NY STATEWIDE CLEAN HEAT CALCULATOR
Version 2.2.6
USER GUIDE
December 1, 2023

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Summary

The Statewide Clean Heat Program Savings Calculator (Clean Heat Calculator) is an excel based tool that has been developed to assist participating contractors applying to the New York State Clean Heat Program (Clean Heat Program) with calculating custom energy savings and incentives for the following heat pump technologies:

- Northeast Energy Efficiency Partnerships (NEEP) listed cold climate single package air source heat pumps.
- NEEP-listed cold climate air source Mini-Splits, Single Package Vertical Heat Pumps and Package Terminal Heat Pumps
- Air-Conditioning, Heating, and Refrigeration Institute ("AHRI") Rated Large Unitary Air-to-Air Heat Pumps
- AHRI Rated Air Source Variable Refrigerant Flow (VRF) Heat Pumps
- AHRI Rated Large Closed Ground Loop Heat (Ground Source) Pumps with Centralized Pumping

This updated version allows users to quantify savings for Heat Pump Upgrades, such as Heat Pumps coupled with Building Envelope Upgrades and Energy /Heat Recovery Ventilator applications. It also allows users to get a rough estimate of the savings and incentives for projects in the early stages to get a feasibility check on pursuing the project further.

When to Use this Calculator:

The Clean Heat Calculator should be used as the default method to calculate energy savings for the technologies mentioned above if one or more of the following statements are true:

- The project involves installing NEEP-listed cold climate air source or mini-split units in new construction or existing multi-family buildings.
- The project proposes to install a combination of the above heat pump technologies. For example, the project scope includes the installation of both NEEP-listed mini-splits and Air Source VRFs.
- The project scope of work involves installing Heat Pump technologies and Energy Recovery or Heat Recovery Ventilators (Heat Pump + ERV/HRV) *Provided ERV/HRV systems are not mandated by federal, state, or local code.
- The project scope of work involves installing Heat pump technologies and building envelope upgrades for new construction, existing building retrofit, or gut renovation of a facility. (Heat Pump + Envelope Upgrade)
- The project scope involves installing Heat pump technologies along with building envelope upgrade coupled with ERV/HRV. (Heat Pump + Envelope Upgrade + ERV/HRV) *Provided ERV/HRV systems are not mandated by federal, state, or local code.

In addition, the version 2.2.6 calculator must be used for projects that have not yet received a **Preliminary Incentive Offer Letter** before December 1, 2023, superseding results obtained with previous versions.

Revisions and Updates:

The following are the summary of updates from the last version (2.2.2) of the Statewide Clean Heat calculator:

Tab	Section	Summary of Revisions
Inputs	Building Characteristics	V2.2.2: Updated to enter no. of dwelling more or less than 2000 sf. specific for Multifamily building type selection V2.2.5: Updated to enter Annual Billing Data for Cooling and Heating Energy. V2.2.6: Updated Construction Type Cell: Changed pull down menu to clarify: "Gut Renovation (use Bundled Set)". You should not use "Gut Renovation" for HP only, ONLY use with Bundled Set.
Eqpt Sched and Eligibility	Layout and User interface Ground Sourced Heat Pump	Follows a General Data entry followed by ASHP /AHRI/NEEP specific data and GSHP data Entry requires GSHP Heating and Cooling capacities and Efficiencies at different temperatures from the AHRI certificate as compared to those at temperatures used in v2.1
ERV	Column Headers	Renamed Sensible and Total ERV efficiency Column Headers more specific entries
Bldg Data & Sizing	All Sections – Partial Load Supplemental Fuel Choice	V2.2.6: Limited the dropdown choice to be existing fuel from Inputs or "Electric Resistance".
Results		V2.2.6: Changed the incentive default values for part-load projects for Central Hudson, National Grid, and RGE/NYSEG.

Exceptions to Using Calculator:

Under certain circumstances, applicants may bypass this calculator, opting instead to calculate savings using their own custom approach, even when one of the above statements is true. Justifiable reasons for doing so include, but are not limited to:

- The applicant has prepared a whole building energy model using one approved modeling software listed in the Clean Heat Program Guide.
- The project proposes installing a heat pump technology that does not fall into one of the above applicable categories available in the clean heat calculator. No prescriptive TRM methodology is available for calculating savings, i.e. Heat Recovery Chillers.
- The project involves a heat pump installation at an existing building, whose existing heating and cooling equipment types do not align with pre-programmed baselines provided in the Clean Heat Calculator. In this case, the applicant may still use the Clean Heat Calculator and should select a counter-factual baseline using pre-programmed baselines in the tool. Alternatively, the applicant may submit custom calculations comparing the proposed heat pump installation to the existing heating and cooling types currently installed at the facility. It is noted that baseline efficiencies should be based on minimum code efficiencies and not the existing equipment efficiency, except for category 4a and LMI projects.

All calculation approaches must use NYS ECC code minimum efficiencies for baseline systems.

General

Users shall review the 'Input,' Eqpt Eligibility & Sched' and 'ERV' tabs and input project-specific details where needed. Cells requiring user input are highlighted in yellow. Cells in white will auto-populate based on the inputs the user enters. Red cells indicate there may be an issue with project or equipment eligibility. Users can fill in the costs and related data in the 'Results Summary Tab'.

Project Information		
Building Characteristics	Zip Code	10577
	Utility	Con Edison
	Program	Multifamily
	Building Type (If Custom, fill in Custom Information in cells G4:J37)	Multifamily
	# of dwellings < 2,000SF	100
	# of dwellings ≥ 2,000SF	1
	Construction Type	Gut Renovation
	Year of construction if renovation	
	Gross Building Area impacted by SOW (SF)	449,000
	Billing Data: Annual Cooling Energy Use (kWh)	
	Billing Data: Annual Heating Energy Use (MMBtu)	
	LMI Building	non-LMI
	Floor to Floor Height (ft)	9
	Scope of work - Heat Pump installation - Bundle Set: Heat Pumps with Envelope Upgrades or ERVs or both	Bundle Set

<-- please provide the billing data

Yellow shaded cells indicate user input is required.

Heat Pump Technology	Outdoor Unit Tag(s) (OPTIONAL)	Outdoor Unit Quantity	Application	Du
NEEP Listed Cold Climate Mini-Split Heat Pump		6	Cooling and Heating	
NEEP Listed Cold Climate Mini-Split Heat Pump		22	Cooling Only	
NEEP Listed Cold Climate Mini-Split Heat Pump		5	Cooling and Heating	
NEEP Listed Cold Climate Mini-Split Heat Pump		6	Cooling and Heating	
NEEP Listed Cold Climate Mini-Split Heat Pump		1	Cooling and Heating	
Air Source Variable Refrigerant Flow Heat Pump		1	Cooling and Heating	

When a row highlights in red, there may be an eligibility issue.

Tabs should be completed in the following order:

1. Inputs
2. Eqpt Sched & Eligibility
3. ERV
4. Results Summary

Tab: Inputs

The latest version of the State-Wide Clean Heat Calculator also enables users to get a rough estimate of the savings and incentives for projects in the early stages to get a feasibility check on pursuing the project further.

Depending on the availability of appropriate required documentation, users can select options from the drop-down in cell E4 to submit a complete project application or get a rough estimate for the project by choosing the Demo Mode as shown below:

	A	B	C	D	E	F
1	Project Information				Select Mode	
2		Zip Code	10577			
4		Utility	Con Edison		Demo Mode (Rough Estimate)	
7		Program	Multifamily		Project Application Submission	
8		Building Type (If Custom, fill in Custom Information in cells G4:J37)	Multifamily		(Rough Estimate)	
9		# of dwellings < 2,000SF	100			
10		# of dwellings ≥ 2,000SF	1			
11		Construction Type	New Construction			
12	Building Characteristics					
13		Gross Building Area impacted by SOW (SF)	449,000			
14		Billing Data: Annual Cooling Energy Use (kWh)				
15		Billing Data: Annual Heating Energy Use (MMBtu)				
16		LMI Building	non-LMI			
17		Floor to Floor Height (ft)	9			
19		Scope of work - Heat Pump installation - Bundle Set: Heat Pumps with Envelope Upgrades or ERVs or both	Bundle Set			

Note:
Project Application Mode is used for the application submission.

Rought Estimate Mode is used only for feasibility studies.

SECTION 1:

A) Project Application Submission Mode- Heat Pump Upgrade

Follow this section if the project application involves replacing/upgrading the heat pump system only. It includes all heat pump categories (1,2,4,5,6) except Category 4A.
Please Note: For Category 4A (Heat Pump + Building Envelope Upgrade) and or ERV/HRV combined applications, follow Section 1 B) which comes after this section on Pg 17. of this document.

Building Characteristics
Zip Code– Enter the zip code pertaining to the weather station eligible for the facility/application submitted.

Utility – Select the electric utility that services the project's territory from the drop-down menu.

Program- Select the appropriate program category based on the building type from the drop-down menu.

Building Type - Select the appropriate building type from the drop-down menu. Selection should correspond to the building type where heat pumps will be installed. Building profiles have been derived from ASHRAE 90.1 Typical Occupancy Schedule and the New York State Technical Reference Manual Appendix A for several building types.

If the listed building type is selected as Multifamily, it will prompt the user to:

- choose whether it is an LMI or Non- LMI building
- # of dwellings < 2,000SF
- # of dwellings > 2,000SF

Suppose the listed building types do not align with the building type in the subject project. In that case, users may select custom from the drop-down in Cell C8 and then use the custom HVAC schedule in cells G4-J37 to create a "custom" building profile, including HVAC schedule, temperature set points, and balance point temperatures closely align with their project application.

- Creating a Custom HVAC Schedule – Select "On" or "Off" from the drop-down menu to correspond to the hours when the building's HVAC system is expected to be operational. Periods designated "On" correlate to times when the building is occupied, while "Off" periods correlate to times when the building is unoccupied or lightly occupied.

Complete table below if Cutom Building Type is selected:			
Hour (Time of Day)	Custom HVAC Schedule		
	Weekday	Saturday	Sunday
1:00 AM (12 to 1 AM)	Off		
2:00 AM (1 to 2 AM)	Off		
3:00 AM (2 to 3 AM)	Off		
4:00 AM (3 to 4 AM)	Off		
5:00 AM (4 to 5 AM)	Off		
6:00 AM (5 to 6 AM)	On		
7:00 AM (6 to 7 AM)	On		
8:00 AM (7 to 8 AM)	On		
9:00 AM (8 to 9 AM)			
10:00 AM (9 to 10 AM)			
11:00 AM (10 to 11 AM)			
12:00 PM (11 to 12 PM)			
1:00 PM (12 to 1 PM)			
2:00 PM (1 to 2 PM)			
3:00 PM (2 to 3 PM)			
4:00 PM (3 to 4 PM)			
5:00 PM (4 to 5 PM)			
6:00 PM (5 to 6 PM)			
7:00 PM (6 to 7 PM)			
8:00 PM (7 to 8 PM)			
9:00 PM (8 to 9 PM)			
10:00 PM (9 to 10 PM)			
11:00 PM (10 to 11 PM)			
12:00 PM (11 to 12 AM)			

- Occupied / Unoccupied Heating and Cooling Temperature Set Points – Enter the building's heating and cooling thermostat temperature set points.
- Occupied / Unoccupied Heating and Cooling Balance Point Temperatures – Enter the building's heating and cooling balance point temperatures.

If balance points are unknown, enter the following pre-set balance point temperatures into the blank table:

- ***Custom Profile - Existing Building Default Balance Point Temperatures:***

	Occupied Hours	Unoccupied Hours
Cooling Balance Point (deg F)	58	61
Heating Balance Point (deg F)	54	51

- ***Custom Profile - New Construction Default Balance Point Temperatures:***

	Occupied Hours	Unoccupied Hours
Cooling Balance Point (deg F)	55	58
Heating Balance Point (deg F)	52	49

Gross Building Area Impacted by SOW (Sf)- Enter the appropriate sq.ft, area impacted by the HVAC and/or building envelope upgrade.

Floor to Floor Height (ft)- Enter the appropriate ft measurement between 2 consecutive floors.

Construction Type – Select from the following drop-down options depending on the project facility application:

1) New Construction

2) Existing Building -Retrofit

3) Gut Renovation[1]

[1]Gut renovation is any work that could be considered an "Alteration" per the Energy Conservation Construction Code of New York State (ECCCNYS), as defined in Sections C202 and R202 of the code and as covered in Sections C503 and R503, which make alterations subject to new construction code requirements.

Construction Type: New Construction-
Selecting this option will prompt the user to fill in the following specific sections along with the other bold highlighted sections:

- Minimum Code Complaint Building Envelope- Heating & Cooling Load
- Minimum Code Complaint HVAC system type

Construction Type: Existing Building / Gut Renovation-
Selecting this option will prompt the user to fill in the following specific sections along with the other bold highlighted sections:

- Existing Building Envelope - Heating & Cooling Load
- Existing HVAC System Type
- Year of Construction If Renovation

Billing Data: Annual Cooling Energy Use (kWh) –

Please provide the current annual cooling energy use from billing data.

Billing Data: Annual Heating Energy Use (MMBtu) –

Please provide the current annual heating energy use from billing data.

Design Temperatures:

1% Dry Bulb Cooling Design Temperature: Enter 1% Dry Bulb Cooling Design Temperature from the design load calculations.

For Reference-Below are typical 1% cooling design dry bulb temperatures based on various ASHRAE 2021 weather station locations. It is expected that the load calculations submitted with the user's application align with the below temperatures, +/- 5˚F.

City Name	ASHRAE 2021 1% Cooling Dry Bulb Temperature (deg F)
Albany	86.3
Binghamton	82.3
Buffalo	83.9
Central Long Island	86.4
Elmira	86.5
Fort Drum	83.8
Glens Falls	84.6
Islip	85.9
Jamestown	81.1
Massena	84.6
Monticello	83.5
New York City - Central Park	87.9
New York City - JFK	86.7
New York City - LaGuardia	89.8
Niagara Falls	85.4
Poughkeepsie	88.4
Rochester	86.0
Saranac Lake	81.0
Syracuse	86.4
Utica	84.4
Watertown	83.3
Westhampton	84.2
White Plains	86.4

99% dry bulb heating design temperature (°F) - Enter 99% Dry Bulb Heating Design Temperature from the design load calculations.

