000 Btuh	$2,459.17
Oversize Penalty:	1.35	$1,324.17
Heating Load:	110,286 Btuh	
Annual Cost (Degree Days Method):		$3,783.33
Total Cost		
Total Annual Operating Cost:		$3,783.33

Input Data - System 2 - Envelope Improvements

		Estimated Cost
Cooling		
System Type:	Standard Air Conditioner	
Model:		
Efficiency:	.00	
Capacity:	Btuh	
Cooling Load:	Btuh	
Annual Cost (Spec Cooling Hours Method):		$.00
Heating		
System Type:	Fuel Oil Boiler	
Model:		
Efficiency:	85 AFUE	
Capacity:	321,000 Btuh	$2,129.21
Oversize Penalty:	1.35	$1,146.50
Heating Load:	96,612 Btuh	
Annual Cost (Degree Days Method):		$3,275.71
Total Cost		
Total Annual Operating Cost:		$3,275.71

Input Data - System 3 - High Eff Air Source Heat Pumps

		Estimated Cost
Cooling		
System Type:	Air Source Heat Pump	
Model:		
Efficiency:	.00	
Capacity:	Btuh	
Cooling Load:	Btuh	
Annual Cost (Bin Data Method):		$.00
Heating		
System Type:	Air Source Heat Pump	
Model:		
Efficiency:	9 HSPF	
Capacity:	96,612 Btuh	
Heating Load:	96,612 Btuh	
47° Capacity:	96,612 Btuh	
17° Capacity:	96,612 Btuh	
47° COP:	3.8	
17° COP:	2.8	
Capacity Balance Point:	-3 °F	
Cutoff Temperature:	-5 °F	
Annual Cost (Bin Data Method):		$2,682.47
Backup		
System Type:	Electric Resistance	
Efficiency:	100.00	
Capacity:	30 kW	
Annual Cost:		$126.98
Total Cost		
Total Annual Operating Cost:		$2,809.45

Input Data - System 4 - Code Miniomum Air Source Heat Pumps

		Estimated Cost
Cooling		
System Type:	Air Source Heat Pump	
Model:		
Efficiency:	.00	
Capacity:	Btuh	
Cooling Load:	Btuh	
Annual Cost (Bin Data Method):		$.00
Heating		
System Type:	Air Source Heat Pump	
Model:		
Efficiency:	8.2 HSPF	
Capacity:	96,612 Btuh	
Heating Load:	96,612 Btuh	
47° Capacity:	96,612 Btuh	
17° Capacity:	60,656 Btuh	
47° COP:	3.7	
17° COP:	2.46	
Capacity Balance Point:	20 °F	
Cutoff Temperature:	-5 °F	
Annual Cost (Bin Data Method):		$2,921.29
Backup		
System Type:	Electric Resistance	
Efficiency:	100.00	
Capacity:	30 kW	
Annual Cost:		$186.18
Total Cost		
Total Annual Operating Cost:		$3,107.47

Input Data - System 5 - Ground Source Heat Pumps

		Estimated Cost
Cooling		
System Type:	Ground Source Heat Pump	
Model:		
Efficiency:	.00	
Capacity:	Btuh	
Cooling Load:	Btuh	
Annual Cost (Bin Data Method):		$.00
Heating		
System Type:	Ground Source Heat Pump	
Model:		
Efficiency:	4.13 COP	
Capacity:	96,612 Btuh	
Heating Load:	96,612 Btuh	
47° Capacity:	96,612 Btuh	
17° Capacity:	96,612 Btuh	
47° COP:	3.8	
17° COP:	2.8	
Capacity Balance Point:	-3 °F	
Cutoff Temperature:	-99 °F	
Annual Cost (Bin Data Method):		$2,085.81
Backup		
System Type:	Electric Resistance	
Efficiency:	100.00	
Capacity:	30 kW	
Annual Cost:		$.00
Total Cost		
Total Annual Operating Cost:		$2,085.81

Monthly Costs - System 1 - Existing

Monthly System Cost

	Cooling		Heating		Total
Month	Cost	%	Cost	%	Cost
January	$.00	0.0%	$680.52	100.0%	$680.52
February	$.00	0.0%	$570.45	100.0%	$570.45
March	$.00	0.0%	$515.23	100.0%	$515.23
April	$.00	0.0%	$298.38	100.0%	$298.38
May	$.00	0.0%	$153.35	100.0%	$153.35
June	$.00	0.0%	$63.71	100.0%	$63.71
July	$.00	0.0%	$27.31	100.0%	$27.31
August	$.00	0.0%	$56.71	100.0%	$56.71
September	$.00	0.0%	$121.23	100.0%	$121.23
October	$.00	0.0%	$250.35	100.0%	$250.35
November	$.00	0.0%	$399.94	100.0%	$399.94
December	$.00	0.0%	$646.16	100.0%	$646.16
Total	$.00	0.0%	$3,783.33	100.0%	$3,783.33

Monthly Fuel Usage and Cost

	Electricity		Natural Gas		Propane		Fuel Oil	
Month	Cost	kWh	Cost	Therm	Cost	Gallons	Cost	Gallons
January	$.00	.0	$.00	.0	$.00	.0	$680.52	255.8
February	$.00	.0	$.00	.0	$.00	.0	$570.45	214.5
March	$.00	.0	$.00	.0	$.00	.0	$515.23	193.7
April	$.00	.0	$.00	.0	$.00	.0	$298.38	112.2
May	$.00	.0	$.00	.0	$.00	.0	$153.35	57.7
June	$.00	.0	$.00	.0	$.00	.0	$63.71	24.0
July	$.00	.0	$.00	.0	$.00	.0	$27.31	10.3
August	$.00	.0	$.00	.0	$.00	.0	$56.71	21.3
September	$.00	.0	$.00	.0	$.00	.0	$121.23	45.6
October	$.00	.0	$.00	.0	$.00	.0	$250.35	94.1
November	$.00	.0	$.00	.0	$.00	.0	$399.94	150.4
December	$.00	.0	$.00	.0	$.00	.0	$646.16	242.9
Total	$.00	.0	$.00	.0	$.00	.0	$3,783.33	1,422.3

Average Fuel Oil Cost Per Gallon: $2.660/Gallon
Total annual cooling load energy: BTU
Total annual heating load energy: 242,318,528 BTU

Monthly Costs - System 2 - Envelope Improvements

Monthly System Cost

	Cooling		Heating		Total
Month	Cost	%	Cost	%	Cost
January	$.00	0.0%	$589.22	100.0%	$589.22
February	$.00	0.0%	$493.91	100.0%	$493.91
March	$.00	0.0%	$446.10	100.0%	$446.10
April	$.00	0.0%	$258.34	100.0%	$258.34
May	$.00	0.0%	$132.78	100.0%	$132.78
June	$.00	0.0%	$55.16	100.0%	$55.16
July	$.00	0.0%	$23.64	100.0%	$23.64
August	$.00	0.0%	$49.10	100.0%	$49.10
September	$.00	0.0%	$104.96	100.0%	$104.96
October	$.00	0.0%	$216.76	100.0%	$216.76
November	$.00	0.0%	$346.28	100.0%	$346.28
December	$.00	0.0%	$559.46	100.0%	$559.46
Total	$.00	0.0%	$3,275.71	100.0%	$3,275.71

Monthly Fuel Usage and Cost

	Electricity		Natural Gas		Propane		Fuel Oil	
Month	Cost	kWh	Cost	Therm	Cost	Gallons	Cost	Gallons
January	$.00	.0	$.00	.0	$.00	.0	$589.22	221.5
February	$.00	.0	$.00	.0	$.00	.0	$493.91	185.7
March	$.00	.0	$.00	.0	$.00	.0	$446.10	167.7
April	$.00	.0	$.00	.0	$.00	.0	$258.34	97.1
May	$.00	.0	$.00	.0	$.00	.0	$132.78	49.9
June	$.00	.0	$.00	.0	$.00	.0	$55.16	20.7
July	$.00	.0	$.00	.0	$.00	.0	$23.64	8.9
August	$.00	.0	$.00	.0	$.00	.0	$49.10	18.5
September	$.00	.0	$.00	.0	$.00	.0	$104.96	39.5
October	$.00	.0	$.00	.0	$.00	.0	$216.76	81.5
November	$.00	.0	$.00	.0	$.00	.0	$346.28	130.2
December	$.00	.0	$.00	.0	$.00	.0	$559.46	210.3
Total	$.00	.0	$.00	.0	$.00	.0	$3,275.71	1,231.5

Average Fuel Oil Cost Per Gallon: $2.660/Gallon
Total annual cooling load energy: BTU
Total annual heating load energy: 212,274,256 BTU

Monthly Costs - System 3 - High Eff Air Source Heat Pumps

Monthly System Cost

	Cooling		Heating		Total
Month	Cost	%	Cost	%	Cost
January	$.00	0.0%	$538.25	100.0%	$538.25
February	$.00	0.0%	$475.41	100.0%	$475.41
March	$.00	0.0%	$359.52	100.0%	$359.52
April	$.00	0.0%	$194.72	100.0%	$194.72
May	$.00	0.0%	$100.22	100.0%	$100.22
June	$.00	0.0%	$43.04	100.0%	$43.04
July	$.00	0.0%	$19.50	100.0%	$19.50
August	$.00	0.0%	$38.81	100.0%	$38.81
September	$.00	0.0%	$81.08	100.0%	$81.08
October	$.00	0.0%	$165.10	100.0%	$165.10
November	$.00	0.0%	$268.66	100.0%	$268.66
December	$.00	0.0%	$525.14	100.0%	$525.14
Total	$.00	0.0%	$2,809.45	100.0%	$2,809.45

Monthly Fuel Usage and Cost

	Electricity		Natural Gas		Propane		Fuel Oil	
Month	Cost	kWh	Cost	Therm	Cost	Gallons	Cost	Gallons
January	$538.25	2,575.3	$.00	.0	$.00	.0	$.00	.0
February	$475.41	2,274.7	$.00	.0	$.00	.0	$.00	.0
March	$359.52	1,720.2	$.00	.0	$.00	.0	$.00	.0
April	$194.72	931.7	$.00	.0	$.00	.0	$.00	.0
May	$100.22	479.5	$.00	.0	$.00	.0	$.00	.0
June	$43.04	205.9	$.00	.0	$.00	.0	$.00	.0
July	$19.50	93.3	$.00	.0	$.00	.0	$.00	.0
August	$38.81	185.7	$.00	.0	$.00	.0	$.00	.0
September	$81.08	387.9	$.00	.0	$.00	.0	$.00	.0
October	$165.10	789.9	$.00	.0	$.00	.0	$.00	.0
November	$268.66	1,285.5	$.00	.0	$.00	.0	$.00	.0
December	$525.14	2,512.6	$.00	.0	$.00	.0	$.00	.0
Total	$2,809.45	13,442.3	$.00	.0	$.00	.0	$.00	.0

Average Electric Cost Per kWh: $.209/kWh
Total annual cooling load energy: BTU
Total annual heating load energy: 275,831,328 BTU

Monthly Costs - System 4 - Code Miniomum Air Source Heat Pumps

Monthly System Cost

	Cooling		Heating		Total
Month	Cost	%	Cost	%	Cost
January	$.00	0.0%	$622.79	100.0%	$622.79
February	$.00	0.0%	$540.50	100.0%	$540.50
March	$.00	0.0%	$390.84	100.0%	$390.84
April	$.00	0.0%	$203.83	100.0%	$203.83
May	$.00	0.0%	$103.06	100.0%	$103.06
June	$.00	0.0%	$43.70	100.0%	$43.70
July	$.00	0.0%	$19.64	100.0%	$19.64
August	$.00	0.0%	$39.42	100.0%	$39.42
September	$.00	0.0%	$83.09	100.0%	$83.09
October	$.00	0.0%	$172.30	100.0%	$172.30
November	$.00	0.0%	$286.38	100.0%	$286.38
December	$.00	0.0%	$601.92	100.0%	$601.92
Total	$.00	0.0%	$3,107.47	100.0%	$3,107.47

Monthly Fuel Usage and Cost

	Electricity		Natural Gas		Propane		Fuel Oil	
Month	Cost	kWh	Cost	Therm	Cost	Gallons	Cost	Gallons
January	$622.79	2,979.8	$.00	.0	$.00	.0	$.00	.0
February	$540.50	2,586.1	$.00	.0	$.00	.0	$.00	.0
March	$390.84	1,870.0	$.00	.0	$.00	.0	$.00	.0
April	$203.83	975.3	$.00	.0	$.00	.0	$.00	.0
May	$103.06	493.1	$.00	.0	$.00	.0	$.00	.0
June	$43.70	209.1	$.00	.0	$.00	.0	$.00	.0
July	$19.64	94.0	$.00	.0	$.00	.0	$.00	.0
August	$39.42	188.6	$.00	.0	$.00	.0	$.00	.0
September	$83.09	397.6	$.00	.0	$.00	.0	$.00	.0
October	$172.30	824.4	$.00	.0	$.00	.0	$.00	.0
November	$286.38	1,370.3	$.00	.0	$.00	.0	$.00	.0
December	$601.92	2,880.0	$.00	.0	$.00	.0	$.00	.0
Total	$3,107.47	14,868.3	$.00	.0	$.00	.0	$.00	.0

Average Electric Cost Per kWh: $.209/kWh
Total annual cooling load energy: BTU
Total annual heating load energy: 275,831,328 BTU

Monthly Costs - System 5 - Ground Source Heat Pumps

Monthly System Cost

	Cooling		Heating		Total
Month	Cost	%	Cost	%	Cost
January	$.00	0.0%	$360.18	100.0%	$360.18
February	$.00	0.0%	$303.41	100.0%	$303.41
March	$.00	0.0%	$278.27	100.0%	$278.27
April	$.00	0.0%	$168.94	100.0%	$168.94
May	$.00	0.0%	$92.35	100.0%	$92.35
June	$.00	0.0%	$41.48	100.0%	$41.48
July	$.00	0.0%	$19.40	100.0%	$19.40
August	$.00	0.0%	$37.42	100.0%	$37.42
September	$.00	0.0%	$75.85	100.0%	$75.85
October	$.00	0.0%	$144.95	100.0%	$144.95
November	$.00	0.0%	$220.41	100.0%	$220.41
December	$.00	0.0%	$343.15	100.0%	$343.15
Total	$.00	0.0%	$2,085.81	100.0%	$2,085.81

Monthly Fuel Usage and Cost

	Electricity		Natural Gas		Propane		Fuel Oil	
Month	Cost	kWh	Cost	Therm	Cost	Gallons	Cost	Gallons
January	$360.18	1,723.4	$.00	.0	$.00	.0	$.00	.0
February	$303.41	1,451.7	$.00	.0	$.00	.0	$.00	.0
March	$278.27	1,331.5	$.00	.0	$.00	.0	$.00	.0
April	$168.94	808.3	$.00	.0	$.00	.0	$.00	.0
May	$92.35	441.9	$.00	.0	$.00	.0	$.00	.0
June	$41.48	198.5	$.00	.0	$.00	.0	$.00	.0
July	$19.40	92.8	$.00	.0	$.00	.0	$.00	.0
August	$37.42	179.1	$.00	.0	$.00	.0	$.00	.0
September	$75.85	362.9	$.00	.0	$.00	.0	$.00	.0
October	$144.95	693.5	$.00	.0	$.00	.0	$.00	.0
November	$220.41	1,054.6	$.00	.0	$.00	.0	$.00	.0
December	$343.15	1,641.9	$.00	.0	$.00	.0	$.00	.0
Total	$2,085.81	9,979.9	$.00	.0	$.00	.0	$.00	.0

Average Electric Cost Per kWh: $.209/kWh
Total annual cooling load energy: BTU
Total annual heating load energy: 275,831,328 BTU

Plainfield Fire Station
HVAC Load Calculations

for

Eversource.Plainfield

Plainfield NH 03781

Elite Software

RHVAC Residential HVAC Loads

Existing Conditions

Prepared By:

Margaret Dillon
S.E.E.D.S.

September 9, 2019

Rhvac is an ACCA approved Manual J and Manual D computer program.
Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.

Project Report

General Project Information

Project Title:	Plainfield Fire Station
Project Date:	Thursday, August 15, 2019
Client Name:	Eversource.Plainfield
Client City:	Plainfield NH 03781
Company Name:	S.E.E.D.S.
Company Representative:	Margaret Dillon
Company E-Mail Address:	mdillon@myfairpoint.net

Design Data

Reference City:		Lebanon, New Hampshire
Building Orientation:		Front door faces Southeast
Daily Temperature Range:		Medium
Latitude:	43	Degrees
Elevation:	493	ft.
Altitude Factor:	.982	

	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-3	-3.6	n/a	n/a	70	n/a
Summer:	86	69	43%	50%	75	15

Check Figures

Total Building Supply CFM:		CFM Per Square ft.:	.000	*
Square ft. of Room Area:	4,704	Square ft. Per Ton:		**
Volume (ft³):	82,240***			

* Based on area of rooms being heated or cooled (whichever governs system) rather than entire floor area.
** Based on area of rooms being cooled.
***Indicated volume is based on custom building volume.

Building Loads

Total Heating Required Including Ventilation Air:	110,287	Btuh	110.287	MBH

Notes

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All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads according to the manufacturer's performance data at your design conditions.

Miscellaneous Report

System 1 Meeting Room, Kitchen, Offices Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-3	-3.6	80%	n/a	70	n/a
Summer:	86	69	43%	50%	75	15.07

System 2 Apparatus Bays Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-3	-3.6	80%	n/a	70	n/a
Summer:	86	69	43%	50%	75	15.07

Duct Sizing Inputs

	Main Trunk		Runouts	
Calculate:	Yes		Yes	
Use Schedule:	Yes		Yes	
Roughness Factor:	.00300		.01000	
Pressure Drop:	.1000	in.wg./100 ft.	.1000	in.wg./100 ft.
Minimum Velocity:	0	ft./min	0	ft./min
Maximum Velocity:	900	ft./min	750	ft./min
Minimum Height:		in.		in.
Maximum Height:		in.		in.

Outside Air Data

	Winter		Summer	
Infiltration Specified:	.475	AC/hr	.220	AC/hr
	651	CFM	302	CFM
Infiltration Actual:	.475	AC/hr	.220	AC/hr
Building Volume:	X 82,240*	Cu.ft.	X 82,240*	Cu.ft.
	39,042	Cu.ft./hr	18,130	Cu.ft./hr
	X 0.0167		X 0.0167	
Total Building Infiltration:	651	CFM	302	CFM
Total Building Ventilation:		CFM		CFM

*Indicated volume is based on custom building volume.

---System 1---

Infiltration & Ventilation Sensible Gain Multiplier: 11.89 = (1.10 X .982 X 11.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 10.07 = (0.68 X .982 X 15.07 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 78.88 = (1.10 X .982 X 73.00 Winter Temp. Difference)
Winter Infiltration Specified: .475 AC/hr (181 CFM)
Summer Infiltration Specified: .220 AC/hr (84 CFM)
Blower Door Data:

Wind Shielding Class:	2 - Few Obstructions
Building Stories:	1
Multi/Single Option:	Single-Point
Assumed n:	.65
Pressure Diff.:	35
Test Flow (Selected):	5,330
Test AC/hr:	3.888619

---System 2---

Infiltration & Ventilation Sensible Gain Multiplier: 11.89 = (1.10 X .982 X 11.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 10.07 = (0.68 X .982 X 15.07 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 78.88 = (1.10 X .982 X 73.00 Winter Temp. Difference)
Winter Infiltration Specified: .475 AC/hr (470 CFM)
Summer Infiltration Specified: .220 AC/hr (218 CFM)
Blower Door Data:

Wind Shielding Class:	2 - Few Obstructions
Building Stories:	1
Multi/Single Option:	Single-Point
Assumed n:	.65
Pressure Diff.:	35

Load Preview Report

Scope	Net Ton	ft.²/Ton	Area	Sen Gain	Lat Gain	Net Gain	Sen Loss	Sys Htg CFM	Sys Clg CFM	Sys Act CFM	Duct Size
Building	.00		4,704				110,287	1,458			
System 1	.00		2,304				33,656	445			0x0*
Zone 1			2,304				33,656	445		445	8x12
1-Meeting Room			1,290				11,614	154		154	2--6
2-Kitchen			280				8,496	112		112	2--5
3-Bathrooms			182				3,704	49		49	1--5
4-Laundry			72				1,566	21		21	1--4
5-Office Interior			120				448	6		6	1--4
6-Office Exterior			120				3,690	49		49	1--5
7-Storage			120				3,690	49		49	1--5
8-Server Room			120				448	6		6	1--4
System 2	.00		2,400				76,631	1,013			0x0*
Zone 1			2,400				76,631	1,013		1,013	12x14
9-Garage Bays			2,400				76,631	1,013		1,013	10--6

Total Building Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
1A-rv-o: Glazing-Single pane, operable window, reflective, vinyl frame, u-value .29, SHGC .26	8.3	175	0		
11I: Door-Wood - Panel With Metal Storm	37.2	978	0		
Existing: Door-Overhead Door	504	5,520	0		
12C-0sm: Wall-Frame, R-13 insulation in 2 x 4 stud cavity, no board insulation, siding finish, metal studs	3277.5	27,514	0		
12C-0bw: Wall-Frame, R-13 insulation in 2 x 4 stud cavity, no board insulation, brick finish, wood studs	813	5,400	0		
18A-19: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-19 blanket or loose fill	4704	17,514	0		
22A-ph: Floor-Slab on grade, No edge insulation, no insulation below floor, any floor cover, passive, heavy moist soil	254	1,855	0		
22A-ph: Floor-Slab on grade, No edge insulation, no insulation below floor, any floor cover, passive, heavy moist soil	2	2	0		
Subtotals for structure:		58,958	0		
People:	0				
Equipment:					
Lighting:	0				
Ductwork:					
Infiltration: Winter CFM: 651, Summer CFM: 302		51,329			
Ventilation: Winter CFM: , Summer CFM:					
Total Building Load Totals:		110,287			

Check Figures

Total Building Supply CFM:		CFM Per Square ft.:	.000	*
Square ft. of Room Area:	4,704	Square ft. Per Ton:		**
Volume (ft³):	82,240***			

* Based on area of rooms being heated or cooled (whichever governs system) rather than entire floor area.
** Based on area of rooms being cooled.
***Indicated volume is based on custom building volume.

