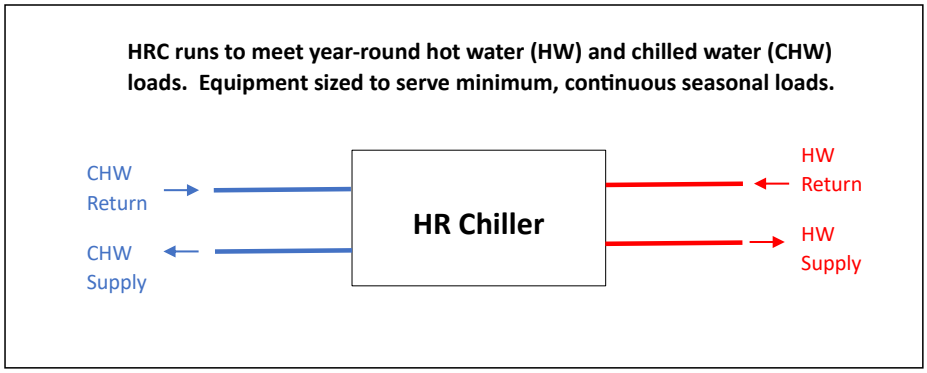
NY STATEWIDE CLEAN HEAT CALCULATOR
HEAT RECOVERY CHILLERS (HRC)
HEAT PUMP CHILLERS (HPC)
Version 2.0
USER GUIDE
June 16, 2025

Contents

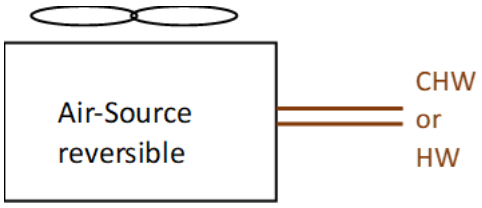
Summary

The Statewide Clean Heat Program Heat Recovery Chiller (HRC) Savings Calculator (Clean Heat HRC Calculator) is an excel based tool that is being developed to assist participating contractors applying to the New York State Clean Heat Program (Clean Heat Program) with calculating custom energy savings for the following heat recovery chiller technologies:

Heat Recovery Chiller (HRC) – chiller operating in mode where heat is moved between HW and CHW loops within the thermal envelope in buildings requiring simultaneous cooling and heating. Unit provides heating and cooling at the same time. Note: exempt from minimum annual heating thresholds applicable to each program.



Heat Pump Chiller (HPC) – chiller operating in mode where heat sink or source is outside of the building (i.e.air source of hot or cold water for the building). Unit provides either heating or cooling but not both at the same time.



This version enables users to quantify savings for specific HRC **OR** HPC applications **ONLY** as indicated below. It also allows users to get a rough estimate of the savings for projects in the early stages to get a feasibility check on pursuing the project further.

When to Use this Calculator:

The Clean Heat HRC 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 water-source HRCs that meet or exceed the applicable minimum efficiency requirements in Table 6.8.1-16 of ASHRAE 90.1 – 2022.
- The project involves installing air-source HPCs that meet or exceed the applicable minimum efficiency requirements in Table 6.8.1-16 of ASHRAE 90.1 – 2022.
- The Operating Mode for the HRC is: Simultaneous Heating and Cooling.
- The Operating Mode for the HPC is: Heat Pump Heating or Cooling.

In addition, the Version 2.0 Clean Heat HRC Calculator must be used for projects that have not yet received a **Preliminary Incentive Offer Letter** before June 16, 2025, superseding previously approved calculation results.

Commented [KPX1]: Version 1.2 throughout this user guide

Commented [AA2]: Is this limitation required for this tool?

Revisions and Updates:

The following are the summary of updates from the last version of the Statewide Clean Heat HRC calculator:

Version	Date	Tab	Section	Summary of Revisions
1.1	12/120/23	Project Info	System Characteristics	EFLH cell was removed. EFLH is now calculated using a BIN Model.
1.1	12/1/2023	Equipment Info	Savings Calculation	Removed this section from the tab.
1.1	12/1/2023	Operational Data	All	Added Tab to allow user input of HRC efficiency curve; HW and Chilled Water Return Temperatures. Default values are pre-populated.
1.2	6/1/2024	Equipment Info	All	Added compatibility for air-source heat pump chillers. "Rated Inputs per unit" revised to require inputs based on ASHRAE 90.1 – 2022 compatibility.
2.0	6/9/2025	Project Info / HPC BIN Model	All	Added all Utility Names and applicable Incentive Rates. Updated the Heat Pump Chiller BIN model.

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 an HRC/HPC technology that does not fall into one of the above applicable categories available in the clean heat calculator and no prescriptive TRM methodology is available for calculating savings.

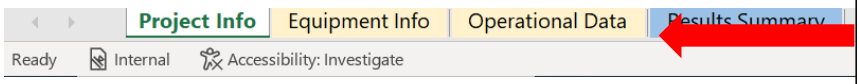
All calculation approaches must use NYS ECC code minimum efficiencies and minimum efficiency requirements in Table 6.8.1-16 of ASHRAE 90.1 – 2022 for baseline HRC/HPC systems.

General

Users shall review the 'Project Information, and 'Equipment Information' 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'

Commented [AA3]: We should add this formatting to this calculator , as well.

Commented [AA4]: Necessary?



Yellow shaded cells indicate user input is required.

							Compliance Check			
Entering / Leaving Heating Liquid Temperature*	Cooling Capacity (Tons)*	Heat Recovery Capacity (MBtu/h)*	Cooling kW/ton IPLV	Cooling kW/ton FL*	Heating COP*	Simultaneous Cooling and Heating COP*	Cooling Efficiency kW/ton - Baseline	Heating COP - Baseline	ASHRAE Simultaneous Heating and Cooling Load Efficiency COP per AHRI 920	ASHRAE Compliance Check
High 120°F/140°F	50.00	854.80		1.497	3.35	4	0.5263	0.80	4.42	Not Compli
	50.00	854.80		1.497			0.5263			Not Compli

Commented [KPX5]: Update with new snip

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

Tabs should be completed in the following order:

1. Project Information (Info) (highlighted cells only)
2. Equipment Information (highlighted cells only)
3. Operational Data (all or use default values)
4. Results Summary (highlighted cells only)

Commented [AA6]: Should have the results summary in a different tab?

