High-Performance Measure Details

Measure Name
Heat Recovery Chiller

Use Category
Space & Service Water Heating Electrification

Effective Date
November 16, 2026

Version
2.4

Measure Code
LM401

Measure Stage
Early Adoption

Table of Contents

High-Performance Measure Details....1
Technology Summary....1
Alignment with CEDA Program Goals....2
CEDA Inducement Requirements....3
Incremental Measure Cost....8
Code Readiness Objectives....10
Code Reference....13
Eligible Climate Zones, Building Types, and Project Scopes....14
Measure Exclusions....15
Appendices....16
Reviewer Checklist....21
Version History Log....23

Technology Summary

A **heat recovery chiller (HRC)** is a vapor-compression chiller or heat pump package that produces **chilled water for cooling** while delivering the heat it removes, plus compressor input, as **useful heating hot water (HHW)** for space heating, service water heating (SWH), controlled environment horticulture (CEH) dehumidification reheat, or other qualifying onsite heating loads. Because recovered heat is only available when a coincident cooling load is present, heating is generally a **secondary benefit of cooling operation** rather than the primary operating mode. When recovered heat is not sufficient, a supplemental heating source, such as an air-to-water heat pump, provides the balance.

This HPM covers two equipment configurations:

- **Liquid-source (water-cooled) HRCs**, including double-bundle, dual-condenser, and dedicated heat recovery chillers that move heat from the chilled water loop to the HHW loop.
- **Air-source 4-pipe (multipurpose) units** that can operate in cooling-only, heating-only (heat pump), or **simultaneous cooling and heating** mode. In simultaneous mode the air coil is idle and the refrigerant

circuit moves heat from the chilled water loop to the HHW loop, the same operating condition as a liquid-source HRC.

HRCs are most effective in buildings with **coincident cooling and heating loads**, including healthcare, laboratories, higher education, data and IT-intensive spaces, hospitality, CEH facilities, and mixed-use and high-rise multifamily buildings with significant SWH demand. Where cooling and heating loads are not coincident, **thermal energy storage** (HHW and/or chilled water buffer tanks) can extend the hours when recovered heat is useful.

Simultaneous performance is rated as **COP_SHC**, the cooling plus heating delivered divided by power input. Because the heat delivered equals the cooling delivered plus the compressor input, the heating-attributable efficiency is approximately **COP_H = (COP_SHC + 1) ÷ 2**. Lower HHW temperatures reduce compressor lift and raise COP; Title 24 rates simultaneous performance at **Low (95°F/105°F)**, **Medium (105°F/120°F)**, and **High (120°F/140°F)** entering/leaving HHW temperature classes.

The **2025 California Energy Code (Title 24, Part 6)** requires **simultaneous mechanical heat recovery** for qualifying newly constructed buildings (**§140.4(s)**). The requirement is based on **capacity**: the heat recovery system must be able to transfer the lesser of 25% of the peak heat rejection of the cooling system or 25% of the combined SWH and space-heating design capacity. Minimum rated efficiencies are set in **§110.2, Tables 110.2-I, 110.2-J, 110.2-K, and 110.2-L**. Table 110.2-K, the primary simultaneous-mode reference, lists **no requirement for air-source units**.

Code minimums alone do not ensure high performance. The mechanical heat recovery provision sets capacity rather than annual utilization, while some receiving-load compliance pathways also set annual recovered-energy requirements, and projects can still underuse recovered heat because of high hydronic design temperatures, oversized cooling capacity relative to heating demand, or control sequences that bypass heat recovery. This HPM supports **above-code efficiency**, **low-temperature hydronic design**, **heat-recovery-priority controls**, and **voluntary HRC adoption** where code does not require it.

Relevant standards include **AHRI 550/590 (I-P)** and **AHRI 551/591 (SI)**, **ASHRAE Standard 90.1**, **ASHRAE Guideline 36**, and **ASHRAE Standard 15**.

Alignment with CEDA Program Goals

The **California Energy Design Assistance (CEDA)** program is a Market Support program intended to support the long-term success of California's nonresidential and high-rise multifamily new construction market by advancing decarbonization, accelerating adoption of emerging and high-performance technologies, informing future codes and standards, and helping project teams achieve deeper energy and operational performance. **High-Performance Measures (HPMs)** support these objectives by creating opportunities for projects to implement, evaluate, and build market experience with technologies and design practices that extend beyond conventional practice.

Projects seeking a CEDA HPM inducement must meet the applicable requirements identified in the following section. Where aligned with Code Readiness priorities, selected projects may also provide market, design, cost, operational, or metered performance information that can help inform future California Codes and Standards activities. This measure supports **CEDA's Market Support** objectives by:

- **Increasing market demand** by giving project teams and owners a pathway beyond the §140.4(s) minimum, including higher-efficiency equipment, low-temperature hydronic design, and voluntary HRCs where code does not require them. This helps keep heat recovery designed into the central plant rather than value-engineered out.
- **Increasing market supply and delivery capability** by growing the number of engineers, contractors, and operators experienced with heat recovery plant design, sequencing, and commissioning. Manufacturers gain clearer visibility into demand for higher simultaneous-mode efficiency and low-temperature products, including air-source 4-pipe units.

- **Building market partnerships and knowledge** by connecting project teams with technical guidance on plant integration, HHW temperature selection, and control sequencing, and by collecting feedback from designers, contractors, manufacturers, and verification staff on barriers to adoption.
- **Advancing innovation and accessibility** by supporting air-source 4-pipe products whose simultaneous-mode performance is not yet regulated in Title 24, along with thermal storage and low-temperature distribution strategies that extend heat recovery utilization.
- **Supporting Code Readiness and future market transformation** by documenting installed simultaneous-mode efficiencies, design HHW temperatures, heat recovery utilization, and installed costs. This record can inform future updates to Table 110.2-K, the §140.4(s) requirements, and potential air-source simultaneous-mode requirements.

CEDA Inducement Requirements

This HPM supports heat recovery chiller systems in CEDA-eligible **nonresidential and high-rise multifamily new construction** projects that **exceed 2025 Title 24, Part 6** in equipment efficiency, hydronic temperature design, or heat recovery adoption.

Eligibility is determined by tier (Table 1) using the heat recovery obligations applicable to the claimed scope, including §140.4(s) and any selected receiving-load compliance pathway. Essential and Advanced reward efficiency or low-temperature performance above a code-compliant HRC baseline. Premium rewards a voluntary HRC installation only where the claimed recovery scope is not required or relied upon for code compliance. See §ME 2.