Building Loads

Total Heating Required Including Ventilation Air: 110,287 Btuh 110.287 MBH

Notes

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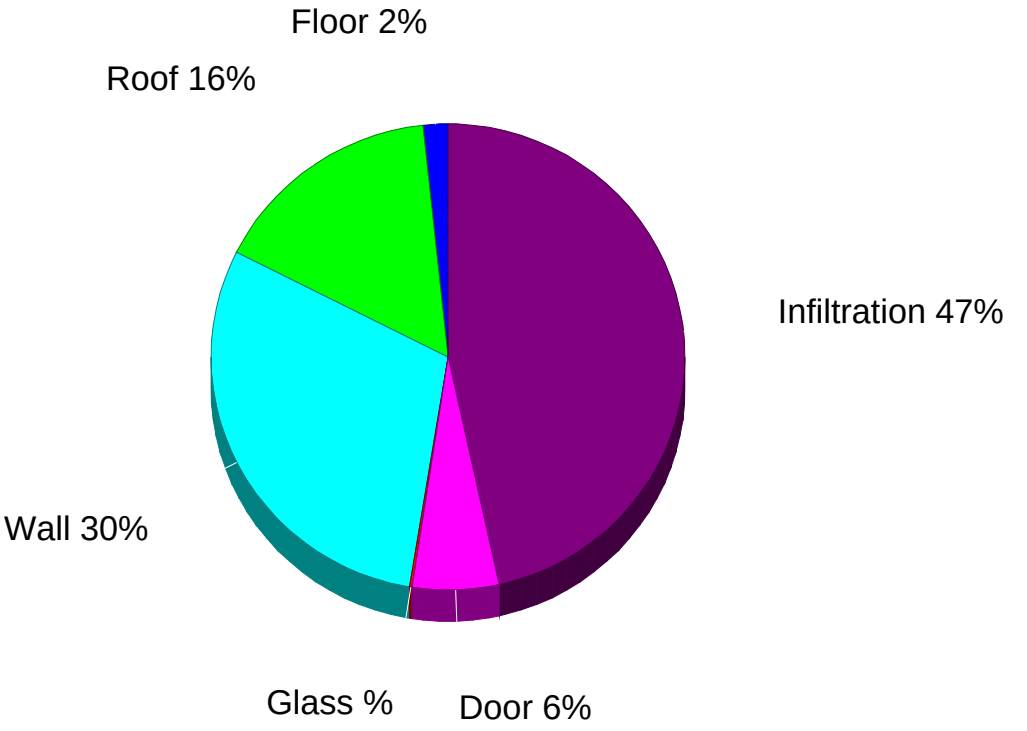
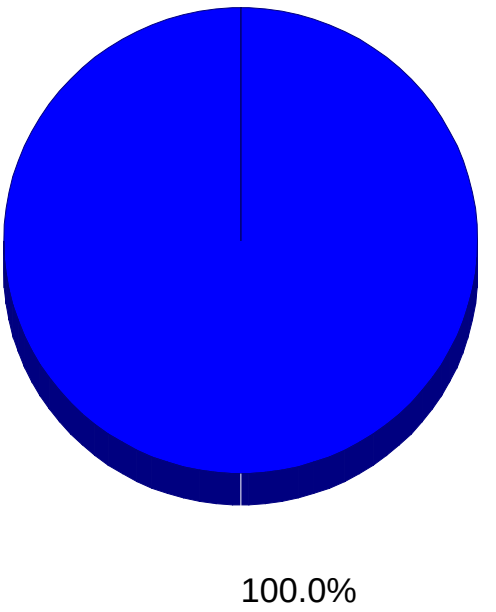
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads according to the manufacturer's performance data at your design conditions.

Building Pie Chart





Plainfield Fire Station
HVAC Load Calculations

for

Eversource.Plainfield

Plainfield NH 03781

Elite Software

RHVAC Residential HVAC Loads

Improved Envelope

Prepared By:

Margaret Dillon
S.E.E.D.S.

September 9, 2019

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Project Report

General Project Information

Project Title:	Plainfield Fire Station
Project Date:	Thursday, August 15, 2019
Client Name:	Eversource.Plainfield
Client City:	Plainfield NH 03781
Company Name:	S.E.E.D.S.
Company Representative:	Margaret Dillon
Company E-Mail Address:	mdillon@myfairpoint.net

Design Data

Reference City:		Lebanon, New Hampshire
Building Orientation:		Front door faces Southeast
Daily Temperature Range:		Medium
Latitude:	43	Degrees
Elevation:	493	ft.
Altitude Factor:	.982	

	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-3	-3.6	n/a	n/a	70	n/a
Summer:	86	69	43%	50%	75	15

Check Figures

Total Building Supply CFM:		CFM Per Square ft.:	.000	*
Square ft. of Room Area:	4,704	Square ft. Per Ton:		**
Volume (ft^3):	82,240***			

* Based on area of rooms being heated or cooled (whichever governs system) rather than entire floor area.
** Based on area of rooms being cooled.
***Indicated volume is based on custom building volume.

Building Loads

Total Heating Required Including Ventilation Air:	96,611	Btuh	96.611	MBH

Notes

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Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads according to the manufacturer's performance data at your design conditions.

Miscellaneous Report

System 1 Meeting Room, Kitchen, Offices Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-3	-3.6	80%	n/a	70	n/a
Summer:	86	69	43%	50%	75	15.07

System 2 Apparatus Bays Input Data	Outdoor Dry Bulb	Outdoor Wet Bulb	Outdoor Rel.Hum	Indoor Rel.Hum	Indoor Dry Bulb	Grains Difference
Winter:	-3	-3.6	80%	n/a	70	n/a
Summer:	86	69	43%	50%	75	15.07

Duct Sizing Inputs

	Main Trunk		Runouts	
Calculate:	Yes		Yes	
Use Schedule:	Yes		Yes	
Roughness Factor:	.00300		.01000	
Pressure Drop:	.1000	in.wg./100 ft.	.1000	in.wg./100 ft.
Minimum Velocity:	0	ft./min	0	ft./min
Maximum Velocity:	900	ft./min	750	ft./min
Minimum Height:		in.		in.
Maximum Height:		in.		in.

Outside Air Data

	Winter		Summer	
Infiltration Specified:	.377	AC/hr	.175	AC/hr
	516	CFM	240	CFM
Infiltration Actual:	.377	AC/hr	.175	AC/hr
Building Volume:	X 82,240*	Cu.ft.	X 82,240*	Cu.ft.
	30,964	Cu.ft./hr	14,379	Cu.ft./hr
	X 0.0167		X 0.0167	
Total Building Infiltration:	516	CFM	240	CFM
Total Building Ventilation:		CFM		CFM

*Indicated volume is based on custom building volume.

---System 1---

Infiltration & Ventilation Sensible Gain Multiplier: 11.89 = (1.10 X .982 X 11.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 10.07 = (0.68 X .982 X 15.07 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 78.88 = (1.10 X .982 X 73.00 Winter Temp. Difference)
Winter Infiltration Specified: .377 AC/hr (143 CFM)
Summer Infiltration Specified: .175 AC/hr (66 CFM)
Blower Door Data:

Wind Shielding Class:	2 - Few Obstructions
Building Stories:	1
Multi/Single Option:	Single-Point
Assumed n:	.65
Pressure Diff.:	50
Test Flow (Selected):	5,330
Test AC/hr:	3.888619

---System 2---

Infiltration & Ventilation Sensible Gain Multiplier: 11.89 = (1.10 X .982 X 11.00 Summer Temp. Difference)
Infiltration & Ventilation Latent Gain Multiplier: 10.07 = (0.68 X .982 X 15.07 Grains Difference)
Infiltration & Ventilation Sensible Loss Multiplier: 78.88 = (1.10 X .982 X 73.00 Winter Temp. Difference)
Winter Infiltration Specified: .377 AC/hr (373 CFM)
Summer Infiltration Specified: .175 AC/hr (173 CFM)
Blower Door Data:

Wind Shielding Class:	2 - Few Obstructions
Building Stories:	1
Multi/Single Option:	Single-Point
Assumed n:	.65
Pressure Diff.:	50

Miscellaneous Report (cont'd)

Outside Air Data

Test Flow (Selected):	5,330
Test AC/hr:	3.888619

Load Preview Report

Scope	Net Ton	ft.²/Ton	Area	Sen Gain	Lat Gain	Net Gain	Sen Loss	Sys Htg CFM	Sys Clg CFM	Sys Act CFM	Duct Size
Building	.00		4,704				96,611	1,277			
System 1	.00		2,304				29,489	390			0x0*
Zone 1			2,304				29,489	390		390	8x10
1-Meeting Room			1,290				10,529	139		139	2--6
2-Kitchen			280				7,255	96		96	1--6
3-Bathrooms			182				3,189	42		42	1--5
4-Laundry			72				1,344	18		18	1--4
5-Office Interior			120				448	6		6	1--4
6-Office Exterior			120				3,138	41		41	1--5
7-Storage			120				3,138	41		41	1--5
8-Server Room			120				448	6		6	1--4
System 2	.00		2,400				67,122	887			0x0*
Zone 1			2,400				67,122	887		887	10x16
9-Garage Bays			2,400				67,122	887		887	9--6

Total Building Summary Loads

Component Description	Area Quan	Sen Loss	Lat Gain	Sen Gain	Total Gain
1A-rv-o: Glazing-Single pane, operable window, reflective, vinyl frame, u-value .29, SHGC .26	8.3	175	0		
11I: Door-Wood - Panel With Metal Storm	37.2	978	0		
Existing: Door-Overhead Door	504	5,520	0		
12C-0sm: Wall-Frame, R-13 insulation in 2 x 4 stud cavity, no board insulation, siding finish, metal studs	3277.5	23,927	0		
12C-0bw: Wall-Frame, R-13 insulation in 2 x 4 stud cavity, no board insulation, brick finish, wood studs	813	5,935	0		
18A-19: Roof/Ceiling-Roof Joists Between Roof Deck and Ceiling or Foam Encapsulated Roof Joists, Dark or Bold-Color Asphalt Shingle, Dark Metal, Dark Membrane, Dark Tar and Gravel, R-19 blanket or loose fill	4704	17,514	0		
22A-ph: Floor-Slab on grade, No edge insulation, no insulation below floor, any floor cover, passive, heavy moist soil	254	1,855	0		
22A-ph: Floor-Slab on grade, No edge insulation, no insulation below floor, any floor cover, passive, heavy moist soil	2	2	0		
Subtotals for structure:		55,906	0		
People:	0				
Equipment:					
Lighting:	0				
Ductwork:					
Infiltration: Winter CFM: 516, Summer CFM: 240		40,705			
Ventilation: Winter CFM: , Summer CFM:					
Total Building Load Totals:		96,611			

Check Figures

Total Building Supply CFM:		CFM Per Square ft.:	.000	*
Square ft. of Room Area:	4,704	Square ft. Per Ton:		**
Volume (ft³):	82,240***			

* Based on area of rooms being heated or cooled (whichever governs system) rather than entire floor area.
** Based on area of rooms being cooled.
***Indicated volume is based on custom building volume.

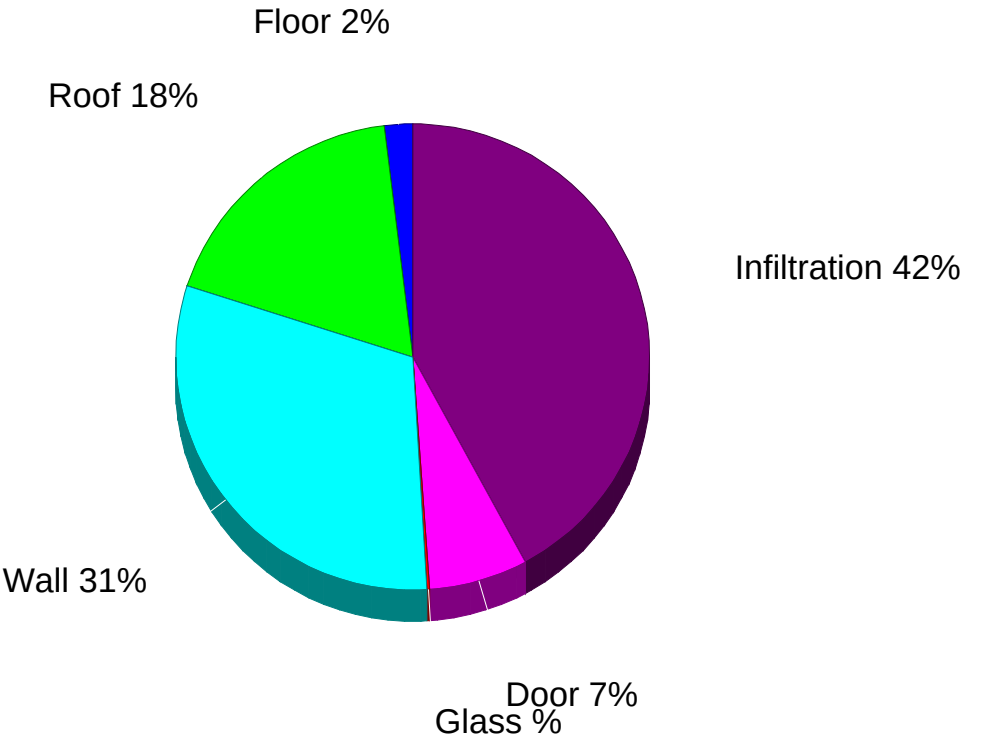
Building Loads

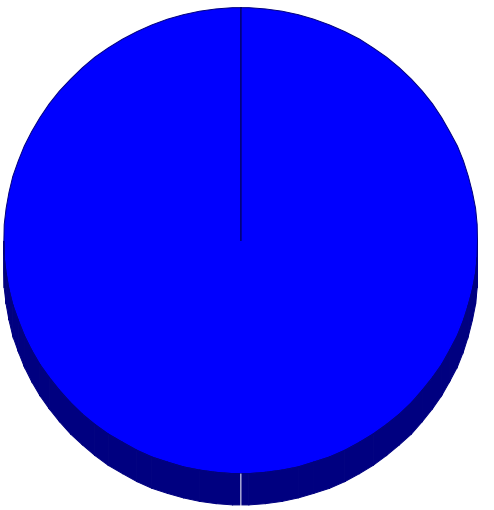
Total Heating Required Including Ventilation Air: 96,611 Btuh 96.611 MBH

Notes

Rhvac is an ACCA approved Manual J and Manual D computer program.
Calculations are performed per ACCA Manual J 8th Edition, Version 2, and ACCA Manual D.
All computed results are estimates as building use and weather may vary.
Be sure to select a unit that meets both sensible and latent loads according to the manufacturer's performance data at your design conditions.

Building Pie Chart





100.0%

DDMi DESIGN DAY Mechanicals Inc

9/11/19

HEATING AND AIR CONDITIONING SCOPE OF WORK

I. Purpose - The purpose for this Heating Scope of Work (SOW) is to solicit Design/ Build proposals for a new heating system for the existing Plainfield Fire Station, 1260 NH Route 12-A, Plainfield, NH. The Brad Atwater is the Town's Representative, the reviewing Mechanical Engineer is Doug Waitt of Design Day Mechanicals, Inc., hereafter known as the Engineer, and the Design/ Build Heating Contractor shall be hereafter known as the Contractor.

   A. Heating load calculations have been performed by Margaret Dillon of S.E.E.D.S and reviewed by the Engineer based on expected existing envelope insulation and air sealing.

   B. The Contractor is responsible for visiting the site to observe existing conditions with the Town's Representative and to correlate existing rooms names with those listed in this SOW. The Contractor will be responsible for all subtrades associated with providing a complete system, including cutting, patching and touch-up painting that may be required. The Contractor shall review all proposed ductwork systems with the Town's Representative for approval prior to any fabrication or installation.

   C. A licensed electrician retained by the Contractor shall provide all required power wiring. The Contractor shall provide all control wiring.

II. Proposed Work:

   A. Three (3) new Heating system options are described herein. Each shall be priced separately. Detailed equipment Submittals are provided with this SOW, with budget pricing based on recent manufacturer's representative per ton pricing, and the manufacturer's representatives contact information. The Contractor shall contact the manufacturer's representative for details on what is and is not included in budget pricing.

   B. Provide, install, duct, pipe and control wire complete new heat pump systems with space thermostats for each option for the two (2) zones of control as described on the Equipment Submittal Sheets. Equipment for the Apparatus Bays shall be located within that space and equipment for the meeting Room, Kitchen and Offices shall be installed above the Meeting Room. Duct and piping design shall be by the Contractor.

   C. Refer to attached Options #1 through #3.

III. Start-up, commission and warranty all equipment and systems for one year from the date of acceptance/ final payment by the Owner.

   End of Heating and Air Conditioning Scope of Work

Andrew W. Arsenault, P.E.	•	81 Pointed Fir Blvd, Wells, ME 04090	•	(207) 337-2473	•	andya@designdaymech.com
Douglas C. Waitt	•	P.O. Box 447, New Ipswich, NH 03071	•	(603) 801-6000	•	dougw@designdaymech.com
Richard D. Gagnon	•	84 Gilford Street, Manchester, NH 03102	•	(603) 668-5027	•	rickg@designdaymech.com
John L. Waitt	•	148 Beaver Ridge Rd, Ctr. Barnstead, NH 03225	•	(603) 269-7253	•	johnw@designdaymech.com
David C. Magnuson	•	65 Old Center Rd, Deerfield, NH 03037	•	(603) 463-1086	•	davem@designdaymech.com
Monique R. Magnuson	•	65 Old Center Rd, Deerfield, NH 03037	•	(603) 463-1086	•	moniquem@designdaymech.com

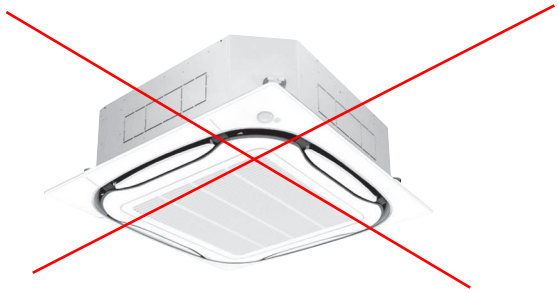
Option #1 – High Efficiency Air Source Heat Pumps (HE-ASHP) and Second Stage Electric Heat, Refer to Equipment Sheets. Budget Equipment Price - $21,000, Manufacturer's Representative – DXS, Attention: Adam Camillo, 1-978-977-9911, adam.camillo@dxseng.com

1. External appearance

1.1 Indoor unit

Ceiling mounted cassette type (Round flow with sensing)

FCQ18TAVJU
FCQ24TAVJU
FCQ30TAVJU
FCQ36TAVJU
FCQ42TAVJU
FCQ48TAVJU

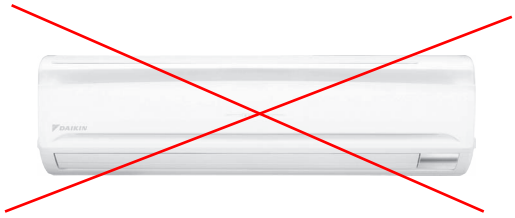


Ceiling suspended type

FHQ18PVJU
FHQ24PVJU
FHQ30PVJU
FHQ36MVJU
FHQ42MVJU

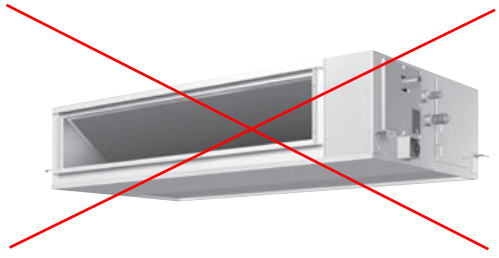
Wall mounted type

FAQ18TAVJU
FAQ24TAVJU



Ceiling mounted duct type

FBQ18PVJU
FBQ24PVJU
FBQ30PVJU
FBQ36PVJU
FBQ42PVJU
FBQ48PVJU



Air handling unit

FTQ18TAVJUD	**FTQ18TAVJUA**
FTQ24TAVJUD	**FTQ24TAVJUA**
FTQ30TAVJUD	**FTQ30TAVJUA**
FTQ36TAVJUD	**FTQ36TAVJUA**
FTQ42TAVJUD	**FTQ42TAVJUA**
FTQ48TAVJUD	**FTQ48TAVJUA**