Tab: Project Information

Yellow shaded cells indicate user input is required.

SECTION 1: Building Characteristics

Project Details	
Program Name	
Tool Generation Date	
Estimated Installation Date	
Utility Name*	Con Edison
Program Type*	Commercial and Industrial

- Program Name – Clean Heat Program
- Tool Generation Date – current date
- Estimated Installation Date – enter projected installation date
- Utility Name* – chose from dropdown menu
- Program Type* – Commercial & Industrial (default)

* Indicates a required field.

SECTION 2: Building Characteristics

Building Characteristics	
Building Type	
Heating System Type	
Cooling System Type	
Heating Fuel Type	
Distribution System Type	
Construction Type*	
Year of Construction/ Renovation	
Gross Building Area Impacted by SOW (SF)	
Billing Data: Annual Cooling Energy Use (kWh)	
Billing Data: Annual Heating Energy Use (MMBtu)*	
Scope of Work*	
Project Zipcode*	

- Building Type - Select the appropriate building type from the drop-down menu. Selection should correspond to the building type that the HRC will be serve. 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.
- Heating System Type – Select current heating system utilized from the drop-down menu.
- Cooling System Type - Select current cooling system utilized from the drop-down menu.
- Heating Fuel Type - Select current fuel type utilized from the drop-down menu.
- Distribution System Type – Not Applicable
- Construction Type* – Select from the following drop-down options depending on the project facility application:
  1) New Construction (not applicable)

  2) Existing Building -Retrofit

  3) Gut Renovation[1]

  [1]Gut renovation is any renovation that removes material down to structural load-bearing beams.

Commented [RK7]: TRM defines Gut Rehab/Renovation as "Any renovation that removes material down to structural load-bearing beams".

- Year of Construction / Renovation
- Gross Building Area Impacted by SOW (SF) – area (square feet) impacted by measure
- Billing Data – Annual Cooling Energy Use (kWh)
- Billing Data - Annual Heating Energy Use (MMBtu)*
- Scope of Work - chose the Clean Heat Program Incentive Category applicable to the project:
    - Category 4 — *Custom Full Load Space Heating Applications*
    - Category 4a — *Custom Full Load Space Heating Applications + Envelope*
    - Category 6 — *Custom Hot Water Heating Applications*
    - Category 10 — *C&I Custom Partial Load Space Heating Applications*
- Project Zip Code*

* Indicates a required field.

SECTION 3: System Characteristics

System Characteristics	
Facility Type (Applicable to Existing Only)	
BCL (MBtu/h)	
BHL (MBtu/h)	
Minimum CHW Demand (MBtu/h)*	
Minimum Heating Demand (MBtu/h)*	
Annual Baseline Heating or Domestic Hot Water (DHW) (MMBtu)	
Annual Baseline CHW (MMBtu)	

- Facility Type (Applicable to Existing Only)
- BCL (MBtu/hr) - Building total sensible and latent heat gain in British Thermal Units per hour (MBtu/h) at the peak design temperature.
- BHL (MBtu/hr) - Building heat loss in British Thermal Units per hour (Btu/h) at the peak design temperature.
- Minimum CHW Demand (MBtu/hr)* – enter minimum historic, calculated or modeled chilled water load required for the space being conditioned by the measure.
- Minimum Heating / DHW Demand (MBtu/hr)* - enter minimum historic, calculated or modeled heating or domestic hot water loads required for the space being conditioned or serviced by the measure.
- Annual Baseline Heating / DHW (MMBtu) – enter the annual historic, calculated or modeled heating or domestic hot water consumption required for the space being conditioned or serviced by the measure.
- Annual Baseline CHW (MMBtu) - enter annual historic, calculated or modeled chilled water load required for the space being conditioned by the measure.

Commented [KPX8]: Added definition for clarity

Commented [KPX9]: Added definition for clarity

* Indicates a required field.

SECTION 4: Account Holder Information

Account Holder Information	
Account Name	
Account Number (15 Digits)	
Title	
Mailing Address	
Unit Number	
City	
Zip	
Contact Person	
Phone	
Email	

- Please complete all fields highlighted in yellow prior to submittal for review.

SECTION 5: Contractor Information

Contractor Information	
Installation Completed By	
Company Name	
Contact Name	
Title	
Tax ID	
Mailing Address	
Phone	
Email	

- Please complete all fields highlighted in yellow prior to submittal for review.

Tab: Equipment Information

A. Heat Recovery Chiller

This tab is utilized to enter equipment information, checks availability and displays the anticipated energy savings for the proposed project based on inputs entered by the user on this and previous tabs.

Section 1 – Inputs

System No.	Make / Model	Quantity*	Chiller Type	Equipment Type*	Heating Operation Type*
1	Multistack MSH070	2	Water-Cooled	Positive Displacement	Simultaneous Heating and Cooling
Total		2			

- System Number – enter each equipment / measure.
- Make / Model – enter full make and model number.
- Number of units – quantity of identical equipment to be installed.
- Chiller Type – drop-down menu: Air Cooled HPC/Water Cooled HRC (only water-cooled is applicable for heat recovery chiller)
- Equipment Type – compressor type drop-down menu: Positive Displacement or Centrifugal
- Heating Operation Type – drop-down menu: Heat Pump Heating/**Simultaneous Cooling and Heating**/Heat Recovery Heating **(Heat Recovery Heating not available on this calculator).**