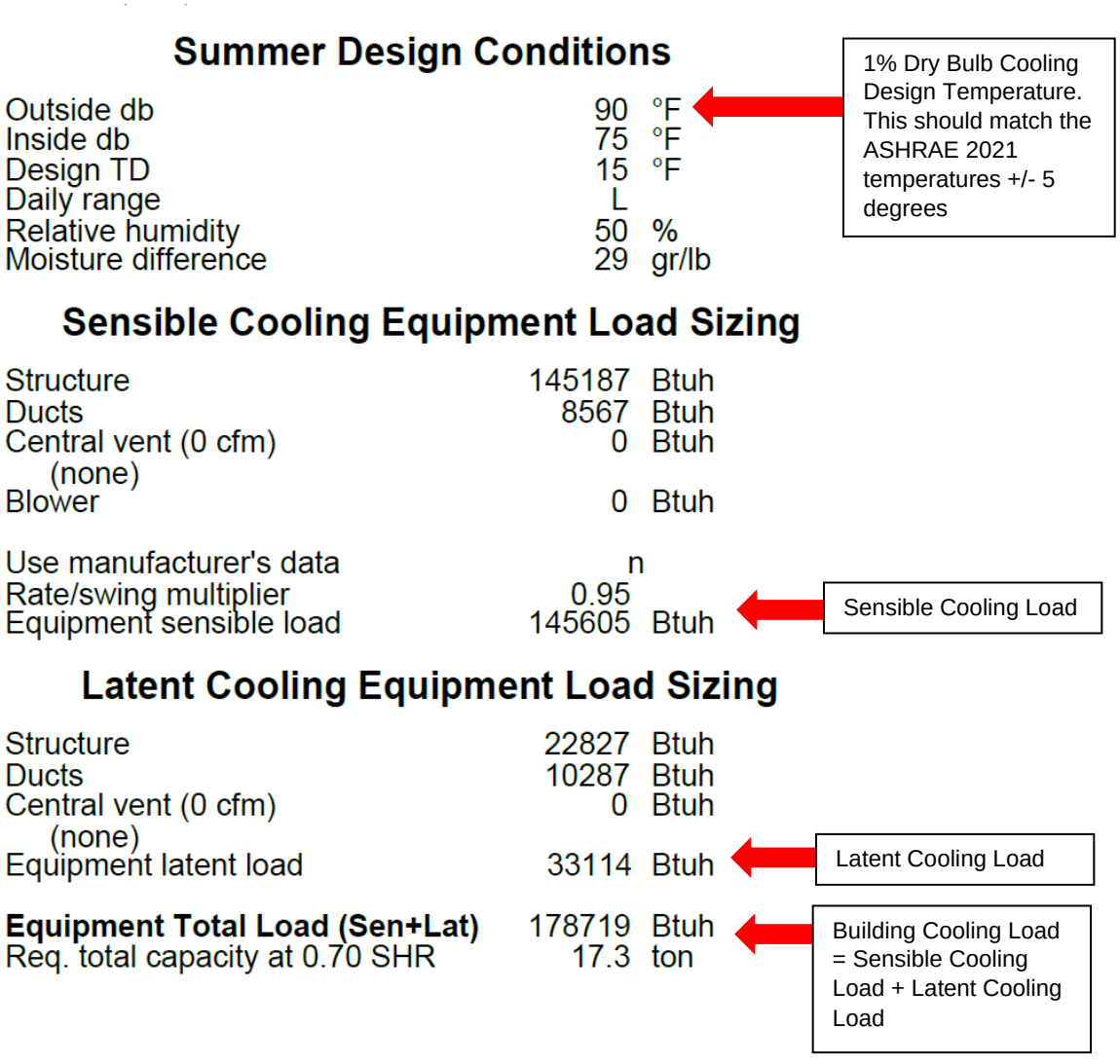
For Reference: Below are typical 99% heating design dry bulb temperatures based on various ASHRAE 2021 weather station locations. It is expected that the load calculations submitted with the user's application align with the below temperatures, +/- 5 ºF

City Name	ASHRAE 2021 99% Heating Dry Bulb Temperature (deg F)
Albany	4.3
Binghamton	3.9
Buffalo	6.8
Central Long Island	16.5
Elmira	4.1
Fort Drum	-4.9
Glens Falls	-2.1
Islip	15.7
Jamestown	4.5
Massena	-7.6
Monticello	4.7
New York City - Central Park	17.3
New York City - JFK	17.5
New York City – LaGuardia	17.9
Niagara Falls	6.5
Poughkeepsie	8.04
Rochester	6.6
Saranac Lake	-12.6
Syracuse	4.1
Utica	0.8
Watertown	-5.4
Westhampton	11.9
White Plains	12.9

Minimum Code Complaint/ Existing Building Envelope:

Building Cooling Load (BCL) – Enter the total design cooling load in British Thermal Units per hour (Btu/h) for the areas impacted by the clean heat project. BCL should be calculated following a code-approved methodology, including ACCA Manual J for residential buildings and ASHRAE/ACCA Standard 183 for commercial buildings. Calculating the building's design cooling load shall be at the 1% dry bulb cooling design temperature for the most relevant ASHRAE 2021 location. Below is an example of building load calculations, showing the building cooling load and cooling design temperature.

Cooling Load Calculations Example:



Building Heating Load (BHL) – Enter the total design heating load in British Thermal Units per hour (Btu/h) for the areas impacted by the clean heat project. BHL should be calculated following a code-approved methodology, such as ACCA Manual J for residential buildings and ASHRAE Standard 183 for commercial buildings. Calculating the building's design heating load shall be at the 99% dry bulb heating design temperature for the most relevant ASHRAE 2021 location. Below are examples of building load calculations, showing the building heating load and heating design temperature.

Heating Load Calculations Example:

Winter Design Conditions

Outside db	17	°F
Inside db	70	°F
Design TD	53	°F

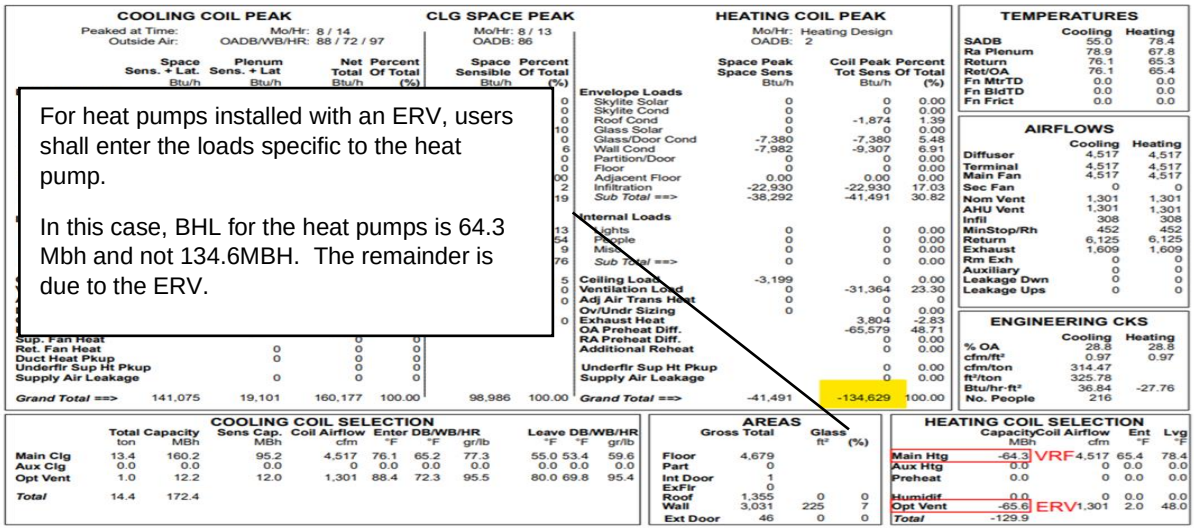
99% Dry Bulb Heating Design Temperature

Heating Summary

Structure	242341	Btuh
Ducts	25712	Btuh
Central vent (0 cfm) (none)	0	Btuh
Humidification	0	Btuh
Piping	0	Btuh
Equipment load	268053	Btuh

Building Heating Load

In cases where an existing energy recovery ventilator also serves the building, the user should only enter the loads relating to the heat pump installation. Refer to the below heat load calculation:

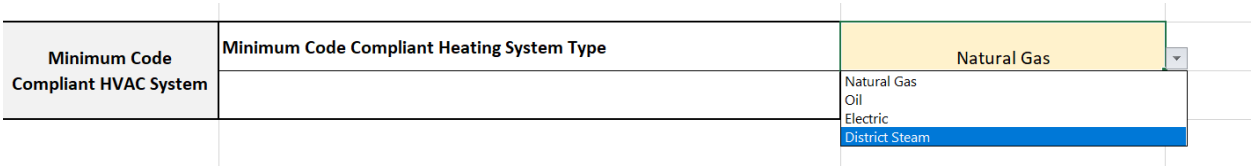


For heat pumps installed with an ERV, users shall enter the loads specific to the heat pump.

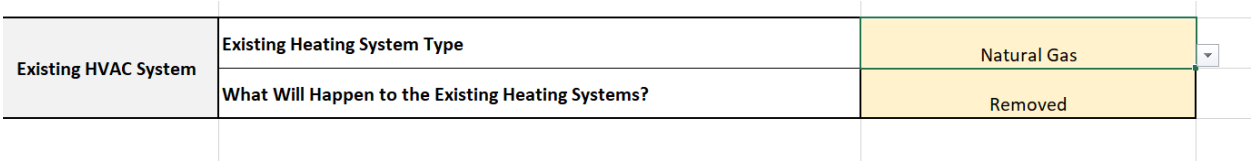
In this case, BHL for the heat pumps is 64.3 Mbh and not 134.6MBH. The remainder is due to the ERV.

Minimum Code Required/ Existing HVAC System Type

New Construction Applications – a minimum code-compliant HVAC system will have to be selected:



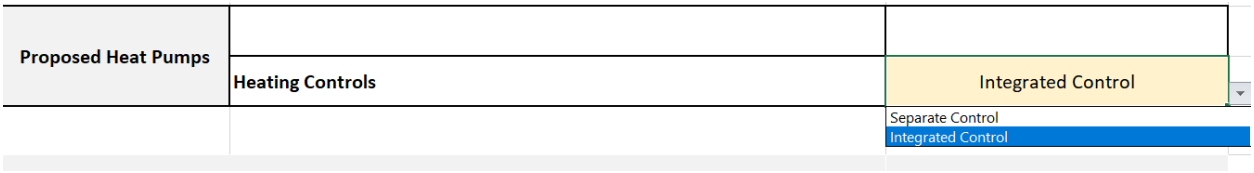
Existing or Gut Renovation Applications- The existing HVAC system will have to be selected along with the option to choose from whether the system will be decommissioned, removed, or will remain in place (active):



For New Construction, Existing-Retrofit and Gut Renovations applications, an NYCECC code minimum baseline will be used as a baseline for efficiency requirements as default, and users will not be required to make any specific selection in these scenarios for efficiency requirements.

Proposed Heat Pump System:

Heating Controls – Select heating controls strategy from the drop-down menu.



- Integrated Control – This option covers two types of control strategies:
  - Integrated/Modulating – The heat pump and backup heating system are on the same thermostat. The backup heater can modulate to meet the load without limiting the ASHP from delivering its maximum capacity.
  - Integrated/Fixed Capacity – The ASHP and backup heating system are on the same thermostat. The backup heater has a fixed capacity to meet the load. The backup heater is larger than the ASHP, so the ASHP is not always able to deliver its maximum capacity (the backup heater supplies a larger share of the load when both are running).
- Separate Control – The heat pump and backup heating system are on separate thermostats and controlled separately.

If there is no backup heating system in the proposed project, the user shall default to integrated control.

The following additional information is required for closed loop ground source systems. To activate the GSHP piping box, you can:

1. **Demo Mode:** Choose "GSHP system" in the input tab at C45.

2. **Project Application Mode:** Select "GSHP technology" in column C under the "eqp sched and eligibility" tab.

Complete table below if Ground Source Heat Pump Type is selected:		
Closed Loop Ground Source Heat Pumps	**Pumping Type**	Sensorless Variable Speed
	Quantity of Duty Pumps	1
	Pump Horsepower	1
	Pump Motor Efficiency	82.5%
	Pumping Design Power (kW)	1
	Loop Type	Closed Loop
	Average Ground Temp (F)	50
	Max Entering Water Temperature (EWT) (deg F) in Cooling	90
	Min Entering Water Temperature (EWT) (deg F) in Heating	30

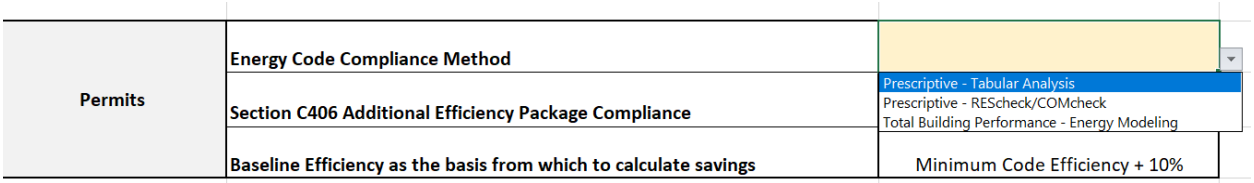
- Pumping Type: Select pumping design methodology from drop down menu:
  - Constant Speed: Design does not incorporate variable speed pumping.
  - Traditional Variable Speed: Install a variable speed drive (VSD) to vary pump speed in order to maintain the required pressure difference across all the heat pumps.
  - Two Stage Speed: Install a two-speed motor that can operate at a lower speed (usually 60% of full speed). Usually, the change in speed is driven by a pressure difference measurement in building loop.
  - Sensor less Variable Speed: Uses a variable speed pump with internal controls to modulate speed to maintain a constant pressure difference across a range of flows. These controllers use a sensor less control approach that attempts to mimic differential-pressure control without requiring a pressure sensor out in the building loop. The controller infers the pressure difference (at the pump) from measured current and speed. These pumps are common in small and medium applications up to 300-400 gpm.
- Quantity of Duty Pumps: Enter pump quantity.
- Pump Horsepower: Enter horsepower per pump.
- Pump Motor Efficiency: Pump motor efficiency auto-populates based on horsepower of pump entered in field above. Motor efficiencies are based on NEMA premium motor efficiencies.
- Pumping Design Power (kW): Pumping design power auto-populates based on the entered quantity, pumping horsepower, motor efficiency, as well as an assumed load factor of 1:

$$Pumping\ Design\ Power\ (kW) = \frac{Quantity\ x\ Horsepower\ x\ Load\ Factor}{Motor\ Efficiency}$$

- Average Ground Temp (F): Enter average ground temperature.
- Max Entering Water Temperature (EWT) (deg F) in Cooling: Enter the maximum temperature of the water entering the heat pump from the ground source system when operating in cooling mode.
- Min Entering Water Temperature (EWT) (deg F) in Heating: Enter the temperature of the water entering the heat pump from the ground source system when operating in heating mode.

Permits

For New Construction Applications, users will be prompted to fill in the code permit requirements as required:



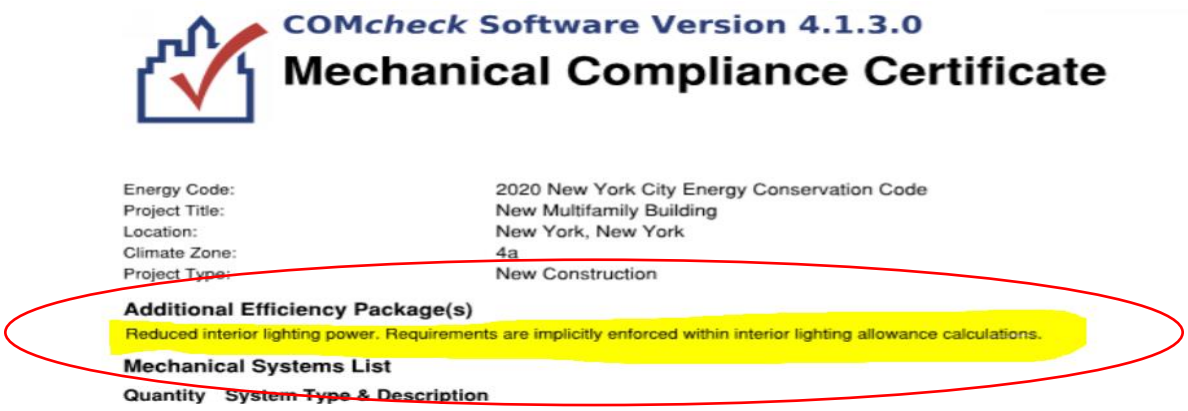
Energy Code Compliance Method – Select the applicable energy code compliance path from the drop-down menu. According to the 2020 New York City / New York State Commercial (NYC/NYS) Energy Codes, projects may comply in the following ways:

1. Prescriptive – Tabular Analysis
2. Prescriptive – REScheck/ COMcheck
3. Total Building Performance -Energy Modeling

The prescriptive compliance path requires each building element to meet a minimum acceptable value listed by the referred energy code. In contrast, the total building performance involves building the virtual model of the project to predict energy usage against an acceptable baseline. The performance path allows the designers to make trade-offs between various components of the building envelope and the systems used for heating, cooling, and lighting. The existing building typically complies with the prescriptive path by submitting a tabular analysis or COM check. Refer to examples of a tabular analysis and COM check below.