The **HPM performance quantity** is the HRC's rated **simultaneous cooling and heating efficiency (COP_SHC)** at the design HHW temperature class, excluding integral pump power. Essential and Advanced require COP_SHC at or above the **qualifying levels in Table 2**: **110% of the Table 110.2-K minimum** for liquid-source HRCs, or the **CEDA air-source reference** for air-source HRCs, where Table 110.2-K lists no requirement. ***Equipment or efficiency levels required by code alone do not qualify for Essential or Advanced.***

Table 1. *Heat Recovery Chiller HPM Tiers*

Tier	Applies To	Baseline	Qualifying Design	IMC Basis
Essential	Claimed recovery included in the code-compliant baseline (ME 2.1)	Code-minimum HRC (Table 110.2-K, or the CEDA air-source baseline)	HRC at or above the Table 2 qualifying level; heat recovery as the primary heating source	$5/MBH
Advanced	Claimed recovery included in the code-compliant baseline (ME 2.1)	Code-minimum HRC at a conventional (Medium or High class) HHW temperature	Essential requirements at the Low class, plus ≤105°F HHW design and heat-recovery-priority controls	$10/MBH
Premium	Voluntary HRC installation after the complete baseline screen (ME 2.2)	Code-compliant cooling-only chiller with conventional heating for the same loads	Voluntary HRC meeting Title 24 efficiency, with functional integration and a verification plan	$44/MBH

Notes: HHW=heating hot water; AWHP=air-to-water heat pump; IMC=incremental measure cost; MBH=thousand Btu per hour of rated heating output. The Heat Recovery Chiller HPM is tracked under ***LM401*** *(HVAC).*

Measure Eligibility (ME) – All Projects

1. **Qualifying Scope**
   1.1. The project shall install one or more liquid-source HRCs or air-source 4-pipe units operating in simultaneous mode that produce chilled water for a documented building cooling or CEH cooling/dehumidification load and deliver recovered heat to a useful onsite heating load.
   1.2. Recovered heat shall be delivered through a hydronic HHW system to one or more qualifying receiving loads: space heating, SWH, CEH dehumidification reheat, process or industrial heating, or pool/spa heating. Use appropriate heat-exchanger separation and fluid compatibility where required by the receiving system or applicable codes.
   1.3. Each HRC system **shall be assigned to exactly one tier** in *Table 1*.
   1.4. The cooling load and receiving heating demand shall be documented and useful under normal operation. Do not create an artificial cooling load solely to produce recovered heat; heating-only air-source operation is not counted as recovered energy.
   1.5. Manufacturer selections shall confirm suitable capacity, efficiency, fluid compatibility, and operating limits at the actual chilled-water, HHW, and receiving-interface conditions. Standard rating-class compliance does not replace this application check.
2. **Tier Assignment (Code Applicability)**
   2.1. Essential and Advanced apply where the claimed heat recovery is included in the applicable code-compliant baseline, including §140.4(s)1 or a receiving-load compliance pathway that requires recovery. This includes the required recovery under §120.6(h)1B or 1C for the selected CEH system, or §110.4(c)3 when that pool/spa compliance option is used. Code-minimum recovery alone does not qualify.
   2.2. Premium applies only where the claimed HRC installation is voluntary and no applicable requirement or selected compliance pathway relies on that recovery. Projects below the §140.4(s)1.A thresholds, or covered by the following exceptions, still require the receiving-load baseline screen:
      2.2.1. **Exception 1:** laboratory buildings with exhaust air heat recovery systems meeting §140.9(c)6; or
      2.2.2. **Exception 2:** buildings in Climate Zone 15 with SWHCAP below 600 kBtu/h.
   2.3. CEDA confirms one tier and a comparable code-compliant baseline for each HRC system using Title 24 documents, an energy model summary, or engineer-of-record certification (§SDR 2). An exemption from §140.4(s)1 does not, by itself, establish Premium eligibility.
3. **Performance Quantity and Rating**
   3.1. The HPM performance quantity is the HRC's **rated COP_SHC** at **AHRI 550/590 (I-P)** simultaneous cooling and heating full-load conditions for the design HHW class, calculated as **(cooling capacity + heating capacity) ÷ power input, excluding integral pump power**. Manufacturers may report this value as total efficiency ratio (TER).
   3.2. **Liquid-source HRCs:** efficiency shall be demonstrated using **certified ratings** listed in the **AHRI Directory** where available.
   3.3. **Air-source HRCs:** because Table 110.2-K lists no air-source requirement, efficiency shall be demonstrated using **manufacturer-published simultaneous-mode performance** at AHRI 550/590 conditions, together with certified cooling and heat pump heating ratings demonstrating compliance with **Tables 110.2-I and 110.2-J**.
   3.4. Where the design leaving HHW temperature falls between rating classes, the class with the **lowest leaving HHW temperature at or above the design temperature** applies.
   3.5. For design conditions or temperature classes not represented by Table 2, CEDA shall document the applicable rating/comparison basis before assigning eligibility; do not extrapolate an unlisted high-temperature process application from a lower-temperature rating.

4. **Code Compliance**
   4.1. All projects shall comply with 2025 Title 24, Part 6, including §110.2 Tables 110.2-I through 110.2-L as applicable; §140.4(s) and §140.4(g); and applicable receiving-load requirements, including §120.6(h), §141.1(c), and §110.4. Applicable federal and CARB refrigerant regulations and local codes also apply.
   4.2. HPM requirements do not replace code obligations. Recovery delivered to process or pool/spa loads shall not substitute for space-heating or SWH recovery required by §140.4(s). For a selected CEH pathway under §120.6(h)1B or 1C, demonstrate at least 75% annual dehumidification-reheat energy from onsite recovery; a design-condition capacity ratio alone is not that annual demonstration.
5. **Electric Resistance Heating**
   5.1. Electric resistance boilers or other electric resistance space heating may be used **only where permitted under §140.4(g)**, for example Exception 1, where electric resistance heating supplements a system in which at least 60% of the annual heating requirement is supplied by site-solar or recovered energy.
   5.2. A conventional chiller with an electric resistance heating plant is **not** an eligible baseline for this HPM.
6. **Eligible Project Types and Climate Zones**
   6.1. As defined in *Eligible Climate Zones, Building Types, and Project Scopes*.
7. **Interaction with Other HPMs and Programs**
   7.1. The same HRC, recovered energy, or incremental cost shall **not** be claimed under more than one CEDA HPM or program.
   7.2. HRC systems shall be claimed under this HPM, not the **Hydronic Heat Pump HPM**. A separate supplemental heat pump may be claimed under the Hydronic Heat Pump HPM where **no equipment is double counted**.
   7.3. Recovered heat delivered to SWH shall **not** also be claimed under the **Central Heat Pump Water Heater Systems HPM**.
   7.4. Heat reclaim from separate refrigeration or qualifying air-conditioning source systems is screened under the Refrigeration Heat Reclaim HPM. Qualifying chilled-water HRC systems serving building or CEH cooling/dehumidification and the receiving loads in ME 1.2 are screened under this HPM.
   7.5. Controls integration claimed under the Building Management Systems HPM shall not include the same HRC equipment scope. HRC-supplied dehumidification reheat may also fit the **High-Performance Dehumidification with Recovered Reheat HPM**; the same HRC, recovered energy, controls, or incremental cost shall use **one inducement path**.
   7.6. The HRC may serve as the qualifying low-temperature source for the **VAV Low-Temperature Hydronic Reheat System HPM**. Terminal reheat coils claimed under that HPM shall **not** be counted in the Advanced tier incremental cost (see *Incremental Measure Cost*).

System Design Level Requirements (SDLR) – New Construction

Each tier has a single set of design requirements. The qualifying levels in *Table 2* govern eligibility under this HPM. The **air-source reference is interim**: it is based on manufacturer simultaneous-mode data for a current air-source 4-pipe product and will be updated through a documented version revision, recorded in the *Version History Log*, as CEDA collects additional submittal data.