Rated Inputs per unit								
Entering / Leaving Heating Liquid Temperature*	Cooling Capacity (Tons)*	Heat Recovery Capacity (MBtu/h)*		Cooling Efficiency IPLV (kW/ton)	Cooling Efficiency FL (kW/ton)*	Heating COP at 44oF Liquid Leaving Temp*		Simultaneous Cooling and Heating COP*
High 120°F/140°F	49.95	854.80			1.498	2.35		5.7
	49.95	854.80	0.00	0	1.498	2.35	0	7

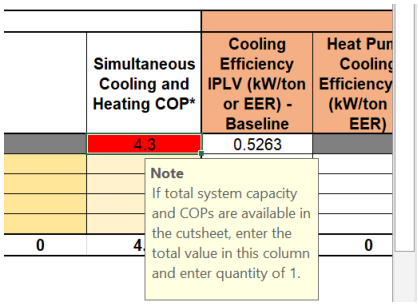
When this value highlights in red, there may be an inconsistent cooling or heating COP value entered or the equipment is not eligible (not compliant with ASHRAE Standards).

- Entering / Leaving Heating Liquid Temperature – drop-down menu
  - Low (95F/105F)
  - Medium (105F/120F)
  - High (120F/140F)
  - Boost (120F/140F) – only available on heat recovery chillers
- Cooling Capacity (tons) – enter cooling capacity of each equipment unit
- Heat Recovery Capacity (MBtu/hr or 1,000 Btu/hr) – enter hourly maximum heat output capacity
- Cooling Efficiency IPLV (kW/ton) – enter integrated part load cooling efficiency
- Cooling Efficiency FL (kW/ton) – enter full load cooling efficiency

Commented [KPX10]: Removed EER

Commented [KPX11]: Removed EER

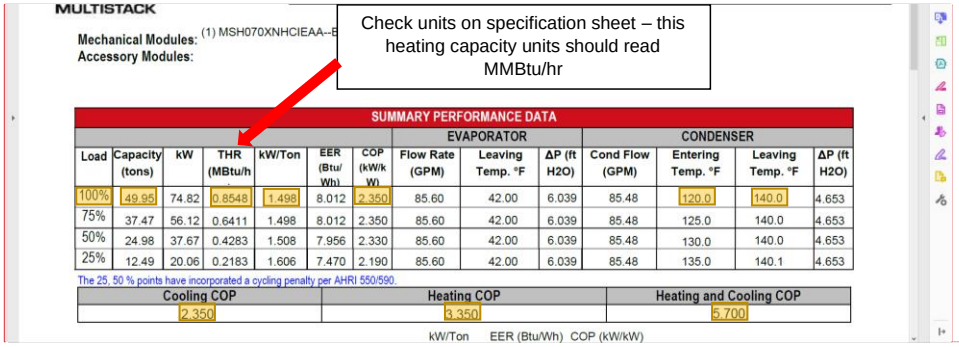
- Heating COP at 44°F Liquid Leaving Temp – enter heating COP at °44 leaving water temperature
- Simultaneous Cooling and Heating COP – enter COP in specific heat recovery operating mode.



	Simultaneous Cooling and Heating COP*	Cooling Efficiency IPLV (kW/ton or EER) - Baseline	Heat Pur Cooling Efficiency (kW/ton EER)
	4.3	0.5263	
0	4		0

Note
If total system capacity and COPs are available in the cutsheet, enter the total value in this column and enter quantity of 1.

Please note sample manufacturer's specification sheet for values referenced in above calculator.



MULTISTACK

Mechanical Modules: (1) MSH070XNHCIEAA--E

Accessory Modules:

Check units on specification sheet – this heating capacity units should read MMBtu/hr

SUMMARY PERFORMANCE DATA

							EVAPORATOR			CONDENSER			
Load	Capacity (tons)	kW	THR (MBtu/h	kW/Ton	EER (Btu/Wh)	COP (kW/kW)	Flow Rate (GPM)	Leaving Temp. °F	ΔP (ft H2O)	Cond Flow (GPM)	Entering Temp. °F	Leaving Temp. °F	ΔP (ft H2O)
100%	49.95	74.82	0.8548	1.498	8.012	2.350	85.60	42.00	6.039	85.48	120.0	140.0	4.653
75%	37.47	56.12	0.6411	1.498	8.012	2.350	85.60	42.00	6.039	85.48	125.0	140.0	4.653
50%	24.98	37.67	0.4283	1.508	7.956	2.330	85.60	42.00	6.039	85.48	130.0	140.0	4.653
25%	12.49	20.06	0.2183	1.606	7.470	2.190	85.60	42.00	6.039	85.48	135.0	140.1	4.653

The 25, 50 % points have incorporated a cycling penalty per AHRI 550/590.

Cooling COP	Heating COP	Heating and Cooling COP
2.350	3.350	5.700

kW/Ton EER (Btu/Wh) COP (kW/kW)

Commented [KPX12]: Need new example

Section 2 – Compliance Check and Savings

ASHRAE 90.1-2022 Compliance Check						
Cooling Efficiency IPLV (kW/ton or EER) - Baseline	Heat Pump Cooling Efficiency FL (kW/ton or EER)	Heating COP - Baseline	Heat Pump Heating COP at 47 °F OAT	Heat Pump Heating COP at 17 °F OAT	ASHRAE 90.1 Simultaneous Heating and Cooling Load Efficiency COP per AHRI 550/590	ASHRAE Compliance Check
0.5263		0.80			4.42	Compliant
0.5263	**0**	**0.8**	**0**	**0**	**4.42**	**Compliant**

- Cooling Efficiency kW/ton – Baseline – automatically populates based on:
  - Equipment Type
  - Cooling Capacity
  - Path B – IPLV (from ASHRAE 90.1–2022–Attachment B)
- Heat Pump Cooling Efficiency FL– not applicable for heat recovery chillers
- Heating COP – Baseline – automatically populates based on:
  - Equipment Type
  - Cooling Capacity
  - Heating Operation Type
  - Entering / Leaving Heating Liquid Temperature
- Heat Pump Heating COP at 47°F OAT – not applicable for heat recovery chillers
- Heat Pump Heating COP at 17°F OAT – not applicable for heat recovery chillers
- ASHRAE 90.1 Simultaneous Heating and Cooling Load Efficiency COP per AHRI 550/590 – from ASHRAE 90.1–2022–Attachment B
- ASHRAE Compliance Check – automatically populated based on eligibility criteria. If equipment is deemed “Not Compliant” – Annual Energy Savings are not calculated.