Section C406 Additional Efficiency Package Compliance (Commercial Code Only) – The 2020 NYC/NYS Commercial Energy Codes require all projects following the prescriptive path to incorporate one of eight additional efficiency package options within their design. Users shall select which additional efficiency package option was used to comply with the code from the drop-down menu. Users may select “Not Applicable” if this requirement doesn’t apply to the project (e.g., the project is a single-family or low-rise multi-family building that complies with the residential energy code). Users can determine which energy efficiency package the design complies with by consulting with the project’s COMcheck or tabular analysis. See below.

COMcheck Example:



COMcheck Software Version 4.1.3.0

Mechanical Compliance Certificate

Energy Code: 2020 New York City Energy Conservation Code
Project Title: New Multifamily Building
Location: New York, New York
Climate Zone: 4a
Project Type: New Construction

Additional Efficiency Package(s)

Reduced interior lighting power. Requirements are implicitly enforced within interior lighting allowance calculations.

Mechanical Systems List

Quantity System Type & Description

Tabular Analysis Example:

2020 NYCECC Commercial Additional Efficencies Tabular Analysis

NYCECC Citation	Provision	Item Description	Code Prescriptive Value (ECC)	Proposed Design Value	Supporting Documentation
C406.1	**Requirements** (for ADDITIONAL EFFICIENCY PACKAGE OPTIONS)	*Sample text: Choose one of six additional efficiency options*	*Buildings shall comply with at least one of the following:* *1. More efficient HVAC performance in accordance with Section C406.2.* *2. Reduced lighting power density system in accordance with Section C406.3.* *3. Enhanced digital lighting controls in accordance with Section C406.4.* *4. Provision of a dedicated outdoor air system with energy recovery ventilation for certain HVAC equipment in accordance with Section C406.5.* *5. High-efficiency service water heating in accordance with Section C406.6.* *6. Enhanced envelope performance in accordance with Section C406.7*	*Sample text: Reduced lighting power density system in accordance with Section C406.3.*	*Sample text: See note on EN-XXX*
C406.2	**More efficient HVAC equipment performance**	*More efficient HVAC equipment performance*	*Sample text:* *Equipment exceeds code min. by 10%:* *1 MBTU/hr gas-fired, hot water boiler @ 80% Et,* *300 ton air-cooled chiller @ 10.1 EER, 14 IPLV*	*Sample text:* *1000 MBH gas-fired, hot water boiler @ 96% Et,* *300 ton air-cooled chiller @ 12 EER, 16 IPLV*	*Sample text: See Mechanical schedule, drawing M-XXX*
C406.3	**Reduced lighting power density**	*Reduced lighting power density*	*Sample text:* *Lighting exceeds code min. by 10%:* *Building Area Method* *Office: 0.69 W/SF*	*Sample text:* *Building Area Method* *Office: 0.50 W/SF*	*Sample text: See RCPs, Lighting Schedule, LPD calculation, drawing A-XXX, EN-XXX*
C406.4	**Enhanced digital lighting controls**	*Enhanced digital lighting controls*	*Interior lighting in the building shall have enhanced lighting controls that shall be located, scheduled and operated in accordance with Section C405.2.2 & C406.4*	*Sample text:* *Office and lobby lighting provided as per requirements*	*Sample text: See RCPs, Lighting Schedule, LPD calculation, drawing A-XXX, EN-XXX*
C406.5	**Dedicated outdoor air system**	*Dedicated outdoor air system with energy recovery*	*Buildings covered by Section C403.4 shall be equipped with an independent ventilation system designed to provide not less than the minimum 1OO percent outdoor air to each individual occupied space, as specified by the New York City Mechanical Code, and be equipped with an energy recovery system.*	*Sample text:* *MAU-1 provides 100% outside air provided to all occupied space and is equipped with an Energy Recovery device*	*Sample text: See Mechanical schedule, drawing M-XXX*

Baseline Efficiency – cells auto-populate based on construction type, Energy Code compliance pathway, and Section C406 compliance user inputs. Suppose a new construction project complies with the 2020 NYC/NYS Commercial by providing more efficient HVAC. In that case, baseline efficiencies will be set as the minimum code efficiency for the selected baseline equipment + 10%. This field should yield 'Minimum Code Efficiency' in all other cases.

Permits	**Energy Code Compliance Method**	Prescriptive - REScheck/COMcheck
	Section C406 Additional Efficiency Package Compliance (New Construction - 2020 Commercial Energy Code Only)	Not Applicable
	Baseline Efficiency	Minimum Code Efficiency

Indicates that baseline equipment efficiencies will be equivalent to the minimum code efficient for that equipment + 10%. E.g., if minimum boiler efficiency in code is 80%, the baseline boiler efficiency used in code will be 88%.

SECTION 1

B) Project Application Submission- Heat Pump + Building Envelope Upgrade and/or Energy Recovery Ventilator (ERV)

Based on the type of application as discussed in detail under Section 1 A), the following sections will also have to be filled in for applications under Cat 4A as applicable:

1) Building Characteristics
2) Design Temperatures
3) Minimum Code/ Existing Building Loads
4) Minimum Code Complaint/ Existing HVAC System Type
5) Permits
6) Proposed Heat Pump
7) Existing HVAC System Efficiency

Refer to Section 1A for detailed guidance and steps to complete fields (1-5) listed above.

Under the Building Characteristics section, select the specific type of technology.

	A	B	C
1		**Project Information**	
2	**Building Characteristics**	**Zip Code**	10577
4		**Utility**	Con Edison
7		**Program**	Multifamily
8		**Building Type** (If Custom, fill in Custom Information in cells G4:J37)	Multifamily
9		**# of dwellings < 2,000SF**	100
10		**# of dwellings ≥ 2,000SF**	1
11		**Construction Type**	New Construction
12			
13		**Gross Building Area impacted by SOW (SF)**	449,000
14		**Billing Data: Annual Cooling Energy Use (kWh)**	
15		**Billing Data: Annual Heating Energy Use (MMBtu)**	
16		**LMI Building**	non-LMI
17		**Floor to Floor Height (ft)**	9
19		**Scope of work** - Heat Pump installation - Bundle Set: Heat Pumps with Envelope Upgrades or ERVs or both	Bundle Set
30			Heat Pumps Bundle Set
31	**Design Temperatures**	**Dry bulb cooling design temperature used in Load Calculations (°F)**	87.9
32		**Dry bulb heating design temperature used in Load Calculations (°F)**	17.3

Please Note: For Applications installing Heat Pump +ERV- (Cat 4) – users are still prompted to select Bundle Set from the drop-down shown in the above snippet. However, they will be prompted to enter the same building heating and cooling loads in the baseline and the proposed case scenario.

Users should select 'Yes' under the Cat 4A Inputs for ERV selection. However, enter the same loads in the proposed case as in the pre or existing case scenario before installation.

6) Proposed Building Envelope Upgrade

Category 4 A Inputs		
Loads Served by Heat Pumps after Envelope Improvements	Building Loads source:	Manual J or ACCA 183 calculations
	Insert Building Loads from Manual J or ACCA 183	Data per Manual J or ACCA 183 load calculations
	BCL Building Cooling Load (Btu/hr) [Eligible Loads Only]	750,215
	BHL Building Heating Load (Btu/hr) [Eligible Loads Only]	714,600
ERV	Proposed Heat Pump system design includes ERV or HRV	Yes
	Select Heat Pump system that uses ERV or HRV	Air Source, not NEEP listed

Based on the building & the construction type, users will be prompted to select load calculations submitted through Manual J or ACCA 183 submissions. Enter the BCL & BHL values from the load calculations in the yellow input cells- C62,63

If the heat pump design application also involves Energy Recovery or Heat Recovery Ventilators, select Yes from the drop-down in cell C68. Users will also be filling out the information specific to the Energy Recovery Ventilation/ Heat Recovery Ventilation system by completing the Tab 'ERV'.

Refer pg. 32 for guidance on how to complete the *ERV tab.*

7)Existing HVAC System Efficiency

For Existing or Gut Renovation Applications, users will also be prompted to fill in the cooling and heating efficiency. Users will be prompted to select a default option of the Existing Equipment select 'Custom' option from the yellow input drop downs from cell C76-77

Existing HVAC system efficiency		
Existing HVAC system	Existing HVAC System Cooling Efficiency (EER)	Existing Equipment
	Existing HVAC System Heating Efficiency (%)	Existing Equipment

And fill in values for cooling & heating capacity (Btu/h) and efficiency for existing HVAC units in cell G71-L91

Complete table below if Existing Equipment Custom Efficiency is selected:					
Unit #	Cooling capacity	Heating capacity	Cooling efficiency EER	Cooling efficiency SEER (if available)	Heating efficiency COP
1	100	100	9	12	0.78
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
Total	100	100			
		Weighted avg Efficiency	9	0	0.78

Existing heating efficiencies can be confirmed after performing combustion testing results on the existing boilers and cooling efficiencies can be confirmed from the type of cooling equipment and name plate data.

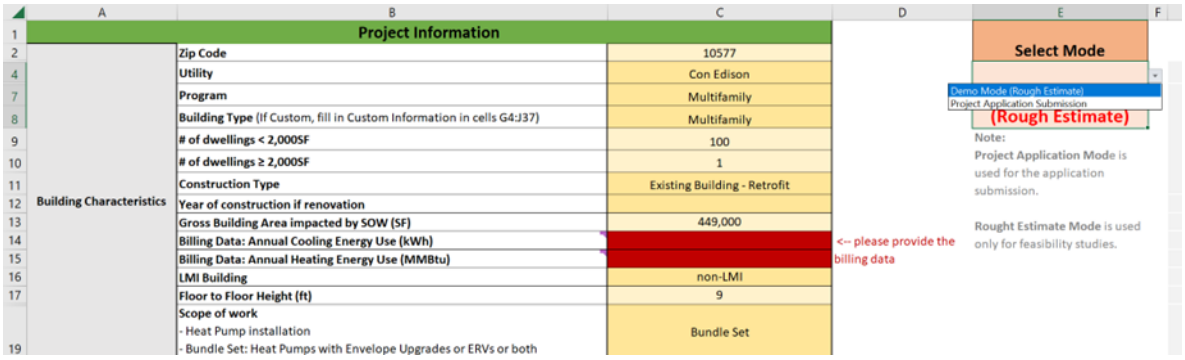
SECTION 2

A) Rough Estimate Submission- Heat Pump Upgrade

Follow this section if the project application involves replacing/upgrading the heat pump system only. It includes all heat pump categories (1,2,4,5,6) except Category 4A.

Please Note: For Category 4A (Heat Pump + Building Envelope Upgrade) and /or ERV/HRV combined project application, follow Section 2 B) which comes after this section on Pg 23. of this document.

Depending on the availability of appropriate required documentation, users can select options from the drop-down in cell E6 to submit a complete project application or get a rough estimate for the project by choosing the Demo Mode as shown below:



	A	B	C	D	E	F
1		**Project Information**				
2		**Zip Code**	10577		**Select Mode**	
4		**Utility**	Con Edison			
7		**Program**	Multifamily		Demo Mode (Rough Estimate)	
8		**Building Type** (If Custom, fill in Custom Information in cells G4:J37)	Multifamily		Project Application Submission	
9		**# of dwellings < 2,000SF**	100		**(Rough Estimate)**	
10		**# of dwellings ≥ 2,000SF**	1		Note:	
11		**Construction Type**	Existing Building - Retrofit		**Project Application Mode** is used for the application submission.	
12	**Building Characteristics**	**Year of construction if renovation**				
13		**Gross Building Area impacted by SOW (SF)**	449,000		**Rought Estimate Mode** is used only for feasibility studies.	
14		**Billing Data: Annual Cooling Energy Use (kWh)**		<-- please provide the billing data		
15		**Billing Data: Annual Heating Energy Use (MMBtu)**				
16		**LMI Building**	non-LMI			
17		**Floor to Floor Height (ft)**	9			
19		**Scope of work** - Heat Pump installation - Bundle Set: Heat Pumps with Envelope Upgrades or ERVs or both	Bundle Set			

Users will be required to input fewer mandatory sections compared to the Project Application Submission mode, which enables them to get a rough estimate of the overall savings and incentive. This rough estimate should aid users in making further feasibility decisions to pursue the project.

Following fields will have to be completed depending on the building and/or construction type:

1) Building Characteristics
2) Design Temperatures
3) Minimum Code Complaint/ Existing HVCA System type
4) Permits
5) Proposed Heat Pumps

For detailed description on 1-4, refer Section 1-A.

5)Proposed Heat Pump System

This section will only be prompted for Demo or Rough Estimate Selection

Heat Pump Type- Select the type of heat pump system from the following options:

- Air Source
- Ground Source
- Mini-Split Air Source

Air Source Heat Pumps for Space Heating application include:

a. Cold Climate Air-to-Air Single Packaged Heat Pumps
b. Air-to-Air Large Commercial Unitary heat pumps (single packaged or split system)
c. Air Source Variable Refrigerant Flow heat pumps; and
d. Packaged Terminal Heat Pumps

SECTION 2

B) Rough Estimate Submission- Heat Pump + Building Envelope Upgrade and /or ERV/HRV

Users will be required to input fewer mandatory sections compared to the project application submission mode, which enables them to get a rough estimate of the overall savings and incentive. This rough estimate should aid users in making further feasibility decisions to pursue the project.