Table 2. *Simultaneous Cooling and Heating Efficiency – Baseline and Qualifying Levels (COP_SHC, W/W)*

Equipment Type	Basis	Low (95°F/105°F)	Medium (105°F/120°F)	High (120°F/140°F)
Liquid-source HRCs (positive displacement and centrifugal)				
Below 400 tons	Table 110.2-K minimum (*baseline*)	8.33	6.41	4.42
	CEDA qualifying level (110%)	**9.16**	**7.05**	**4.86**
400 tons and above	Table 110.2-K minimum (*baseline*)	8.90	6.98	5.00

Equipment Type	Basis	Low (95°F/105°F)	Medium (105°F/120°F)	High (120°F/140°F)
	CEDA qualifying level (110%)	**9.79**	**7.68**	**5.50**
Air-source 4-pipe HRCs (Table 110.2-K lists no requirement)				
All sizes	CEDA air-source minimum (*baseline*) (reference ÷ 1.10)	7.38	5.68	3.92
All sizes	**CEDA air-source reference (qualifying level, interim)**	**8.12**	**6.25**	**4.31**

Notes: Liquid-source values are from 2025 Title 24, Part 6, Table 110.2-K at 44°F leaving chilled water; the "below 400 tons" row covers the above 11.25 to below 400 ton size categories. The air-source Medium reference is the manufacturer-published COP_SHC (excluding pumps) of a current air-source 4-pipe product at near-Medium conditions; that product exceeds the Table 110.2-I air-source IPLV minimum by about 24%. Low and High references scale the liquid-source values by the same ratio (≈0.975). Classes not shown (e.g., Boost) are determined by CEDA during review.

1. **Essential Level: Above-Code Heat Recovery Chiller Efficiency**
   - 1.1. Provide an HRC serving a qualifying receiving load under §ME 1.2 with rated COP_SHC at or above the Table 2 qualifying level for the design HHW class: ≥110% of Table 110.2-K for liquid-source HRCs, or ≥ the CEDA air-source reference for air-source HRCs.
   - 1.2. The HRC shall comply with the applicable cooling (**Table 110.2-I**) and heating (**Table 110.2-J**) efficiency requirements.
   - 1.3. The heat recovery system shall meet applicable code-required recovery capacity, annual-energy, and receiving-load obligations. Where §140.4(s)1 applies, meet §140.4(s)1.B; also meet §140.4(s)2 where applicable.
   - 1.4. **System integration:** recovered heat shall be the **primary heating source during simultaneous operation**. Supplemental heating, such as a boiler or AWHP, shall operate only as backup or trim when recovered heat is insufficient.
   - 1.5. The **sequence of operations shall prioritize heat recovery** before enabling supplemental heating.
2. **Advanced Level: Low-Temperature Optimized Heat Recovery Design**
   - 2.1. Meet **all Essential Level requirements**, with the HRC at or above the **Low class (95°F/105°F) qualifying level** in Table 2.
   - 2.2. Design leaving HHW supply temperature shall be 105°F or lower, with hydronic distribution, heat exchangers, and receiving equipment sized to meet the qualifying heating loads at that temperature.
   - 2.3. Supplemental heating, if required, shall be provided only by an **air-to-water heat pump**, a **water-to-water heat pump**, or an **electric boiler where permitted under §140.4(g)**. Fuel-fired supplemental heating is not permitted at this tier.
   - 2.4. Controls shall **limit HHW temperature reset above the design temperature** so that heat recovery efficiency is not degraded.
3. **Premium Level: Voluntary Heat Recovery Chiller Installation**
   - 3.1. The claimed HRC installation shall be voluntary under the complete baseline screen in §ME 2.2, not merely exempt from §140.4(s)1.
   - 3.2. Provide an HRC serving one or more qualifying receiving loads under §ME 1.2.
   - 3.3. **Liquid-source HRCs** shall meet or exceed Table 110.2-K. **Air-source HRCs** shall meet Tables 110.2-I and 110.2-J and provide manufacturer simultaneous-mode performance (§ME 3.3).
   - 3.4. The HRC shall be configured to operate during **any available simultaneous cooling and heating condition**, with controls that enable a **measurable heat recovery contribution** during applicable operating hours.
4. **Utilization Enhancements (Optional – Advanced Savings Credit)**
   - 4.1. Advanced projects may document the following features to support **increased estimated heat recovery utilization** in CEDA savings calculations:

4.1.1. heat recovery capacity **above the §140.4(s)1.B minimum**;
4.1.2. HHW and/or chilled water **thermal storage** sized to time-shift recovered heat; and
4.1.3. **all space-heating loads**, including zone reheat, served from the heat recovery HHW loop.

4.2. Utilization credit requires **BTU metering and BAS trending of recovered heat** (§SDR 9).
4.3. These features are **not** required for eligibility and do not change the tier or IMC.

Supporting Documentation Requirements (SDR)

Documentation already included in the project drawings, schedules, submittals, control sequences, Title 24 compliance documents, or cost estimate **does not** need to be duplicated. This section identifies the **minimum information needed to verify** tier assignment, rated efficiency, and system integration.

All Projects

1. **Construction Documents**
   1.1. Engineered, stamped, and permitted mechanical drawings and schedules identifying each HRC, equipment tags, manufacturer, model, rated cooling/heating capacity, actual design chilled-water and HHW temperatures/flows, and each cooling and receiving load. Show hydronic integration, any separating heat exchangers, and supplemental heating.
2. **Code Applicability Confirmation**
   2.1. Title 24 compliance documentation (e.g., applicable NRCC-MCH or NRCC-PRC forms), an energy model summary, or EOR certification identifying §140.4(s) applicability and all relevant receiving-load compliance pathways. Identify required recovery capacity or annual-energy performance, the compliant baseline, and the incremental scope supporting the claimed tier.
3. **Equipment Submittals and Ratings**
   3.1. Approved **equipment submittals** stamped by the Engineer of Record (EOR) for each HRC.
   3.2. For liquid-source HRCs, provide an AHRI Directory certificate matching the installed model. For air-source HRCs, provide manufacturer simultaneous-mode data at the applicable rating class and certified ratings for Tables 110.2-I and 110.2-J. Also provide manufacturer selections confirming capacity, input power, temperatures, flow, and fluid suitability at the actual project design conditions (§ME 1.5).
4. **Sequence of Operations**
   4.1. Written sequence of operations defining simultaneous heating/cooling logic, useful-heat and receiving-load priority, supplemental-heating enable conditions, HHW reset limits, and normal heat rejection when recovery is not useful. Identify how the sequence avoids unnecessary cooling or elevated condensing temperature solely to generate or export heat.
5. **Startup and Installation Verification**
   5.1. Documentation confirming **startup by a manufacturer-authorized representative**, with a record of verified HHW supply temperature and flow at startup.
   5.2. **Nameplate photos** showing model and serial numbers, or equivalent confirmation during CEDA verification, demonstrating that installed equipment matches the submitted models.
6. **Cost Information**
   6.1. Cost information **as available**, such as a contractor estimate, quote, invoice, pay application, or schedule of values, for HRC equipment, supplemental heating, receiving-load interfaces, and controls. Identify the incremental scope beyond code-required recovery and exclude equipment or costs claimed under another HPM. Fully itemized invoices are **not** required.

Tier-Specific Documentation

Additional documentation is required **only** where the All Projects items do not already demonstrate the tier requirements.

7. **Advanced Level**
   7.1. HHW, heat-exchanger, and receiving-equipment schedules showing a design leaving HHW supply temperature of 105°F or lower.
8. **Premium Level**
   8.1. Written confirmation, with its basis, that the claimed HRC installation is voluntary under ME 2.2 and is not required or relied upon for a receiving-load compliance pathway.
   8.2. An **operational verification plan** describing how simultaneous operation will be verified after installation (e.g., BAS trending points, metering plan).
9. **Utilization Enhancements (if claimed)**
   9.1. Drawings or schedules showing each claimed feature (§SDLR 4.1), plus the **BTU meter locations and BAS trend points** for recovered heat.

Incremental Measure Cost

The Incremental Measure Cost (IMC) values below are **program calibration inputs** used to support CEDA inducement development and cost-cap screening. They represent normalized estimates of the incremental first cost of an HRC system that meets this HPM's requirements, relative to the applicable base case.