Commented [AA13]: Need to perhaps enable conitional formatting to turn red if "Not Compliant".

B. Heat Pump Chiller

This tab is utilized to enter equipment information, checks availability, and displays the anticipated energy savings for the proposed project based on inputs entered by the user on this and previous tabs.

Section 1 – Inputs

System Configuration					
System No.	Make / Model	Number of Units*	Chiller Type*	Equipment Type*	Heating Operation Type*
1	LG ACHH060HBAB	3	Air-Cooled		Heat Pump Heating
Total		3			

- System Number – enter each equipment / measure.
- Make / Model – enter full make and model number.
- Quantity – quantity of identical equipment to be installed.
- Chiller Type – drop-down menu: Air Cooled HPC/Water Cooled HRC ~~air/water cooled~~ (only air-cooled is applicable for this calculator)
- Equipment Type – compressor type drop-down menu: not available for Air-Cooled Chiller Types
- Heating Operation Type – drop-down menu: **Heat Pump Heating**

Rated Inputs per unit								
Entering / Leaving Heating Liquid Temperature*	Cooling Capacity (Tons)*	Heating Capacity (MBtu/h) at 47oF OAT*	Heating Capacity (MBtu/h) at 17oF OAT*	Cooling Efficiency IPLV (EER)	Cooling Efficiency FL (EER)*	Heating COP at 47oF OAT*	Heating COP at 17oF*	Simultaneous Cooling and Heating COP*
Low 95°F/105°F	16.21	204.70	163.80	19.46	10.560	3.65	2.22	
	16.21	204.70	163.80	19.46	10.56	3.65	2.22	5.7

- Entering / Leaving Heating Liquid Temperature – drop-down menu
  - Low (95F/105F)
  - Medium (105F/120F)
  - High (120F/140F)
- Cooling Capacity (tons) – enter cooling capacity of each equipment unit.
- Heating Capacity (MBtu/hr or 1,000 Btu/hr) at 47°F OAT – enter hourly maximum heat output capacity at 47°F outside air temperature.
- Heating Capacity (MBtu/hr or 1,000 Btu/hr) at 17°F OAT – enter hourly maximum heat output capacity at 17°F outside air temperature.
- Cooling Efficiency IPLV (EER) – enter integrated part load cooling efficiency.
- Cooling Efficiency FL (EER) – enter full load cooling efficiency
- Heating COP at 47°F OAT – enter heating COP at 47° outside air temperature
- Heating COP at 17°F OAT – enter heating COP at 17° outside air temperature
- Simultaneous Cooling and Heating COP – Not available for Heat Pump Chillers

Commented [KPX14]: Made text bold for HPC

Commented [KPX15]: Update with new snip

Commented [KPX16]: Removed Boost

Commented [KPX17]: Removed kW/ton

Commented [KPX18]: Removed kW/ton

Please note sample manufacturer's specification sheet for values referenced in above calculator.

Model Number		ACHH***VBAB 208-230V/60Hz/3PH 017	020	033	040	050	060
Cooling Capacity[1]	(TR)	16.21	18.48	32.42	36.96	48.62	55.45
Power Input[1]	(kW)	18.42	21.91	36.84	43.82	55.26	65.73
EER[1]	(Btu/kW)	10.56	10.12	10.56	10.12	10.56	10.12
IPLV[1]	(EER)	19.46	19.46	19.46	19.46	19.46	19.46
Energy Efficiency	(kW/TR)	0.617	0.617	0.617	0.617	0.617	0.617
Heating Capacity 47°F /105°F LWT	(MBH)	204.7	238.8	409.4	477.6	614.1	716.4
COP 47°F /105°F LWT[2]	(W/W)	3.65	3.59	3.65	3.59	3.65	3.59
Heating Capacity 17°F /105°F LWT	(MBH)	163.8	203.0	327.6	406.0	491.4	609.0
COP 17°F /105°F LWT[2]	(W/W)	2.22	2.16	2.22	2.16	2.22	2.16
Heating Capacity 47°F /120°F LWT	(MBH)	204.7	238.8	409.4	477.6	614.1	716.4
COP 47°F /120°F LWT[2]	(W/W)	3.15	3.10	3.15	3.10	3.15	3.10
Heating Capacity 17°F /120°F LWT	(MBH)	153.5	191.1	307.0	382.2	460.5	573.3
COP 17°F /120°F LWT[2]	(W/W)	2.01	1.96	2.01	1.96	2.01	1.96
Sound Pressure Cooling 30 at feet[3]	db(A)	51	51	54	54	56	56
Sound Pressure Heating 30 at feet[3]	db(A)	55	55	58	58	60	60
Frames		Single	Single	Double	Double	Triple	Triple

Section 2 – Compliance Check and Savings

ASHRAE 90.1-2022 Compliance Check						
Cooling Efficiency IPLV (kW/ton or EER) - Baseline	**Heat Pump Cooling Efficiency FL (kW/ton or EER)**	**Heating COP - Baseline**	**Heat Pump Heating COP at 47 ^{0}F OAT**	**Heat Pump Heating COP at 17 ^{0}F OAT**	**ASHRAE 90.1 Simultaneous Heating and Cooling Load Efficiency COP per AHRI 550/590**	**ASHRAE Compliance Check**
13.0200	9.5950	0.80	2.31	1.48		**Compliant**
13.02	**9.595**	**0.8**	**2.31**	**1.483**	**0**	**Compliant**