The Following fields will have to be completed depending on the building and/or construction type:

1) Building Characteristics
2) Design Temperatures
3) Minimum Code Complaint/ Existing HVCA System type
4) Permits
5) *Existing HVAC System Efficiency
6) Proposed Building Envelope Upgrades

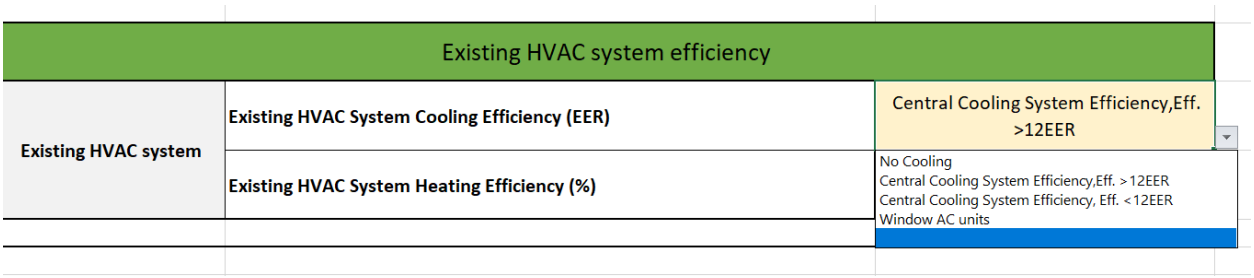
Refer to Section 1A for detailed guidance and steps to complete the numbered fields listed above (1-4)

Under the Building Characteristics section, select the specific option based on the scope of work. For Heat Pump + Envelope Upgrade and /or ERV, select Bundle Set from the below drop-down option:

1	Project Information			
2	Building Characteristics	Zip Code	11201	
4		Utility	Con Edison	
7		Program	Multifamily	
8		Building Type (If Custom, fill in Custom Information in cells G4:J37)	Multifamily	
9		# of dwellings < 2,000SF	100	
10		# of dwellings ≥ 2,000SF	1	
11		Construction Type	Existing Building - Retrofit	
12		Year of construction if renovation	Old (before 1950)	
13		Gross Building Area impacted by SOW (SF)	449,000	
14		Billing Data: Annual Cooling Energy Use (kWh)		<-- please provide the billing data
15		Billing Data: Annual Heating Energy Use (MMBtu)		
16		LMI Building	non-LMI	
17		Floor to Floor Height (ft)	9	
19		Scope of work - Heat Pump installation - Bundle Set: Heat Pumps with Envelope Upgrades or ERVs or both	Bundle Set	
30			Heat Pumps Bundle Set	

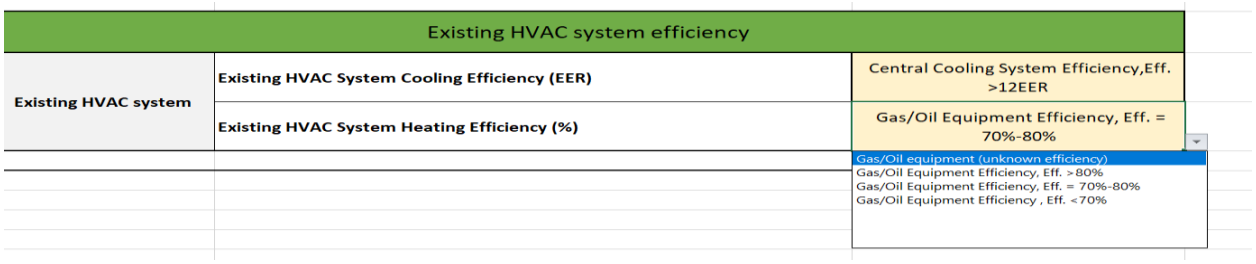
5***)* Existing HVAC System Efficiency***- Applicable only for Existing Building Retrofit/ Gut Renovations applications.

Select appropriate existing HVAC system cooling efficiency from the drop-down options based on the system type (Cell C76):



Existing HVAC Cooling Efficiencies can be confirmed based on the type of cooling equipment and from the name /model plate.

Select appropriate existing HVAC system heating efficiency from the drop-down options based on the heating system type (Cell C77):



Existing HVAC heating efficiencies can be confirmed after the boiler testing and combustion testing results done before demolition or removal of the equipment.

New Construction applications will consider a minimum code compliant HVAC system baseline efficiency based on selected code complaint HVAC system type. Users do not have to input baseline efficiencies for new construction projects, as the calculator defaults to the code minimum efficiencies.

Please Note: For Applications installing Heat Pump +ERV- (Cat 4) – users are still prompted to select Bundle Set from the drop-down shown in the above snippet. However, they will be prompted to enter the same building heating and cooling loads in the baseline and the proposed case scenario.

Users should select ‘Yes’ under the Cat 4A Inputs for ERV selection. However, enter the same loads in the proposed case as in the pre or existing case scenario before installation.

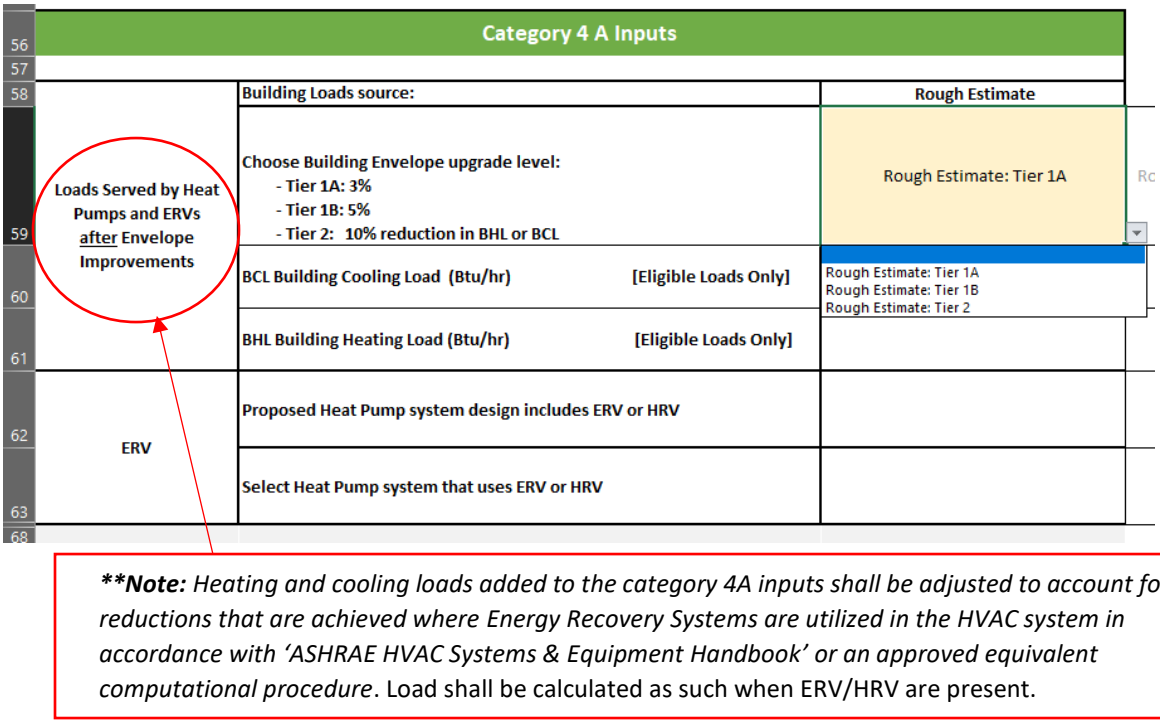
6)Proposed Building Envelope Upgrades-

Users will be asked to enter loads specific to the project type generated by the load calculations.

As this is a rough estimate, an analysis is based on a reduction in the building loads due to building envelope upgrades. Users will be prompted to select options from the drop-down based on their estimate of potential decreases in the BHL & BCL.

The following selection is recommended for New Construction Facilities:

- Tier 1A- (3% reduction in BHL/BCL)
- Tier 1B- (5% reduction in BHL/BCL)
- Tier 2-(10% reduction in BHL/BCL)-



***Note:** Heating and cooling loads added to the category 4A inputs shall be adjusted to account for load reductions that are achieved where Energy Recovery Systems are utilized in the HVAC system in accordance with 'ASHRAE HVAC Systems & Equipment Handbook' or an approved equivalent computational procedure*. Load shall be calculated as such when ERV/HRV are present.

The following selection is recommended for the Existing Facilities and Gut Renovation:

- Tier 1A- (15% reduction in BHL/BCL)
- Tier 1B- (25% reduction in BHL/BCL)
- Tier 2-(35% reduction in BHL/BCL)

56	**Category 4 A Inputs**		
57			
58	**Loads Served by Heat Pumps and ERVs after Envelope Improvements**	**Building Loads source:**	**Rough Estimate**
59		**Choose Building Envelope upgrade level, % reduction in BHL or BCL:** **- Tier 1A: 15%** **- Tier 1B: 25%** **- Tier 2: 35% reduction in BHL or BCL**	Rough Estimate: Tier 1A
60		**BCL Building Cooling Load (Btu/hr) [Eligible Loads Only]**	Rough Estimate: Tier 1A Rough Estimate: Tier 1B Rough Estimate: Tier 2
61		**BHL Building Heating Load (Btu/hr) [Eligible Loads Only]**	
62	**ERV**	**Proposed Heat Pump system design includes ERV or HRV**	
63		**Select Heat Pump system that uses ERV or HRV**	

Tab: Eqpt Sched & Eligibility

Overall layout of this tab has been modified since tool v1.1 and 2.1 to accommodate all the essential inputs pertaining to the heat pump system and have a clear understanding to the users to make the inputs.

Tab is rearranged to collect information pertaining to General Data for the Heat Pumps, Air Sourced Heat pumps, NEEP listed equipment and Ground Source Heat Pump.

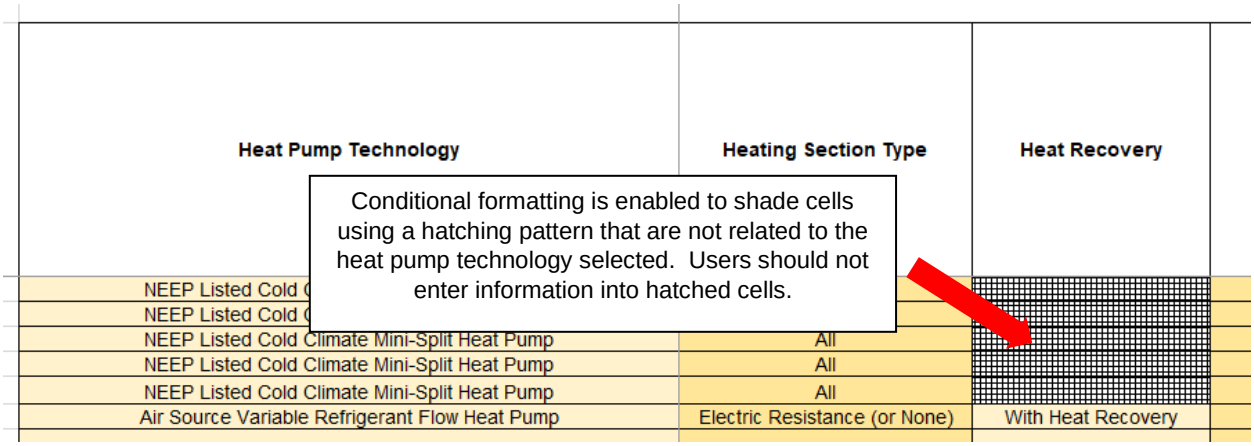
General data:

	General Data									
Heat Pump Technology	**Outdoor Unit Tag(s) (OPTIONAL)**	**Outdoor Unit Quantity**	**Application**	**Ducted / Non-Ducted / Mix**	**Heating Section Type**	**Heat Recovery**	**Make**	**Model**	**Total Heating Capacity at Design Temperature (OPTIONAL)**	**AHRI Certific No. (OPTIONAL**
Single Package Vertical Heat Pump		1	Cooling and Heating	Non-Ducted	All		Daikin	RXTQ36TAVJ9A		
NEEP Listed Centralized Air Source Heat Pump (<65kbtu cooling)		371	Cooling and Heating	Non-Ducted	All		de minimum	Code		
Large Unitary Air Source Heat Pump		1	Cooling and Heating	Non-Ducted	Electric Resistance (or None)		LG	ARUM096		

Heat Pump Technology – Select applicable heat pump technology proposed for installation from the drop-down menu:

- NEEP-listed Cold Climate Single Package Air Source Heat Pump
- NEEP-listed Cold Climate Mini-Split Heat Pump
- Air Source Variable Refrigerant Flow Heat Pump
- Large Unitary Air Source Heat Pump
- Package Terminal Heat Pump
- Single Package Vertical Heat Pump
- Large Unitary Ground Source Heat Pump, Brine to Water Ground Loop
- Large Unitary Ground Source Heat Pump, Brine to Air Ground Loop
- Ground Source Variable Refrigerant Flow Heat Pump

Tab utilizes conditional formatting; Once a heat pump technology is selected from the drop-down menu, cells that are not applicable to the technology selected will be shaded using a hatching pattern. ***Users should not fill information into hatched cells.***

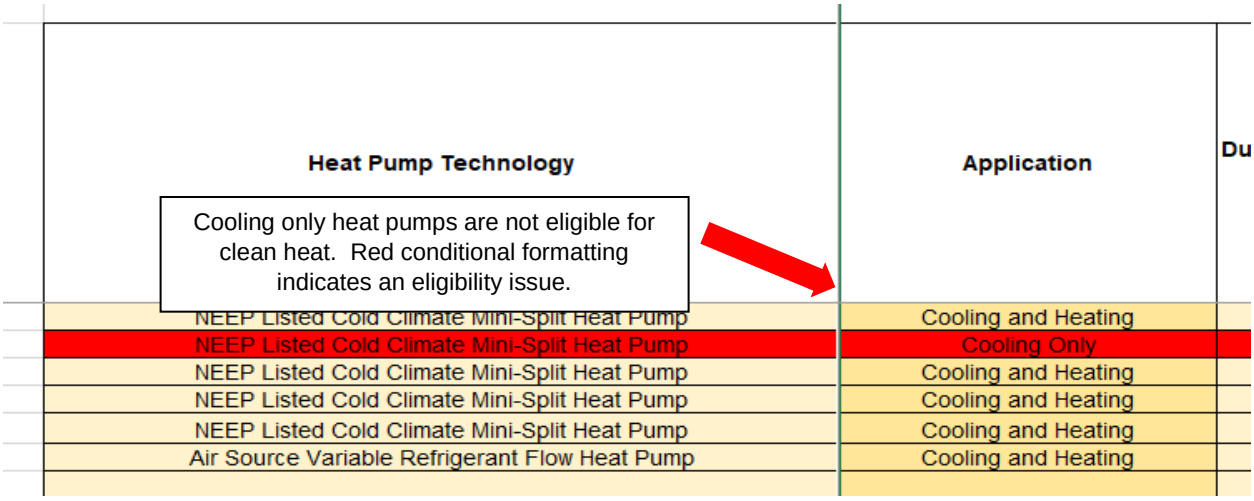


Outdoor Unit Tag(s) – Enter equipment name tag or identifier. This is an optional cell.

Outdoor Unit Quantity – Enter quantity of outdoor condensers.

Application – Select application of heating pump installation from drop-down menu. Only heat pumps providing heating and cooling **OR** heating only are eligible for program incentives. If user selects 'cooling only' from drop down, row will highlight red to flag that equipment is not eligible for clean heat incentives.

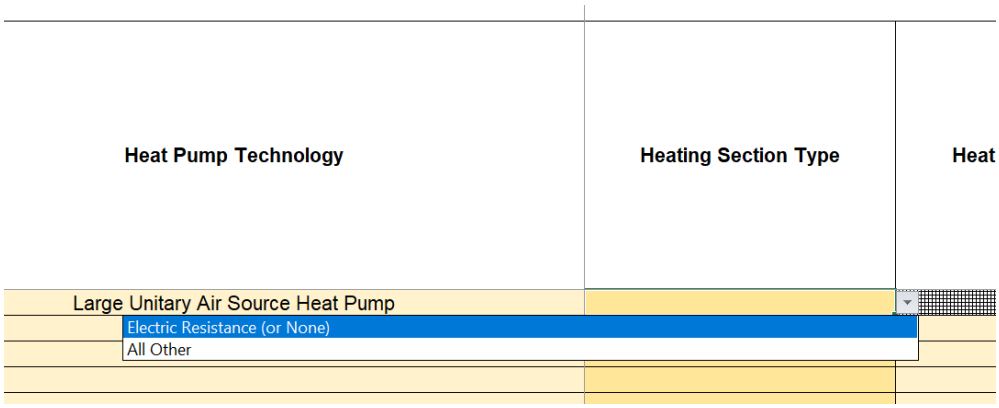
`



Ducted / Non-Ducted / Mix – Select the ducting configuration.