Option #1
HE-ASHP-1
Meeting, Kitchen, Offices
HE-ASHP-2 & 3
Apparatus Bays

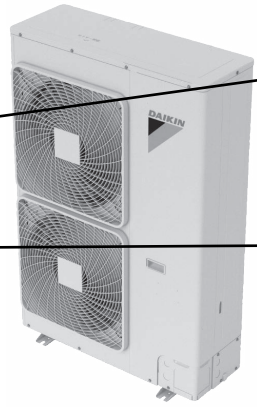
1.2 Outdoor unit

RZR18TAVJU
RZR24TAVJU

RZQ18TAVJU
RZQ24TAVJU

RZR30TAVJU
RZR36TAVJU
RZR42TAVJU
RZR48TAVJU

RZQ30TAVJU
RZQ36TAVJU
RZQ42TAVJU
RZQ48TAVJU



Option #1
HE-ASHP-1
Meeting, Kitchen, Offices
HE-ASHP-2 & 3
Apparatus Bays

Air handling unit, continued

HE-ASHP-1

Model	Indoor unit	with factory disconnect		FTQ30TAVJUD	FTQ36TAVJUD
		without factory disconnect		FTQ30TAVJUA	FTQ36TAVJUA
	Outdoor unit			RZQ30TAVJU	RZQ36TAVJU
Power supply				1 phase, 208/230 V, 60 Hz	1 phase, 208/230 V, 60 Hz
★1, ★4 Cooling capacity			Btu/h (kW)	30,000 (8.8)	36,000 (10.6)
★2, ★4 Heating capacity			Btu/h (kW)	34,000 (10.0)	40,000 (11.7)
★3, ★4 Heating capacity			Btu/h (kW)	22,000 (6.4)	26,000 (7.6)
SEER (Rated)				16.0	15.3
EER (Rated)			Btu/h-W	12.5	11.3
HSPF (Rated)				10.4	9.5
Indoor unit		with factory disconnect		FTQ30TAVJUD	FTQ36TAVJUD
		without factory disconnect		FTQ30TAVJUA	FTQ36TAVJUA
Casing/color				Daikin Slate Gray	Daikin Slate Gray
Dimensions	H × W × D		in. (mm)	45 × 17.5 × 21 (1,143 × 445 × 533)	45 × 17.5 × 21 (1,143 × 445 × 533)
Coil	Type			Cross fin coil	Cross fin coil
	Face area		ft.² (m²)	3.75 (35)	3.75 (35)
Fan	Type			Sirocco FC Centrifugal	Sirocco FC Centrifugal
	Motor output		HP	1/2	1/2
	Airflow rate (H/M/L)		cfm (m³/min)	1,000/850/700 (28.3/24.1/19.8)	1,050/900/750 (29.7/25.5/21.2)
	External static pressure		in. w.g.	0.1” - 0.9”	0.1” - 0.9”
Air filter				— ★5	— ★5
Weight			lbs (kg)	115 (52.2)	140 (63.5)
Piping connections		Liquid	in. (mm)	ϕ3/8 (ϕ9.5) (Brazing connection)	ϕ3/8 (ϕ9.5) (Brazing connection)
		Gas	in. (mm)	ϕ5/8 (ϕ15.9) (Brazing connection)	ϕ5/8 (ϕ15.9) (Brazing connection)
		Drain	in. (mm)	3/4” (19.1)	3/4” (19.1)
Remote controller (accessory)		Wired		BRC1E73, BRC2A71	BRC1E73, BRC2A71
		Wireless		BRC4C82	BRC4C82
Outdoor unit				RZQ30TAVJU	RZQ36TAVJU
Casing/color				Ivory white	Ivory white
Dimensions	H × W × D		in. (mm)	52–15/16 × 35–7/16 × 12–5/8 (1,345 × 900 × 320)	52–15/16 × 35–7/16 × 12–5/8 (1,345 × 900 × 320)
Coil	Type			Cross fin coil	Cross fin coil
	Rows × Stages × FPI			2 × 60 × 19	2 × 60 × 19
	Face area		ft.² (m²)	12.2 (1.134)	12.2 (1.134)
Compressor	Model			2YC90GXD#D	2YC90GXD#D
	Type			Hermetically sealed swing type	Hermetically sealed swing type
	Motor output		kW	3.5	3.5
Fan	Model			P47N	P47N
	Type			Propeller fan	Propeller fan
	Motor output		W	70 × 2	70 × 2
	Airflow rate		cfm (m³/min)	3,741 (106)	3,741 (106)
Weight			lbs (kg)	225 (102)	225 (102)
Piping connections		Liquid	in. (mm)	ϕ3/8 (ϕ9.5) (Flare connection)	ϕ3/8 (ϕ9.5) (Flare connection)
		Gas	in. (mm)	ϕ5/8 (ϕ15.9) (Flare connection)	ϕ5/8 (ϕ15.9) (Flare connection)
		Drain	in. (mm)	ϕ1 (ϕ26) (Hole)	ϕ1 (ϕ26) (Hole)
Safety devices				High pressure switch, Outdoor fan driver overload protector, Inverter overload protector, Fusible plugs, Fuse	High pressure switch, Outdoor fan driver overload protector, Inverter overload protector, Fusible plugs, Fuse
Capacity step			%	14-100	14-100
Refrigerant control				Electronic expansion valve	Electronic expansion valve
Ref. piping	Standard length		ft (m)	25 (7.6)	25 (7.6)
	Max. length		ft (m)	230 (70)	230 (70)
	Max. height difference		ft (m)	98 (30)	98 (30)
Refrigerant	Type			R410A	R410A
	Charge		lbs (kg)	7.9 (3.6)	7.9 (3.6)
Ref. oil	Type			Refer to the name plate of compressor.	Refer to the name plate of compressor.
	Charge		L	1.52	1.52

Notes:

★1 Indoor temp. : 80°FDB (26.7°CDB), 67°FWB (19.4°CWB) / Outdoor temp. : 95°FDB (35.0°CDB) / Equivalent piping length : 25 ft. (7.6 m), level difference : 0 ft. (0 m).
★2 Indoor temp. : 70°FDB (21.1°CDB) / Outdoor temp. : 47°FDB (8.3°CDB), 43°FWB (6.1°CWB) / Equivalent piping length : 25 ft. (7.6 m), level difference : 0 ft. (0 m).
★3 Indoor temp.: 70°FDB (21.1°CDB) / Outdoor temp.: 17°FDB (−8.3°CDB), 15°FWB (−9.4°CWB) / Equivalent piping length: 25 ft. (7.6 m), level difference: 0 ft. (0 m).
★4 Capacities are net, including a deduction for cooling (an addition for heating) for indoor fan motor heat.
★5 Air filter is not standard accessory (field supply parts), but please mount it in the duct system of the suction side.

Air handling unit, continued

HE-ASHP-2 & 3

Model	Indoor unit	with factory disconnect		FTQ42TAVJUD	FTQ48TAVJUD
		without factory disconnect		FTQ42TAVJUA	FTQ48TAVJUA
	Outdoor unit			RZQ42TAVJU	RZQ48TAVJU
Power supply				1 phase, 208/230 V, 60 Hz	1 phase, 208/230 V, 60 Hz
★1, ★4 Cooling capacity			Btu/h (kW)	42,000 (12.3)	48,000 (14.1)
★2, ★4 Heating capacity			Btu/h (kW)	47,000 (13.8)	54,000 (15.8)
★3, ★4 Heating capacity			Btu/h (kW)	31,000 (9.1)	32,000 (9.4)
SEER (Rated)				16.0	14.8
EER (Rated)			Btu/h-W	11.0	9.5
HSPF (Rated)				9.0	9.0
Indoor unit		with factory disconnect		FTQ42TAVJUD	FTQ48TAVJUD
		without factory disconnect		FTQ42TAVJUA	FTQ48TAVJUA
Casing/color				Daikin Slate Gray	Daikin Slate Gray
Dimensions	H × W × D		in. (mm)	53.43 × 21 × 21 (1,357 × 533 × 533)	53.43 × 21 × 21 (1,357 × 533 × 533)
Coil	Type			Cross fin coil	Cross fin coil
	Face area		ft.² (m²)	5.15 (48)	5.15 (48)
Fan	Type			Sirocco FC Centrifugal	Sirocco FC Centrifugal
	Motor output		HP	3/4	3/4
	Airflow rate (H/M/L)		cfm (m³/min)	1,400/1,190/980 (39.7/33.7/27.8)	1,520/1,290/1,060 (43.1/36.5/30.0)
	External static pressure		in. w.g.	0.1” - 0.9”	0.1” - 0.9”
Air filter				— ★5	— ★5
Weight			lbs (kg)	150 (68)	150 (68)
Piping connections		Liquid	in. (mm)	ϕ3/8 (ϕ9.5) (Brazing connection)	ϕ3/8 (ϕ9.5) (Brazing connection)
		Gas	in. (mm)	ϕ5/8 (ϕ15.9) (Brazing connection)	ϕ5/8 (ϕ15.9) (Brazing connection)
		Drain	in. (mm)	3/4” (19.1)	3/4” (19.1)
Remote controller (accessory)		Wired		BRC1E73, BRC2A71	BRC1E73, BRC2A71
		Wireless		BRC4C82	BRC4C82
Outdoor unit				RZQ42TAVJU	RZQ48TAVJU
Casing/color				Ivory white	Ivory white
Dimensions	H × W × D		in. (mm)	52–15/16 × 35–7/16 × 12–5/8 (1,345 × 900 × 320)	52–15/16 × 35–7/16 × 12–5/8 (1,345 × 900 × 320)
Coil	Type			Cross fin coil	Cross fin coil
	Rows × Stages × FPI			2 × 60 × 19	2 × 60 × 19
	Face area		ft.² (m²)	12.2 (1.134)	12.2 (1.134)
Compressor	Model			2YC90GXD#D	2YC90GXD#D
	Type			Hermetically sealed swing type	Hermetically sealed swing type
	Motor output		kW	3.5	3.5
Fan	Model			P47N	P47N
	Type			Propeller fan	Propeller fan
	Motor output		W	70 × 2	70 × 2
	Airflow rate		cfm (m³/min)	3,741 (106)	3,741 (106)
Weight			lbs (kg)	225 (102)	225 (102)
Piping connections		Liquid	in. (mm)	ϕ3/8 (ϕ9.5) (Flare connection)	ϕ3/8 (ϕ9.5) (Flare connection)
		Gas	in. (mm)	ϕ5/8 (ϕ15.9) (Flare connection)	ϕ5/8 (ϕ15.9) (Flare connection)
		Drain	in. (mm)	ϕ1 (ϕ26) (Hole)	ϕ1 (ϕ26) (Hole)
Safety devices				High pressure switch, Outdoor fan driver overload protector, Inverter overload protector, Fusible plugs, Fuse	High pressure switch, Outdoor fan driver overload protector, Inverter overload protector, Fusible plugs, Fuse
Capacity step			%	14-100	14-100
Refrigerant control				Electronic expansion valve	Electronic expansion valve
Ref. piping	Standard length		ft (m)	25 (7.6)	25 (7.6)
	Max. length		ft (m)	230 (70)	230 (70)
	Max. height difference		ft (m)	98 (30)	98 (30)
Refrigerant	Type			R410A	R410A
	Charge		lbs (kg)	7.9 (3.6)	7.9 (3.6)
Ref. oil	Type			Refer to the name plate of compressor.	Refer to the name plate of compressor.
	Charge		L	1.52	1.52

Notes:

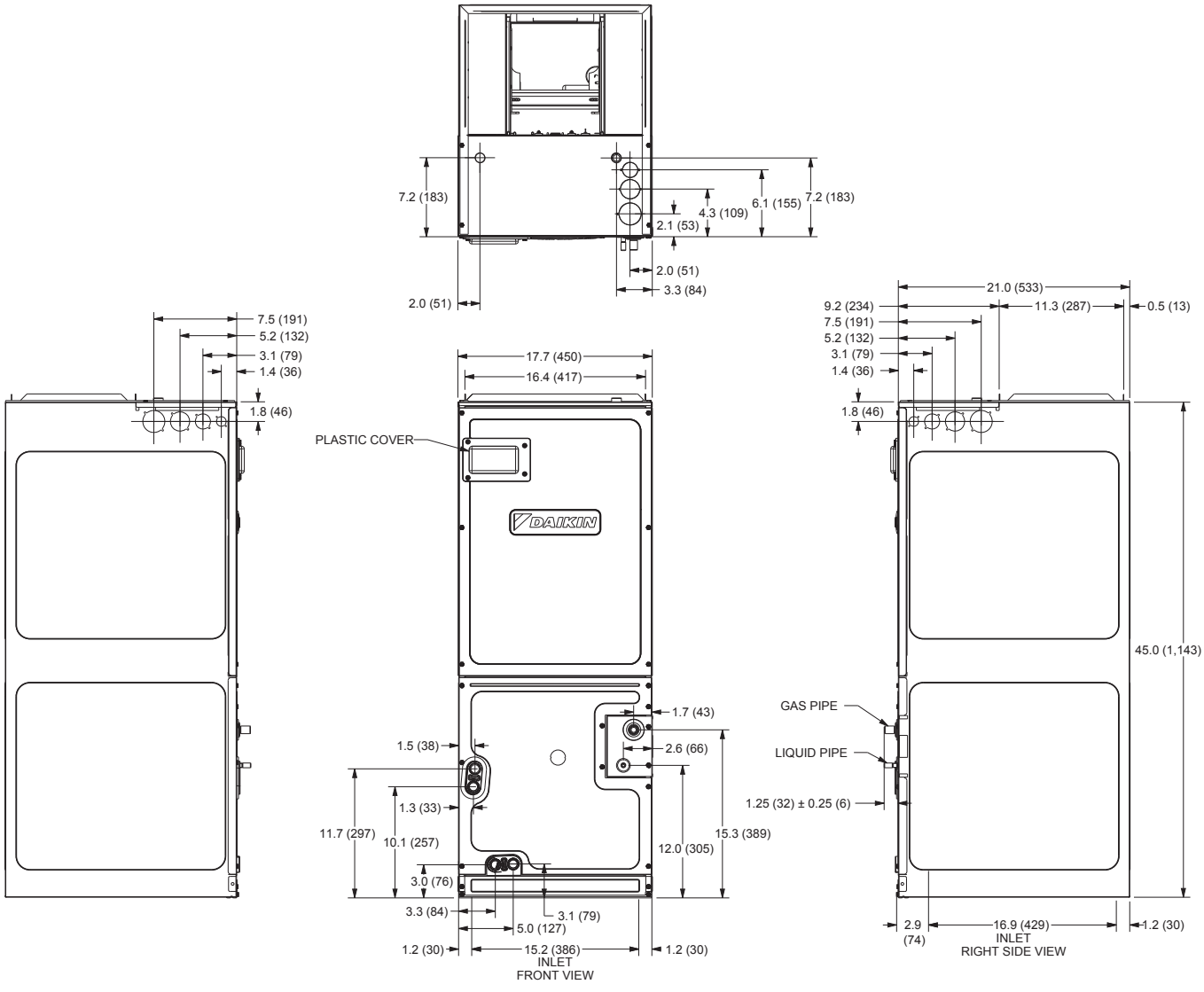
★1 Indoor temp. : 80°FDB (26.7°CDB), 67°FWB (19.4°CWB) / Outdoor temp. : 95°FDB (35.0°CDB) / Equivalent piping length : 25 ft. (7.6 m), level difference : 0 ft. (0 m).
★2 Indoor temp. : 70°FDB (21.1°CDB) / Outdoor temp. : 47°FDB (8.3°CDB), 43°FWB (6.1°CWB) / Equivalent piping length : 25 ft. (7.6 m), level difference : 0 ft. (0 m).
★3 Indoor temp.: 70°FDB (21.1°CDB) / Outdoor temp.: 17°FDB (−8.3°CDB), 15°FWB (−9.4°CWB) / Equivalent piping length: 25 ft. (7.6 m), level difference: 0 ft. (0 m).
★4 Capacities are net, including a deduction for cooling (an addition for heating) for indoor fan motor heat.
★5 Air filter is not standard accessory (field supply parts), but please mount it in the duct system of the suction side.

4.1.6 FTQ

FTQ18-36TAVJUD HE-ASHP-1

FTQ18-36TAVJUA

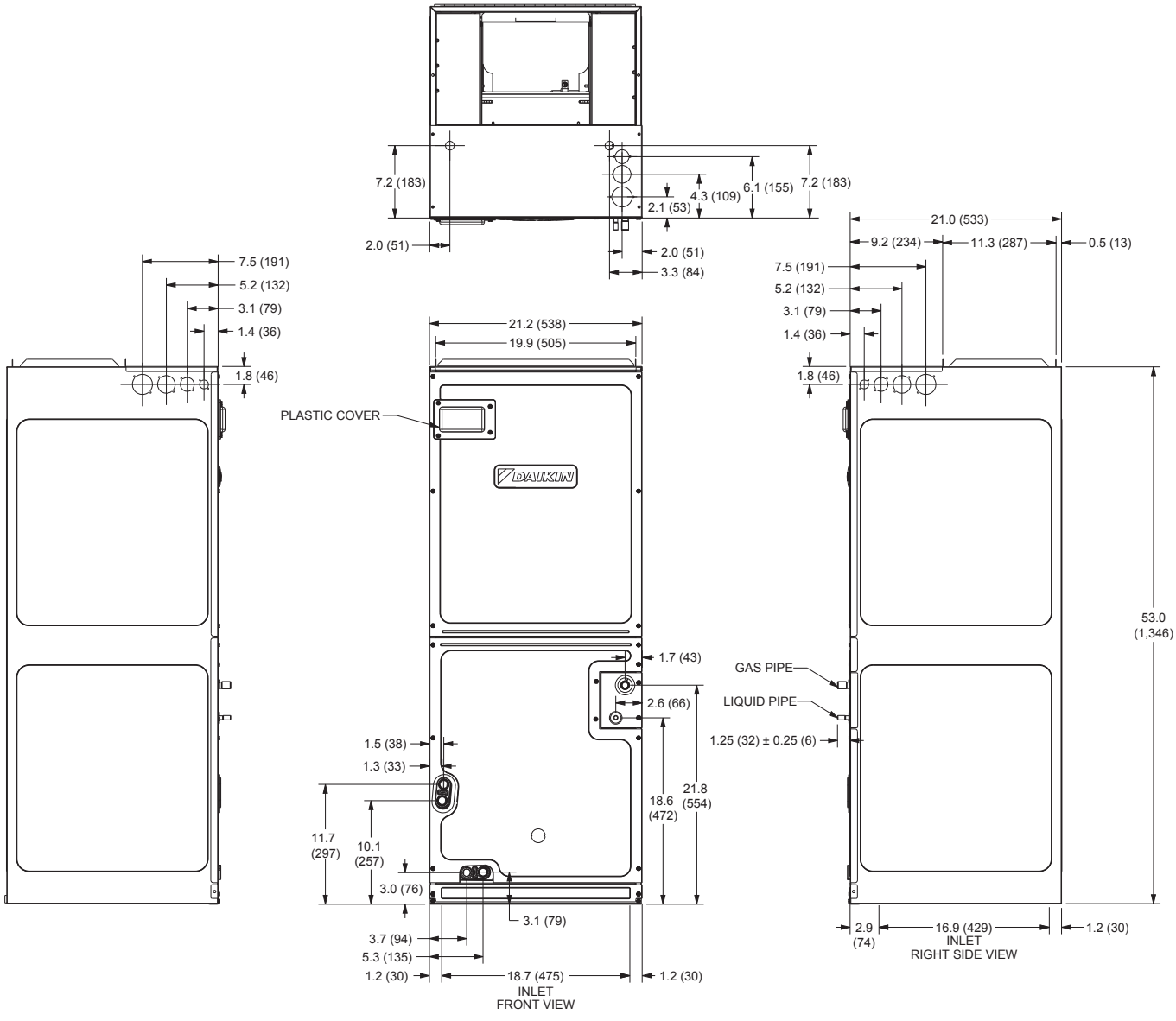
Unit : in. (mm)



FTQ42-48TAVJUD
FTQ42-48TAVJUA

HE-ASHP-2 & 3

Unit : in. (mm)



FTQ18-48TAVJUD
FTQ18-48TAVJUA

Model	Power Supply					IFM		Input (W)	
	Hz	Volts	Voltage range	MCA	MOP	HP	FLA	Cooling	Heating
FTQ18TAVJUD	60	208/230 V	Max. 229 V Min. 187 V Max. 253 V Min. 209 V	4.9	15	1/2	3.9	215	215
FTQ24TAVJUD	60	208/230 V		4.9	15	1/2	3.9	273	273
FTQ30TAVJUD	60	208/230 V		4.9	15	1/2	3.9	407	407
FTQ36TAVJUD	60	208/230 V		4.9	15	1/2	3.9	436	436
FTQ42TAVJUD	60	208/230 V		6.5	15	3/4	5.2	473	473
FTQ48TAVJUD	60	208/230 V		6.5	15	3/4	5.2	518	518
FTQ18TAVJUA	60	208/230 V	Max. 229 V Min. 187 V Max. 253 V Min. 209 V	4.9	15	1/2	3.9	215	215
FTQ24TAVJUA	60	208/230 V		4.9	15	1/2	3.9	273	273
FTQ30TAVJUA	60	208/230 V		4.9	15	1/2	3.9	407	407
FTQ36TAVJUA	60	208/230 V		4.9	15	1/2	3.9	436	436
FTQ42TAVJUA	60	208/230 V		6.5	15	3/4	5.2	473	473
FTQ48TAVJUA	60	208/230 V		6.5	15	3/4	5.2	518	518

Symbols:
MCA : Minimum Circuit Amps (A)
MOP : Maximum Overcurrent Protective Device (A)
IFM : Indoor Fan Motor
HP : Fan Motor Rated Output (HP)
FLA : Full Load Amps (A)

Notes:
1. Voltage range
   Units are suitable for use on electrical systems where voltage supplied to unit terminals is not below or above listed range limits.
2. Maximum allowable voltage imbalance between phases is 2%.
3. Select wire size based on the MCA.