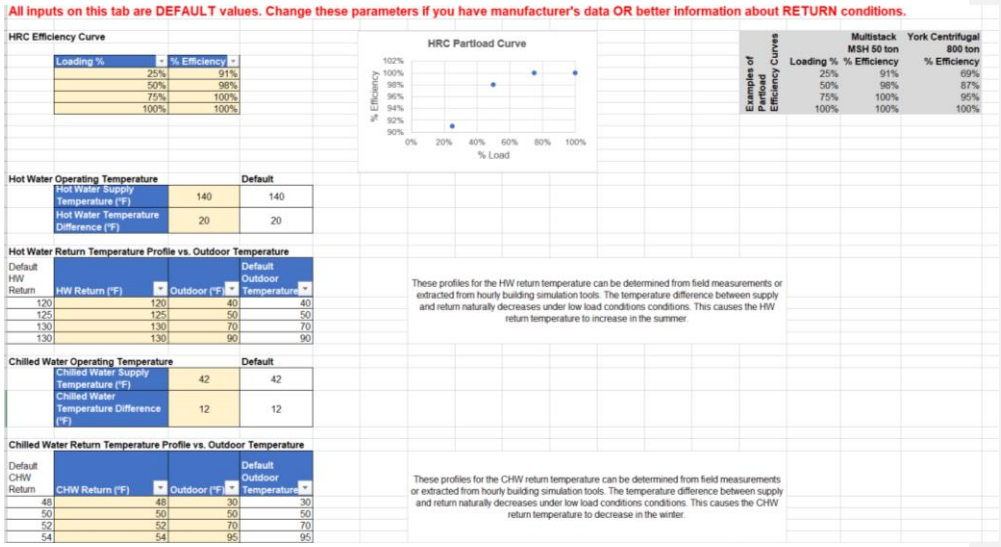
- Cooling Efficiency IPLV – Baseline – automatically populates based on:
  - Equipment Type
  - Cooling Capacity
  - Path B – IPLV (from ASHRAE 90.1–2022–Attachment B)
- Heat Pump Cooling Efficiency FL– automatically populates based on:
  - Equipment Type
  - Cooling Capacity

- Path A – IPLV (from ASHRAE 90.1–2022–Attachment B)

- Heating COP – Baseline - automatically populates based on:
  - Equipment Type
  - Cooling Capacity
  - Heating Operation Type
  - Entering / Leaving Heating Liquid Temperature
- Heat Pump Heating COP at 47°F OAT –automatically populates based on from ASHRAE 90.1–2022–Attachment B
- Heat Pump Heating COP at 17°F OAT – automatically populates based on from ASHRAE 90.1–2022–Attachment B
- ASHRAE 90.1 Simultaneous Heating and Cooling Load Efficiency COP per AHRI 550/590 – not applicable for heat pump chillers
- ASHRAE Compliance Check– automatically populated based on eligibility criteria. If equipment is deemed "Not Compliant" – Annual Energy Savings are not calculated

Commented [AA19]: Need to perhaps enable conitional formatting to turn red if "Not Compliant".

Tab: Operational Data – Only Applicable for HRC



- HRC Efficiency Curve: % Efficiency Default values may be changed based on submitted manufacturer's specification sheets.

Loading %	% Efficiency
25%	91%
50%	98%
75%	100%
100%	100%

- Hot Water Operating Temperature: use default or enter project specific values.

Hot Water Operating Temperature			Default
	Hot Water Supply Temperature (ºF)	140	140
	Hot Water Temperature Difference (ºF)	20	20

- Hot Water Return Temperature Profile vs. Outdoor Temperature: use default or enter project specific values.

  These profiles for the HW return temperature can be determined from field measurements or extracted from hourly building simulation tools. The temperature difference between supply and return naturally decreases under low load conditions conditions. This causes the HW return temperature to increase in the summer.

Hot Water Return Temperature Profile vs. Outdoor Temperature			
Default HW Return	HW Return (ºF)	Outdoor (ºF)	Default Outdoor Temperature
120	120	40	40
125	125	50	50
130	130	70	70
130	130	90	90

- Chilled Water Operating Temperature: use default or enter project specific values.

Chilled Water Operating Temperature			Default
	Chilled Water Supply Temperature (ºF)	42	42
	Chilled Water Temperature Difference (ºF)	12	12

- Chilled Water Return Temperature Profile vs. Outdoor Temperature: use default or enter project specific values.

  These profiles for the CHW return temperature can be determined from field measurements or extracted from hourly building simulation tools. The temperature difference between supply and return naturally decreases under low load conditions conditions. This causes the CHW return temperature to decrease in the winter.

Chilled Water Return Temperature Profile vs. Outdoor Temperature			
Default CHW Return	CHW Return (°F)	Outdoor (°F)	Default Outdoor Temperature
48	48	30	30
50	50	50	50
52	52	70	70
54	54	95	95

Tab: Results Summary

Technology	Material Cost	Labor Cost	Total Cost
Heat Recovery Chiller			$ -

- Enter Material and Labor Costs for each Measure.
- Total Cost = Material + Labor Costs

Net MMBtu Savings	Heating Electrification Savings (kWh)	Cooling Savings (kWh)	Net kWh savings	kW Savings	Therms Savings
14,549.9	-	(673,526.8)	(673,526.77)	(85.4)	168,481.1

- Net MMBtu Savings = Annual Energy Savings (MMBtu) - calculations described in Attachment C
- Heating Electrification Savings (kWh) = HRC Heating Energy = Zero (0) Free Heating - calculations described in Attachment C
- Cooling Savings (kWh) - calculations described in Attachment C
- Net kWh savings - calculations described in Attachment C
- kW Savings - calculations described in Attachment C
- Therm Savings - calculations described in Attachment C

Commented [AA20]: Need to show calculation methodology?