Heating Section Type – Some heat pumps may have an integrated supplemental heating source such an electric resistance strip or gas furnace to assist with providing heating at low outdoor air temperatures. Select from available options in the drop-down menu. Note that only one option is available for selection for all heat pump technologies other than 'Large Unitary Air Source Heat Pumps'. For these technologies, the user shall select the one available option. For 'Large Unitary Air Source Heat Pump' user's may select from 'Electric Resistance Heating (or None)' or 'All Other'. In other words, if the Large

Unitary Air Source Heat Pump has an integrated electric resistance strip or has no supplemental heating source, select 'Electric Resistance (or None)'. In all other cases, select 'All Other'.



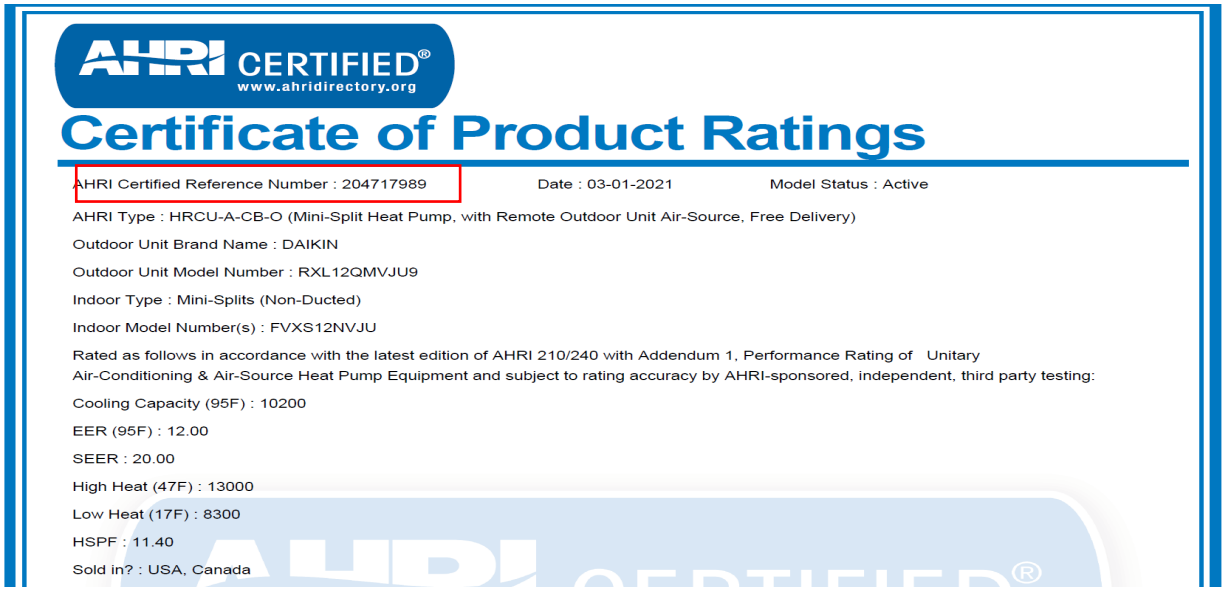
Heat Recovery – Select whether units have heat recovery. Cell applies to VRF systems only. For all other technologies, cell will be hatched.

Make – Enter manufacturer of proposed equipment.

Model – Enter proposed equipment model.

Total Heating Capacity at Design Temperature: If known, user shall enter the manufacturer heating output for heat pump appliance at the heating design temperature. Note this is NOT the same as the rated heating capacity. If unknown, leave this cell blank.

AHRI Certificate Number: This is an optional field. Enter the AHRI Certified Reference number.


AHRI CERTIFIED®
www.ahridirectory.org

Certificate of Product Ratings

AHRI Certified Reference Number : 204717989 Date : 03-01-2021 Model Status : Active

AHRI Type : HRCU-A-CB-O (Mini-Split Heat Pump, with Remote Outdoor Unit Air-Source, Free Delivery)

Outdoor Unit Brand Name : DAIKIN

Outdoor Unit Model Number : RXL12QMVJU9

Indoor Type : Mini-Splits (Non-Ducted)

Indoor Model Number(s) : FVXS12NVJU

Rated as follows in accordance with the latest edition of AHRI 210/240 with Addendum 1, Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment and subject to rating accuracy by AHRI-sponsored, independent, third party testing:

Cooling Capacity (95F) : 10200

EER (95F) : 12.00

SEER : 20.00

High Heat (47F) : 13000

Low Heat (17F) : 8300

HSPF : 11.40

Sold in? : USA, Canada

Air Sourced Heat Pump- AHRI Specific Information:

ASHP										
ASHP Heating Efficiency Characteristics							ASHP Cooling Efficiency Characteristics			
Proposed Heating Efficiency from AHRI Certificate (HSPF)	Proposed Heating Efficiency from AHRI Certificate (HSPF2)	ASHP: Rated Heating Capacity from AHRI Certificate at 17 °F (Btu/h)	ASHP: Rated Heating Capacity from AHRI Certificate at 47 °F (Btu/h)	ASHP: Rated Cooling Capacity at 95 F from AHRI Certificate (Btu/h)	ASHP: Rated Proposed Heating Efficiency at 17 °F from AHRI Certificate (COP17)	ASHP: Rated Proposed Heating Efficiency at 47 °F from AHRI Certificate (COP47)	Proposed Cooling Efficiency from AHRI Certificate (SEER)	Proposed Cooling Efficiency from AHRI Certificate (SEER2)	ASHP: Proposed Cooling Efficiency from AHRI Certificate (EER)	ASHP: Proposed Cooling Efficiency from AHRI Certificate (IEER)
8.00	9.00	23,600	37,000	34,200				15	12	
8.20		37,000	57,000	46,250			0	15	9.8	
		67,000	103,000	92,000	2.85	4.33			14.4	33

The following cells should be filled out based on the proposed equipment's AHRI certificate; Only fill in cells related to the selected heat pump technology (i.e. cells not formatted with pattern hatching):

ASHP Heating Efficiency Characteristics:

- Rated Proposed Heating Efficiency at 17 °F from AHRI Certificate (COP17): Applies to air source VRFs (tested under AHRI 1230) and AHRI certified large air source heat pumps (tested under AHRI 340/360)
- Rated Proposed Heating Efficiency at 47 °F from AHRI Certificate (COP47)
- Proposed Heating Efficiency from AHRI Certificate (HPSF): Applies to cold climate air source heat pumps only (tested under AHRI 210/240)
- Proposed Rated Heating Capacities at 17 and 47 deg F: Applies to Air Sourced VRFs and certified large air sourced heat pump

See Examples Below:

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Certificate of Product Ratings

AHRI Certified Reference Number : 204717989 Date : 03-01-2021 Model Status : Active

AHRI Type : HRCU-A-CB-O (Mini-Split Heat Pump, with Remote Outdoor Unit Air-Source, Free Delivery)

Outdoor Unit Brand Name : DAIKIN

Outdoor Unit Model Number : RXL12QMVJU9

Indoor Type : Mini-Splits (Non-Ducted)

Indoor Model Number(s) : FVXS12NVJU

Rated as follows in accordance with the latest edition of AHRI 210/240 with Addendum 1, Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment and subject to rating accuracy by AHRI-sponsored, independent, third party testing:

Cooling Capacity (95F) : 10200

EER (95F) : 12.00

SEER : 20.00

High Heat (47F) : 13000

Low Heat (17F) : 8300

HSPF : 11.40

Sold in? : USA, Canada

Rated Heating Capacities at 47 deg F and 17 deg F

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Certificate of Product Ratings

AHRI Certified Reference Number : 205281459 Date : 09-16-2020 Model Status : Active

Brand Name : LG

AHRI Type : HMSR-A-CB

Indoor Type : Ducted Indoor Units

System Model Number : ARUM096BTE5

Module Model Number 1 : ARUM096BTE5

Rated as follows in accordance with the latest edition of AHRI Standard 1230 for VRF Air-Conditioning and Heat Pump Equipment and subject to rating accuracy by AHRI-sponsored, independent, third party testing:

Cooling Capacity (95F) : 92000

EER (95F) : 13.50

IEER : 25.10

SCHE : 27.00

High Heating Capacity (47F) : 103000

High COP (47F) : 3.66

Low Heating Capacity (17F) : 67000

Low COP (17F) : 2.73

ASHP Cooling Efficiency Characteristics:

- Rated Cooling Capacity at 95 F from AHRI Certificate (Btu/h): Applies to cold climate NEEP-listed air source heat pumps and mini-splits (tested under AHRI 210/240), air source VRFs (tested under AHRI 1230) and AHRI certified large air source heat pumps (tested under AHRI 340/360)
- Proposed Cooling Efficiency from AHRI Certificate (SEER): Applies to cold climate NEEP-listed air source heat pumps and mini-splits (tested under AHRI 210/240)
- Proposed Cooling Efficiency from AHRI Certificate (EER): Applies to cold climate NEEP-listed air source heat pumps and mini-splits (tested under AHRI 210/240), air source VRFs (tested under AHRI 1230) and AHRI certified large air source heat pumps (tested under AHRI 340/360)
- Proposed Cooling Efficiency from AHRI Certificate (IEER): Applies to air source VRFs (tested under AHRI 1230) and AHRI certified large air source heat pumps (tested under AHRI 340/360)

Example:

NEEP Listed Equipment:

Is Equipment NEEP-listed – Cell applies to 'Cold Climate Air Source Heat Pump' and 'Cold Climate Mini-Split Heat Pump' technology types only. If 'No' is selected, row will conditionally format in red, indicating the unit may not be eligible for program incentives. Users should continue to fill in performance data for this technology, despite the unit potentially being ineligible. Data should be entered into any cells that are not hatched.

Note that per the Statewide Program Manual, air source heat pumps and mini-splits that are tested under AHRI Standard 210/240 but are not NEEP-listed are eligible for program incentives under Category 4 Custom Space Heating Applications if the Participating Contractor submits manufacturer performance data showing the units meet or exceed the NEEP ccASHP specification. This calculator, however, is not programmed to calculate savings for Non-NEEP-listed ccASHP and ccMSHPs. Therefore, if the non-NEEP-listed unit is eligible, the Participating Contractor should submit separate custom calculations for this technology.

Is Equipment NEEP Listed	Minimum Heating Capacity at 5 °F (From NEEP list, Btu/h)	Maximum Heating Capacity at 5 °F (From NEEP list, Btu/h)	Minimum Heating Capacity at 17 °F (From NEEP list, Btu/h)	Maximum Heating Capacity at 17 °F (From NEEP list Btu/h)
No	[illegible]	[illegible]	[illegible]	[illegible]
Yes	26,000	31,000	33,000	37,000

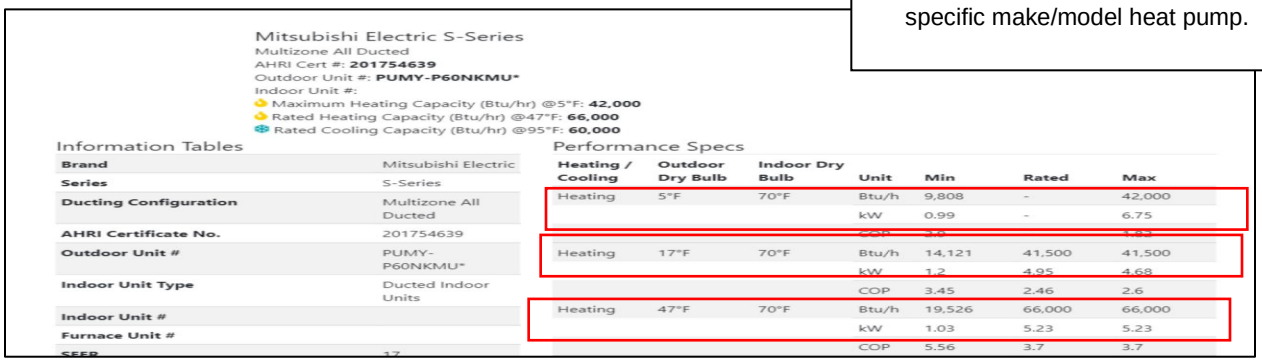
NEEP Heating Efficiency Characteristics:

The following cells should be completed for NEEP-listed cold climate air source heat pumps and mini-splits only; for all other technologies, cells will be hatched-out.

- Minimum Heating Capacity at 5 °F
- Maximum Heating Capacity at 5 °F
- Minimum Heating Capacity at 17 °F
- Maximum Heating Capacity at 17 °F
- Minimum Heating Capacity at 47 °F
- Maximum Heating Capacity at 47 °F
- Minimum Cooling Capacity at 82 °F
- Maximum Cooling Capacity at 82 °F
- Minimum Cooling Capacity at 95 °F
- Maximum Cooling Capacity at 95 °F
- Minimum Proposed Heating Efficiency at 5 °F from NEEP list (COP5 Min)
- Maximum Proposed Heating Efficiency at 5 °F from NEEP list (COP5 Max)
- Minimum Proposed Heating Efficiency at 17 °F from NEEP list (COP17 Min)
- Rated Proposed Heating Efficiency at 17 °F from NEEP list (COP17)
- Maximum Proposed Heating Efficiency at 17 °F from NEEP list (COP17 Max)
- Minimum Proposed Heating Efficiency at 47 °F from NEEP list (COP47 Min)
- Rated Proposed Heating Efficiency at 47 °F from NEEP list (COP47)
- Maximum Proposed Heating Efficiency at 47 °F from NEEP list (COP47 Max)

Locate the Minimum, Rated, and Max Heating Capacities at 5 deg F, 17 deg F, and 47 deg F respectively for the specific make/model heat pump.