8.2 Electric heater

HE-ASHP-1

FTQ18-36TAVJUD
FTQ18-36TAVJUA

Model	CIRCUIT 1			CIRCUIT 2			SINGLE-POINT KIT	
	AMPS	MCA	MOP	AMPS	MCA	MOP	MCA	MOP
FTQ18TAVJUD FTQ18TAVJUA	**0/0**	**4.9/4.9**	**15/15**	—	—	—	—	—
HKS*03XC*	10.8/12.5	18.4/21	20/25	—	—	—	—	—
HKS*05XC*	17.3/20	27/29.9	30/30	—	—	—	—	—
HKS*06XC*	21.7/25	32/36.1	35/40	—	—	—	—	—
HKS*08XC*	28.9/33.3	41/46.5	45/50	—	—	—	—	—
HKS*10XC*	34.7/40	48/54.9	50/60	—	—	—	—	—
FTQ24TAVJUD FTQ24TAVJUA	**0/0**	**4.9/4.9**	**15/15**	—	—	—	—	—
HKS*03XC*	10.8/12.5	18.4/21	20/25	—	—	—	—	—
HKS*05XC*	17.3/20	27/29.9	30/30	—	—	—	—	—
HKS*06XC*	21.7/25	32/36.1	35/40	—	—	—	—	—
HKS*08XC*	28.9/33.3	41/46.5	45/50	—	—	—	—	—
HKS*10XC*	34.7/40	48/54.9	50/60	—	—	—	—	—
FTQ30TAVJUD FTQ30TAVJUA	**0/0**	**4.9/4.9**	**15/15**	—	—	—	—	—
HKS*03XC*	10.8/12.5	18.4/21	20/25	—	—	—	—	—
HKS*05XC*	17.3/20	27/29.9	30/30	—	—	—	—	—
HKS*06XC*	21.7/25	32/36.1	35/40	—	—	—	—	—
HKS*08XC*	28.9/33.3	41/46.5	45/50	—	—	—	—	—
HKS*10XC*	34.7/40	48/54.9	50/60	—	—	—	—	—
FTQ36TAVJUD FTQ36TAVJUA	**0/0**	**4.9/4.9**	**15/15**	—	—	—	—	—
HKS*03XC*	10.8/12.5	18.4/21	20/25	—	—	—	—	—
HKS*05XC*	17.3/20	27/29.9	30/30	—	—	—	—	—
HKS*06XC*	21.7/25	32/36.1	35/40	—	—	—	—	—
HKS*08XC*	28.9/33.3	41/46.5	45/50	—	—	—	—	—
HKS*10XC*	34.7/40	48/54.9	50/60	—	—	—	—	—

Notes:

1. AMPS indicates heater amp draw.
2. Circuit 1 indicates single point power connection requirements when using a single stage electric heater. Circuit 1 powers both the FTQ printed circuit board as well as the 1st stage of heat.
3. Circuit 2 indicates the power requirements for a second power point connection when using a two stage heater (15 kW and above).
4. Consult installation manual when using electric heater with FTQ18-36TAVJUD models.

FTQ42-48TAVJUD HE-ASHP-2 & 3
FTQ42-48TAVJUA

Model	CIRCUIT 1			CIRCUIT 2			SINGLE-POINT KIT	
	AMPS	MCA	MOP	AMPS	MCA	MOP	MCA	MOP
FTQ42TAVJUD FTQ42TAVJUA	**0/0**	**6.5/6.5**	**15/15**	—	—	—	—	—
HKS*05XC*	17.3/20	28.2/32	30/35	—	—	—	—	—
HKS*06XC*	21.7/25	33.6/38	35/40	—	—	—	—	—
HKS*08XC*	28.9/33.3	42.6/48	45/50	—	—	—	—	—
HKS*10XC*	34.7/40	49.8/57	50/60	—	—	—	—	—
HKS*15*#*	34.7/40	49.8/57	50/60	17.3/20	21.7/25	25/25	71.5/81.5	80/90
HKSC19C*#*	34.7/40	49.8/57	50/60	34.7/40	43.3/50	45/50	93.2/106.5	100/110
FTQ48TAVJUD FTQ48TAVJUA	**0/0**	**6.5/6.5**	**15/15**	—	—	—	—	—
HKS*05XC*	17.3/20	28.2/32	30/35	—	—	—	—	—
HKS*06XC*	21.7/25	33.6/38	35/40	—	—	—	—	—
HKS*08XC*	28.9/33.3	42.6/48	45/50	—	—	—	—	—
HKS*10XC*	34.7/40	49.8/57	50/60	—	—	—	—	—
HKS*15*#*	34.7/40	49.8/57	50/60	17.3/20	21.7/25	25/25	71.5/81.5	80/90
HKSC19C*#*	34.7/40	49.8/57	50/60	34.7/40	43.3/50	45/50	93.2/106.5	100/110

Notes:

1. AMPS indicates heater amp draw.
2. Circuit 1 indicates single point power connection requirements when using a single stage electric heater. Circuit 1 powers both the FTQ printed circuit board as well as the 1st stage of heat.
3. Circuit 2 indicates the power requirements for a second power point connection when using a two stage heater (15 kW and above).
4. Consult installation manual when using electric heater with FTQ42-48TAVJUD models.

8.3 Outdoor unit

RZR18-48TAVJU
RZQ18-48TAVJU

Model		Units				Power supply		Comp.	OFM	
		Hz	Volts	Min.	Max.	MCA	MOP	RLA	kW	FLA
RZQ18TAVJU	H/P	60	208/230	187	253	16.5	25	15.3	0.2	0.6
RZQ24TAVJU										
RZR18TAVJU	C/O									
RZR24TAVJU										
RZQ30TAVJU	H/P	60	208/230	187	253	29.1	35	19.0	0.070 + 0.070	0.3 + 0.3
RZQ36TAVJU										
RZQ42TAVJU										
RZQ48TAVJU										
RZR30TAVJU	C/O									
RZR36TAVJU										
RZR42TAVJU										
RZR48TAVJU										

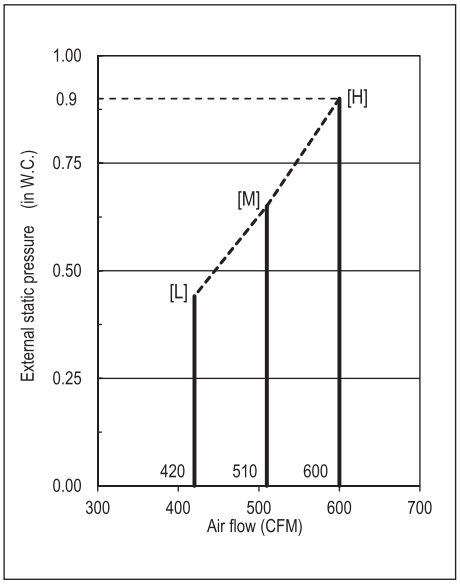
Symbols:
MCA: Minimum Circuit Ampacity (A)
MOP: Maximum Overcurrent Protective Device (See note 7). (A)
RLA: Rated Load Ampere. (A)
OFM: Outdoor Fan Motor. (A)
FLA: Full Load Ampere. (A)
KW: Fan Motor Rated Output. (kW)

Notes:
1. RLA is based on the following conditions.
   Power supply: 60 Hz 208/230 V
   Cooling
   Indoor temp. 80.0°FDB (26.7°CDB) / 67.0°FWB (19.4°CWB)
   Outdoor temp. 95.0°FDB (35.0°CDB)
   Heating
   Indoor temp. 70.0°FDB (21.1°CDB)
   Outdoor temp. 47.0°FDB (8.3°CDB) / 43.0°FWB (6.1°CWB)
2. Voltage range
   Units are suitable for use on electrical systems where voltage supplied to unit terminal is not below or above listed range limits.
3. Maximum allowable voltage variation between phases is 2%.
4. MCA represents maximum input current.
5. MOP represents capacity which may accept MCA.
6. Select wire size based on the value of MCA.
7. MOP is used to select a fuse, circuit breaker, or ground fault circuit interrupter.

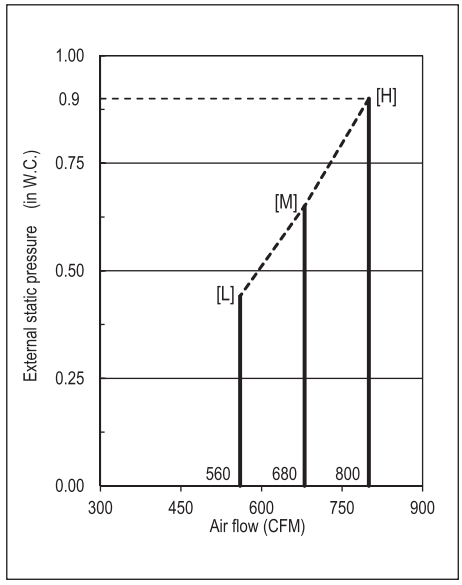
3D115460

16.2 FTQ

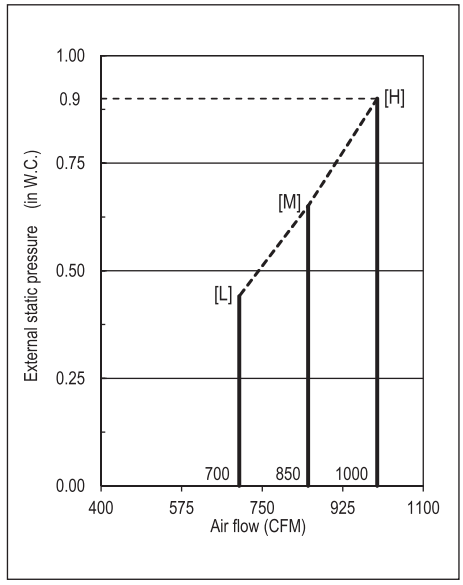
FTQ18TAVJUD
FTQ18TAVJUA



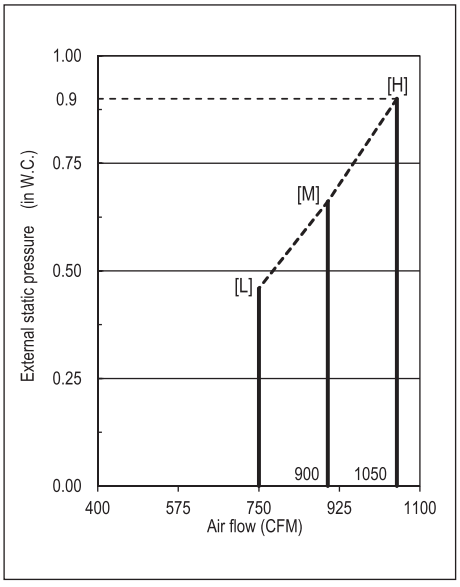
FTQ24TAVJUD
FTQ24TAVJUA



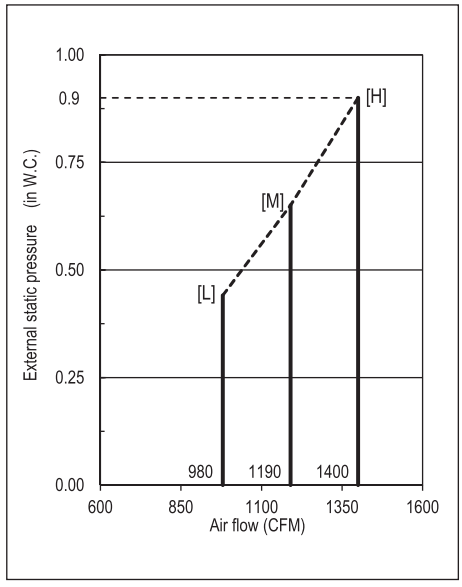
FTQ30TAVJUD
FTQ30TAVJUA



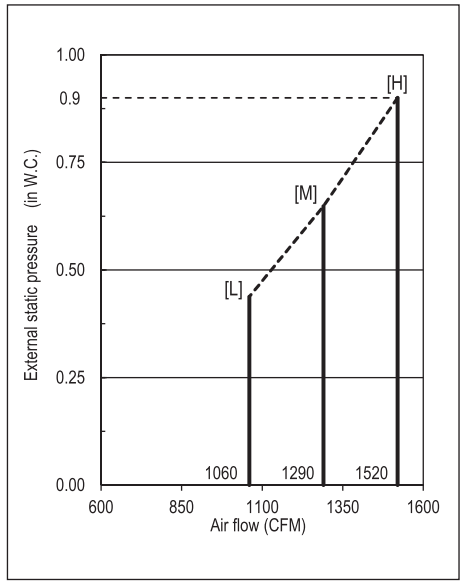
FTQ36TAVJUD
FTQ36TAVJUA



FTQ42TAVJUD
FTQ42TAVJUA



FTQ48TAVJUD
FTQ48TAVJUA



Notes:

1. If the airflow is less than 10% of the rated air volume, it is automatically adjusted to the rated air volume.
2. The unit automatically adjusts the external static pressure between 0.0 in. W.C. - 0.9 in. W.C.
3. Airflow cannot operate at the rated value if it is outside the ESP range in the above graph.
4. Fan speed is changeable by using the remote controller.

FTQ30TAVJUD / FTQ30TAVJUA + RZQ30TAVJU

Cooling Capacity for Standard Condition (Te: 43°F)

Outdoor air temp.	Indoor air temp. °FWB																				
	57			61			64			67			70			72			75		
	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI
°FDB	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW
23	19.5	15.7	0.71	23.7	18.5	0.87	26.8	20.4	0.99	30.0	21.4	1.13	33.2	22.1	1.26	35.3	23.2	1.36	38.4	23.3	1.50
30	19.5	15.7	0.73	23.7	18.5	0.89	26.8	20.4	1.03	30.0	21.4	1.16	33.2	22.1	1.31	35.3	23.2	1.40	38.4	23.3	1.55
40	19.5	15.7	0.76	23.7	18.5	0.94	26.8	20.4	1.08	30.0	21.4	1.22	33.2	22.1	1.37	35.3	23.2	1.47	38.4	23.3	1.63
50	19.5	15.7	0.79	23.7	18.5	0.98	26.8	20.4	1.13	30.0	21.4	1.28	33.2	22.1	1.44	35.3	23.2	1.55	38.4	23.3	1.71
54	19.5	15.7	0.81	23.7	18.5	1.00	26.8	20.4	1.15	30.0	21.4	1.31	33.2	22.1	1.47	35.3	23.2	1.58	38.4	23.3	1.75
58	19.5	15.7	0.82	23.7	18.5	1.02	26.8	20.4	1.18	30.0	21.4	1.34	33.2	22.1	1.50	35.3	23.2	1.61	38.1	23.2	1.75
62	19.5	15.7	0.84	23.7	18.5	1.04	26.8	20.4	1.20	30.0	21.4	1.37	33.2	22.1	1.54	35.3	23.2	1.65	37.5	22.9	1.79
66	19.5	15.7	0.86	23.7	18.5	1.07	26.8	20.4	1.23	30.0	21.4	1.40	33.2	22.1	1.62	35.3	23.2	1.78	36.9	22.6	1.89
70	19.5	15.7	0.88	23.7	18.5	1.09	26.8	20.4	1.29	30.0	21.4	1.51	33.2	22.1	1.76	35.3	23.2	1.93	36.4	22.3	1.99
72	19.5	15.7	0.89	23.7	18.5	1.13	26.8	20.4	1.34	30.0	21.4	1.57	33.2	22.1	1.83	35.3	23.2	2.00	36.1	22.1	2.04
75	19.5	15.7	0.92	23.7	18.5	1.19	26.8	20.4	1.42	30.0	21.4	1.67	33.2	22.1	1.93	35.1	23.1	2.10	35.7	21.9	2.11
79	19.5	15.7	0.99	23.7	18.5	1.28	26.8	20.4	1.53	30.0	21.4	1.80	33.2	22.1	2.09	34.5	22.8	2.20	35.1	21.6	2.22
83	19.5	15.7	1.06	23.7	18.5	1.37	26.8	20.4	1.64	30.0	21.4	1.93	33.2	22.1	2.25	33.9	22.4	2.30	34.5	21.3	2.32
87	19.5	15.7	1.13	23.7	18.5	1.48	26.8	20.4	1.76	30.0	21.4	2.08	33.0	22.0	2.39	33.4	22.1	2.40	34.0	21.0	2.42
91	19.5	15.7	1.21	23.7	18.5	1.58	26.8	20.4	1.89	30.0	21.4	2.23	32.4	21.7	2.49	32.8	21.8	2.50	33.4	20.7	2.52
93	19.5	15.7	1.25	23.7	18.5	1.64	26.8	20.4	1.96	30.0	21.4	2.32	32.1	21.5	2.54	32.5	21.6	2.56	33.1	20.5	2.57
95	19.5	15.7	1.30	23.7	18.5	1.70	26.8	20.4	2.03	30.0	21.4	2.40	31.8	21.2	2.59	32.2	21.2	2.61	32.9	20.1	2.62
99	19.5	15.7	1.39	23.7	18.5	1.82	26.8	20.4	2.18	30.0	21.4	2.58	31.3	20.9	2.70	31.7	20.9	2.71	31.7	19.4	2.71
103	19.5	15.7	1.48	23.7	18.5	1.95	26.8	20.4	2.34	30.0	21.4	2.77	30.4	20.3	2.79	30.4	20.1	2.79	30.4	18.6	2.79
106	19.5	15.7	1.56	23.7	18.5	2.05	26.8	20.4	2.46	28.6	20.4	2.52	28.6	19.2	2.53	28.6	18.9	2.53	28.7	17.6	2.53
110	19.5	15.7	1.67	23.7	18.5	2.20	24.6	18.7	2.20	24.6	17.6	2.20	24.7	16.6	2.21	24.7	16.4	2.21	24.8	15.2	2.21
115	19.5	15.7	1.85	19.6	15.3	1.80	19.7	15.0	1.80	19.7	14.1	1.80	19.8	13.3	1.81	19.8	13.1	1.81	19.8	12.2	1.81
118	16.6	13.4	1.55	16.7	13.0	1.56	16.7	12.8	1.56	16.8	12.0	1.56	16.8	11.3	1.57	16.8	11.2	1.57	16.9	10.0	1.57
122	12.7	10.0	1.23	12.7	10.0	1.24	12.8	9.80	1.24	12.8	9.20	1.24	12.9	8.70	1.25	12.9	8.60	1.25	13.0	8.00	1.25

TC: Total capacity: MBH
SHC: Sensible heat capacity: MBH
PI: Power input: kW

Notes: 1. ▒ is shown as reference.
2. This table shows the average value of conditions which may occur.
This table is based on projection. Actual results may vary according to conditions of use.
3. ▭ shows rated condition.

Heating Capacity for Standard Condition (Tc: 115°F)

Outdoor air temp.		Indoor air temp. °FDB											
		61		65		68		70		72		75	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
°FDB	°FWB	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW
-3.64	-4.0	40.3	7.33	37.8	6.73	35.5	6.17	34.0	5.81	32.5	5.46	30.2	4.95
-1.84	-2.2	40.8	7.19	37.8	6.45	35.5	5.91	34.0	5.57	32.5	5.23	30.2	4.75
5.5	5.0	40.8	6.12	37.8	5.50	35.5	5.06	34.0	4.77	32.5	4.49	30.2	4.09
9.5	8.5	40.8	5.70	37.8	5.13	35.5	4.72	34.0	4.46	32.5	4.20	30.2	3.82
13.0	12.0	40.8	5.34	37.8	4.81	35.5	4.43	34.0	4.18	32.5	3.94	30.2	3.60
15.0	14.0	40.8	5.15	37.8	4.64	35.5	4.28	34.0	4.04	32.5	3.81	30.2	3.48
17.0	15.5	40.8	5.01	37.8	4.52	35.5	4.17	34.0	3.94	32.5	3.72	30.2	3.39
19.0	18.0	40.8	4.80	37.8	4.34	35.5	4.00	34.0	3.78	32.5	3.57	30.2	3.26
22.0	20.0	40.8	4.65	37.8	4.20	35.5	3.88	34.0	3.67	32.5	3.46	30.2	3.16
26.0	24.0	40.8	4.37	37.8	3.95	35.5	3.65	34.0	3.45	32.5	3.26	30.2	2.98
30.0	28.0	40.8	4.12	37.8	3.73	35.5	3.45	34.0	3.26	32.5	3.08	30.2	2.82
35.0	32.0	40.8	3.89	37.8	3.53	35.5	3.26	34.0	3.09	32.5	2.93	30.2	2.68
39.0	36.0	40.8	3.69	37.8	3.35	35.5	3.10	34.0	2.94	32.5	2.78	30.2	2.55
44.0	40.0	40.8	3.51	37.8	3.19	35.5	2.95	34.0	2.80	32.5	2.65	30.2	2.44
47.0	43.0	40.8	3.39	37.8	3.08	35.5	2.85	34.0	2.71	32.5	2.56	30.2	2.35
51.0	47.0	40.8	3.23	37.8	2.94	35.5	2.73	34.0	2.59	32.5	2.45	30.2	2.26
54.0	50.0	40.8	3.13	37.8	2.85	35.5	2.64	34.0	2.51	32.5	2.38	30.2	2.19
57.0	53.0	–	–	37.8	2.76	35.5	2.56	34.0	2.43	32.5	2.31	30.2	2.12
60.0	56.0	–	–	37.8	2.68	35.5	2.49	34.0	2.36	32.5	2.24	30.2	2.06
64.0	60.0	–	–	–	–	–	–	34.0	2.27	32.5	2.16	30.2	1.99

TC: Total capacity: MBH
PI: Power input: kW

Notes: 1. ▒ is shown as reference.
2. This table shows the average value of conditions which may occur.
This table is based on projection. Actual results may vary according to conditions of use.
3. ▭ shows rated condition.