These values are intended for program planning and inducement calibration only. They are **not** contractor bids, project estimates, or reconciliation values, and actual project costs will vary with capacity, configuration, plant complexity, site conditions, procurement timing, and contractor markup. Values will be **revisited as CEDA obtains participating-project cost data**.

Equipment material costs are derived from the CPUC-approved **water-cooled chiller (SWHC005-04)** and **air-cooled Path B chiller (SWHC052-02)** deemed measure packages, escalated to current dollars. Neither package covers heat recovery chillers, so their code-minimum and Tier 1 costs serve as parallels for the HRC equipment and efficiency premiums. Values not directly established by a source are identified as **proposed CEDA calibration assumptions**.

Base Case

The Base Case reflects a **2025 Title 24 code-compliant central plant**. Code-required features are included and are not counted as incremental cost:

- **Essential and Advanced:** a code-compliant HRC meeting Table 110.2-K (liquid source) or the CEDA air-source baseline (air source), at the conventional HHW temperature appropriate to the same receiving load, with standard plant sequences. Recovery required by §140.4(s), §120.6(h), §110.4(c)3 when selected, or another applicable obligation is included in the Base Case.
- **Premium:** a code-compliant cooling-only chiller of the same cooling capacity meeting Table 110.2-D, with a conventional gas-fired boiler or AWHP plant serving the same qualifying heating loads. The baseline must be permitted for the application and must not omit required recovery. An electric resistance heating plant is not an eligible baseline (§ME 5.2).

Chiller installation labor, the cooling plant, and the heating plant needed for peak and non-simultaneous loads are present in both cases and are not counted as incremental cost.

Measure Case

The Measure Case is an HRC system meeting the System Design Level Requirements for the claimed tier:

- **Essential:** HRC selection at or above the Table 2 qualifying level. Incremental cost is limited to the **higher-efficiency equipment premium**.
- **Advanced:** the Essential premium plus **low-temperature hydronic design** (≤105°F HHW), including larger receiving coils or heat exchangers and added design coordination. Terminal reheat coils claimed under the VAV Low-Temperature Hydronic Reheat System HPM are excluded (§ME 7.6).
- **Premium:** the **HRC equipment premium** over a cooling-only chiller, plus **heat recovery integration**: heating-hot-water-side piping, pumps, valves, sensors, controls, and startup.

IMC Values and Normalization

IMC values are normalized to **$/MBH of rated heating output** in simultaneous cooling and heating mode at the design HHW rating class, consistent with Table 110.2-K and Table 2. Heating output tracks the recovered-heat scope this HPM induces. Per-ton package costs are converted at **16 MBH of heating output per ton of cooling**, the heat delivered by an HRC at the Medium class qualifying COP_SHC of 7.05 (12 MBH of cooling plus about 4 MBH of compressor input). The same heating capacity or recovered energy shall not be counted more than once across receiving loads or HPMs.

$$\textit{IMC} = (\text{Measure Material} + \text{Measure Labor}) - (\text{Base Material} + \text{Base Labor})$$

Table 3. *Incremental Measure Cost by Tier*

Tier	Unit	Base Material[2]	Base Labor[1]	Measure Material[2,3]	Measure Labor[1,3]	Full Measure Cost	IMC
Essential	MBH	$68.51	Equal	$73.52	Equal	—	**$5/MBH**
Advanced	MBH	$68.51	Equal	$76.52	Equal + $2.00	—	**$10/MBH**
Premium	MBH	$53.53	Equal	$80.02	Equal + $17.26	—	**$44/MBH**

[1] Chiller or HRC installation labor is equal in the base and measure cases and is not determined, consistent with SWHC005-04 and SWHC052-02, so a full measure cost is not shown. Advanced and Premium entries show only the added labor.

[2] Average of SWHC005-04 water-cooled chillers up to 299 tons (code minimum $788/ton; Tier 1 premium $99/ton) and SWHC052-02 air-cooled Path B chillers (code minimum $925/ton; Tier 1 premium $61/ton), escalated from 2022 to December 2025 dollars (×1.14) and divided by 16 MBH/ton.

[3] Proposed CEDA calibration assumptions: HRC equipment at 1.28 times a cooling-only chiller of the same capacity, the ratio of this HPM's prior installed-cost anchors ($3,200/ton vs. $2,500/ton); an Advanced low-temperature adder of $3.00/MBH material and $2.00/MBH labor; and Premium heat recovery integration equal to the balance of the prior $700/ton installed delta, split 40% material and 60% labor.

IMC values are rounded to the nearest dollar and calculated from unrounded costs.

Calculation basis:

- **Essential** uses the deemed-package Tier 1 level (about 10% better than code at full and part load) as the parallel for the Essential level of 110% of the Table 110.2-K minimum. The liquid-source premium ($99/ton) and air-source premium ($61/ton) average $80/ton ÷ 16 MBH/ton = **$5/MBH**. Separately, they equal about $6/MBH and $4/MBH; one rate is retained for both equipment types.
- **Advanced** adds $5/MBH for low-temperature receiving coils, heat exchangers, and design coordination to the Essential premium = **$10/MBH**. Low-class HRC selections operate at lower lift and are not assumed to add equipment cost.

- **Premium** adds the HRC equipment premium (0.28 × $856/ton = $240/ton) and heat recovery integration ($460/ton) for a total of $700/ton ÷ 16 MBH/ton = **$44/MBH**. This corrects V2.3, which divided the same $700/ton delta by 12 MBH/ton of cooling rather than heating output ($60/MBH).
- For newly eligible **CEH, process/industrial, or pool/spa** applications, confirm that the actual temperatures, comparable baseline, and incremental equipment scope are represented by the applicable rate. Atypical applications require a documented cost-basis review rather than automatic use of the Premium rate.

Sources

IMC values are informed by CPUC-approved deemed measure cost data, published price indices, prior CEDA market pricing anchors, and program experience, and are intended to reflect typical market conditions rather than project-specific pricing, including:

- eTRM SWHC005-04, *Water-Cooled Chiller* (effective 2025): https://www.caetrm.com/measure/SWHC005/04/
- eTRM SWHC052-02, *Air-Cooled Chiller, Path B* (effective 2023): https://www.caetrm.com/measure/SWHC052/02/
- U.S. Bureau of Labor Statistics, *Producer Price Index by Industry: HVAC and Commercial Refrigeration Equipment* (PCU33343334), used for escalation: https://fred.stlouisfed.org/series/PCU33343334
- RSMeans, *Building Construction Cost Data* (2023–2025 editions), basis of the prior chiller and HRC installed-cost anchors: https://www.rsmeans.com/
- ETCC, *Nonresidential Heat Recovery Chiller and Air-to-Water Heat Pump Measure Package Development*: https://etcc-ca.com/reports/nonresidential-heat-recovery-chiller-and-air-water-heat-pump-measure-package-development

Code Readiness Objectives

This measure supports CEDA's Code Readiness role by generating **project-level evidence on how heat recovery chillers perform beyond the code minimum**, including simultaneous-mode efficiency margins, real-world heat recovery utilization, low-temperature hydronic adoption, and the performance of air-source 4-pipe products that Table 110.2-K does not yet regulate.

Routine CEDA verification under this HPM is limited to the documentation in the *Supporting Documentation Requirements*. Deeper field monitoring applies **only** to projects **separately selected** for Code Readiness activities.