<u>Example for Heating Capacities:</u>



Mitsubishi Electric S-Series
Multizone All Ducted
AHRI Cert #: **201754639**
Outdoor Unit #: **PUMY-P60NKMU***
Indoor Unit #:
Maximum Heating Capacity (Btu/hr) @5°F: **42,000**
Rated Heating Capacity (Btu/hr) @47°F: **66,000**
Rated Cooling Capacity (Btu/hr) @95°F: **60,000**

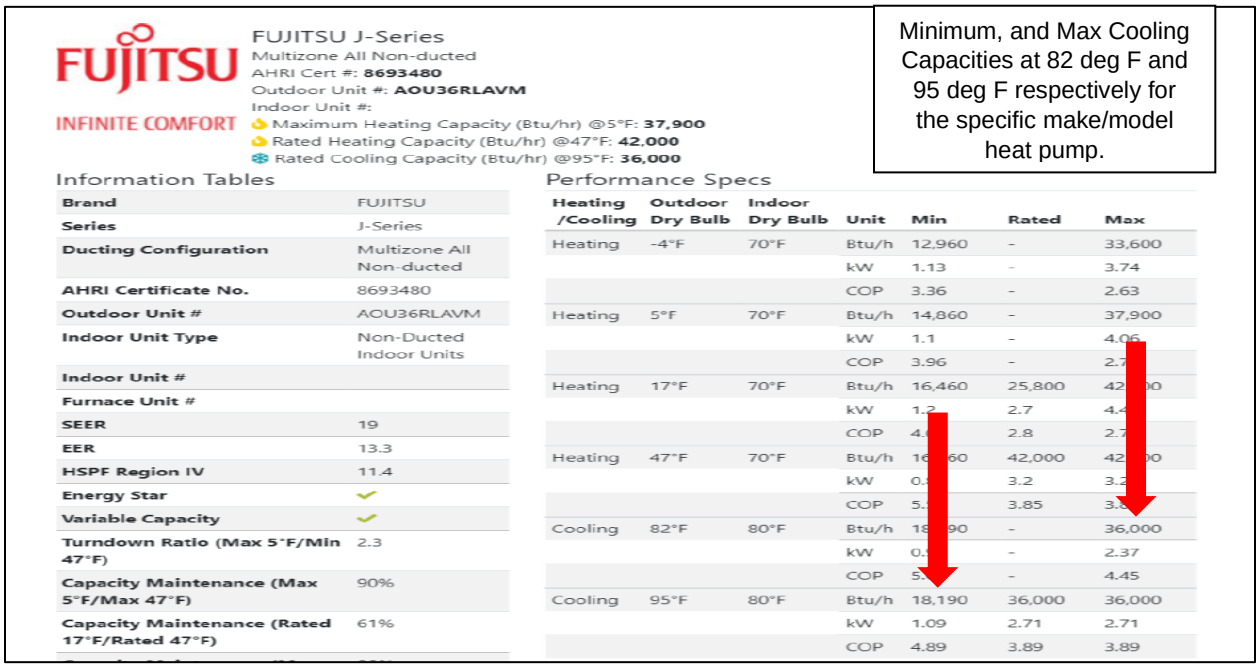
Information Tables

Brand	Mitsubishi Electric
Series	S-Series
Ducting Configuration	Multizone All Ducted
AHRI Certificate No.	201754639
Outdoor Unit #	PUMY-P60NKMU*
Indoor Unit Type	Ducted Indoor Units
Indoor Unit #	
Furnace Unit #	
SEER	17

Performance Specs

Heating / Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated	Max
Heating	5°F	70°F	Btu/h	9,808	-	42,000
			kW	0.99	-	6.75
			COP	2.9	-	1.83
Heating	17°F	70°F	Btu/h	14,121	41,500	41,500
			kW	1.2	4.95	4.68
			COP	3.45	2.46	2.6
Heating	47°F	70°F	Btu/h	19,526	66,000	66,000
			kW	1.03	5.23	5.23
			COP	5.56	3.7	3.7

Example for Cooling Capacities:



FUJITSU J-Series
Multizone All Non-ducted
AHRI Cert #: **8693480**
Outdoor Unit #: **AOU36RLAVM**
Indoor Unit #:
Maximum Heating Capacity (Btu/hr) @5°F: **37,900**
Rated Heating Capacity (Btu/hr) @47°F: **42,000**
Rated Cooling Capacity (Btu/hr) @95°F: **36,000**

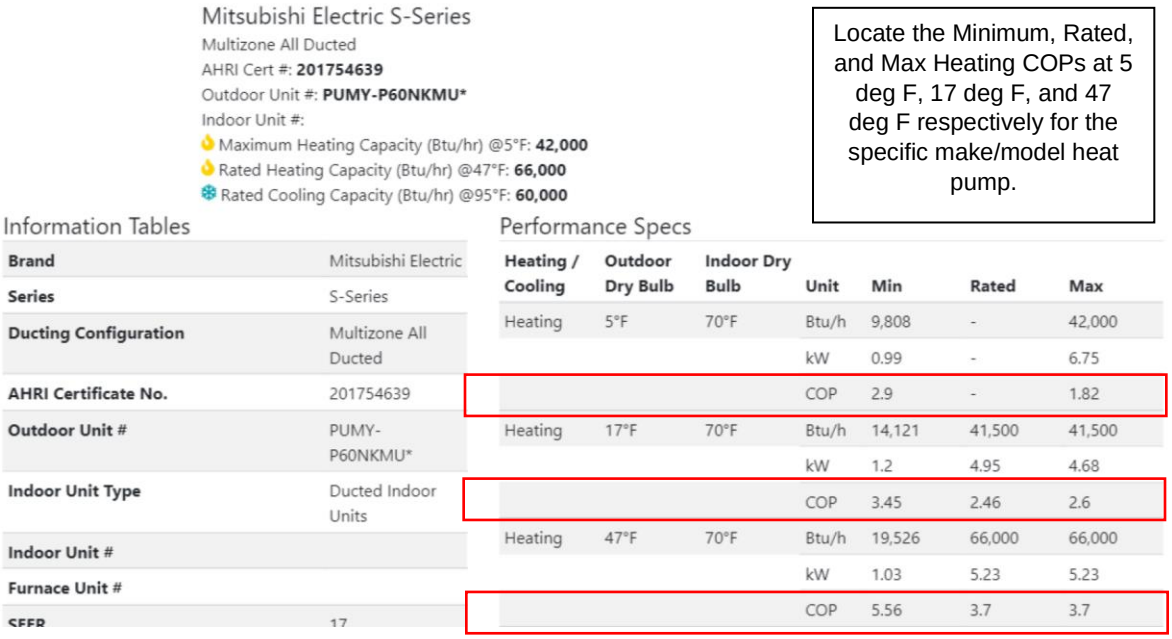
Minimum, and Max Cooling Capacities at 82 deg F and 95 deg F respectively for the specific make/model heat pump.

Information Tables

Brand	FUJITSU
Series	J-Series
Ducting Configuration	Multizone All Non-ducted
AHRI Certificate No.	8693480
Outdoor Unit #	AOU36RLAVM
Indoor Unit Type	Non-Ducted Indoor Units
Indoor Unit #	
Furnace Unit #	
SEER	19
EER	13.3
HSPF Region IV	11.4
Energy Star	✓
Variable Capacity	✓
Turndown Ratio (Max 5°F/Min 47°F)	2.3
Capacity Maintenance (Max 5°F/Max 47°F)	90%
Capacity Maintenance (Rated 17°F/Rated 47°F)	61%

Performance Specs

Heating /Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated	Max
Heating	-4°F	70°F	Btu/h	12,960	-	33,600
			kW	1.13	-	3.74
			COP	3.36	-	2.63
Heating	5°F	70°F	Btu/h	14,860	-	37,900
			kW	1.1	-	4.06
			COP	3.96	-	2.7
Heating	17°F	70°F	Btu/h	16,460	25,800	42,[illegible]00
			kW	1.2	2.7	4.4
			COP	4.[illegible]	2.8	2.7
Heating	47°F	70°F	Btu/h	16,[illegible]60	42,000	42,[illegible]00
			kW	0.[illegible]	3.2	3.2
			COP	5.[illegible]	3.85	3.8
Cooling	82°F	80°F	Btu/h	18,[illegible]90	-	36,000
			kW	0.[illegible]	-	2.37
			COP	5.[illegible]	-	4.45
Cooling	95°F	80°F	Btu/h	18,190	36,000	36,000
			kW	1.09	2.71	2.71
			COP	4.89	3.89	3.89



Mitsubishi Electric S-Series
Multizone All Ducted
AHRI Cert #: **201754639**
Outdoor Unit #: **PUMY-P60NKMU***
Indoor Unit #:
Maximum Heating Capacity (Btu/hr) @5°F: **42,000**
Rated Heating Capacity (Btu/hr) @47°F: **66,000**
Rated Cooling Capacity (Btu/hr) @95°F: **60,000**

Locate the Minimum, Rated, and Max Heating COPs at 5 deg F, 17 deg F, and 47 deg F respectively for the specific make/model heat pump.

Information Tables

Brand	Mitsubishi Electric
Series	S-Series
Ducting Configuration	Multizone All Ducted
AHRI Certificate No.	201754639
Outdoor Unit #	PUMY-P60NKMU*
Indoor Unit Type	Ducted Indoor Units
Indoor Unit #	
Furnace Unit #	
SEER	17

Performance Specs

Heating / Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated	Max
Heating	5°F	70°F	Btu/h	9,808	-	42,000
			kW	0.99	-	6.75
			COP	2.9	-	1.82
Heating	17°F	70°F	Btu/h	14,121	41,500	41,500
			kW	1.2	4.95	4.68
			COP	3.45	2.46	2.6
Heating	47°F	70°F	Btu/h	19,526	66,000	66,000
			kW	1.03	5.23	5.23
			COP	5.56	3.7	3.7

NEEP Cooling Efficiency Characteristics:

The following cells should be completed for NEEP-listed cold climate single package air source heat pumps and mini-splits only; for all other technologies, cells will be hatched-out.

- Minimum Proposed Cooling Efficiency at 82 °F from NEEP list (COP82 Min)
- Maximum Proposed Cooling Efficiency at 82°F from NEEP list (COP82 Max)
- Minimum Proposed Cooling Efficiency at 95 °F from NEEP list (COP95 Min)
- Rated Proposed Cooling Efficiency at 95°F from NEEP list (COP95)
- Maximum Proposed Cooling Efficiency at 95°F from NEEP list (COP95 Max)

Example:

FUJITSU J-Series
Multizone All Non-ducted
AHRI Cert #: **8693480**
Outdoor Unit #: **AOU36RLAVM**
Indoor Unit #:
Maximum Heating Capacity (Btu/hr) @5°F: **37,900**
Rated Heating Capacity (Btu/hr) @47°F: **42,000**
Rated Cooling Capacity (Btu/hr) @95°F: **36,000**

Locate the Minimum, Rated, and Max Cooling COPs at 82 deg F and 95 deg F respectively for the specific make/model heat pump.

Information Tables

Brand	FUJITSU
Series	J-Series
Ducting Configuration	Multizone All Non-ducted
AHRI Certificate No.	8693480
Outdoor Unit #	AOU36RLAVM
Indoor Unit Type	Non-Ducted Indoor Units
Indoor Unit #	
Furnace Unit #	
SEER	19
EER	13.3
HSPF Region IV	11.4
Energy Star	✔
Variable Capacity	✔
Turndown Ratio (Max 5°F/Min 47°F)	2.3
Capacity Maintenance (Max 5°F/Max 47°F)	90%
Capacity Maintenance (Rated 17°F/Rated 47°F)	61%

Performance Specs

Heating /Cooling	Outdoor Dry Bulb	Indoor Dry Bulb	Unit	Min	Rated	Max
Heating	-4°F	70°F	Btu/h	12,960	-	33,600
			kW	1.13	-	3.74
			COP	3.36	-	2.63
Heating	5°F	70°F	Btu/h	14,860	-	37,900
			kW	1.1	-	4.06
			COP	3.96	-	2.74
Heating	17°F	70°F	Btu/h	16,460	25,800	42,000
			kW	1.2	2.7	4.43
			COP	4.02	2.8	2.78
Heating	47°F	70°F	Btu/h	16,460	42,000	42,000
			kW	0.87	3.2	3.2
			COP	5.54	3.85	3.85
Cooling	82°F	80°F	Btu/h	18,190	-	36,000
			kW	0.95	-	2.37
			COP	5.61	-	4.45
Cooling	95°F	80°F	Btu/h	18,190	36,000	36,000
			kW	1.09	2.71	2.71
			COP	4.89	3.89	3.89

Ground Sourced Heat Pump:

For heat pump technologies other than the Ground Sourced- Brine to Air or Brine to water & Variable Refrigerant Sourced, the cells underneath GSHP will be hatched out.

GSHP Heating Efficiency Characteristics							GSHP Cooling Efficiency Characteristics		
Closed Loop GSHP: Rated Heating Capacity from AHRI Certificate at 41 F (Btu/h)	Closed Loop GSHP: Rated Part Load Heating Capacity from AHRI Certificate at 41 F (Btu/h)	Open Loop GSHP: Rated Cooling capacity from AHRI Certificate at 59 F (Btu/h)	Closed Loop GSHP: Rated Full Load Cooling Capacity from AHRI Certificate at 68 F (Btu/h)	Closed Loop GSHP: Rated Part Load Cooling Capacity from AHRI Certificate at 68 F (Btu/h)	Closed Loop GSHP: Proposed Rated Heating Full Load Efficiency at 41 F from AHRI Certificate	Closed Loop GSHP: Proposed Rated Heating Part Load Efficiency at 41 F from AHRI Certificate	Open Loop GSHP: Prposed Cooling Efficiency at 59 F from AHRI Certifiate (EER)	Closed Loop GSHP: Proposed Cooling Full Load Efficiency at 68F from AHRI Certificate (EER)	Closed Loop GSHP: Proposed Cooling Part Load Efficiency at 68F from AHRI Certificate (EER)

For Eligible Technologies users will be prompted to fill in following cells:

- Rated Heating Capacity from AHRI certificate at 41 deg F
- Rated Heating Full Load and Part Load Efficiency at 41 deg F from AHRI certificate
- Rated Part Load Heating Capacity from AHRI certificate at 41 deg F
- Rated Cooling capacity from AHRI certificate at 59 deg F
- Rated Full Load Cooling Capacity from AHRI certificate at 68 deg F
- Rated Part Load Cooling Capacity from AHRI certificate at 68 deg F
- Proposed Cooling Efficiency at 59 F from AHRI Certificate (EER)
- Proposed Cooling Full and Part Load Efficiency at 68 F from AHRI Certificate (EER)

Example:

AHRI CERTIFIED® www.ahridirectory.org

Certificate of Product Ratings

AHRI Certified Reference Number : 205767472 Date : 11-15-2020 Model Status: Active
Old AHRI Reference Number :
Product : Water-to-Air and Brine-to-Air
Model Number : TYV/H048
Brand Name : ClimateMaster

Rated as follows in accordance with ANSI/AHRI/ASHARE/ISO Standard 13256-1 Water-toAir and Brine-To-Air Heat Pumps and subject to verification of rating accuracy by AHRI-sponsored, independent third party testing:

	Full Load	Part Load1	Part Load2	Part Load3
Air Flow Rate - Cooling:	1500	1250		
Air Flow Rate - Heating:		1250		
WLHP (Water-Loop Heat Pumps)				
Cooling Capacity (Btuh)	45900/45900	34100/34100		
Cooling EER Rating (Btuh/watt)	14.00/14.00	15.20/15.20		
Cooling Fluid Flow Rate (gpm)	12.00	11.00		
Heating Capacity (Btuh)	53800/53800	39500/39500		
Heating Cop (watt/watt)	4.90/4.90	5.50/5.50		
Heating Fluid Flow Rate (gpm)	12.00	11.00		
GWHP (Ground Water-Heat Pumps)				
Cooling Capacity (Btuh)	51800/51800	39200/39200		
Cooling EER Rating (Btuh/Watt)	20.90/20.90	26.80/26.80		
Cooling Fluid Flow Rate (gpm)	12.00	11.00		
Heating Capacity (Btuh)	45000/45000	32600/32600		
Heating COP (watt/watt)	4.40/4.40	4.60/4.60		
Heating Fluid Flow Rate (gpm)	12.00	11.00		
GLHP (Ground -Loop Heat Pumps)				
Cooling Capacity (Btuh)	48100/48100	37600/37600		
Cooling EER Rating (Btuh/Watt)	15.50/15.50	21.20/21.20		
Cooling Fluid Flow Rate (gpm)	12.00	11.00		
Heating Capacity (Btuh)	35600/35600	29200/29200		
Heating COP (watt/watt)	3.70/3.70	4.10/4.10		
Heating Fluid Flow Rate (gpm)	12.00	11.00		

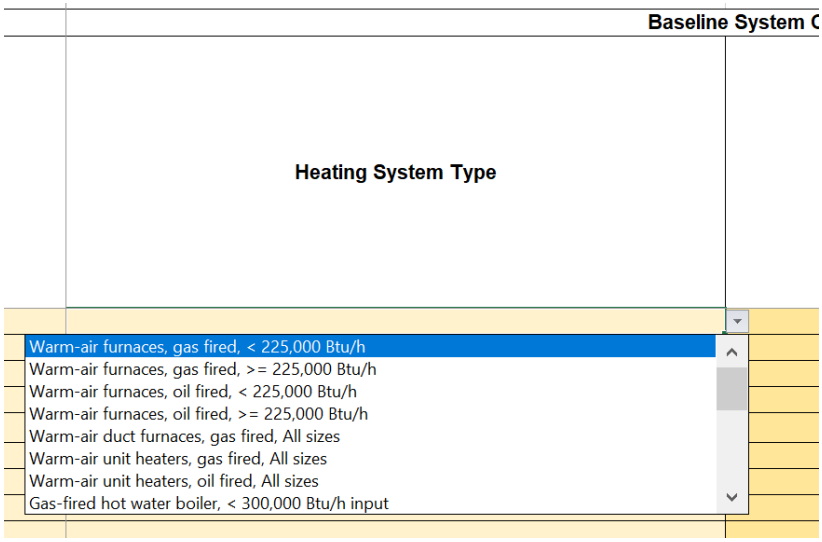
Baseline System:

Heating System Type – Select a baseline heating equipment type from drop-down menu. For existing facilities, users should select the equipment type that most closely aligns with the equipment type installed at the site currently. If none of the options in the drop-down align with the existing heating equipment, the user shall select a counterfactual baseline or may opt to submit their own custom calculations for the project. For new construction projects, users shall select a counterfactual natural gas heating baseline from the drop-down menu.