FTQ42TAVJUD / FTQ42TAVJUA + RZQ42TAVJU

Cooling Capacity for Standard Condition (Te: 43°F)

Outdoor air temp.	Indoor air temp. °FWB																				
	57			61			64			67			70			72			75		
	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI	TC	SHC	PI
°FDB	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW	MBH	MBH	kW
23	27.3	23.0	1.12	33.2	26.8	1.38	37.6	29.3	1.58	42.0	30.6	1.79	46.4	31.8	2.01	49.4	33.3	2.16	53.8	33.8	2.39
30	27.3	23.0	1.15	33.2	26.8	1.42	37.6	29.3	1.63	42.0	30.6	1.85	46.4	31.8	2.08	49.4	33.3	2.23	53.8	33.8	2.46
40	27.3	23.0	1.21	33.2	26.8	1.49	37.6	29.3	1.71	42.0	30.6	1.94	46.4	31.8	2.18	49.4	33.3	2.34	53.8	33.8	2.59
50	27.3	23.0	1.26	33.2	26.8	1.56	37.6	29.3	1.80	42.0	30.6	2.04	46.4	31.8	2.29	49.4	33.3	2.46	53.8	33.8	2.72
54	27.3	23.0	1.29	33.2	26.8	1.59	37.6	29.3	1.83	42.0	30.6	2.08	46.4	31.8	2.34	49.4	33.3	2.51	53.8	33.8	2.78
58	27.3	23.0	1.31	33.2	26.8	1.63	37.6	29.3	1.87	42.0	30.6	2.13	46.4	31.8	2.39	49.4	33.3	2.57	53.3	33.5	2.79
62	27.3	23.0	1.34	33.2	26.8	1.66	37.6	29.3	1.91	42.0	30.6	2.18	46.4	31.8	2.44	49.4	33.3	2.62	52.5	33.1	2.85
66	27.3	23.0	1.37	33.2	26.8	1.70	37.6	29.3	1.96	42.0	30.6	2.23	46.4	31.8	2.58	49.4	33.3	2.83	51.7	32.6	3.00
70	27.3	23.0	1.39	33.2	26.8	1.73	37.6	29.3	2.05	42.0	30.6	2.41	46.4	31.8	2.79	49.4	33.3	3.07	50.9	32.2	3.16
72	27.3	23.0	1.41	33.2	26.8	1.79	37.6	29.3	2.13	42.0	30.6	2.50	46.4	31.8	2.90	49.4	33.3	3.19	50.5	32.0	3.24
75	27.3	23.0	1.46	33.2	26.8	1.89	37.6	29.3	2.25	42.0	30.6	2.65	46.4	31.8	3.08	49.1	33.2	3.34	49.9	31.7	3.36
79	27.3	23.0	1.57	33.2	26.8	2.04	37.6	29.3	2.43	42.0	30.6	2.86	46.4	31.8	3.32	48.3	32.7	3.50	49.2	31.2	3.52
83	27.3	23.0	1.68	33.2	26.8	2.19	37.6	29.3	2.61	42.0	30.6	3.07	46.4	31.8	3.58	47.5	32.2	3.66	48.4	30.8	3.69
87	27.3	23.0	1.80	33.2	26.8	2.35	37.6	29.3	2.81	42.0	30.6	3.31	46.1	31.6	3.81	46.7	31.7	3.82	47.6	30.3	3.85
91	27.3	23.0	1.93	33.2	26.8	2.52	37.6	29.3	3.01	42.0	30.6	3.55	45.3	31.2	3.97	45.9	31.3	3.98	46.8	29.9	4.01
93	27.3	23.0	1.99	33.2	26.8	2.61	37.6	29.3	3.12	42.0	30.6	3.68	45.0	30.9	4.05	45.5	31.0	4.07	46.4	29.7	4.09
95	27.3	23.0	2.06	33.2	26.8	2.70	37.6	29.3	3.23	42.0	30.6	3.82	44.6	30.5	4.13	45.1	30.5	4.15	46.0	29.0	4.18
99	27.3	23.0	2.20	33.2	26.8	2.89	37.6	29.3	3.47	42.0	30.6	4.10	43.8	30.0	4.29	44.3	30.0	4.31	44.4	28.1	4.31
103	27.3	23.0	2.36	33.2	26.8	3.10	37.6	29.3	3.72	42.0	30.6	4.40	42.5	29.2	4.44	42.5	28.8	4.44	42.6	27.0	4.44
106	27.3	23.0	2.48	33.2	26.8	3.26	37.6	29.3	3.92	40.0	29.2	4.01	40.0	27.5	4.02	40.1	27.2	4.02	40.2	25.5	4.03
110	27.3	23.0	2.65	33.2	26.8	3.50	34.4	26.8	3.50	34.5	25.2	3.50	34.5	23.8	3.51	34.6	23.5	3.51	34.7	22.0	3.52
115	27.3	23.0	2.94	27.4	22.2	2.86	27.5	21.5	2.86	27.6	20.2	2.87	27.7	19.1	2.87	27.7	18.9	2.88	27.8	17.7	2.88
118	23.2	19.6	2.47	23.3	18.9	2.48	23.4	18.3	2.48	23.5	17.2	2.49	23.5	16.3	2.49	23.6	16.1	2.49	23.6	15.0	2.50
122	17.7	15.0	1.96	17.8	14.0	1.97	17.9	14.0	1.97	17.9	13.0	1.98	18.0	12.0	1.98	18.1	12.0	1.98	18.1	12.0	1.99

TC: Total capacity: MBH
SHC: Sensible heat capacity: MBH
PI: Power input: kW

Notes: 1. ▒ is shown as reference.
2. This table shows the average value of conditions which may occur.
This table is based on projection. Actual results may vary according to conditions of use.
3. ▭ shows rated condition.

Heating Capacity for Standard Condition (Tc: 115°F)

Outdoor air temp.		Indoor air temp. °FDB											
		61		65		68		70		72		75	
		TC	PI	TC	PI	TC	PI	TC	PI	TC	PI	TC	PI
°FDB	°FWB	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW	MBH	kW
-3.64	-4.0	40.7	5.84	40.6	6.04	40.5	6.19	40.4	6.28	40.4	6.38	40.3	6.53
-1.84	-2.2	41.9	5.93	41.8	6.12	41.7	6.26	41.7	6.35	41.6	6.45	41.5	6.59
5.5	5.0	46.9	6.22	46.8	6.39	46.7	6.51	46.6	6.60	44.9	6.30	41.8	5.73
9.5	8.5	49.3	6.34	49.2	6.50	49.1	6.62	47.0	6.25	44.9	5.89	41.8	5.36
13.0	12.0	51.7	6.45	51.6	6.60	49.1	6.21	47.0	5.86	44.9	5.53	41.8	5.04
15.0	14.0	53.1	6.50	52.2	6.51	49.1	6.00	47.0	5.66	44.9	5.34	41.8	4.87
17.0	15.5	54.1	6.54	52.2	6.34	49.1	5.84	47.0	5.52	44.9	5.21	41.8	4.75
19.0	18.0	55.8	6.61	52.2	6.08	49.1	5.61	47.0	5.30	44.9	5.00	41.8	4.57
22.0	20.0	56.4	6.52	52.2	5.89	49.1	5.43	47.0	5.14	44.9	4.85	41.8	4.43
26.0	24.0	56.4	6.12	52.2	5.54	49.1	5.11	47.0	4.84	44.9	4.57	41.8	4.18
30.0	28.0	56.4	5.77	52.2	5.22	49.1	4.83	47.0	4.57	44.9	4.32	41.8	3.96
35.0	32.0	56.4	5.45	52.2	4.94	49.1	4.57	47.0	4.33	44.9	4.10	41.8	3.76
39.0	36.0	56.4	5.17	52.2	4.69	49.1	4.35	47.0	4.12	44.9	3.90	41.8	3.58
44.0	40.0	56.4	4.92	52.2	4.47	49.1	4.14	47.0	3.93	44.9	3.72	41.8	3.41
47.0	43.0	56.4	4.74	52.2	4.31	49.1	4.00	47.0	3.79	44.9	3.59	41.8	3.30
51.0	47.0	56.4	4.53	52.2	4.12	49.1	3.82	47.0	3.63	44.9	3.44	41.8	3.16
54.0	50.0	56.4	4.38	52.2	3.99	49.1	3.70	47.0	3.52	44.9	3.33	41.8	3.07
57.0	53.0	–	–	52.2	3.87	49.1	3.59	47.0	3.41	44.9	3.23	41.8	2.98
60.0	56.0	–	–	52.2	3.75	49.1	3.48	47.0	3.31	44.9	3.14	41.8	2.89
64.0	60.0	–	–	–	–	–	–	47.0	3.19	44.9	3.03	41.8	2.79

TC: Total capacity: MBH
PI: Power input: kW

Notes: 1. ▒ is shown as reference.
2. This table shows the average value of conditions which may occur.
This table is based on projection. Actual results may vary according to conditions of use.
3. ▭ shows rated condition.

Option #2 – Code Minimum Air Source Heat Pumps (ASHP) and Second Stage Electric Heat, Refer to Equipment Sheets. Budget Equipment Price - $13,000, Manufacturer's Representative – DCNE, Attention: Brian LaFramboise, 1-978-977-9911, BLAFRAMBOISE2dcne.com

25HBC5
Comfort™ 15 Heat Pump with Puron® Refrigerant
1–1/2 to 5 Nominal Tons

Carrier
turn to the experts

Product Data

Option #2 ASHP-1 Meeting, Kitchen, Offices, ASHP- 2 & 3 Apparatus Bays Outdoor Heat Pumps

Puron

Carrier heat pumps with Puron® refrigerant provide a collection of features unmatched by any other family of equipment. The 25HBC has been designed utilizing Carrier's non-ozone depleting Puron refrigerant.

This product has been designed and manufactured to meet Energy Star® criteria for energy efficiency when matched with appropriate coil components. Refer to the AHRI directory 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

Efficiency

- 14.0 - 16.0 SEER/ 11.0-13.0 EER / 8.2 - 9.0 HSPF
- Microtube Technology™ refrigeration system
- Indoor air quality accessories available

Sound

- Sound level as low as 69 dBA
- Sound levels as low as 68 dBA with accessory sound blanket

Comfort

- System supports Edge® Thermidistat™ or standard thermostat controls

Reliability

- Non-ozone depleting Puron® refrigerant
- Scroll compressor
- Internal pressure relief valve
- Internal thermal overload
- High pressure switch
- Loss of charge switch
- Filter drier
- Balanced refrigeration system for maximum reliability

Durability

WeatherArmor Ultra™ protection package:

- Solid, durable sheet metal construction
- Dense wire coil guard standard
- Baked-on powder paint

Applications

- Long-line - up to 250 feet (76.20 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 -10°F/-23°C) with accessory kit

FB4C
Base Series Fan Coil
Sizes 018 thru 061

Carrier
turn to the experts

Product Data

Option #2 ASHP-1 Meeting, Kitchen, Officces, ASHP-2 & 3 Indoor Air Handlers Apparatus Bays

A10082

AIR HANDLER TECHNOLOGY AT ITS FINEST

The FB4C fan coil has the proven technology of Carrier fan coil units with Puron® refrigerant as well as vertical and horizontal applications. The design features contoured condensate pans with rugged drain connections, ensuring that little water is left in the unit at the end of the cooling duty cycle. The lack of standing condensate and corrosion free pans improves IAQ and product life, features homeowners appreciate.

Standard features include grooved tubing and louvered fins. Coil circuiting has also been updated to make the most of all Carrier heat pumps and air conditioners. Units come with solid state fan controls, 1–inch (25mm) thick insulation with R–value of 4.2, multi–speed motors, and fully–wettable coils. Units can accommodate factory– and/or field–installed heaters from 3 to 30 kW.

Assembled at the factory compliant with low leak requirements of less than 2% cabinet leakage rate at 0.5 inches W.C. and 1.4% cabinet leakage rate at 0.5 inches W.C. when tested in accordance with ASHRAE 193 standard.

The FB4C fan coil design is loaded with popular features. These fan coils utilize the latest in electronic commutation motor (ECM) technology through the use of high efficiency, multi–tap ECM motors allowing reliable air delivery with increased static pressure. It comes in a pre–painted (taupe metallic) galvanized steel casing and a factory–supplied power plug for ease of installation. The FB4C unit is shipped with a factory–installed Teflon–ring piston FB4CNF(018–048) or a Puron refrigerant TXV FB4CNP (018–061).

ASHP-1 Outdoor

ASHP-2 & 3 Outdoor

PHYSICAL DATA

UNIT SIZE SERIES	18–30	24–30	30–30	37–30	42–30	48–31	60–30	61–30
Compressor Type	Scroll							
REFRIGERANT	Puron® (R–410A)							
Control	TXV (Puron Hard Shutoff)							
Charge lb (kg)	5.60 (2.54)	7.60 (3.45)	7.00 (3.18)	11.20 (5.08)	8.90 (4.04)	9.87 (4.48)	12.50 (5.67)	13.00 (5.90)
Outdoor Heating Piston #	42	46	52	55	61	TXV	76	65
COND FAN	Propeller Type, Direct Drive							
Air Discharge	Vertical							
Air Qty (CFM)	2233	3223	3223	3223	3810	4046	4046	4400
Motor HP	1/12	1/12	1/12	1/12	1/5	1/4	1/4	1/3
Motor RPM	800	800	800	810	800	810	800	767
COND COIL								
Face Area (Sq ft)	15.09	20.12	20.12	20.10	17.60	20.10	25.15	35.47
Fins per In.	20	20	20	20	20	20	20	20
Rows	1	1	1	2	2	2	2	2
Circuits	4	5	5	8	7	8	9	12
VALVE CONNECT. (In. ID)								
Vapor	5/8	5/8	3/4	3/4	7/8	7/8	7/8	7/8
Liquid	3/8"							
REFRIGERANT TUBES (In. OD)								
Rated Vapor*	5/8	5/8	3/4	3/4	7/8	7/8	1 1/8	1 1/8
Liquid	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.

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 HP systems with Puron refrigerant:

Vapor Line Sizing and Cooling Capacity Losses - Puron® Refrigerant 1- Stage Heat Pump Applications

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 (46.0–50.3)	176–200 (53.6–60.0)	201–225 (61.3–68.6)	226–250 (68.9–76.2)
18,000 1–Stage HP with Puron	3/8	1/2	1	2	3	4	6	7	8	9	10
		5/8	0	0	1	1	1	2	2	3	3
24,000 1–Stage HP with Puron	3/8	5/8	0	1	1	2	3	3	4	4	5
		3/4	0	0	0	0	1	1	1	1	1
30,000 1–Stage HP with Puron	3/8	5/8	1	2	3	3	4	5	6	7	8
		3/4	0	0	1	1	1	2	2	2	3
		7/8	0	0	0	0	1	1	1	1	1
37,000 1–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	0	0	1	1	1	1	2
42,000 1–Stage HP with Puron	3/8	3/4	0	1	2	2	3	4	4	5	6
		7/8	0	0	1	1	1	2	2	2	3
48,000 1–Stage HP with Puron	3/8	3/4	0	1	2	3	4	5	5	6	7
		7/8	0	0	1	1	2	2	2	3	3
60,000+ 1–Stage HP with Puron	3/8	3/4	1	2	4	5	6	7	9	10	11
		7/8	0	1	2	2	3	4	4	5	5
		1–1/8	0	0	0	1	1	1	1	1	1

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 See Long Line Application Guidelines

ASHP-1 Indoor

PHYSICAL DATA

ORDERING NO.	NOMINAL COOLING CAPACITY (Btuh)	DIMENSIONS			SHIPPING WEIGHT
		Height	Width	Depth	
FB4CN(F,P)018L	18,000	42−11/16 in. 1084mm	14−5/16 in. 363mm	22−1/16 in. 560mm	112 lb 51 kg
FB4CNF024L	24,000	42−11/16 in. 1084mm	14−5/16 in. 363mm	22−1/16 in. 560mm	112 lb 51 kg
FB4CNP025L	24,000	49−5/8 in. 1260mm	17−5/8 in. 447mm	22−1/16 in. 560mm	122 lb 55 kg
FB4CN(F,P)030L	30,000	49−5/8 in. 1260mm	17−5/8 in. 447mm	22−1/16 in. 560mm	122 lb 55 kg
FB4CN(F,P)036L	36,000	49−5/8 in. 1260mm	17−5/8 in. 447mm	22−1/16 in. 560mm	122 lb 55 kg
FB4CN(F,P)042L	42,000	49−5/8 in. 1260mm	21−1/8 in. 536mm	22−1/16 in. 560mm	157 lb 71 kg
FB4CN(F,P)048L	48,000	49−5/8 in. 1260mm	21−1/8 in. 536mm	22−1/16 in. 560mm	157 lb 71 kg
FB4CNP060L	60,000	53−7/16 in. 1357mm	21−1/8 in. 536mm	22−1/16 in. 560mm	175 lb 79 kg
FB4CNP061L	60,000	59−3/16 in. 1503mm	24−11/16 in. 447mm	22−1/16 in. 560mm	201 lb 91 kg

ASHP-2 & 3 Indoor

SPECIFICATIONS

FB4C	18	24	25	30	36	42	48	60	61
EVAPORATOR COIL									
Face Area (sq. ft)	2.23		2.97	2.97		4.45		5.93	7.42
Configuration	Slope					A			
FB4CNF Metering Device (Teflon−ring piston) Puron Refrigerant	EA52PT049	EA52PT055	N/A	EA52PT061	EA52PT067	EA52PT076	EA52PT080	N/A	N/A
FB4CNP Metering Device Puron Refrigerant	TXV	TXV	TXV	TXV	TXV	TXV	TXV	TXV	TXV
FILTER*									
21−1/2−in (546 mm) X	13−in (330 mm)		16−3/8−in (417 mm)	16−3/8−in (417 mm)		19−7/8−in (505 mm)			23−5/16−in (585 mm)
BLOWER ASSEMBLY									
Motor Type (ECM)	Multi−tap ECM								
Motor HP	1/3	1/3	1/3	1/3	1/2	1/2	3/4	3/4	3/4
CFM	600	800	800	1000	1200	1400	1600	1750	2000

*Filter must be field−supplied for FB4C units.

ASHP-1 Outdoor

ELECTRICAL DATA

UNIT SIZE	V/PH	OPER VOLTS*		COMPR		FAN	MCA	MAX FUSE† or BRK AMPS
		MAX	MIN	LRA	RLA	FLA		
18–30	208/230/1	253	197	48.0	9.0	0.50	11.8	20
24–30				58.3	12.8	0.50	16.5	25
30–30				73.0	14.1	0.50	18.1	30
37–30				75.0	16.8	0.60	21.6	35
42–30				109.0	21.1	1.20	27.6	40
48–31				130.0	24.4	1.30	31.8	45
60–30				134.0	26.4	1.20	34.2	50
61–30				152.5	24.9	2.80	33.9	50

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

† 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 2007 requirements of ASHRAE Standards 90.1

ASHP-2 & 3 Outdoor

A-WEIGHTED SOUND POWER (dBA)

UNIT SIZE	STANDARD RATING dBA	TYPICAL OCTAVE BAND SPECTRUM (dB, without tone adjustment)						
		125	250	500	1000	2000	4000	8000
18–30	73	49.5	60.0	65.0	69.0	65.5	62.0	55.0
24–30	69	48.5	59.5	61.5	62.5	61.0	59.0	53.5
30–30	71	51.0	58.5	61.5	65.5	62.5	60.0	53.5
37–30	72	67.7	66.8	68.1	69.9	62.8	60.3	55.2
42–30	74	56.5	64.0	67.0	68.5	65.0	62.0	57.5
48–31	73	67.5	67.8	70.1	70.6	63.1	58.5	53.3
60–30	74	59.0	62.0	65.0	68.0	65.0	62.5	62.0
61–30	70	61.7	65.6	68.1	65.8	59.8	58.4	56.1

NOTE: 37 size tested in accordance with AHRI Standard 270–2008 (not listed in AHRI). All other sizes tested in accordance with AHRI Standard 270–1995 (not listed in AHRI).

A-WEIGHTED SOUND POWER (dBA) WITH ACCESSORY SOUND SHIELD

UNIT SIZE	STANDARD RATING dBA	TYPICAL OCTAVE BAND SPECTRUM (dB, without tone adjustment)						
		125	250	500	1000	2000	4000	8000
18–30	72	50.5	60.0	65.0	67.5	64.5	61.5	53.5
24–30	68	49.5	58.5	61.5	62.0	61.0	58.5	51.5
30–30	69	50.5	58.5	61.5	64.0	61.5	58.5	51.5
37–30	71	68.2	66.4	67.5	68.4	59.6	58.2	52.4
42–30	72	56.5	64.5	66.5	66.5	64.5	61.0	54.5
48–31	71	68.4	67.7	69.7	67.6	59.4	56.4	50.0
60–30	73	58.5	62.5	65.0	67.0	64.0	61.0	56.5
61–30	69	63.7	65.4	67.3	64.9	58.3	56.2	51.9

NOTE: 37 size tested in accordance with AHRI Standard 270–2008 (not listed in AHRI). All other sizes tested in accordance with AHRI Standard 270–1995 (not listed in AHRI).