Commented [KPX21]: Added for consistency

Effective Useful Life (years)	Lifetime Net MMBtu Savings	Capped Incentive
-	-	$ -

- Effective Useful Life (years) – Source NYS TRM Version 10 – Appendix P
- Lifetime Net MMBtu Savings – Net MMBtu Savings x Effective Useful Life
- Capped Incentive – Total incentive automatically populates and includes all compliant measures based on calculated Net MMBtu Annual Savings, project information and location. Applicable program caps are applied.

- **The incentive value should not be construed as a Preliminary Incentive Offer Letter (PIOL). A PIOL will be offered after the project is reviewed by the participating utility.**

Appendices

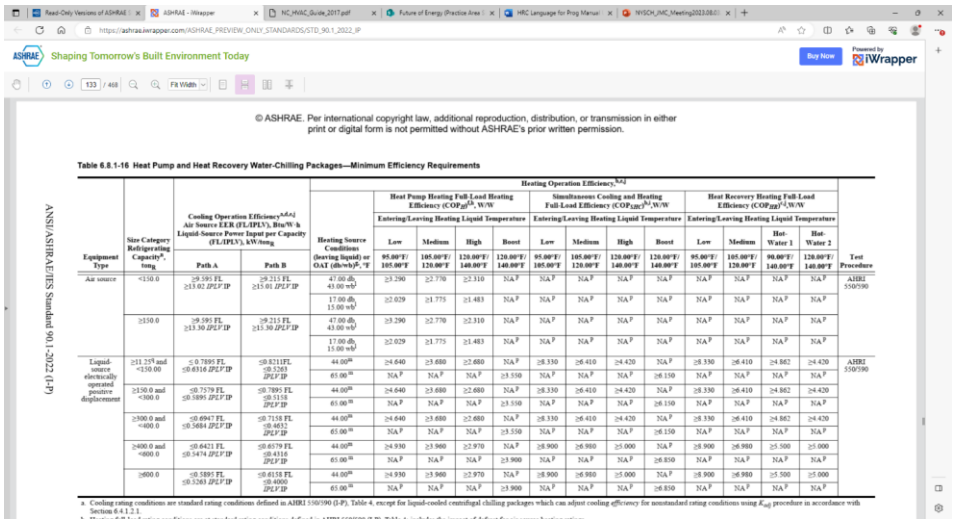
A. Definitions

- **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.
- **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.
- **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).

- **Heat Pump Chiller (HPC)** – chiller operating in mode where heat sink or source is outside of the building (i.e., well field, air or chilled water loop as source of hot or cold water for the building). Unit provides either heating or cooling but not at the same time. Savings from HPC projects will be evaluated on a case-by-case basis as part of the review of the custom project under the purview of the Program Administrator.
- **Heat Recovery Chiller (HRC)** – chiller operating in mode where heat is moved between HW and CHW loops within the thermal envelope in buildings requiring simultaneous cooling and heating. Unit provides heating and cooling at the same time. Note: HRC are exempt from minimum annual baseline heating consumption displacement thresholds applicable to each program. This calculator may be utilized for HRC projects as described in the schematic below. The project would still retain the option to be evaluated on a case-by-case basis as part of the review of the custom project under the purview of the Program Administrator.
- **Heat Pump Chiller/ Heat Recovery Chiller (HPC+HRC)** – chiller that will operate in both of the above modes for a project. This calculator does not currently have the capability to calculate savings for HPC+HRC projects. Savings from HPC+HRC projects will be evaluated on a case-by-case basis as part of the review of the custom project under the purview of the Program Administrator.

Commented [KPX22]: Removed language about the inability to calculate HPC.

B. Applicable ASHRAE 90.1 – 2022 Efficiency Requirements



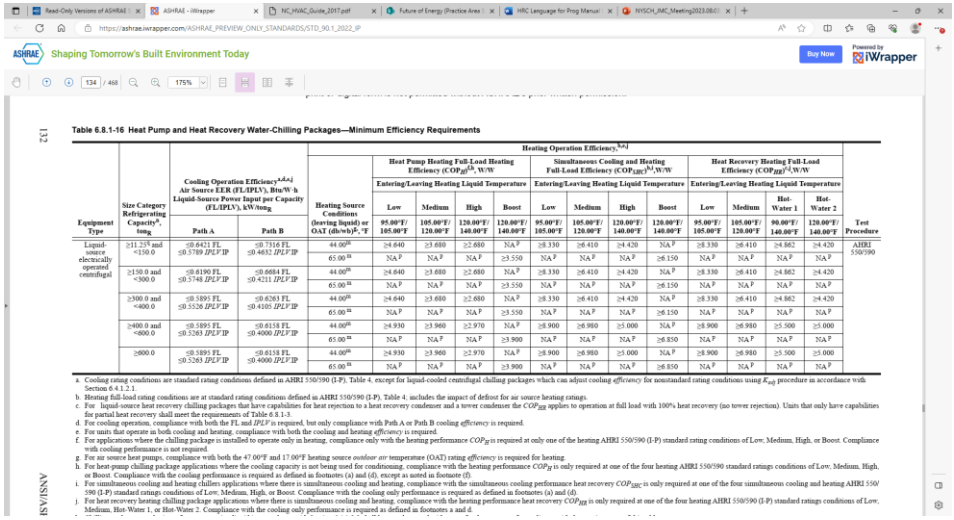
Shaping Tomorrow's Built Environment Today

ANSI/ASHRAE/IES Standard 90.1-2022 (I-P)

Table 6.8.1-16 Heat Pump and Heat Recovery Water-Chilling Packages—Minimum Efficiency Requirements