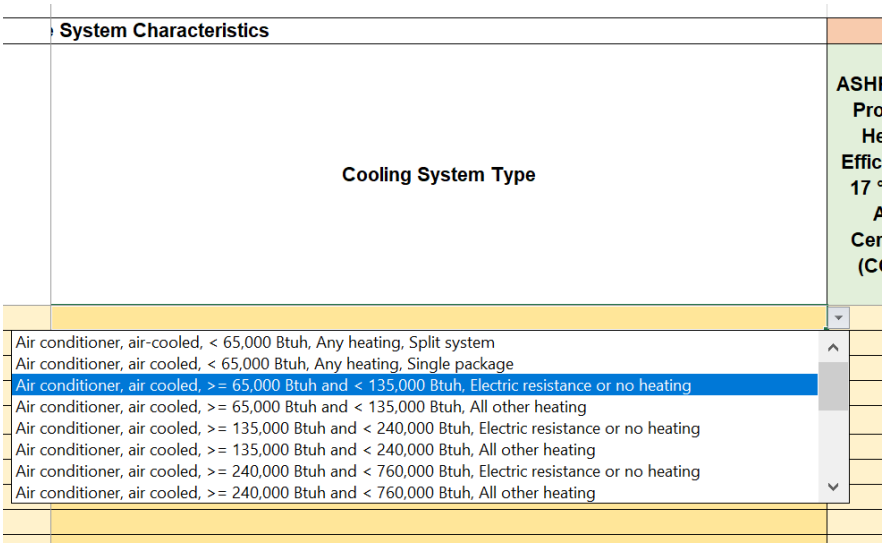
The counterfactual heating capacity mirrors the proposed equipment capacity of a single piece of equipment.

For instance, if a proposed system involves installing 6 ASHPs, each with a heating capacity of 60,000 Btu/h at 17F, the total capacity amounts to 360,000 Btu/h. In such a scenario, for a gas baseline, you would choose "Gas-fired hot water boiler, < 300,000 Btu/h input." This is based on our assumption that a project owner would opt for modular gas boilers with 60,000 Btu/h each.

On the other hand, if a project is setting up (3) three GSHP or ASHP systems, and each equipment piece has a heating capacity of 360,000 BTU/h at 17F, you would select "Gas-fired hot water boiler, >= 300,000 Btu/h and <= 2,500,000 input." Here, it's assumed there would be three large boilers, each 360,000 Btu/h, mirroring the proposed equipment capacity.



Cooling System Type – Select a baseline cooling equipment type from drop-down menu. For existing facilities, users should select the equipment type that most closely aligns with the equipment type installed at the site currently. If none of the options in the drop-down align with the existing cooling equipment, the user shall select a counterfactual baseline or may opt to submit their own custom calculations for the project.



Tab: Energy/Heat Recovery Ventilator (ERV/HRV)

For Heat Pump or Heat Pump + Envelope Upgrade applications coupled with installation of Energy Recovery and Heat Recovery Ventilator, users will be required to complete these cells in the ERV Tab.

ERV or HRV	Units	Tag	Make	Model #	Is ERV/HRV Required by Code Y/N?	CFM	Supply and Exhaust Fan for newly-installed ERV (provide in HP or kW)		Baseline Exhaust Fan HP (Optional)	Winter Heat Exchanger Sensible Efficiency, %	Summer Heat Exchanger Total Efficiency % for ERV, or Heat Exchanger Sensible Efficiency % for HRV	Typical Operating Schedule
							[HP]	[kW]				
ERV	1				No	15000	10		2.5	65.0%	62.0%	Mon-Sun 6AM-10PM
ERV					Yes	10000	8		2	70.0%	57.0%	Mon-Sun 6AM-12AM
ERV					Yes	10000	8		2	50.0%	50.0%	Mon-Sun 6AM-12AM
ERV	1				No	13000	7.5		5			

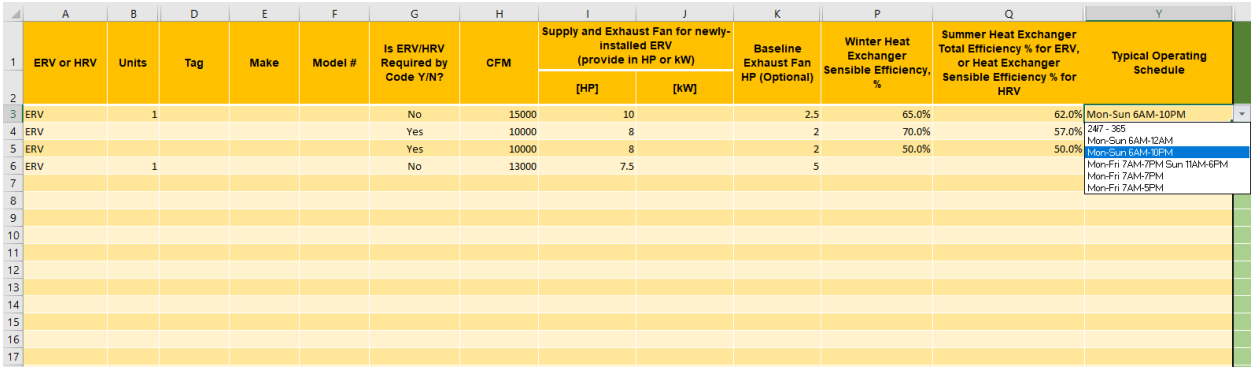
Fill in Yellow Cells

Basic information about the type of ventilation system and the specifications of the proposed model can be entered from columns A-E.

This measure only applies in cases where ERV/HRV functionality is not required by federal, state, local or municipal codes or standards. Hence in event of for a new construction application, claiming additional savings through ERV/HRV installation is not eligible under the Clean Heat Program.

Product specific information like the CFM, Supply and Exhaust fan HP or demand, Efficiency can be found in the specification sheet for the ERV/HRV.

Colum Y can be used to select the appropriate schedule for which the ERV/HRV is operating.



	A	B	D	E	F	G	H	I	J	K	P	Q	Y
1	ERV or HRV	Units	Tag	Make	Model #	Is ERV/HRV Required by Code Y/N?	CFM	Supply and Exhaust Fan for newly-installed ERV (provide in HP or kW)		Baseline Exhaust Fan HP (Optional)	Winter Heat Exchanger Sensible Efficiency, %	Summer Heat Exchanger Total Efficiency % for ERV, or Heat Exchanger Sensible Efficiency % for HRV	Typical Operating Schedule
2								[HP]	[kW]				
3	ERV	1				No	15000	10		2.5	65.0%	62.0%	Mon-Sun 6AM-10PM
4	ERV					Yes	10000	8		2	70.0%	57.0%	
5	ERV					Yes	10000	8		2	50.0%	50.0%	
6	ERV	1				No	13000	7.5		5			
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													

Green Columns AI-AK will be auto populated displaying the estimated electric, demand and therms savings.

ΔkWh	ΔkW	Δtherms
18737.51664	1.55	-
153,591.40	9.12	-
(29,824.14)	(5.23)	-
(32,157.47)	(14.04)	-

Green Cells will be auto populated

Tab: Results Summary

This tab displays the anticipated energy savings and incentive for the proposed project based on inputs entered by the user on the previous tabs.

Depending on the type of application and upgrade category selection, results will be displayed in the following summary fields:

- Heat Pump Complementary Summary
- Heat Pumps Summary
- Project Summary

Heat Pump Complementary Summary

This summary field should get populated in any scenario based on application and/or incentive category selection.

Material & Labor Costs – Enter the material and labor costs related to all eligible equipment. ***Non-eligible equipment should not be included in the project costs.***

Heat Pumps Complementary Products Summary										
Category	Material Cost	Labor Cost	Total Cost	Net MMBtu Savings	Heating Electrification Savings (kWh)	Cooling Savings (kWh)	Net kWh savings	kW Savings	Therms savings	CO_2 emissions reduction (Metric Tons/yr)
Eligible Envelope Upgrades	300,000	350,000	$ 30,000	-	#N/A	-	#N/A		-	-
ERV/HRV	10,000	50,000		-	-	-	-	-	-	-

Enter material and labor costs for each applicable category. The total cost column will auto-sum.

The following cells will populate automatically:

- Total Cost: Cell will auto-populate as the sum of the material and labor cost entered by the user.
- Net MMBtu Savings: Estimation of first-year site energy savings, which accounts for both the decreased fuel and the change in electricity consumed at the site.
- Heating Electrification Savings (kWh): Estimate of energy savings due to electrification of a fossil fuel heating system. Value is negative.
- Cooling Savings (kWh): Estimate of energy savings yielded by installing a heat pump with a higher efficiency than the cooling baseline. Value is positive.
- Net kWh Savings: Sum of the heating electrification savings and cooling savings in kWh. Value is typically negative.
- Total KW Savings- Estimate of the peak electric demand savings.
- Therms Savings: Estimate of energy savings due to decreased fuel consumption.
- Co2 Emission Reduction: Net Co2 reduction based on increased efficiency of the system.
- Category Incentive Rate: Depending on incentive category.
- Max reduction in Dominant Load BHL/BCL: Depending on the type of Tier selection- the appropriate % is applied for reduction from the base building load.
- Uncapped Measure Incentive: Calculated incentive for the proposed project measure.
- Incentive Capping based on Installation Costs: Individual measure incentives are capped at 100% of each measure cost.

All costs, savings, and incentives for individual measures are totaled in the 'TOTAL' row. The sum of the measure installation incentive capped cannot be greater than 50% of the total project cost (i.e. cost of all measures combined).

SUMMARY						
Category	Material Cost	Labor Cost	Total Cost	Uncapped Measure Incentive	Oversizing Measure Incentive Cap	Measure Installation Incentive Cap
PROJECT TOTALS	$ 19,000.00	$ 35,000.00	$ 54,000.00	$ 73,414.65		$ 27,000.00

Total uncapped incentive exceeds 50% of the total project. Project Incentive is capped at 50% of the install cost. $54,000.00 x 50% = $27,000.00

Heat Pump Summary

Applications involving Heat Pump Upgrade only can fill in the material and labor costs associated with the technologies. It is recommended that users carefully review and verify the upgrades to get to the EUL value. Examples: Weighted average EUL: Windows 20, Wall insulation 30, Infiltration 5, etc.

Heat Pumps Summary										
Technology	Material Cost	Labor Cost	Total Cost	Net MMBtu Savings	Heating Electrification Savings (kWh)	Cooling Savings (kWh)	Net kWh savings	kW Savings	Therms savings (Natural Gas)	CO_2 emissions reduction (Metric Tons/yr)
NEEP Listed Cold Climate Air Source Heat Pumps	$ 14,000	$ 7,000	$ 21,000	147.000	(17,663.392)	1,392.748	(16,270.644)	0.614	2,025.158	6.7
SPVHP's, PTHP's	$ 30,567	$ 7,000	$ 37,567	130.931	(23,213.586)	(1,895.945)	(25,109.531)	(0.844)	2,166.051	4.7
AHRI Rated Air Source Heat Pumps (VRFs, Large Unitary ASHPs)	$ 76,667	$ 38,333	$ 115,000	473.161	(39,183.937)	9,748.171	(29,435.766)	11.022	5,735.963	24.4
Closed Loop Ground Source Heat Pumps	$ 18,100	$ 9,050	$ 27,150	145.547	(14,453.269)	3,503.064	(10,950.204)	3.123	1,829.089	7.3

Fill in Yellow Cells and the White cells will already be auto populated.

The following cells will populate automatically:

- Total Cost: Cell will auto-populate as the sum of the material and labor cost entered by the user.
- Net MMBtu Savings: Estimation of first-year site energy savings, which accounts for both the decreased fuel and the change in electricity consumed at the site.
- Heating Electrification Savings (kWh): Estimate of energy savings due to electrification of a fossil fuel heating system. Value is negative.
- Cooling Savings (kWh): Estimate of energy savings yielded by installing a heat pump with a higher efficiency than the cooling baseline. Value is positive.
- Net kWh Savings: Sum of the heating electrification savings and cooling savings in kWh. Value is typically negative.
- Total KW Savings- Estimate of the peak electric demand savings
- Therms Savings: Estimate of energy savings due to decreased fuel consumption.
- Co2 Emission Reduction: Net Co2 reduction based on increased efficiency of the system
- Lifetime Net MMBTU Savings: Net savings resulting during the effective useful life of the measure upgrade. Lifetime or LMMBTU savings are calculated by multiplying the EUL years to the net annual MMBTU savings resulting from the measure
- Oversizing Measure Incentive Cap: Penalty applies to over-sized category 2 cold climate air source heat pumps and mini-splits projects only. If the calculated heating sizing ratio for a ccASHP or ccMSHP system on the 'Eqpt Sched & Eligibility' tab is greater than 120%, the measure incentive will be capped as follows:

$$NEEP\ Maximum\ Heating\ Capacity\ (Btu/hr)@\ 5\ \mathrm{deg}\,F\ x\ \frac{\$}{10{,}000\ btu/hr}\ x\ \frac{1.20}{Heat\ Sizing\ Ratio}$$

- Category Incentive Rate: Depending on incentive category
- Uncapped Measure Incentive: Calculated incentive for the proposed project measure.

Project Summary

This summary field will auto populate for projects with different incentive category selection and submission.