CHARGING SUBCOOLING (TXV-TYPE EXPANSION DEVICE)

UNIT SIZE–SERIES	REQUIRED SUBCOOLING °F (°C)
18–30	12 (6.7)
24–30	13 (7.2)
30–30	10 (5.6)
37–30	10 (5.6)
42–30	12 (6.7)
48–31	9 (5.0)
60–30	13 (7.2)
61–30	7 (3.9)

DIMENSIONS

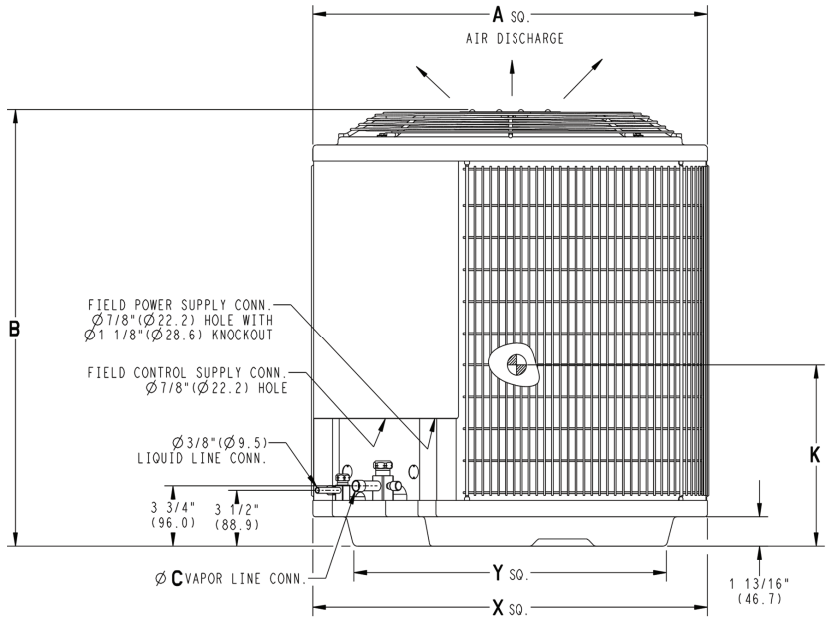
UNIT	SERIES	ELECTRICAL CHARACTERISTICS				A		B		C		D		E		F		G		H		I		J		K		OPERATING WEIGHT		SHIPPING WEIGHT		SHIPPING LENGTH / WIDTH (Sq.)		SHIPPING HEIGHT	
						INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	INCH	MM	Lbs	Kgs	Lbs	Kgs	INCH	MM	INCH	MM
25HBC518A0030061	0	Y	N	N	N	31 3/16	792.5	28 11/16	728.7	5/8	15.9	6 9/16	166.1	24 11/16	626.3	9 1/8	231.3	1 1/8	28.2	3 13/16	97.4	16	406.4	15	381.0	14	355.6	169	76.7	207	93.9	33 5/16	846.6	33 3/16	843.1
25HBC524A0030061	0	Y	N	N	N	35	889.0	32 1/16	815.1	5/8	15.9	6 9/16	166.1	28 7/16	722.8	9 1/8	231.3	1 1/8	28.2	3 13/16	97.4	15 3/4	400.1	16 3/4	425.5	16 1/2	419.1	200	90.7	233	105.7	37 1/8	943.1	36 5/8	929.5
25HBC530A0030061	0	Y	N	N	N	35	889.0	32 1/16	815.1	3/4	19.1	6 9/16	166.1	28 7/16	722.8	9 1/8	231.3	1 1/8	28.2	3 13/16	97.4	16 1/4	412.8	16	406.4	15 1/2	393.7	196	88.9	242	109.8	37 1/8	943.1	36 5/8	929.5
25HBC537A0030010	0	Y	N	N	N	35	889.0	32 1/16	815.1	3/4	19.1	6 9/16	166.1	28 7/16	722.8	9 1/8	231.3	1 1/8	28.2	3 13/16	97.4	17 3/8	441.3	17 1/2	444.5	13 3/4	349.3	215	97.5	253	114.8	37 1/8	943.1	36 5/8	929.5
25HBC542A0030061	0	Y	N	N	N	35	889.0	28 11/16	728.7	7/8	22.2	6 9/16	166.1	28 7/16	722.8	9 1/8	231.3	1 1/8	28.2	3 13/16	97.4	17	431.8	16 3/4	425.5	14 3/4	374.7	245	111.1	290	131.5	37 1/8	943.1	33 3/16	843.1
25HBC548B0031010	1	Y	N	N	N	35	889.0	32 1/16	815.1	7/8	22.2	6 9/16	166.1	28 7/16	722.8	9 1/8	231.3	1 1/8	28.2	3 13/16	97.4	16 1/8	409.6	18	457.2	14 7/8	377.8	238	108.0	276	125.2	37 1/8	943.1	36 5/8	929.5
25HBC560A0030061	0	Y	N	N	N	35	889.0	38 7/8	987.8	7/8	22.2	6 9/16	166.1	28 7/16	722.8	9 1/8	231.3	1 1/8	28.2	3 13/16	97.4	17 1/4	438.2	16 1/4	412.8	18 1/4	463.6	294	133.4	345	156.5	37 1/8	943.1	43 3/8	1102.2
25HBC561A0030010	0	Y	N	N	N	35	889.0	45 11/16	1160.5	7/8	22.2	6 9/16	166.1	28 7/16	722.8	9 1/8	231.3	1 1/8	28.2	3 13/16	97.4	17 7/8	454.0	16 1/4	412.8	19	482.6	288	130.6	334	151.5	37 1/8	943.1	50 3/16	1274.9

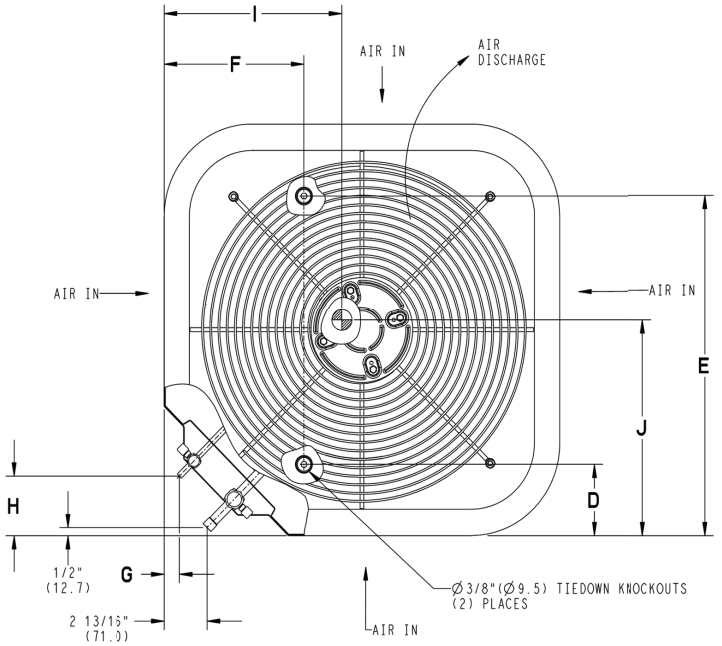
208-230-1-60	208/230-3-60	460-3-60	575-3-60

Y=YES
N=NO

NOTES:

1. CENTER OF GRAVITY .





UNIT SIZE	"X" MINIMUM GROUND MOUNTING PAD APPLICATION DIMENSIONS		"Y" MINIMUM ROOF-TOP MOUNTING PAD APPLICATION DIMENSIONS	
-	23 1/8	587.3	17 7/8	454.6
-	25 3/4	654.0	20 7/16	518.5
18	31 3/16	792.5	22 15/16	583.2
24,30,37,42,48,60,61	35	889.0	26 3/4	679.7

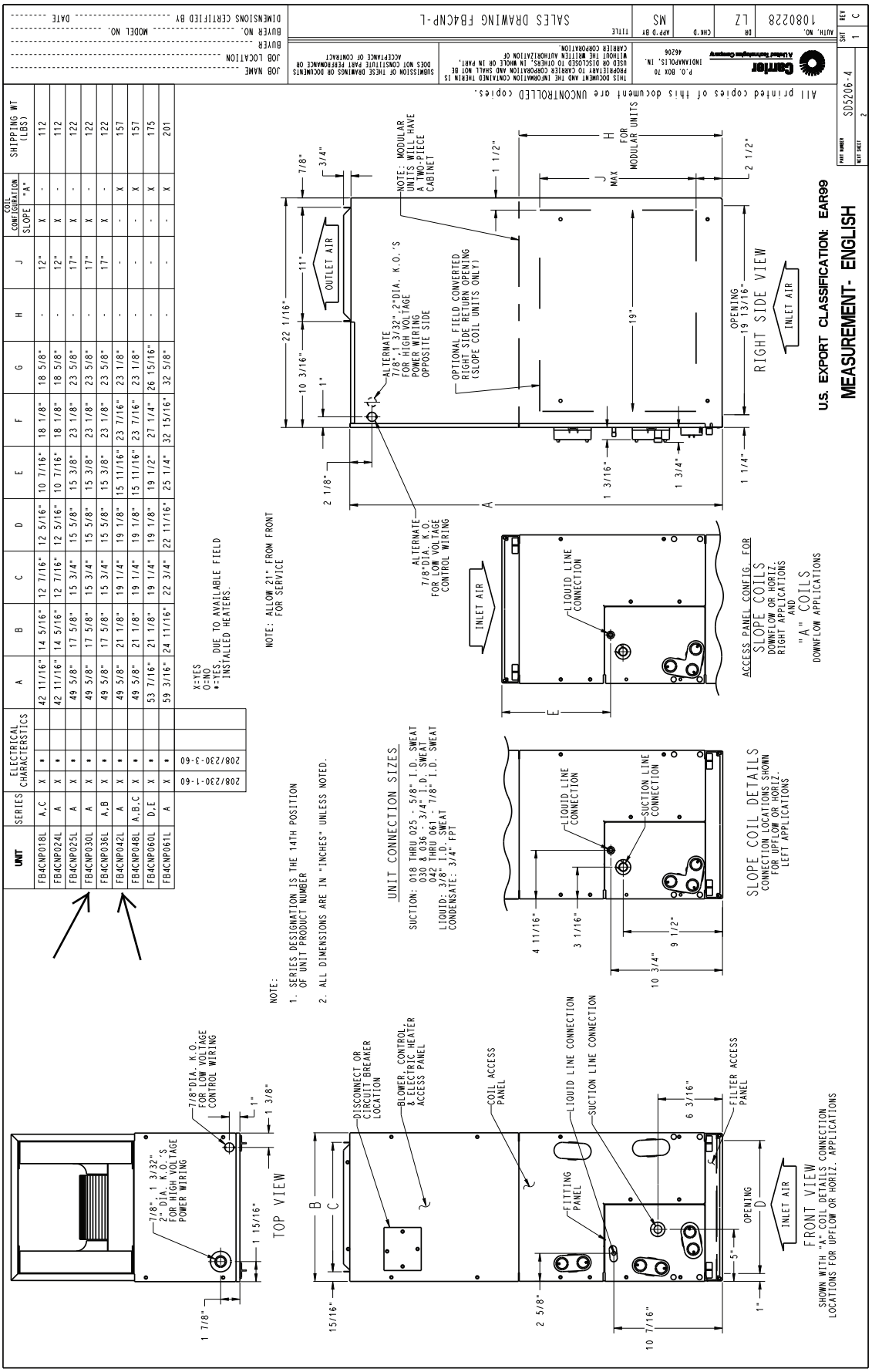
NOTE: ALL DIMENSIONS IN INCH (MM)

U.S. ECCN: Not Subject to Regulation (N.S.R.)

SD5363-4 REV. D

ASHP-1, 2 & 3 Outdoor

DIMENSIONS



UNIT	SERIES	ELECTRICAL CHARACTERISTICS				A	B	C	D	E	F	G	H	J	COIL CONFIGURATION SLOPE	COIL CONFIGURATION "A"	SHIPPING WT (LBS)
				208/230-1-60	208/230-3-60												
FB4CNP018L	A,C	X	*			42 11/16"	14 5/16"	12 7/16"	12 5/16"	10 7/16"	18 1/8"	18 5/8"	-	12"	X	-	112
FB4CNP024L	A	X	*			42 11/16"	14 5/16"	12 7/16"	12 5/16"	10 7/16"	18 1/8"	18 5/8"	-	12"	X	-	112
FB4CNP025L	A	X	*			49 5/8"	17 5/8"	15 3/4"	15 5/8"	15 3/8"	23 1/8"	23 5/8"	-	17"	X	-	122
FB4CNP030L	A	X	*			49 5/8"	17 5/8"	15 3/4"	15 5/8"	15 3/8"	23 1/8"	23 5/8"	-	17"	X	-	122
FB4CNP036L	A,B	X	*			49 5/8"	17 5/8"	15 3/4"	15 5/8"	15 3/8"	23 1/8"	23 5/8"	-	17"	X	-	122
FB4CNP042L	A	X	*			49 5/8"	21 1/8"	19 1/4"	19 1/8"	15 11/16"	23 7/16"	23 1/8"	-	-	-	X	157
FB4CNP048L	A,B,C	X	*			49 5/8"	21 1/8"	19 1/4"	19 1/8"	15 11/16"	23 7/16"	23 1/8"	-	-	-	X	157
FB4CNP060L	D,E	X	*			53 7/16"	21 1/8"	19 1/4"	19 1/8"	19 1/2"	27 1/4"	26 15/16"	-	-	-	X	175
FB4CNP061L	A	X	*			59 3/16"	24 11/16"	22 3/4"	22 11/16"	25 1/4"	32 15/16"	32 5/8"	-	-	-	X	201

A150081

Fig. 1 – FB4CNP – English

ASHP-1 Indoor

HEATER ELECTRICAL DATA

ELECTRIC HEATER INTERNAL PROTECTION

HEATER kW	PHASE	FUSE QTY/SIZE	CKT BKR* QTY/SIZE
5	1	—	1/60
8	1	—	1/60
9	1/3	—	—
10	1	—	1/60
15	1	2/30–2/60	2/60
15	3	—	—
18	3	—	—
20	1	4/60	2/60
24	1/3	6/60	—
30	1/3	6/60	—

*All circuit breakers are 2 pole.

When using units with 20–, 24–, and 30–kW electric heaters, maintain a 1–in. (25mm) clearance from combustible materials to discharge plenum and ductwork and maintain a distance of 36–in (914mm) from the unit. Use an accessory downflow base to maintain proper clearance on downflow installations. Use flexible connectors between ductwork and unit to prevent transmission of vibration. When electric heater is installed, use heat resistant material for flexible connector between ductwork and unit at discharge connection. Ductwork passing through unconditioned space must be insulated and covered with vapor barrier.

ASHP-2 & 3 Indoor

ACCESSORIES

ITEM		ACCESSORY PART NO.*	FAN COIL SIZE USED WITH
1.	Disconnect Kit	KFADK0201DSC	All single phase 3kW – 10kW heaters
2.	Downflow Base Kit	KFACB0101CFB	018, 024
		KFACB0201CFB	025, 030, 036
		KFACB0301CFB	042, 048, 060
		KFACB0401CFB	061
3.	Downflow Conversion Kit †	KFADC0201SLP	Slope Coil Units—018, 024, 030, 036
		KFADC0401ACL	A–Coil Units—042, 048, 060, 061
4.	Downflow/Horizontal Conversion Gasket Kit	KFAHD0101SLP	All
5.	Horizontal Water Management Kit (25 pack) ‡	KFAHC0125AAA	A–Coil Units—042, 048, 060, 061
6.	Single–Point Wiring Kit	KFASP0101SPK	Only with 15– and 20–kW Fused Heaters
7.	Filter Kit (12 Pack)	KFAFK0112SML	018, 024
		KFAFK0212MED	025, 030, 036
		KFAFK0312LRG	042, 048, 060
		KFAFK0412XXL	061
8.	Fan Coil Filter Cabinet (Fan Coil Filter Media)	FNCCABCC0014 (FILXXFNC0014)	018, 024
		FNCCABCC0017 (FILXXFNC0017)	030, 036
		FNCCABCC0021 (FILXXFNC0021)	042, 048, 060
9.	PVC Condensate Trap Kit (50 pack)	KFAET0150ETK	All
10.	Air Cleaner 240–volt Conversion Kit	KEAVC0201240	All
11.	Standard Filter Rack Kit	KFAFR0101FRM	018, 024
		KFAFR0201FRM	025, 030, 036
		KFAFR0301FRM	042, 048, 060
		KFAFR0401FRM	061
12.	TXV Kit Puron (R–410A), Copper and Tin Coils Only	KSATX0201PUR	018, 024, 025, 030
		KSATX0301PUR	036, 042
		KSATX0401PUR	048
13.	TXV Kit R–22, Copper and Tin Coils Only	KSATX0601HSO	018, 024, 025, 030, 036, 042
		KSATX0701HSO	048
		KSATX1001HSO	060, 061
14.	TXV Kit, Puron (R–410A), Aluminum Coils Only	KSBTX0201PUR	018L, 024L, 025L, 030L
		KSBTX0301PUR	036L, 042L
		KSBTX0401PUR	048L
15.	TXV Kit R–22, Aluminum Coils Only	KSBTX0601HSO	018L, 024L, 030L, 036L, 042L
		KSBTX0701HSO	048L
		KSBTX1001HSO	060L, 061L
16.	Door Gasket Kit **	344994–751	All

* Factory authorized and listed, field–installed.
** This kit is for replacement of factory installed gaskets if they are damaged or removed from the fan coil. †
KFAHD0101SLP must also be purchased for downflow applications.
‡ KFAHD0101SLP must also be purchased for downflow or horizontal applications.

Option #3 – Water Source Heat Pump System, Refer to Equipment Submittal Sheets. Budget Equipment Price - $17,000, Manufacturer's Representative – HTS New England, Attention: Derek Anneser, 1-978-977-9911, Derek.Anneser@hts.com
Geothermal Borehole estimate $37,000. Contact Cushing and Sons, Bart Cushing, 1-800-831-8883, Bart@CushingAndSons.com

Option #3 Ground Source Heat Pumps GSHP-1, 2 & 3

5 Series

500A11

Geothermal heat pump

1-6 ton (single speed)

2-6 ton (dual capacity)

WaterFurnace
Smarter from the Ground Up™

Submittal Data

English Language/IP Units

SD2500AN 11/17

Option #3 Ground Source Heat Pumps
GSHP-1, 2 & 3

Contractor: _____ P.O.: _____

Engineer: _____

Project Name: _____ Unit Tag: _____

5 Series 500A11
1-6 Ton 60Hz

WaterFurnace® Smarter from the Ground Up™

Model Nomenclature

1	2	3	4-6	7	8	9	10	11	12	13	14	15	16
N	D	V	049	*	1	1	1	C	T	L	0	A	N

Model Type
N – 5 Series Water-to-Air

Compressor Type
D – Dual-Stage
S – Single Stage

Cabinet Configuration
V – Vertical
H - Horizontal

Unit Capacity (MBTUH)
012, 018, 022, 026, 030
036, 038, 042, 048, 049
060, 064, 070, 072

Vintage
* – Internal Factory Use Only

Voltage
1 – 208-230/60/1

Hot Water Generation
0 – No Hot Water Generation
1 – Hot Water Generation with Factory Installed Pump

Blower Options
0 – PSC (Single Stage Only)
1 – Variable Speed ECM
2 – High Static Variable Speed ECM (036-049 Only)
3 – High Static PSC (022, 030, 036, 042, 048)
4 – 5-Speed ECM (022-072)

IntelliStart® & Air Coil Option*
N – No IntelliStart, Uncoated Coil
A – IntelliStart, Uncoated Coil
B – No IntelliStart, AlumiSeal
C – IntelliStart, AlumiSeal

Control Option
A – Aurora™ Base Control (ABC)
B – Aurora Advanced Control (ABC & AXB)
C – Aurora Performance Package (018 – 072, ECM Blowers Only)[2]
D – Aurora Performance and Refrigeration Package (018 – 072, ECM Blowers Only)[2]
E – Aurora™ Base Control w UPC[2,3]
F – Aurora Advanced Control w UPC[2,3]
G – Aurora Performance Package w UPC[2,3]
H – Aurora Performance and Refrigeration Package w UPC[2,3]

Filter Option
0 – 2 inch MERV11 Filter
1 – AlpinePure 411 (Vertical Only, 022-072)[1]

Return Air Configuration
L – Left
R – Right

Discharge Air Configuration
T – Top (Vertical)
B – Bottom (Vertical)
R – Rear (Vertical)
S – Side (Horizontal)
E – End (Horizontal)

Water Coil Option
C – Copper
N – CuproNickel

Notes:
All Models include sound kits as std. equipment
[1] Available on vertical configurations only
[2] Control option not available with PSC motor
[3] UPC is not compatible with Symphony or IntelliZone2