Equipment Type	Size Category Refrigerating Capacity[a], tons	Cooling Operation Efficiency[a,d,e,j] Air Source EER (FL/IPLV), Btu/W·h Liquid-Source Power Input per Capacity (FL/IPLV), kW/ton[g] Path A	Path B	Heating Source Conditions (leaving liquid) or OAT (db/wb)[b], °F	Heating Operation Efficiency[b,e,j] Heat Pump Heating Full-Load Heating Efficiency (COP_{HP})[h], W/W — Entering/Leaving Heating Liquid Temperature: Low 95.00°F/105.00°F	Medium 105.00°F/120.00°F	High 120.00°F/140.00°F	Boost 120.00°F/140.00°F	Simultaneous Cooling and Heating Full-Load Efficiency (COP_{SHC})[i], W/W — Entering/Leaving Heating Liquid Temperature: Low 95.00°F/105.00°F	Medium 105.00°F/120.00°F	High 120.00°F/140.00°F	Boost 120.00°F/140.00°F	Heat Recovery Heating Full-Load Efficiency (COP_{HR})[i], W/W — Entering/Leaving Heating Liquid Temperature: Low 95.00°F/105.00°F	Medium 105.00°F/120.00°F	Hot-Water 1 90.00°F/140.00°F	Hot-Water 2 120.00°F/140.00°F	Test Procedure
Air source	<150.0	≥9.595 FL ≥13.02 *IPLV.IP*	≥9.215 FL ≥15.01 *IPLV.IP*	47.00 db 43.00 wb	≥3.290	≥2.770	≥2.310	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	AHRI 550/590
				17.00 db 15.00 wb	≥2.029	≥1.775	≥1.483	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	
	≥150.0	≥9.595 FL ≥13.30 *IPLV.IP*	≥9.215 FL ≥13.30 *IPLV.IP*	47.00 db 43.00 wb	≥3.290	≥2.770	≥2.310	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	
				17.00 db 15.00 wb	≥2.029	≥1.775	≥1.483	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	NA[f]	
Liquid-source electrically operated positive displacement	≥11.25[k] and <150.00	≤ 0.7895 FL ≤0.6316 *IPLV.IP*	≤0.8211FL ≤0.5263 *IPLV.IP*	44.00[m]	≥4.640	≥3.680	≥2.680	NA[f]	≥8.330	≥6.410	≥4.420	NA[f]	≥8.330	≥6.410	≥4.862	≥4.420	AHRI 550/590	
				65.00[m]	NA[f]	NA[f]	NA[f]	≥3.550	NA[f]	NA[f]	NA[f]	≥6.150	NA[f]	NA[f]	NA[f]	NA[f]		
	≥150.0 and <300.0	≤0.7579 FL ≤0.5895 *IPLV.IP*	≤0.7895 FL ≤0.5158 *IPLV.IP*	44.00[m]	≥4.640	≥3.680	≥2.680	NA[f]	≥8.330	≥6.410	≥4.420	NA[f]	≥8.330	≥6.410	≥4.862	≥4.420		
				65.00[m]	NA[f]	NA[f]	NA[f]	≥3.550	NA[f]	NA[f]	NA[f]	≥6.150	NA[f]	NA[f]	NA[f]	NA[f]		
	≥300.0 and <400.0	≤0.6947 FL ≤0.5684 *IPLV.IP*	≤0.7158 FL ≤0.4632 *IPLV.IP*	44.00[m]	≥4.640	≥3.680	≥2.680	NA[f]	≥8.330	≥6.410	≥4.420	NA[f]	≥8.330	≥6.410	≥4.862	≥4.420		
				65.00[m]	NA[f]	NA[f]	NA[f]	≥3.550	NA[f]	NA[f]	NA[f]	≥6.150	NA[f]	NA[f]	NA[f]	NA[f]		
	≥400.0 and <600.0	≤0.6421 FL ≤0.5474 *IPLV.IP*	≤0.6579 FL ≤0.4316 *IPLV.IP*	44.00[m]	≥4.930	≥3.960	≥2.970	NA[f]	≥8.900	≥6.980	≥5.000	NA[f]	≥8.900	≥6.980	≥5.500	≥5.000		
				65.00[m]	NA[f]	NA[f]	NA[f]	≥3.900	NA[f]	NA[f]	NA[f]	≥6.830	NA[f]	NA[f]	NA[f]	NA[f]		
	≥600.0	≤0.5895 FL ≤0.5263 *IPLV.IP*	≤0.6158 FL ≤0.4000 *IPLV.IP*	44.00[m]	≥4.930	≥3.960	≥2.970	NA[f]	≥8.900	≥6.980	≥5.000	NA[f]	≥8.900	≥6.980	≥5.500	≥5.000		
				65.00[m]	NA[f]	NA[f]	NA[f]	≥3.900	NA[f]	NA[f]	NA[f]	≥6.830	NA[f]	NA[f]	NA[f]	NA[f]		

a. Cooling rating conditions are standard rating conditions defined in AHRI 550/590 (I-P), Table 4, except for liquid-cooled centrifugal chilling packages which can adjust cooling efficiency for nonstandard rating conditions using K_{adj} procedure in accordance with Section 6.4.1.2.1.



132

Table 6.8.1-16 Heat Pump and Heat Recovery Water-Chilling Packages—Minimum Efficiency Requirements