The objectives include the following:

- **Quantify the efficiency margin** above Table 110.2-K for liquid-source HRCs, and characterize **air-source simultaneous-mode performance** to inform a potential air-source requirement.
- **Measure heat recovery utilization**: the share of annual heating load served by recovered heat and the frequency of simultaneous operation, to assess the capacity-based §140.4(s) requirement.
- **Evaluate simultaneous performance conditions** (temperatures, load ratios, and COP) relative to rated values.
- **Assess low-temperature hydronic adoption** (≤105°F HHW) and its performance impacts.
- **Evaluate thermal storage and load-diversity strategies** that extend heat recovery utilization when cooling and heating loads are not coincident.
- **Compare climate zones and building types** to identify where mechanical heat recovery delivers the greatest decarbonization benefit.
- **Collect installed cost, product availability, and contractor experience data** to recalibrate IMC values and assess market readiness for broader requirements.

Code Readiness Site Monitoring

If selected for Code Readiness monitoring, equipment energy consumption and mechanical system performance may be monitored on-site for a period of **up to 24 months**. To support performance evaluation and data collection, projects shall provide reasonable access for the installation and operation of metering, sensors, and communication equipment.

Projects equipped with a Building Automation System (BAS), Energy Management System (EMS), or equivalent platform should enable integration of advanced metering devices through the existing system to facilitate data collection and remote access. For projects without a BAS or EMS, the Code Readiness team may install temporary stand-alone data loggers, sensors, and communication equipment as needed to monitor system performance for the duration of the monitoring period.

Instrumentation may be installed or supplemented, where necessary, to measure key system and equipment parameters sufficient to evaluate system performance and operational characteristics. All monitoring equipment will be **temporary** and installed in a manner that **minimizes disruption to normal building operations**. Monitored parameters are **not** HPM eligibility requirements.

Data Benefits

Collected data will help support:

- Evaluation of whether **Table 110.2-K efficiency levels** can be strengthened, and whether an **air-source simultaneous-mode requirement** is supportable.
- Evidence on **low-temperature hydronic design** performance compared with Medium and High class designs.
- Evaluation of **§140.4(s) thresholds**, including whether lower thresholds or utilization-based provisions would broaden cost-effective heat recovery.
- Refinement of the **CEDA air-source reference** and **recalibration of IMC values** using participating-project data.

Sample Data Points

A sample set of data points is provided below for reference. This list will be re-developed for each project based on the available infrastructure and the needs of the monitoring effort.

Data Point	Unit	Additional Specifications
Minimum/Core Data Points		
HRC electric power and energy	kW, kWh	Per unit; 1- to 15-minute intervals
Recovered heat delivered	Btu, Btu/h	BTU meter on the heat recovery HHW loop
Chilled water delivered	Btu, Btu/h	BTU meter on the chilled water loop
HHW supply and return temperature; flow	°F; gpm	At the HRC heat recovery connections
Chilled water supply and return temperature; flow	°F; gpm	At the HRC evaporator connections
Operating mode	Cooling / Simultaneous / Heating / Off	From the equipment controller or BAS
Supplemental heating energy	kWh or therms	Boiler, AWHP, or electric heater serving the HHW loop

Data Point	Unit	Additional Specifications
Outdoor air dry-bulb temperature	°F	On-site sensor or nearby weather station
Optional Data Points		
Pump power	kW	HRC-dedicated pumps
Heat rejected to tower or ambient	Btu	Condenser water or air-side rejection
Thermal storage tank temperatures	°F	Stratification sensors, if storage is installed
SWH preheat delivered	Btu	Where recovered heat serves SWH
Outdoor air relative humidity	% RH	Measured at the unit or site
Calculated Values		
COP_SHC and heating-attributable COP_H	W/W	Per interval and seasonal averages
Heat recovery utilization	%	Recovered heat ÷ total heating delivered

Code Reference

Applicable Codes and Standards

The table below identifies the California and industry requirements that affect the Base Case or Measure Case for this HPM. Applicability varies by **tier, equipment type, and project scope**. Selected excerpts are provided in the *Appendices*.

2025 Energy Code source: CEC-400-2025-010-F (July 2025)

CODE	APPLICABLE CODE REFERENCE	EFFECTIVE DATE	CODE REVIEW DATE
CA Building Energy Efficiency Standards – Title 24, Part 6	§110.2, **Tables 110.2-I, 110.2-J, 110.2-K, and 110.2-L**: heat pump and heat recovery chiller packages, cooling, heating, simultaneous, and heat recovery efficiency	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	§110.2, **Table 110.2-D**: water chilling packages (Premium baseline chiller)	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	**§140.4(s)1**: simultaneous mechanical heat recovery, including applicability thresholds (1.A), capacity (1.B), and Exceptions 1–2	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	**§140.4(s)2**: heat recovery for service water heating	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	**§140.4(g)**: electric resistance heating, including Exceptions 1–7	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	§120.6(h)1B–C and §141.1(c): selected CEH integrated HVAC/chilled-water paths require onsite recovery for at least 75% of annual dehumidification-reheat energy.	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	§110.4(c)3: pool/spa compliance option using at least 60% annual heating energy from onsite renewable or recovered energy; include the selected option in the baseline.	January 1, 2026	November 2026
CA Building Energy Efficiency Standards – Title 24, Part 6	§100.1: definitions of **recovered energy** and **simultaneous mechanical heat recovery**	January 1, 2026	November 2026
AHRI Standard 550/590 (I-P) and 551/591 (SI)	Performance rating of water-chilling and heat pump water-heating packages, including **simultaneous cooling and heating** and heat recovery ratings	Edition referenced by Title 24	November 2026
ANSI/ASHRAE/IES Standard 90.1	**§6.5.6.3 (2022)**: heat recovery for space conditioning; **§6.5.6.2 (2007)**: heat recovery for service water heating	2022 and 2007 editions	November 2026
ASHRAE Guideline 36	High-performance sequences of operation, including plant sequencing and reset strategies	Current edition	November 2026
ANSI/ASHRAE Standard 15	Safety standard for refrigeration systems (equipment rooms, refrigerant safety)	Current edition	November 2026

Eligible Climate Zones, Building Types, and Project Scopes

Eligible Climate Zones

This high-performance measure applies statewide in California Climate Zones 1–16 (Title 24). Confirm climate zone from the project compliance documents. Climate Zone 15 projects with SWHCAP below 600 kBtu/h are exempt from §140.4(s)1, but still require the receiving-load baseline screen in §ME 2 before Premium is assigned.

Eligible Building Types

This high-performance measure applies to:

- **High-Rise Multifamily:** buildings with **four (4) or more habitable stories above grade**, where an HRC serves a **central space-heating and/or SWH plant** for dwelling units and common areas.
- **Nonresidential: commercial, public, agricultural, and industrial** facilities (e.g., offices, retail, lodging, education, healthcare, laboratories, data and IT-intensive spaces, food service, warehouses, manufacturing, civic buildings, CEH facilities).

Eligibility is based on a qualifying HRC serving the cooling and receiving loads in §ME 1 and the tier assignment in §ME 2, not building type alone. CEH cooling/dehumidification and useful process/industrial or pool/spa receiving loads are not excluded solely by their end-use label. Laboratory exemptions under §140.4(s)1 also remain subject to the complete baseline screen.

Eligible Project Scopes

This high-performance measure applies to:

- **New construction**, including additions and alterations eligible for CEDA participation, is covered under the same HPM design requirements. The tier follows all applicable heat recovery obligations for the claimed project scope under §ME 2.