Rev.: 10/4/2017

GSHP-1 SIZE 042, GSHP-2 & 3 SIZE 048

Contractor: _____ P.O.: _____

Engineer: _____

Project Name: _____ Unit Tag: _____

5 Series 500A11
1-6 Ton 60Hz

WaterFurnace® Smarter from the Ground Up™

AHRI/ISO 13256-1 Performance Ratings

Variable Speed ECM or 5-Speed ECM Motor

AHRI/ASHRAE/ISO 13256-1
English (IP) Units

Model	Capacity Modulation	Flow Rate		Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
				Cooling EWT 86° F		Heating EWT 68° F		Cooling EWT 59° F		Heating EWT 50° F		Cooling Brine Full Load 77° F Part Load 68° F		Heating Brine Full Load 32°F Part Load 41°F	
		gpm	cfm	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER	Heating Capacity	COP
026	Full	8	950	24,900	16.8	30,100	5.5	27,700	24.0	23,900	4.8	26,400	19.6	19,500	4.0
026	Part	7	750	18,900	18.6	22,000	6.1	22,200	29.7	17,500	4.9	21,000	26.0	16,400	4.5
038	Full	9	1300	36,500	17.0	43,300	5.5	40,000	24.4	35,000	4.9	38,200	19.7	28,500	4.2
038	Part	8	1150	26,500	19.0	31,300	6.4	29,900	32.1	24,900	5.1	29,500	28.0	22,900	4.8
049	Full	12	1600	49,100	17.2	59,000	5.5	54,100	24.5	47,200	4.6	50,800	19.3	38,200	4.0
049	Part	11	1400	36,300	19.1	41,700	6.1	41,600	33.0	33,600	4.7	39,800	27.4	31,000	4.4
064	Full	16	1800	62,300	16.4	73,900	5.2	69,000	23.9	60,400	4.6	65,500	19.3	47,300	3.8
064	Part	14	1500	45,800	18.1	53,200	5.9	53,000	30.7	43,500	4.8	50,500	26.5	38,200	4.3
072	Full	18	2000	70,100	15.6	88,000	4.8	79,000	22.0	71,000	4.3	73,800	18.2	55,400	3.7
072	Part	16	1500	54,200	17.0	66,000	5.1	61,500	27.6	52,700	4.3	59,400	24.9	47,400	3.9
018	Single	5	600	17,400	15.7	23,000	5.3	20,600	26.0	18,700	4.6	18,500	18.3	14,500	3.8
022	Single	8	800	18,100	15.6	23,700	6.0	21,900	27.5	19,500	5.0	19,200	18.7	15,000	4.0
030	Single	8	1000	27,000	18.9	32,900	5.6	31,200	29.5	26,000	4.8	28,100	22.0	20,500	3.9
036	Single	9	1200	32,300	18.8	36,500	5.7	36,800	28.8	29,200	4.9	33,700	22.0	24,400	4.2
042	Single	11	1300	39,000	18.6	45,600	5.8	43,900	28.1	36,100	4.9	40,700	21.7	28,900	4.0
048	Single	12	1500	44,100	16.3	55,600	5.4	50,300	25.9	44,700	4.7	45,900	18.8	36,400	4.0
060	Single	15	1800	61,100	16.4	74,100	5.5	66,900	24.3	59,200	4.7	62,200	18.4	47,900	4.0
070	Single	18	2000	66,200	15.3	85,000	5.0	75,000	22.9	68,000	4.4	69,100	17.6	54,000	3.7

NOTE: 018 not available with 5-Speed ECM motor

7/15/2015

Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature
Heating capacities based upon 68°F DB, 59°F WB entering air temperature
All ratings based upon 208V operation

GSHP-2 & 3 SIZE 048 Apparatus Bays

Contractor: _____ P.O.: _____

Engineer: _____

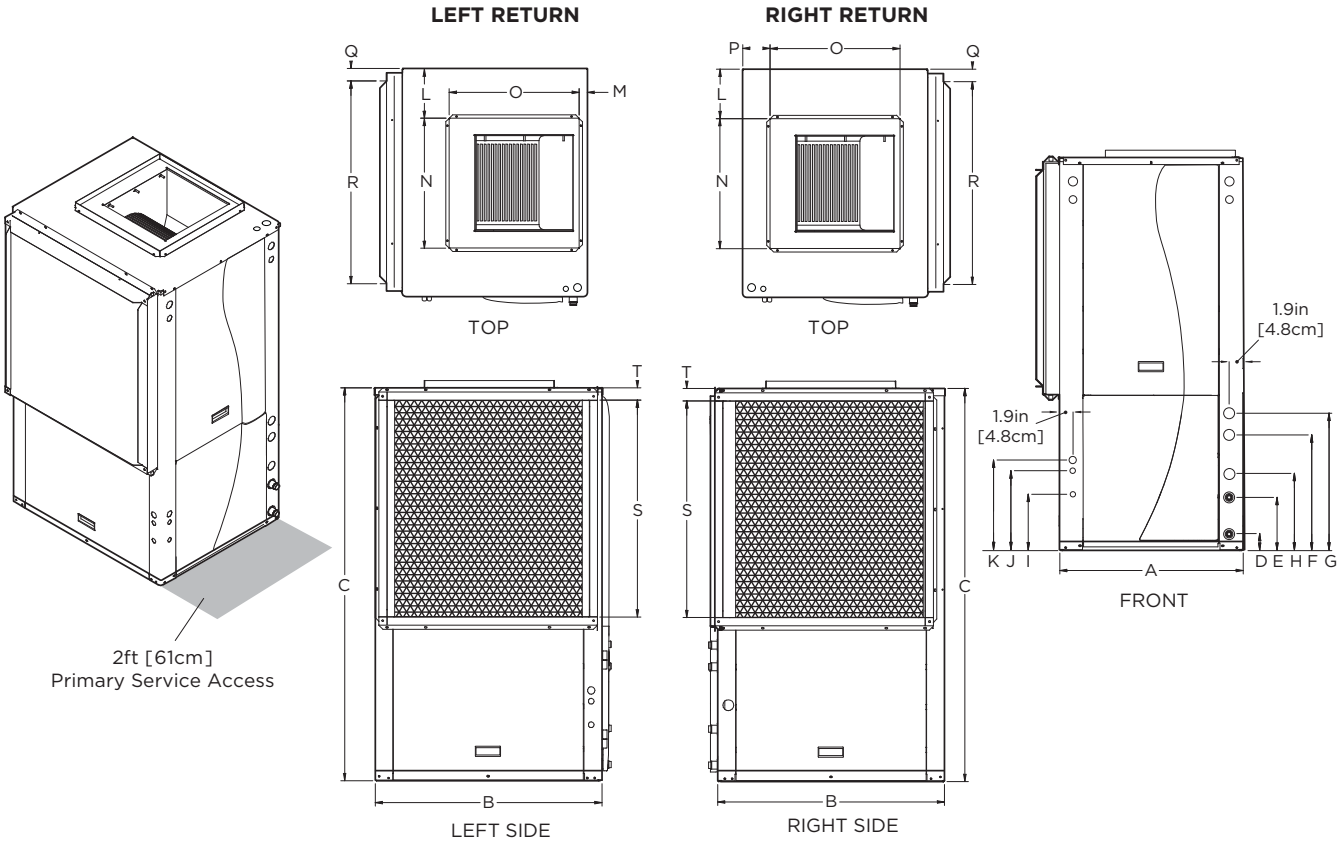
Project Name: _____ Unit Tag: _____

5 Series 500A11
1-6 Ton 60Hz

WaterFurnace® Smarter from the Ground Up™

Vertical Dimensional Data

Top Air Discharge



Vertical Top Flow Model		Overall Cabinet			Water Connections							Electrical Connections			Discharge Connection duct flange installed (±0.10 in)					Return Connection using std deluxe filter rack (±0.10 in)			
		A	B	C	D	E	F	G	H			I 3/4 in. cond	J 1/2 in. cond	K 1/2 in. cond	L	M	N	O	P	Q	R	S	T
		Width	Depth	Height	Loop In	Loop Out	HWG In	HWG Out	Cond-ensate	Loop Water FPT	HWG Sweat (I.D.)	Power Supply	Ext Pump	Low Voltage			Supply Width	Supply Depth			Return Depth	Return Height	
012	in.	22.2	22.5	34.5	2.3	5.3	11.9	14.9	8.6	1 in. Swivel	1/2 in. Female	6.9	9.4	11.7	6.1	3.7	10.0	10.0	0.7	2.4	18.1	14.2	1.7
	cm.	56.4	57.2	87.6	5.9	13.5	30.2	37.8	21.8			17.5	23.9	29.7	15.5	9.4	25.4	25.4	1.8	6.1	46.0	36.1	4.3
018	in.	22.5	26.5	39.4	2.3	5.3	13.4	16.4	9.6	1 in. Swivel	1/2 in. Female	6.9	9.4	11.7	6.3	0.7	14.0	14.0	2.7	2.3	22.0	18.0	2.0
	cm.	57.2	67.3	100.1	5.8	13.5	34.0	41.7	24.4			17.5	23.9	29.7	16.0	1.8	35.6	35.6	6.9	5.8	55.9	45.7	5.1
022-030	in.	22.5	26.5	48.5	2.0	7.0	13.5	16.5	10.2	1 in. Swivel	1/2 in. Female	9.5	12.1	14.3	6.1	0.8	14.0	14.0	4.4	1.7	22.2	26.0	1.7
	cm.	57.2	67.3	123.2	5.1	17.8	34.3	41.9	25.9			24.1	30.7	36.3	15.5	2.0	35.6	35.6	11.2	4.3	56.4	66.0	4.3
036-038	in.	25.6	31.6	50.4	2.3	7.3	15.9	18.9	10.6	1 in. Swivel	1/2 in. Female	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	1.7	28.1	26.0	1.7
	cm.	65.0	80.3	128.0	5.8	18.5	40.4	48.0	26.9			24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	4.3	71.4	66.0	4.3
042-049	in.	25.6	31.6	54.4	2.3	7.3	15.9	18.9	10.6	1 in. Swivel	1/2 in. Female	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	1.7	28.1	30.0	1.7
	cm.	65.0	80.3	138.2	5.8	18.5	40.4	48.0	26.9			24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	4.3	71.4	76.2	4.3
060-072	in.	25.6	31.6	58.4	2.3	7.3	15.9	18.9	10.6	1 in. Swivel	1/2 in. Female	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	1.7	28.1	34.0	1.7
	cm.	65.0	80.3	148.3	5.8	18.5	40.4	48.0	26.9			24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	4.3	71.4	86.4	4.3

Condensate is 3/4 in. PVC female glue socket and is switchable from side to front 7/11/12
Unit shipped with deluxe 2 in. (field adjustable to 1 in.) duct collar/filter rack extending from unit 3.25 in. and is suitable for duct connection.
Discharge flange is field installed and extends 1 in. [25.4 mm] from cabinet
Decorative molding and/or water connections extend 1.2 in. [30.5 mm] beyond front of cabinet.
Top panel has 1.375 in. and 1.125 in. knockouts for electrical connections.

GSHP-1 SIZE 042 Meeting, Kitchen, and Offices

Contractor: _____ P.O.: _____

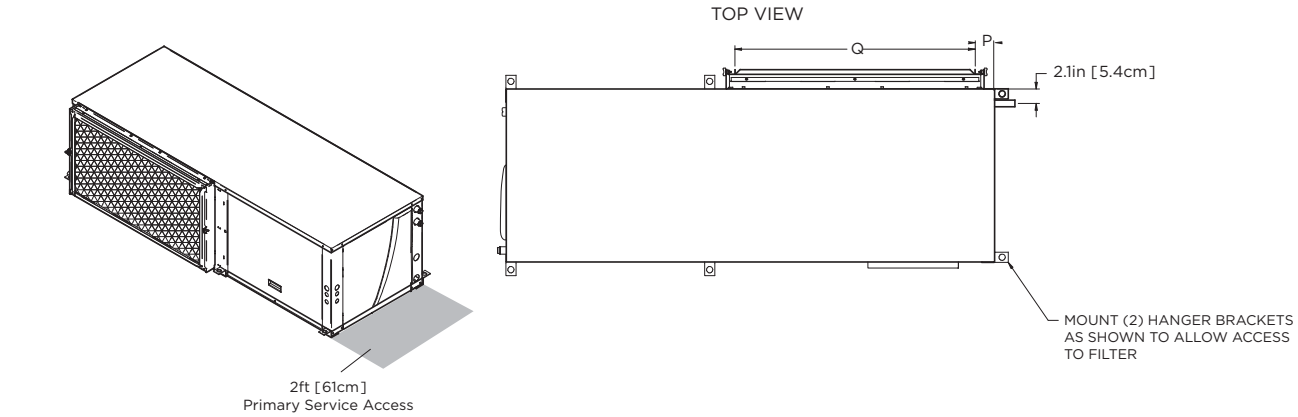
Engineer: _____

Project Name: _____ Unit Tag: _____

5 Series 500A11
1-6 Ton 60Hz

WaterFurnace® Smarter from the Ground Up™

Horizontal Dimensional Data



AS SHOWN LR UNIT (RR UNIT ON OPPOSITE SIDE—SAME DIMENSIONS)

Horizontal Model		Overall Cabinet			Water Connections							Electrical Connections			Discharge Connection duct flange installed (±0.10 in)				Return Connection using std deluxe filter rack (±0.10 in)			
		A	B	C	D	E	F	G	H	Loop Water FPT	HWG Sweat (I.D.)	I 3/4 in. cond	J 1/2 in. cond	K 1/2 in. cond	L	M	N	O	P	Q	R	S
		Width	Depth	Height	In	Out	HWG In	HWG Out	Cond-ensate			Power Supply	Ext Pump	Low Voltage		Supply Height	Supply Depth			Return Depth	Return Height	
012	in.	22.5	44.0	17.3	2.3	5.3	11.9	14.9	8.0	1 in. Swivel	1/2 in. Female	6.9	9.5	11.7	4.1	7.3	9.7	5.8	1.7	17.8	14.6	1.4
	cm.	57.2	111.8	43.9	5.8	13.5	30.2	37.8	20.3			17.5	24.1	29.7	10.4	18.5	24.6	14.7	4.3	45.2	37.1	3.6
018	in.	22.5	53.0	19.3	2.3	5.3	13.8	16.8	8.0	1 in. Swivel	1/2 in. Female	6.9	9.5	11.7	1.8	10.5	9.5	8.2	2.2	21.8	16.5	1.5
	cm.	57.2	134.6	49.0	5.8	13.5	35.1	42.7	20.3			17.5	24.1	29.7	4.6	26.7	24.1	20.8	5.6	55.4	41.9	3.8
022-030	in.	22.5	63.0	19.3	2.0	7.0	13.5	16.5	0.8	1 in. Swivel	1/2 in. Female	9.5	12.1	14.3	2.3	10.5	9.4	5.8	2.8	30.5	16.9	1.3
	cm.	57.2	160.0	49.0	5.1	17.8	34.3	41.9	2.0			24.1	30.7	36.3	5.8	26.7	23.9	14.7	7.1	77.5	42.9	3.3
036-038	in.	25.6	72.0	21.3	2.3	7.3	15.9	18.9	0.8	1 in. Swivel	1/2 in. Female	9.5	12.1	14.3	SEE CHART	13.6	13.2	SEE CHART	2.8	35.5	18.9	1.3
	cm.	65.0	182.9	54.1	5.8	18.5	40.4	48.0	2.0			24.1	30.7	36.3		34.5	33.5		7.1	90.2	48.0	3.3
042-049	in.	25.6	77.0	21.3	2.3	7.3	15.9	18.9	0.8	1 in. Swivel	1/2 in. Female	9.5	12.1	14.3	SEE CHART	13.6	13.2	SEE CHART	2.8	40.4	18.9	1.3
	cm.	65.0	195.6	54.1	5.8	18.5	40.4	48.0	2.0			24.1	30.7	36.3		34.5	33.5		7.1	102.6	48.0	3.3
060-072	in.	25.6	82.0	21.3	2.3	7.3	15.9	18.9	0.8	1 in. Swivel	1/2 in. Female	9.5	12.1	14.3	SEE CHART	13.6	13.2	SEE CHART	2.8	45.4	18.9	1.3
	cm.	65.0	208.3	54.1	5.8	18.5	40.4	48.0	2.0			24.1	30.7	36.3		34.5	33.5		7.1	115.3	48.0	3.3

Condensate is 3/4 in. PVC female glue socket and is switchable from side to front 7/11/12
Unit shipped with deluxe 2 in. (field adjustable to 1 in.) duct collar/filter rack extending from unit 3.25 in. and is suitable for duct connection.
Discharge flange is field installed and extends 1 in. [25.4mm] from cabinet
Decorative molding and/or water connections extend 1.2 in. [30.5mm] beyond front of cabinet.

Units Not Shown Above		L	O
Right Return End Discharge	in	2.8	4.6
	cm	7.1	11.8
Right Return Side Discharge	in	4.9	6.9
	cm	12.4	17.5
Left Return End Discharge	in	4.9	7.6
	cm	12.4	19.4
Left Return Side Discharge	in	2.8	6.9
	cm	7.1	17.5

Contractor: _____ P.O.: _____

Engineer: _____

Project Name: _____ Unit Tag: _____

Physical Data

Single Speed

Model		SINGLE SPEED								
		012	018	022	030	036	042	048	060	070
Compressor (1 each)		Rotary		Scroll						
Factory Charge R410a, oz [kg] (Aluminum tube and fin air coil)	Vertical	36 [1.02]	42 [1.19]	56 [1.58]	64 [1.81]	82 [2.32]	84 [2.38]	92 [2.60]	112 [3.17]	134 [3.79]
Factory Charge R410a, oz [kg] (Aluminum tube and fin air coil)	Horizontal	36 [1.02]	42 [1.19]	54 [1.53]	64 [1.81]	76 [2.15]	84 [2.38]	92 [2.60]	88 [2.49]	110 [3.11]
Blower Motor & Blower										
Blower Motor Type/Speeds	VS ECM	n/a	Variable Speed ECM							
	5-Spd ECM	n/a	n/a	5 Speed ECM						
	PSC	PSC - 4 Speeds	PSC - 3 Speeds							
Blower Motor- hp [W]	VS ECM	n/a	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1 [746]	1 [746]
	5-Spd ECM	n/a	n/a	1/2 [373]	1/2 [373]	1/2 [373]	1 [746]	1 [746]	1 [746]	1 [746]
	PSC	1/10 [75]	1/6 [134]	1/5 [149]	1/3 [249]	1/2 [373]	1/2 [373]	1/2 [373]	1 [746]	1 [746]
High Static Blower Motor - hp [W]	VS ECM	n/a	n/a	n/a	n/a	1 [746]	1 [746]	1 [746]	n/a	n/a
	PSC	n/a	n/a	1/ [249]	1/3 [249]	1/2 [373]	3/4 [560]	3/4 [560]	n/a	n/a
Blower Wheel Size (Dia x W), in. [mm]	VS ECM & 5-Spd ECM	n/a	9 x 7 [229 x 178]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
	PSC	6 x 8 [152 x 203]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	10 x 10 [254 x 254]	10 x 10 [254 x 254]	10 x 10 [254 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
High Static Blower Wheel Size (Dia x W), in. [mm]	VS ECM	n/a	n/a	n/a	n/a	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	n/a	n/a
	PSC	n/a	n/a	9 x 7 [229 x 178]	9 x 7 [229 x 178]	10 x 10 [254 x 254]	10 x 10 [254 x 254]	10 x 10 [254 x 254]	n/a	n/a
Coax and Water Piping										
Water Connections Size - Swivel - in [mm]		1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]	1" [25.4]
HWG Connection Size - Female Sweat I.D. - in [mm]		n/a	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]	1/2" [12.7]
Coax & Piping Water Volume - gal [l]		0.35 [1.3]	0.40 [1.5]	0.7 [2.6]	1.0 [3.8]	1.3 [4.9]	1.3 [4.9]	1.6 [6.1]	1.6 [6.1]	2.3 [8.7]
Vertical										
Air Coil Dimensions (H x W), in. [mm]		16 x 16 [406 x 406]	19 x 20 [483 x 508]	24 x 20 [610 x 542]	28 x 20 [711 x 542]	28 x 25 [711 x 635]	32 x 25 [813 x 635]	32 x 25 [813 x 635]	36 x 25 [914 x 635]	36 x 25 [914 x 635]
Air Coil Total Face Area, ft2 [m2]		1.8 [0.167]	2.6 [0.242]	3.3 [0.310]	3.9 [0.362]	4.9 [0.451]	5.6 [0.570]	5.6 [0.570]	6.3 [0.641]	6.3 [0.641]
Air Coil Tube Size, in [mm]		3/8 [9.5]	5/16 [7.9]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	3	3	3	3	3	4	4
Filter Standard - 2" [51mm] Pleated MERV11 Throwaway, in [mm]		16 x 20 [406 x 508]	20 x 24 [508 x 610]	28 x 24 [712 x 610]	28 x 24 [712 x 610]	28 x 30 [712 x 762]	32 x 30 [813 x 762]	32 x 30 [813 x 762]	36 x 30 [914 x 762]	36 x 30 [914 x 762]
Weight - Operating, lb [kg]		165 [75]	200 [91]	293 [133]	308 [140]	353 [160]	368 [167]	408 [185]	443 [201]	468 [212]
Weight - Packaged, lb [kg]		185 [84]	220 [100]	313 [142]	328 [149]	373 [169]	388 [176]	428 [194]	463 [210]	488 [221]
Horizontal										
Air Coil Dimensions (H x W), in. [mm]		16 x 16 [406 x 406]	18 x 21 [457 x 533]	18 x 27 [457 x 686]	18 x 30 [457 x 762]	20 x 35 [508 x 889]	20 x 40 [508 x 1016]	20 x 40 [508 x 1016]	20 x 45 [508 x 1143]	20 x 45 [508 x 1143]
Air Coil Total Face Area, ft2 [m2]		1.8 [0.167]	2.6 [0.242]	3.4 [0.316]	3.9 [0.362]	4.9 [0.451]	5.6 [0.570]	5.6 [0.570]	6.3 [0.641]	6.3 [0.641]
Air Coil Tube Size, in [mm]		3/8 [9.5]	5/16 [7.9]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	3	3	3	3	3	3	3
Filter Standard - 2" [51mm] Pleated MERV11 Throwaway, in [mm]		1 - 16 x 20 [406 x 508]	1 - 18 x 24 [457 x 610]	1 - 18 x 32 [457 x 813]	1 - 18 x 32 [457 x 813]	1 - 20 x 37 [686 x 940]	1 - 20 x 20 [508 x 508] 1 - 20 x 22 [508 x 559]	1 - 20 x 20 [508 x 508] 1 - 20 x 22 [508 x 559]	1 - 20 x 25 [508 x 635] 1 - 20 x 22 [508 x 559]	1 - 20 x 25 [508 x 635] 1 - 20 x 22 [508 x 559]
Weight - Operating, lb [kg]		165 [75]	200 [91]	300 [136]	315 [143]	368 [167]	403 [183]	418 [190]	453 [205]	478 [217]
Weight - Packaged, lb [kg]		185 [84]	220 [100]	320 [145]	335 [152]	388 [176]	423 [192]	438 [199]	473 [215]	498 [226]