Equipment Type	Size Category Refrigerating Capacity[a], tons	Cooling Operation Efficiency[a,d,e,i] Air Source EER (FL/IPLV), Btu/W·h Liquid-Source Power Input per Capacity (FL/IPLV), kW/ton		Heating Operation Efficiency[b,e,i]													Test Procedure
				Heating Source Conditions (leaving liquid) or OAT (db/wb)[c], °F	Heat Pump Heating Full-Load Heating Efficiency (COP_{HP})[f,h], W/W				Simultaneous Cooling and Heating Full-Load Efficiency (COP_{SHC})[h,i], W/W				Heat Recovery Heating Full-Load Efficiency (COP_{HR})[g,i], W/W				
					Entering/Leaving Heating Liquid Temperature				Entering/Leaving Heating Liquid Temperature				Entering/Leaving Heating Liquid Temperature				
		Path A	Path B		Low	Medium	High	Boost	Low	Medium	High	Boost	Low	Medium	Hot-Water 1	Hot-Water 2	
					95.00°F/ 105.00°F	105.00°F/ 120.00°F	120.00°F/ 140.00°F	120.00°F/ 140.00°F	95.00°F/ 105.00°F	105.00°F/ 120.00°F	120.00°F/ 140.00°F	120.00°F/ 140.00°F	95.00°F/ 105.00°F	105.00°F/ 120.00°F	90.00°F/ 140.00°F	120.00°F/ 140.00°F	
Liquid-source electrically operated centrifugal	≥11.25 and <150.0	≤0.6421 FL ≤0.5789 *IPLV*.IP	≤0.7316 FL ≤0.4632 *IPLV*.IP	44.00[j]	≥4.640	≥3.680	≥2.680	NA[p]	≥8.330	≥6.410	≥4.420	NA[p]	≥8.330	≥8.410	≥4.862	≥4.420	AHRI 550/590
				65.00[k]	NA[p]	NA[p]	NA[p]	≥3.550	NA[p]	NA[p]	NA[p]	≥6.150	NA[p]	NA[p]	NA[p]	NA[p]	
	≥150.0 and <300.0	≤0.6190 FL ≤0.5748 *IPLV*.IP	≤0.6684 FL ≤0.4211 *IPLV*.IP	44.00[j]	≥4.640	≥3.680	≥2.680	NA[p]	≥8.330	≥6.410	≥4.420	NA[p]	≥8.330	≥8.410	≥4.862	≥4.420	
				65.00[k]	NA[p]	NA[p]	NA[p]	≥3.550	NA[p]	NA[p]	NA[p]	≥6.150	NA[p]	NA[p]	NA[p]	NA[p]	
	≥300.0 and <400.0	≤0.5895 FL ≤0.5526 *IPLV*.IP	≤0.6263 FL ≤0.4105 *IPLV*.IP	44.00[j]	≥4.640	≥3.680	≥2.680	NA[p]	≥8.330	≥6.410	≥4.420	NA[p]	≥8.330	≥8.410	≥4.862	≥4.420	
				65.00[k]	NA[p]	NA[p]	NA[p]	≥3.550	NA[p]	NA[p]	NA[p]	≥6.150	NA[p]	NA[p]	NA[p]	NA[p]	
	≥400.0 and <800.0	≤0.5895 FL ≤0.5263 *IPLV*.IP	≤0.6158 FL ≤0.4000 *IPLV*.IP	44.00[j]	≥4.930	≥3.960	≥2.970	NA[p]	≥8.900	≥6.980	≥5.000	NA[p]	≥8.900	≥8.980	≥5.500	≥5.000	
				65.00[k]	NA[p]	NA[p]	NA[p]	≥3.900	NA[p]	NA[p]	NA[p]	≥6.850	NA[p]	NA[p]	NA[p]	NA[p]	
	≥800.0	≤0.5895 FL ≤0.5263 *IPLV*.IP	≤0.6158 FL ≤0.4000 *IPLV*.IP	44.00[j]	≥4.930	≥3.960	≥2.970	NA[p]	≥8.900	≥6.980	≥5.000	NA[p]	≥8.900	≥8.980	≥5.500	≥5.000	
				65.00[k]	NA[p]	NA[p]	NA[p]	≥3.900	NA[p]	NA[p]	NA[p]	≥6.850	NA[p]	NA[p]	NA[p]	NA[p]	

a. Cooling rating conditions are standard rating conditions defined in AHRI 550/590 (I-P), Table 4, except for liquid-cooled centrifugal chilling packages which can adjust cooling *efficiency* for nonstandard rating conditions using K_{adj} procedure in accordance with Section 6.4.1.2.1.

b. Heating full-load rating conditions are at standard rating conditions defined in AHRI 550/590 (I-P), Table 4, includes the impact of defrost for air source heating ratings.

c. For liquid-source heat recovery chilling packages that have capabilities for heat rejection to a heat recovery condenser and a tower condenser the COP_{HR} applies to operation at full load with 100% heat recovery (no tower rejection). Units that only have capabilities for partial heat recovery shall meet the requirements of Table 6.8.1-3.

d. For cooling operation, compliance with both the FL and *IPLV* is required, but only compliance with Path A or Path B cooling *efficiency* is required.

e. For units that operate in both cooling and heating, compliance with both the cooling and heating *efficiency* is required.

f. For applications where the chilling package is installed to operate only in heating, compliance only with the heating performance COP_{H} is required at only one of the heating AHRI 550/590 (I-P) standard rating conditions of Low, Medium, High, or Boost. Compliance with cooling performance is not required.

g. For air source heat pumps, compliance with both the 47.00°F and 17.00°F heating source *outdoor air* temperature (OAT) rating *efficiency* is required for heating.

h. For heat-pump chilling package applications where the cooling capacity is not being used for conditioning, compliance with the heating performance COP_{H} is only required at one of the four heating AHRI 550/590 standard ratings conditions of Low, Medium, High, or Boost. Compliance with the cooling performance is required as defined as footnotes (a) and (d), except as noted in footnote (f).

i. For simultaneous cooling and heating chillers applications where there is simultaneous cooling and heating, compliance with the simultaneous cooling performance heat recovery COP_{SHC} is only required at one of the four simultaneous cooling and heating AHRI 550/590 (I-P) standard ratings conditions of Low, Medium, High, or Boost. Compliance with the cooling only performance is required as defined in footnotes (a) and (d).

j. For heat recovery heating chilling package applications where there is simultaneous cooling and heating, compliance with the heating performance heat recovery COP_{HR} is only required at one of the four heating AHRI 550/590 (I-P) standard ratings conditions of Low, Medium, Hot-Water 1, or Hot-Water 2. Compliance with the cooling only performance is required as defined in footnotes a and d.

ANSI/ASH