This high-performance measure does not apply to (not in scope):

- **Low-rise residential** (single-family and multifamily with three or fewer habitable stories above grade).
- **Equipment replacement** projects that do not meet CEDA participation eligibility.
- Systems that do not provide a documented building or CEH cooling/dehumidification load together with a useful onsite heating load through a qualifying HRC.

Measure Exclusions

The following are **not** eligible under this HPM:

1. **Cooling-only chillers or unused heat recovery hardware** that does not deliver recovered heat to a qualifying load under §ME 1.2, including heat-recovery-ready equipment, capped connections, and future provisions.
2. **Systems without useful recovered-heat delivery**, or that create an artificial cooling load solely to produce heating. Process/industrial, CEH reheat, and pool/spa receiving loads are not excluded solely by application type; they must meet §ME 1 and the actual-condition performance requirements.
3. **Code-minimum recovery or equipment alone.** Essential and Advanced systems must exceed the applicable HRC baseline and meet Table 2; Premium is unavailable where the claimed recovery is required or relied upon for code compliance.
4. **Equipment that cannot be documented** with certified ratings (liquid source) or manufacturer-published simultaneous-mode performance (air source) as required in §SDR 3, or that does not comply with Tables 110.2-I and 110.2-J.
5. **Systems that do not use recovered heat as the primary heating source** during simultaneous operation, including sequences that bypass heat recovery or enable supplemental heating first.
6. **Electric resistance heating** not permitted under §140.4(g), and any **electric resistance heating plant used as a baseline**.
7. **Refrigeration heat reclaim** systems, which are screened under the Refrigeration Heat Reclaim HPM, and **non-vapor-compression waste heat recovery** such as exhaust air, flue gas, or drain water heat recovery.
8. **Projects that fail to submit** the required supporting documentation, or that make material deviations from the approved design temperature, efficiency, or sequence-of-operation requirements.
9. **Double counting.** The same HRC, recovered energy, incremental cost, or performance benefit shall not receive overlapping inducements under this and another CEDA HPM, including the High-Performance Dehumidification with Recovered Reheat, Hydronic Heat Pump, VAV Low-Temperature Hydronic Reheat System, Refrigeration Heat Reclaim, Central Heat Pump Water Heater Systems, Pool and Spa AWHP, Extended-Range WSHP/VRF, and Building Management Systems HPMs, or under another program for the same scope unless expressly allowed by CEDA program rules.

Exclusion from this HPM does **not** necessarily mean exclusion from other CEDA offerings.

CEDA program administrators reserve the right to determine whether claimed measures constitute overlapping scope for the same equipment, controls integration, or monitoring infrastructure.

Appendices

Appendix Section 1: 2025 Title 24, Part 6; Section 140.4(s) Mechanical Heat Recovery

(s) **Mechanical heat recovery**

1. **Simultaneous mechanical heat recovery.**

A. Simultaneous mechanical heat recovery is required for newly constructed buildings that meet either i or ii:

i. CHL + 0.1 x CLL ≥ 200 tons and SWHCAP + HCAP ≥ 2200 kBtuh; or

ii. CCAP ≥ 300 tons and SWHCAP + 0.1 x HCAP ≥ 700 kBtuh

where:

CCAP = design capacity of all mechanical cooling systems.

CHL = coincident peak cooling load of all spaces with a design equipment power density > 5 watts/ft^2 and a minimum outdoor airflow requirement < 0.5 cfm/ft^2 (i.e., high load spaces).

CLL = CCAP - CHL. If the design includes capacity for future cooling systems, then assume 20 percent of future systems serve high load spaces.

SWHCAP = design capacity of all service water heating (SWH) systems, excluding systems expected to operate less than 5 hours per week, such as instant-hot water systems for emergency eyewash stations.

HCAP = design capacity of all space-heating systems.

B. The heat recovery system shall include a heat recovery chiller, or other means, capable of transferring the lesser of the following from spaces in cooling to spaces in heating and/or to the SWH system:

i. 25 percent of the peak heat rejection of the cooling system.

ii. 25 percent of (SWHCAP + HCAP).

EXCEPTION 1 to Section 140.4(s)1: Laboratory buildings with exhaust air heat recovery systems meeting Section 140.9(c)6.

EXCEPTION 2 to Section 140.4(s)1: Buildings in Climate Zone 15 with SWHCAP < 600 kBtuh.

2. **Heat recovery for service water heating.**

If the building is required to have simultaneous mechanical heat recovery by Section 140.4(s)1, and SWHCAP ≥ 500 kBtuh, then the heat recovery system shall also heat or preheat the service hot water. The heat recovery system shall have the capacity to transfer the smaller of:

A. 30 percent of the peak heat rejection of the cooling system; or

B. 30 percent of SWHCAP.

EXCEPTION to Section 140.4(s): Buildings with a computer room heat recovery system or wastewater heat recovery system capable of providing not less than 25 percent of SWHCAP + HCAP.

Appendix Section 2: 2025 Title 24, Part 6; Table 110.2-K (Simultaneous Cooling and Heating)

TABLE 110.2-K Heat Pump and Heat Recovery Chiller Packages, Simultaneous Cooling and Heating, Heating Operation– Minimum Efficiency Requirements

Equipment Type: Air Source

Size Category Refrigerating Capacity[a], Ton_R	Heating Source Conditions (leaving liquid) or OAT (db/wb)[b], F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Low, 95 F/105 F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Medium, 105 F/120 F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, High, 120 F/140 F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Boost, 120 F/140 F	Test Procedure
< 150	47 db 43 wb	NA[j]	NA[j]	NA[j]	NA[j]	AHRI 550/590
< 150	17 db 15 wb	NA[j]	NA[j]	NA[j]	NA[j]	AHRI 550/590
> 150	47 db 43 wb	NA[j]	NA[j]	NA[j]	NA[j]	AHRI 550/590
> 150	17 db 15 wb	NA[j]	NA[j]	NA[j]	NA[j]	AHRI 550/590

(CONTINUED) TABLE 110.2-K Heat Pump and Heat Recovery Chiller Packages, Simultaneous Cooling and Heating, Heating Operation– Minimum Efficiency Requirements

Equipment Type: Liquid source electrically operated positive displacement

Size Category Refrigerating Capacity[a], Ton_R	Heating Source Conditions (leaving liquid) or OAT (db/wb)[b], F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Low, 95 F/105 F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Medium, 105 F/120 F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, High, 120 F/140 F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Boost, 120 F/140 F	Test Procedure
> 11.25[h] and < 150	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	AHRI 550/590
> 11.25[h] and < 150	65[i]	NA[j]	NA[j]	NA[j]	> 6.150	AHRI 550/590
> 150 and < 300	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	AHRI 550/590
> 150 and < 300	65[i]	NA[j]	NA[j]	NA[j]	> 6.150	AHRI 550/590
> 300 and < 400	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	AHRI 550/590
> 300 and < 400	65[i]	NA[j]	NA[j]	NA[j]	> 6.150	AHRI 550/590
> 400 and < 600	44[i]	> 8.9	> 6.98	> 5	NA[j]	AHRI 550/590
> 400 and < 600	65[i]	NA[j]	NA[j]	NA[j]	> 6.85	AHRI 550/590
> 600	44[i]	> 8.9	> 6.98	> 5	NA[j]	AHRI 550/590
> 600	65[i]	NA[j]	NA[j]	NA[j]	> 6.85	AHRI 550/590

(CONTINUED) TABLE 110.2-K Heat Pump and Heat Recovery Chiller Packages, Simultaneous Cooling and Heating, Heating Operation– Minimum Efficiency Requirements