Appendices

A. Definitions

- **Air-Conditioning, Heating, and Refrigeration Institute (AHRI)**: A trade association representing manufacturers of heating, ventilation, air-conditioning, refrigeration, and water heating equipment. AHRI provides the database of equipment performance specifications, which is used in this program to determine the rebate amount.
- **Air Source Heat Pump (ASHP)**: An HVAC system that provides space heating using electricity through vapor-compression refrigeration cycle. An ASHP extracts heat from outdoor air and transfers the extracted heat into the conditioned spaces via various means. ASHPs are also used to provide space cooling by reversing the cycle to extract heat from a building and transfer the heat to the outside air.
- **Air-to-Air Variable Refrigerant Flow (VRF) Heat Pumps:** Heat Pump systems that circulate refrigerant between a variable capacity compressor and multiple indoor air handlers, each capable of individual zone temperature control. VRF systems can be built with heat recovery and cooling capabilities that allow simultaneously heating to some zones and cooling to other zones.
- **Building Heating Load (BHL)**: Building heat loss in British Thermal Units per hour (Btu/h). For residential buildings, BHL shall be calculated using ACCA Manual J or another code-approved methodology. For commercial buildings, BHL shall be calculated following ANSI/ASHRAE/ACCA Standard 183-2007(RA2017), or other code-approved equivalent computational procedure. Calculation of the building's design heating load shall be at the 99% dry bulb heating design temperature for the most relevant ASHRAE 2017 location.
- **Building Cooling Load (BCL)**: Building total sensible and latent heat gain in British Thermal Units per hour (Btu/h). For residential buildings, BCL shall be calculated using ACCA Manual J or another code-approved methodology. For commercial buildings, BHL shall be calculated following ANSI/ASHRAE/ACCA Standard 183-2007 (RA2017), or other code-approved equivalent computational procedure. Calculation of the building's design cooling load shall be at the 1% dry bulb cooling design temperature for the most relevant ASHRAE 2017 location.
- **Closed Loop:** A ground heat exchange method in which the heat transfer fluid is permanently contained in a closed piping system.
- **Cold climate air source heat pump:** A heat pump product listed on the Northeast Energy Efficiency Partnership (NEEP) Cold Climate Air Source Heat Pump (ccASHP) Specification and Product List ("NEEP Product List"), designed to identify air-source heat pumps that are best suited to heat efficiently in cold climates (IECC climate zone 4 and higher).
- **Cold climate single package air source heat pump:** A NEEP-listed cold climate air source heat pump, in which all the essential components are housed inside a single cabinet or "package."
- **Cooling Balance Point Temperature:** The outdoor temperature above which the building's cooling system begins to operate.
- **Coefficient of performance (COP)**: COP is the ratio of work or useful energy output of a system versus the work or energy input, measured in the same units. It is a measure of performance often used for electrically-powered heating and cooling equipment, with the higher the system COP corresponding to the more efficient operation.
- **Energy Efficiency Ratio (EER)**: A measure of how efficiently a cooling system will operate when the outdoor temperature is 95 degrees Fahrenheit. It is calculated by dividing the rated cooling output at 95 degrees Fahrenheit by the watts used by the AC/HP system. A higher EER means the system is more efficient. It is an instantaneous measure of electrical efficiency, unlike SEER (Seasonal Energy Efficiency Rating), which is an averaged value of efficiency. This is a term applied to air conditioning equipment.
- **Full Load Heating System**: A system installed as a building's primary heating source, with a total system heating capacity that satisfies a minimum of 90% of building heating load (BHL).

- **Ground Source Closed-Loop Heat Pump.** A ground source closed-loop heat pump typically uses fluid circulated through a subsurface piping loop as a heat source/heat sink. The heat exchange loop may be placed in horizontal trenches or vertical bores, or submerged in a body of surface water. The temperature of the fluid is related to climatic and operating history conditions and usually varies from 25°F to 100°F [-3.9°C to 37.7°C]. Rated efficiencies include an allowance for power to circulate the fluid. A ground source closed-loop heat pump consists of one or more factory-made assemblies which normally include an indoor conditioning coil with air moving means, compressor(s) and refrigerant-to-fluid heat exchanger(s), including means to provide both cooling and heating, cooling only or heating only functions. When such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together, and the requirements of rating outlined in the standard are based upon the use of matched assemblies.
- **Heating Balance Point Temperature:** The outdoor temperature below which the building's heating system begins to operate.
- **Large Air-to-Air Heat Pumps:** Large commercial heat pump systems that include individual heat pump appliances that are powered by three-phase electricity or have rated cooling capacities ≥65,000 Btu/h for the individual appliance. Systems are tested under AHRI 340/360.
- **Ground Loop Heat Pump Application:** Brine-to-air or brine-to-water ground source heat pump using a brine solution circulating through a subsurface piping loop function as a heat source / heat sink.
- **Mini-Split Heat Pump (MSHP):** A type of ccASHP that can circulate refrigerant between an outdoor unit containing a variable capacity compressor and one or more indoor air handlers. MSHPs are often referred to as “ductless mini-splits” because they are typically ductless. These units can also be installed with short duct runs that enable single air handlers to serve more than one room at a time. Systems are tested under AHRI 210/240.
- **North East Energy Partnership (NEEP):** *NEEP* was founded in 1996 as a non-profit accelerating energy efficiency in the Northeast and Mid-Atlantic states. Today, it is one of six Regional Energy Efficiency Organizations (REEOs) funded, in part, by US Department of Energy to support state efficiency policies and programs.
- **Partial Load Heating System**: A partial load heating system is a system installed in addition to an existing heating system, and which has a total heat pump system heating capacity that satisfies <90% of BHL.

B. Building Profiles

The following building profiles have been programmed into the heat pump savings calculator. Profiles are derived from the following sources:

- HVAC Schedules: ASHRAE 90.1
- Temperature Set Points: Appendix A of the New York State Technical Reference Manual (v8)
- Balance Point Temperatures: ARUP Carbon Neutral Building Road Map Analysis prepared for NYSERDA

Office Building

	Office		
Hour (Time of Day)	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	Off	Off	Off
2:00	Off	Off	Off
3:00	Off	Off	Off
4:00	Off	Off	Off
5:00	Off	Off	Off
6:00	On	On	Off
7:00	On	On	Off
8:00	On	On	Off
9:00	On	On	Off
10:00	On	On	Off
11:00	On	On	Off
12:00	On	On	Off
13:00	On	On	Off
14:00	On	On	Off
15:00	On	On	Off
16:00	On	On	Off
17:00	On	On	Off
18:00	On	Off	Off
19:00	On	Off	Off
20:00	On	Off	Off
21:00	On	Off	Off
22:00	Off	Off	Off
23:00	Off	Off	Off
0:00	Off	Off	Off

						Balance Point (deg F)							
Building Profiles		Setpoints (deg F)				Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Building Type		Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating
Office	1	75	70	78	67	57	53	60	50	54	51	57	48

Assembly

Hour (Time of Day)	Assembly		
	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	Off	Off	Off
2:00	Off	Off	Off
3:00	Off	Off	Off
4:00	Off	Off	Off
5:00	Off	Off	Off
6:00	On	Off	Off
7:00	On	On	On
8:00	On	On	On
9:00	On	On	On
10:00	On	On	On
11:00	On	On	On
12:00	On	On	On
13:00	On	On	On
14:00	On	On	On
15:00	On	On	On
16:00	On	On	On
17:00	On	On	On
18:00	On	On	On
19:00	On	On	On
20:00	On	On	On
21:00	On	On	On
22:00	On	On	On
23:00	On	On	On
0:00	Off	Off	Off

						Balance Point (deg F)							
Building Profiles		Setpoints (deg F)				Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Building Type		Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating
Assembly	2	76	72	79	69	58	54	61	51	55	52	58	49

Health

	Health		
Hour (Time of Day)	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	On	On	On
2:00	On	On	On
3:00	On	On	On
4:00	On	On	On
5:00	On	On	On
6:00	On	On	On
7:00	On	On	On
8:00	On	On	On
9:00	On	On	On
10:00	On	On	On
11:00	On	On	On
12:00	On	On	On
13:00	On	On	On
14:00	On	On	On
15:00	On	On	On
16:00	On	On	On
17:00	On	On	On
18:00	On	On	On
19:00	On	On	On
20:00	On	On	On
21:00	On	On	On
22:00	On	On	On
23:00	On	On	On
0:00	On	On	On

						Balance Point (deg F)							
Building Profiles		Setpoints (deg F)				Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Building Type		Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating
Health	3	76	72	79	69	58	54	61	51	55	52	58	49

Light Manufacturing

Hour (Time of Day)	Light Manufacturing		
	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	Off	Off	Off
2:00	Off	Off	Off
3:00	Off	Off	Off
4:00	Off	Off	Off
5:00	Off	Off	Off
6:00	Off	Off	Off
7:00	On	On	Off
8:00	On	On	Off
9:00	On	On	Off
10:00	On	On	Off
11:00	On	On	Off
12:00	On	On	Off
13:00	On	On	Off
14:00	On	On	Off
15:00	On	On	Off
16:00	On	On	Off
17:00	On	On	Off
18:00	On	On	Off
19:00	On	Off	Off
20:00	On	Off	Off
21:00	On	Off	Off
22:00	On	Off	Off
23:00	Off	Off	Off
0:00	Off	Off	Off

					Balance Point (deg F)								
Building Profiles		Setpoints (deg F)				Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Building Type		Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating
Light Manufacturing	4	78	70	81	67	58	54	61	51	55	52	58	49

Restaurant

Hour (Time of Day)	Restaurant		
	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	On	On	On
2:00	On	On	On
3:00	On	On	On
4:00	Off	Off	Off
5:00	Off	Off	Off
6:00	Off	Off	Off
7:00	Off	Off	Off
8:00	On	Off	Off
9:00	On	Off	Off
10:00	On	On	Off
11:00	On	On	On
12:00	On	On	On
13:00	On	On	On
14:00	On	On	On
15:00	On	On	On
16:00	On	On	On
17:00	On	On	On
18:00	On	On	On
19:00	On	On	On
20:00	On	On	On
21:00	On	On	On
22:00	On	On	On
23:00	On	On	On
0:00	On	On	On

		Balance Point (deg F)											
Building Profiles		Setpoints (deg F)				Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Building Type		Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating
Restaurant	5	77	72	80	69	61	58	64	55	59	52	62	49

Retail

	Retail		
Hour (Time of Day)	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	Off	Off	Off
2:00	Off	Off	Off
3:00	Off	Off	Off
4:00	Off	Off	Off
5:00	Off	Off	Off
6:00	Off	Off	Off
7:00	On	On	Off
8:00	On	On	Off
9:00	On	On	On
10:00	On	On	On
11:00	On	On	On
12:00	On	On	On
13:00	On	On	On
14:00	On	On	On
15:00	On	On	On
16:00	On	On	On
17:00	On	On	On
18:00	On	On	Off
19:00	On	On	Off
20:00	On	On	Off
21:00	On	On	Off
22:00	Off	On	Off
23:00	Off	Off	Off
0:00	Off	Off	Off

						Balance Point (deg F)							
Building Profiles		Setpoints (deg F)				Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Building Type		Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating
Retail	6	76	72	79	69	61	54	64	51	59	52	62	49

School

Hour (Time of Day)	School		
	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	Off	Off	Off
2:00	Off	Off	Off
3:00	Off	Off	Off
4:00	Off	Off	Off
5:00	Off	Off	Off
6:00	Off	Off	Off
7:00	Off	Off	Off
8:00	On	Off	Off
9:00	On	On	Off
10:00	On	On	Off
11:00	On	On	Off
12:00	On	On	Off
13:00	On	On	Off
14:00	On	Off	Off
15:00	On	Off	Off
16:00	On	Off	Off
17:00	On	Off	Off
18:00	On	Off	Off
19:00	On	Off	Off
20:00	On	Off	Off
21:00	On	Off	Off
22:00	On	Off	Off
23:00	Off	Off	Off
0:00	Off	Off	Off

						Balance Point (deg F)							
Building Profiles		Setpoints (deg F)				Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Building Type		Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating
School	7	76	72	81	67	58	56	61	53	49	48	52	45

Warehouse

Hour (Time of Day)	Warehouse		
	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	Off	Off	Off
2:00	Off	Off	Off
3:00	Off	Off	Off
4:00	Off	Off	Off
5:00	Off	Off	Off
6:00	Off	Off	Off
7:00	Off	Off	Off
8:00	On	Off	Off
9:00	On	On	Off
10:00	On	On	Off
11:00	On	On	Off
12:00	On	On	Off
13:00	On	On	Off
14:00	On	On	Off
15:00	On	On	Off
16:00	On	On	Off
17:00	On	Off	Off
18:00	Off	Off	Off
19:00	Off	Off	Off
20:00	Off	Off	Off
21:00	Off	Off	Off
22:00	Off	Off	Off
23:00	Off	Off	Off
0:00	Off	Off	Off

						Balance Point (deg F)								
Building Profiles		Setpoints (deg F)				Existing Building				New Construction				
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		
Building Type		Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	
Warehouse	8	80	68	85	63	65	51	68	48	62	49	65	46	

Laboratory

Hour (Time of Day)	Laboratory		
	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	On	On	On
2:00	On	On	On
3:00	On	On	On
4:00	On	On	On
5:00	On	On	On
6:00	On	On	On
7:00	On	On	On
8:00	On	On	On
9:00	On	On	On
10:00	On	On	On
11:00	On	On	On
12:00	On	On	On
13:00	On	On	On
14:00	On	On	On
15:00	On	On	On
16:00	On	On	On
17:00	On	On	On
18:00	On	On	On
19:00	On	On	On
20:00	On	On	On
21:00	On	On	On
22:00	On	On	On
23:00	On	On	On
0:00	On	On	On

						Balance Point (deg F)							
Building Profiles		Setpoints (deg F)				Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Building Type		Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating	Cooling	Heating
Laboratory	9	76	72	79	69	58	54	61	51	55	52	58	49

Hotel

Hour (Time of Day)	Hotel		
	HVAC Schedule		
	Weekday	Sat	Sunday
1:00	On	On	On
2:00	On	On	On
3:00	On	On	On
4:00	On	On	On
5:00	On	On	On
6:00	On	On	On
7:00	On	On	On
8:00	On	On	On
9:00	On	On	On
10:00	On	On	On
11:00	On	On	On
12:00	On	On	On
13:00	On	On	On
14:00	On	On	On
15:00	On	On	On
16:00	On	On	On
17:00	On	On	On
18:00	On	On	On
19:00	On	On	On
20:00	On	On	On
21:00	On	On	On
22:00	On	On	On
23:00	On	On	On
0:00	On	On	On

						Balance Point (deg F)							
Building Profiles		Setpoints (deg F)				Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Hotel	10	76	72	81	67	52	51	55	48	52	50	55	47

Residential

Hour (Time of Day)	Residential		
	HVAC Schedule		
	Weekday	Sat	Sun
1:00	On	On	On
2:00	On	On	On
3:00	On	On	On
4:00	On	On	On
5:00	On	On	On
6:00	On	On	On
7:00	On	On	On
8:00	On	On	On
9:00	Off	On	On
10:00	Off	On	On
11:00	Off	On	On
12:00	Off	On	On
13:00	Off	On	On
14:00	Off	On	On
15:00	Off	On	On
16:00	On	On	On
17:00	On	On	On
18:00	On	On	On
19:00	On	On	On
20:00	On	On	On
21:00	On	On	On
22:00	On	On	On
23:00	On	On	On
0:00	On	On	On

					Balance Point (deg F)							
Building Profiles		Setpoints (deg F)			Existing Building				New Construction			
		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Residential	11	75	73	78	70	58	60	61	57	63	55	66	52

Multi-Family

Hour (Time of Day)	Multi-Family HVAC Schedule		
	Weekday	Sat	Sun
1:00	On	On	On
2:00	On	On	On
3:00	On	On	On
4:00	On	On	On
5:00	On	On	On
6:00	On	On	On
7:00	On	On	On
8:00	On	On	On
9:00	Off	On	On
10:00	Off	On	On
11:00	Off	On	On
12:00	Off	On	On
13:00	Off	On	On
14:00	Off	On	On
15:00	Off	On	On
16:00	On	On	On
17:00	On	On	On
18:00	On	On	On
19:00	On	On	On
20:00	On	On	On
21:00	On	On	On
22:00	On	On	On
23:00	On	On	On
0:00	On	On	On

		Balance Point (deg F)							
		Existing Building				New Construction			
Building Profiles		Occupied Hours		Unoccupied Hours		Occupied Hours		Unoccupied Hours	
Multi-Family	12	58	60	61	57	63	55	66	52
Custom	13	0	0	0	0	0	0	0	0

		Setpoints (deg F)			
		Occupied Hours		Unoccupied Hours	
Multi-Family	12	75	70	78	67
Custom	13	0	0	0	0