11/13/2017

Contractor: _____ P.O.: _____

Engineer: _____

Project Name: _____ Unit Tag: _____

Electrical Data

Single Speed Unit with Variable Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA	LRA**						
018	208-230/60/1	187/253	10.4	6.7	33.5	n/a	0.4	5.4	4.0	16.5	18.1	20
022	208-230/60/1	187/253	14.0	9.0	48.0	17.0	0.4	5.4	4.0	18.8	21.0	30
030	208-230/60/1	187/253	20.0	12.8	58.3	21.0	0.4	5.4	4.0	22.6	25.8	35
036	208-230/60/1	187/253	22.0	14.1	73.0	26.0	0.4	5.4	4.0	23.9	27.4	40
036*	208-230/60/1	187/253	22.0	14.1	73.0	26.0	0.4	5.4	7.0	26.9	30.4	40
042	208-230/60/1	187/253	26.0	16.6	79.0	28.0	0.4	5.4	4.0	26.4	30.6	45
042*	208-230/60/1	187/253	26.0	16.6	79.0	28.0	0.4	5.4	7.0	29.4	33.6	50
048	208-230/60/1	187/253	31.0	19.8	109.0	38.0	0.4	5.4	4.0	29.6	34.6	50
048*	208-230/60/1	187/253	31.0	19.8	109.0	38.0	0.4	5.4	7.0	32.6	37.6	50
060	208-230/60/1	187/253	41.2	26.4	134.0	47.0	0.4	5.4	7.0	39.2	45.8	70
070	208-230/60/1	187/253	44.2	28.3	178.0	63.0	0.4	5.4	7.0	41.1	48.2	70

4/6/12

* With optional 1 hp ECM motor
** With optional IntelliStart®
Rated voltage of 208/230/60/1
All fuses Class RK-5
HACR circuit breaker in USA only

Single Speed Unit with 5-Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA	LRA**						
022	208-230/60/1	187/253	14.0	9.0	48.0	17.0	0.4	5.4	4.1	18.9	21.1	30
030	208-230/60/1	187/253	20.0	12.8	58.3	21.0	0.4	5.4	4.1	22.7	25.9	35
036	208-230/60/1	187/253	22.0	14.1	73.0	26.0	0.4	5.4	4.1	24.0	27.5	40
042	208-230/60/1	187/253	26.0	16.6	79.0	28.0	0.4	5.4	7.6	30.0	34.2	50
048	208-230/60/1	187/253	31.0	19.8	109.0	38.0	0.4	5.4	7.6	33.2	38.2	50
060	208-230/60/1	187/253	41.2	26.4	134.0	47.0	0.4	5.4	7.6	39.8	46.4	70
070	208-230/60/1	187/253	44.2	28.3	178.0	63.0	0.4	5.4	7.6	41.7	48.8	70

4/6/12

** With optional IntelliStart®
Rated voltage of 208/230/60/1
All fuses Class RK-5
HACR circuit breaker in USA only

Single Speed Unit with PSC Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA	LRA**						
012	208-230/60/1	187/253	7.7	4.9	25.0	n/a	-	5.4	0.6	10.9	12.2	15
018	208-230/60/1	187/253	10.4	6.7	33.5	n/a	0.4	5.4	1.1	13.6	15.2	20
022	208-230/60/1	187/253	14.0	9.0	48.0	17.0	0.4	5.4	1.2	16.0	18.2	25
022*	208-230/60/1	187/253	14.0	9.0	48.0	17.0	0.4	5.4	1.5	16.3	18.5	25
030	208-230/60/1	187/253	20.0	12.8	58.3	21.0	0.4	5.4	1.5	20.1	23.3	35
030*	208-230/60/1	187/253	20.0	12.8	58.3	21.0	0.4	5.4	2.8	21.4	24.6	35
036	208-230/60/1	187/253	22.0	14.1	73.0	26.0	0.4	5.4	2.8	22.7	26.2	40
036*	208-230/60/1	187/253	22.0	14.1	73.0	26.0	0.4	5.4	3.5	23.4	26.9	40
042	208-230/60/1	187/253	26.0	16.6	79.0	28.0	0.4	5.4	3.5	25.9	30.1	45
042*	208-230/60/1	187/253	26.0	16.6	79.0	28.0	0.4	5.4	4.6	27.0	31.2	45
048	208-230/60/1	187/253	31.0	19.8	109.0	38.0	0.4	5.4	3.5	29.1	34.1	50
048*	208-230/60/1	187/253	31.0	19.8	109.0	38.0	0.4	5.4	4.6	30.2	35.2	50
060	208-230/60/1	187/253	41.2	26.4	134.0	47.0	0.4	5.4	5.9	38.1	44.7	70
070	208-230/60/1	187/253	44.2	28.3	158.0	63.0	0.4	5.4	5.9	41.8	49.3	70

4/6/12

* With optional high static motor
** With optional IntelliStart®
Rated voltage of 208/230/60/1
All fuses Class RK-5
HACR circuit breaker in USA only

Performance Data cont.

NS042 - Single Speed with Variable Speed or 5-Speed ECM (1350 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	5.0	0.8	1.9	Operation not recommended							Operation not recommended							
	8.0	2.3	5.3															
	11.0	4.4	10.3	1150	24.0	2.12	16.8	89.3	3.32	4.1								
				1350	24.3	2.10	17.1	86.7	3.39	3.7								
30	5.0	0.8	1.8	Operation not recommended							Operation not recommended							
	8.0	2.2	5.1	1150	27.9	2.16	20.6	92.5	3.80	4.3	1150	40.2	24.5	0.61	1.34	44.8	29.9	---
				1350	28.3	2.14	21.0	89.4	3.87	3.9	1350	42.1	27.5	0.65	1.42	46.9	29.6	---
	11.0	4.3	10.0	1150	28.3	2.16	21.0	92.8	3.85	4.4	1150	40.6	24.5	0.60	1.31	45.0	31.1	---
				1350	28.7	2.14	21.4	89.7	3.93	4.0	1350	42.5	27.5	0.65	1.38	47.2	30.8	---
40	5.0	0.8	1.8	Operation not recommended							Operation not recommended							
	8.0	2.1	4.9	1150	31.8	2.24	24.1	95.6	4.15	4.7	1150	41.9	26.2	0.62	1.43	46.8	29.3	---
				1350	32.3	2.21	24.7	92.1	4.28	4.3	1350	43.8	29.4	0.67	1.51	48.9	29.0	---
	11.0	4.2	9.7	1150	32.4	2.25	24.7	96.1	4.21	4.9	1150	42.3	26.2	0.62	1.39	47.1	30.5	---
				1350	32.9	2.21	25.3	92.5	4.35	4.4	1350	44.2	29.4	0.66	1.47	49.2	30.1	---
50	5.0	0.7	1.7	1150	34.2	2.26	26.5	97.5	4.44	5.1	1150	42.6	27.0	0.63	1.62	48.1	26.3	2.5
				1350	34.8	2.21	27.2	93.8	4.61	4.7	1350	44.4	30.4	0.68	1.71	50.2	26.0	2.6
	8.0	2.1	4.8	1150	35.6	2.31	27.7	98.7	4.52	5.3	1150	43.1	27.3	0.63	1.55	48.3	27.9	2.3
				1350	36.2	2.26	28.5	94.8	4.71	4.8	1350	44.8	30.7	0.68	1.63	50.4	27.6	2.5
	11.0	4.1	9.4	1150	36.3	2.32	28.4	99.3	4.58	5.4	1150	43.5	27.3	0.63	1.50	48.6	29.0	2.1
				1350	37.0	2.27	29.3	95.4	4.78	5.0	1350	45.3	30.7	0.68	1.58	50.7	28.7	2.4
60	5.0	0.7	1.7	1150	37.5	2.32	29.6	100.2	4.73	5.7	1150	42.5	27.7	0.65	1.78	48.5	23.8	3.0
				1350	38.3	2.26	30.5	96.2	4.96	5.3	1350	44.1	31.1	0.71	1.87	50.5	23.6	3.2
	8.0	2.0	4.6	1150	39.2	2.39	31.0	101.6	4.80	5.9	1150	43.0	28.0	0.65	1.70	48.8	25.4	2.8
				1350	40.0	2.32	32.1	97.4	5.06	5.4	1350	44.7	31.4	0.70	1.78	50.8	25.1	3.0
	11.0	3.9	9.1	1150	40.1	2.41	31.9	102.3	4.87	6.1	1150	43.4	28.0	0.64	1.65	49.1	26.4	2.6
				1350	41.0	2.34	33.0	98.1	5.14	5.6	1350	45.1	31.4	0.70	1.73	51.0	26.1	2.9
70	5.0	0.7	1.6	1150	40.7	2.40	32.5	102.8	4.97	6.4	1150	42.6	28.6	0.67	1.97	49.4	21.6	3.8
				1350	41.6	2.32	33.7	98.6	5.26	6.0	1350	44.2	32.1	0.73	2.06	51.2	21.4	4.0
	8.0	1.9	4.5	1150	42.7	2.48	34.2	104.4	5.04	6.6	1150	43.3	28.9	0.67	1.87	49.7	23.1	3.5
				1350	43.7	2.39	35.5	100.0	5.36	6.1	1350	44.9	32.5	0.72	1.96	51.5	22.9	3.8
	11.0	3.8	8.8	1150	43.8	2.51	35.2	105.2	5.11	6.8	1150	43.7	28.9	0.66	1.82	49.9	24.1	3.3
				1350	44.9	2.42	36.6	100.8	5.45	6.3	1350	45.3	32.5	0.72	1.90	51.8	23.8	3.6
80	5.0	0.7	1.6	1150	43.7	2.44	35.4	105.2	5.26	7.2	1150	41.0	27.9	0.68	2.19	48.5	18.7	4.8
				1350	44.9	2.34	36.9	100.8	5.63	6.7	1350	42.4	31.4	0.74	2.29	50.2	18.5	5.1
	8.0	1.9	4.3	1150	46.0	2.54	37.4	107.0	5.32	7.5	1150	41.8	28.2	0.68	2.08	48.9	20.1	4.5
				1350	47.3	2.42	39.0	102.4	5.72	6.9	1350	43.2	31.7	0.73	2.17	50.6	19.9	4.8
	11.0	3.7	8.5	1150	47.3	2.57	38.6	108.1	5.39	7.7	1150	42.2	28.2	0.67	2.02	49.1	20.9	4.1
				1350	48.7	2.46	40.3	103.4	5.82	7.1	1350	43.6	31.7	0.73	2.11	50.8	20.7	4.6
90	5.0	0.7	1.5	1150	46.7	2.48	38.2	107.6	5.51	8.1	1150	38.9	27.1	0.70	2.45	47.2	15.9	6.0
				1350	48.0	2.37	40.0	102.9	5.95	7.5	1350	40.1	30.5	0.76	2.55	48.8	15.7	6.4
	8.0	1.8	4.2	1150	49.2	2.60	40.4	109.6	5.55	8.4	1150	39.7	27.4	0.69	2.31	47.6	17.1	5.6
				1350	50.8	2.47	42.4	104.8	6.03	7.8	1350	40.9	30.8	0.75	2.41	49.1	17.0	6.1
	11.0	3.5	8.2	1150	50.8	2.64	41.8	110.9	5.63	8.6	1150	40.1	27.4	0.68	2.25	47.7	17.8	5.2
				1350	52.4	2.51	43.9	106.0	6.14	8.0	1350	41.3	30.8	0.75	2.34	49.3	17.6	5.8
100	5.0	0.6	1.5	Operation not recommended							Operation not recommended							
	8.0	1.7	4.0								1150	38.2	26.9	0.70	2.58	47.0	14.8	6.9
											1350	39.2	30.2	0.77	2.68	48.4	14.6	7.5
	11.0	3.4	7.9								1150	38.5	26.9	0.70	2.50	47.1	15.4	6.4
											1350	39.6	30.2	0.76	2.60	48.5	15.2	7.2
110	5.0	0.6	1.4								Operation not recommended							
	8.0	1.7	3.9								1150	34.8	24.9	0.71	2.88	44.6	12.1	8.5
											1350	35.7	27.9	0.78	2.98	45.9	12.0	9.2
	11.0	3.3	7.6								1150	35.1	24.9	0.71	2.79	44.7	12.6	7.9
											1350	36.0	27.9	0.77	2.89	45.9	12.5	8.8
120	5.0	0.6	1.3								Operation not recommended							
	8.0	1.6	3.7								1150	32.8	24.6	0.75	3.20	43.7	10.2	10.3
											1350	33.5	27.6	0.82	3.31	44.8	10.1	11.1
	11.0	3.2	7.3								1150	33.1	24.6	0.74	3.11	43.7	10.7	9.5
											1350	33.9	27.6	0.81	3.21	44.8	10.6	10.6

2/10/12

Performance Data cont.

NS048 - Single Speed with Variable Speed or 5-Speed ECM (1500 cfm)

EWT °F	Flow Rate GPM	WPD		HEATING - EAT 70°F							COOLING - EAT 80/67 °F							
		PSI	FT/HD	Airflow CFM	HC MBtu/h	Power kW	HE MBtu/h	LAT °F	COP	HWC Mbtu/h	Airflow CFM	TC Mbtu/h	SC Mbtu/h	S/T Ratio	Power kW	HR Mbtu/h	EER	HWC Mbtu/h
20	6.0	1.1	2.6	Operation not recommended							Operation not recommended							
	9.0	2.3	5.4															
	12.0	4.0	9.2	1300	31.6	2.84	21.9	92.5	3.26	5.3								
				1500	32.0	2.82	22.4	89.7	3.33	4.8								
30	6.0	1.1	2.5	Operation not recommended							Operation not recommended							
	9.0	2.3	5.3	1300	36.3	2.92	26.3	95.8	3.64	5.6	1300	48.2	29.6	0.61	1.58	53.6	30.5	---
				1500	36.7	2.90	26.8	92.6	3.71	5.2	1500	50.5	33.3	0.66	1.67	56.2	30.2	---
	12.0	3.9	9.0	1300	36.8	2.93	26.8	96.2	3.68	5.8	1300	48.7	29.6	0.61	1.53	53.9	31.8	---
				1500	37.2	2.90	27.3	93.0	3.76	5.3	1500	51.0	33.3	0.65	1.62	56.5	31.4	---
40	6.0	1.1	2.5	Operation not recommended							Operation not recommended							
	9.0	2.2	5.1	1300	41.7	3.05	31.3	99.7	4.00	6.2	1300	50.1	31.2	0.62	1.74	56.0	28.9	---
				1500	42.2	3.00	32.0	96.1	4.13	5.7	1500	52.3	35.1	0.67	1.83	58.6	28.6	---
	12.0	3.8	8.7	1300	42.4	3.06	31.9	100.2	4.06	6.4	1300	50.6	31.2	0.62	1.68	56.4	30.0	---
				1500	43.0	3.01	32.7	96.5	4.19	5.8	1500	52.9	35.1	0.66	1.78	58.9	29.7	---
50	6.0	1.0	2.4	1300	44.7	3.09	34.1	101.8	4.24	6.7	1300	51.2	32.5	0.63	2.02	58.1	25.3	2.9
				1500	45.4	3.02	35.1	98.0	4.40	6.2	1500	53.3	36.5	0.68	2.13	60.6	25.1	3.1
	9.0	2.1	4.9	1300	46.5	3.16	35.7	103.1	4.32	6.9	1300	51.7	32.8	0.63	1.93	58.3	26.8	2.7
				1500	47.3	3.08	36.7	99.2	4.49	6.4	1500	53.9	36.8	0.68	2.03	60.8	26.6	2.9
	12.0	3.7	8.4	1300	47.4	3.18	36.6	103.8	4.37	7.2	1300	52.2	32.8	0.63	1.87	58.6	27.9	2.5
				1500	48.2	3.10	37.7	99.8	4.56	6.5	1500	54.4	36.8	0.68	1.97	61.1	27.6	2.8
60	6.0	1.0	2.3	1300	49.1	3.18	38.2	105.0	4.52	7.6	1300	50.0	32.1	0.64	2.24	57.6	22.3	3.5
				1500	50.0	3.10	39.5	100.9	4.74	7.0	1500	51.9	36.0	0.69	2.35	59.9	22.1	3.7
	9.0	2.1	4.8	1300	51.3	3.28	40.1	106.5	4.59	7.8	1300	50.6	32.4	0.64	2.13	57.9	23.7	3.3
				1500	52.3	3.18	41.5	102.3	4.83	7.2	1500	52.6	36.4	0.69	2.24	60.2	23.5	3.6
	12.0	3.5	8.2	1300	52.5	3.31	41.2	107.4	4.65	8.0	1300	51.1	32.4	0.63	2.07	58.2	24.7	3.0
				1500	53.6	3.20	42.7	103.1	4.91	7.4	1500	53.1	36.4	0.69	2.17	60.5	24.4	3.4
70	6.0	1.0	2.2	1300	53.6	3.29	42.4	108.2	4.78	8.5	1300	49.7	32.4	0.65	2.51	58.3	19.8	4.4
				1500	54.7	3.17	43.9	103.8	5.05	7.9	1500	51.5	36.5	0.71	2.63	60.5	19.6	4.7
	9.0	2.0	4.6	1300	56.1	3.40	44.5	110.0	4.84	8.8	1300	50.5	32.8	0.65	2.38	58.6	21.2	4.1
				1500	57.4	3.27	46.3	105.5	5.14	8.1	1500	52.3	36.8	0.70	2.50	60.9	21.0	4.5
	12.0	3.4	7.9	1300	57.6	3.44	45.8	111.0	4.91	9.0	1300	51.0	32.8	0.64	2.31	58.9	22.0	3.8
				1500	59.0	3.31	47.7	106.4	5.22	8.3	1500	52.9	36.8	0.70	2.42	61.1	21.8	4.2
80	6.0	0.9	2.1	1300	57.1	3.37	45.6	110.7	4.97	9.6	1300	47.7	31.7	0.67	2.81	57.3	17.0	5.6
				1500	58.6	3.23	47.5	106.2	5.32	8.8	1500	49.3	35.6	0.72	2.94	59.3	16.8	5.9
	9.0	1.9	4.5	1300	60.1	3.50	48.1	112.8	5.03	9.8	1300	48.5	32.0	0.66	2.66	57.6	18.2	5.2
				1500	61.7	3.35	50.3	108.1	5.40	9.1	1500	50.2	36.0	0.72	2.78	59.7	18.0	5.6
	12.0	3.3	7.6	1300	61.8	3.55	49.7	114.0	5.10	10.1	1300	49.0	32.0	0.65	2.59	57.8	19.0	4.8
				1500	63.5	3.39	51.9	109.2	5.49	9.4	1500	50.7	36.0	0.71	2.70	59.9	18.8	5.4
90	6.0	0.9	2.1	1300	60.7	3.45	48.9	113.2	5.16	10.7	1300	44.5	30.3	0.68	3.14	55.2	14.2	7.0
				1500	62.4	3.29	51.2	108.5	5.56	9.9	1500	45.9	34.0	0.74	3.27	57.0	14.0	7.4
	9.0	1.9	4.3	1300	64.1	3.61	51.7	115.6	5.20	11.1	1300	45.4	30.6	0.67	2.97	55.5	15.3	6.5
				1500	66.0	3.43	54.3	110.7	5.64	10.2	1500	46.8	34.3	0.73	3.09	57.4	15.1	7.1
	12.0	3.2	7.4	1300	66.1	3.67	53.5	117.0	5.27	11.4	1300	45.9	30.6	0.67	2.88	55.7	15.9	6.1
				1500	68.1	3.48	56.2	112.0	5.74	10.6	1500	47.3	34.3	0.73	3.00	57.5	15.7	6.7
100	6.0	0.9	2.0	Operation not recommended							Operation not recommended							
	9.0	1.8	4.2								1300	43.9	30.1	0.69	3.33	55.2	13.2	8.1
											1500	45.1	33.9	0.75	3.46	56.9	13.0	8.8
	12.0	3.1	7.1								1300	44.3	30.1	0.68	3.23	55.3	13.7	7.5
											1500	45.6	33.9	0.74	3.36	57.0	13.6	8.4
110	6.0	0.8	1.9								Operation not recommended							
	9.0	1.7	4.0								1300	39.7	28.0	0.71	3.71	52.3	10.7	9.9
											1500	40.7	31.4	0.77	3.84	53.8	10.6	10.8
	12.0	3.0	6.8								1300	40.1	28.0	0.70	3.60	52.3	11.1	9.2
											1500	41.1	31.4	0.77	3.73	53.8	11.0	10.2
120	6.0	0.8	1.8								Operation not recommended							
	9.0	1.7	3.8								1300	37.6	27.4	0.73	4.13	51.7	9.1	12.0
											1500	38.4	30.8	0.80	4.27	53.0	9.0	13.0
	12.0	2.8	6.6								1300	37.9	27.4	0.72	4.01	51.6	9.5	11.1
											1500	38.8	30.8	0.79	4.15	53.0	9.4	12.4

2/10/12