Equipment Type: Liquid source electrically operated centrifugal

Size Category Refrigerating Capacity[a], Ton_R	Heating Source Conditions (leaving liquid) or OAT (db/wb)[b], F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Low, 95 F/105 F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Medium, 105 F/120 F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, High, 120 F/140 F	Simultaneous Cooling and Heating Full Load Efficiency (COP_{SHC}) [c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Boost, 120 F/140 F	Test Procedure
> 11.25[h] and < 150	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	AHRI 550/590
> 11.25[h] and < 150	65[i]	NA[j]	NA[j]	NA[j]	> 6.150	AHRI 550/590
> 150 and < 300	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	AHRI 550/590
> 150 and < 300	65[i]	NA[j]	NA[j]	NA[j]	> 6.150	AHRI 550/590
> 300 and < 400	44[i]	> 8.33	> 6.41	> 4.42	NA[j]	AHRI 550/590
> 300 and < 400	65[i]	NA[j]	NA[j]	NA[j]	> 6.150	AHRI 550/590
> 400 and < 600	44[i]	> 8.9	> 6.98	> 5	NA[j]	AHRI 550/590
> 400 and < 600	65[i]	NA[j]	NA[j]	NA[j]	> 6.85	AHRI 550/590
> 600	44[i]	> 8.9	> 6.98	> 5	NA[j]	AHRI 550/590
> 600	65[i]	NA[j]	NA[j]	NA[j]	> 6.85	AHRI 550/590

Appendix Section 3: 2025 Title 24, Part 6; Table 110.2-J (Heat Pump Heating Operation)

TABLE 110.2-J Heat Pump and Heat Recovery Chiller Packages, Heat Pump, Heating Operation– Minimum Efficiency Requirements

Equipment Type: Air Source

Size Category Refrigerating Capacity[a], Ton_R	Heating Source Conditions (leaving liquid) or OAT (db/wb)[b], F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Low, 95 F/105 F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Medium, 105 F/120 F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, High, 120 F/140 F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Boost, 120 F/140 F	Test Procedure
< 150	47 db 43 wb	> 3.29	> 2.77	> 2.31	NA[j]	AHRI 550/590
< 150	17 db 15 wb	> 2.029	> 1.775	> 1.483	NA[j]	AHRI 550/590
> 150	47 db 43 wb	> 3.29	> 2.77	> 2.31	NA[j]	AHRI 550/590
> 150	17 db 15 wb	> 2.029	> 1.775	> 1.483	NA[j]	AHRI 550/590

(CONTINUED) TABLE 110.2-J Heat Pump and Heat Recovery Chiller Packages, Heat Pump, Heating Operation– Minimum Efficiency Requirements

Equipment Type: Liquid source electrically operated positive displacement

Size Category Refrigerating Capacity[a], Ton_R	Heating Source Conditions (leaving liquid) or OAT (db/wb)[b], F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Low, 95 F/105 F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Medium, 105 F/120 F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, High, 120 F/140 F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Boost, 120 F/140 F	Test Procedure
> 11.25[h] and < 150	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	AHRI 550/590
> 11.25[h] and < 150	65[i]	NA[j]	NA[j]	NA[j]	> 3.55	AHRI 550/590
> 150 and < 300	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	AHRI 550/590
> 150 and < 300	65[i]	NA[j]	NA[j]	NA[j]	> 3.55	AHRI 550/590
> 300 and < 400	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	AHRI 550/590
> 300 and < 400	65[i]	NA[j]	NA[j]	NA[j]	> 3.55	AHRI 550/590
> 400 and < 600	44[i]	> 4.93	> 3.96	> 2.97	NA[j]	AHRI 550/590
> 400 and < 600	65[i]	NA[j]	NA[j]	NA[j]	> 3.9	AHRI 550/590
> 600	44[i]	> 4.93	> 3.96	> 2.97	NA[g]	AHRI 550/590
> 600	65[i]	NA[j]	NA[j]	NA[j]	> 3.9	AHRI 550/590

(CONTINUED) TABLE 110.2-J Heat Pump and Heat Recovery Chiller Packages, Heat Pump, Heating Operation– Minimum Efficiency Requirements

Equipment Type: Liquid source electrically operated centrifugal

Size Category Refrigerating Capacity[a], Ton_R	Heating Source Conditions (leaving liquid) or OAT (db/wb)[b], F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Low, 95 F/105 F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Medium, 105 F/120 F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, High, 120 F/140 F	Heat Pump Heating Full Load Heating Efficiency (COP_H)[c,d,e,f,g], W/W, Entering/Leaving Heating Liquid Temperature, Boost, 120 F/140 F	Test Procedure
> 11.25[h] and < 150	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	AHRI 550/590
> 11.25[h] and < 150	65[i]	NA[j]	NA[j]	NA[j]	> 3.55	AHRI 550/590
> 150 and < 300	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	AHRI 550/590
> 150 and < 300	65[i]	NA[j]	NA[j]	NA[j]	> 3.55	AHRI 550/590
> 300 and < 400	44[i]	> 4.64	> 3.68	> 2.68	NA[j]	AHRI 550/590
> 300 and < 400	65[i]	NA[g]	NA[g]	NA[g]	> 3.55	AHRI 550/590
> 400 and < 600	44[i]	> 4.93	> 3.96	> 2.97	NA[j]	AHRI 550/590
> 400 and < 600	65[i]	NA[j]	NA[j]	NA[j]	> 3.9	AHRI 550/590
> 600	44[i]	> 4.93	> 3.96	> 2.97	NA[j]	AHRI 550/590
> 600	65[i]	NA[j]	NA[j]	NA[j]	> 3.9	AHRI 550/590

Appendix Section 4: 2025 Title 24, Part 6; Table 110.2-I (Cooling Operation)

TABLE 110.2-I Heat Pump and Heat Recovery Chiller Packages, Cooling Operation - Minimum Efficiency Requirements

Equipment Type	Size Category Refrigerating Capacity[a], ton_R	Cooling Operation Efficiency[b,c,d,e], Air Source EER (FL/IPLV), Btu/W h, Liquid Source Power Input per Capacity (FL/IPLV), kW/ton_R Path A	Cooling Operation Efficiency[b,c,d,e], Air Source EER (FL/IPLV), Btu/W h, Liquid Source Power Input per Capacity (FL/IPLV), kW/ton_R Path B	Test Procedure
Air Source	< 150	> 5.595 FL > 13.02 IPLV.IP	> 9.215 FL > 15.01 IPLV.IP	AHRI/550/590
Air Source	> 150	> 5.595 FL > 13.30 IPLV.IP	> 9.215 FL > 15.30 IPLV.IP	AHRI/550/590
Liquid source electrically operated positive displacement	> 11.25[f] and < 150	< 0.7895 FL < 0.6316 IPLV.IP	< 0.8211 FL < 0.5263 IPLV.IP	AHRI/550/590
Liquid source electrically operated positive displacement	> 150 and < 300	< 0.7579 FL < 0.5895 IPLV.IP	< 0.7895 FL < 0.5158 IPLV.IP	AHRI/550/590
Liquid source electrically operated positive displacement	> 300 and < 400	< 0.6947 FL < 0.5684 IPLV.IP	< 0.7158 FL < 0.4632 IPLV.IP	AHRI/550/590
Liquid source electrically operated positive displacement	> 400 and < 600	< 0.6421 FL < 0.5474 IPLV.IP	< 0.6579 FL < 0.4316 IPLV.IP	AHRI/550/590
Liquid source electrically operated positive displacement	> 600	< 0.5895 FL < 0.5263 IPLV.IP	< 0.6158 FL < 0.4000 IPLV.IP	AHRI/550/590
Liquid source electrically operated centrifugal	> 11.25[f] and < 150	< 0.6421 FL < 0.5789 IPLV.IP	< 0.7316 FL < 0.4632 IPLV.IP	AHRI/550/590
Liquid source electrically operated centrifugal	> 150 and < 300	< 0.6190 FL < 0.5748 IPLV.IP	< 0.6684 FL < 0.4211 IPLV.IP	AHRI/550/590
Liquid source electrically operated centrifugal	> 300 and < 400	< 0.5895 FL < 0.5526 IPLV.IP	< 0.6263 FL < 0.4105 IPLV.IP	AHRI/550/590
Liquid source electrically operated centrifugal	> 400 and < 600	< 0.5895 FL < 0.5263 IPLV.IP	< 0.6158 FL < 0.4000 IPLV.IP	AHRI/550/590
Liquid source electrically operated centrifugal	> 600	< 0.5895 FL < 0.5263 IPLV.IP	< 0.6158 FL < 0.4000 IPLV.IP	AHRI/550/590

a. The size category is the full-load net refrigeration cooling mode capacity, which is the capacity of the evaporator available for cooling of the thermal load external to the chilling package.
b. 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 the K_{adj} procedure in accordance with Section 110.2(a).
c. 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.
d. For units that operate in both cooling and heating, compliance with both the cooling and heating efficiency is required.

Appendix Section 5: ASHRAE Standard 90.1-2022, Section 6.5.6.3

6.5.6.3 Heat Recovery for Space Conditioning. Where heating water is used for *space* heating, a heat-pump chiller meeting the requirements of Table 6.8.1-16 for heat recovery that uses the cooling *system* return water as the heat source shall be installed, provided all of the following are true:

a. The *building* is an acute inpatient hospital, where the *building* or portion of a *building* is used on a 24-hour basis for the inpatient medical, obstetric, or surgical care for patients.
b. The total design chilled-water capacity for the acute inpatient hospital, either air cooled or water cooled, required at cooling *design conditions* exceeds 3,600,000 Btu/h of cooling.
c. Simultaneous heating, including *reheat*, and cooling occurs above 60°F *outdoor air temperature.*

The required heat recovery *system* shall have a cooling capacity that is at least 7% of the total design chilled-water capacity of the acute inpatient hospital at peak *design conditions*.

Exception to 6.5.6.3: Buildings in Climate Zones 5C, 6B, 7, and 8.

Appendix Section 6: ASHRAE Standard 90.1-2007, Section 6.5.6.2

6.5.6.2 Heat Recovery for Service Water Heating

6.5.6.2.1 Condenser heat recovery systems shall be installed for heating or preheating of service hot water provided all of the following are true:

a. The facility operates 24 hours a day.
b. The total installed heat rejection capacity of the water-cooled systems exceeds 6,000,000 Btu/h of heat rejection.
c. The design service water heating load exceeds 1,000,000 Btu/h.

6.5.6.2.2 The required heat recovery system shall have the capacity to provide the smaller of

a. 60% of the peak heat rejection load at design conditions or
b. preheat of the peak service hot water draw to 85°F.

Exceptions:

a. Facilities that employ condenser heat recovery for space heating with a heat recovery design exceeding 30% of the peak water-cooled condenser load at design conditions.
b. Facilities that provide 60% of their service water heating from *site-solar* or *site-recovered energy* or from other sources.

Reviewer Checklist

HPM Reviewer Checklist: LM401 – Heat Recovery Chiller – V2.4

Checklist Description: This checklist captures the minimum design and post-installation elements used to confirm HPM inducement eligibility and identify projects for optional Code Readiness monitoring.

Project Name: _____ **Review Date:** _____

Assessment:

☐ Approved

☐ Not approved

Notes:

Reviewer: _____ **Signature:** _____

Reviewer Checklist – High-Performance Measure Requirements

Use this checklist to confirm that the submitted project scope, design documents, and supporting documentation demonstrate compliance with the claimed tier. Review only the items applicable to the claimed project scope.

Project Eligibility

☐ Nonresidential or high-rise multifamily (**4+ habitable stories**) new construction, including CEDA-eligible additions and alterations (§ME 6; *Eligible Project Scopes*)

☐ Climate zone confirmed from Title 24 documents (*Eligible Climate Zones*)

☐ Documented building or CEH cooling/dehumidification load, useful receiving load under ME 1.2, hydronic delivery, and actual-condition manufacturer selections (§ME 1.1-1.5; Excl. 1-2)

Tier Assignment (one tier per HRC system; §ME 1.3)

☐ Complete recovery baseline documented, including §140.4(s), selected CEH/pool pathways, and other applicable obligations (§ME 2; §SDR 2)

- ☐ Recovery included in code-compliant baseline: Essential or Advanced; no code-minimum-only claim (§ME 2.1)
- ☐ No applicable obligation or selected compliance path relies on claimed recovery: Premium (§ME 2.2)

Performance Quantity and Ratings

☐ Rated **COP_SHC** at AHRI 550/590 simultaneous conditions for the design HHW class, **excluding pump power** (§ME 3.1, 3.4)

- ☐ **Liquid source:** AHRI Directory certificate (§ME 3.2)
- ☐ **Air source:** manufacturer simultaneous-mode performance, plus Tables 110.2-I and 110.2-J compliance (§ME 3.3)

HPM Reviewer Checklist: LM401 – Heat Recovery Chiller – V2.4

Tier Requirements (check the tier claimed)

☐ Essential: COP_SHC meets Table 2; applicable equipment efficiencies and recovery obligations met; useful, recovered heat prioritized (§SDLR 1.1-1.5)

☐ **Advanced:** all Essential items at the **Low class** qualifying level (§SDLR 2.1); design HHW supply **≤105°F**, with distribution sized accordingly (§SDLR 2.2); supplemental heating limited to AWHP, WWHP, or a permitted electric boiler (§SDLR 2.3); HHW reset limited (§SDLR 2.4)

☐ Premium: complete voluntary-recovery screen passed; efficiency and functional integration requirements met (§SDLR 3.1-3.4)

Example: an air-source 4-pipe HRC rated at COP_SHC 6.30 (excluding pumps) at the Medium class, in a building required to provide heat recovery, meets the Essential qualifying level of 6.25 in Table 2.

Utilization Enhancements (optional; Advanced savings credit)

☐ Claimed features documented: capacity above §140.4(s)1.B, thermal storage, and/or all heating loads on the heat recovery loop (§SDLR 4.1; §SDR 9)

☐ **BTU metering and BAS trending** of recovered heat provided (§SDLR 4.2)

Code and Scope Coordination

☐ Applicable annual-energy requirements distinguished from design capacity; required space/SWH recovery not displaced by another receiving load (§ME 4-5; Excl. 6)

☐ Same HRC, recovered energy, controls, and IMC not claimed under another HPM or program (§ME 7; Excl. 9)

☐ Rated heating-output MBH recorded; expanded-application cost basis checked; required hardware, VAV terminal reheat coils, and overlapping receiving loads not counted twice (IMC)

Supporting Documentation

☐ Construction documents and schedules (§SDR 1)

☐ Code applicability confirmation (§SDR 2)

☐ Approved submittals and ratings (§SDR 3)

☐ Sequence of operations (§SDR 4)

☐ Startup and installation verification (§SDR 5)

☐ Cost information, as available (§SDR 6)

☐ Tier-specific documentation, where applicable (§SDR 7–9)

Note: Deeper trend logging or metering beyond §SDR 9 is required only if the project is separately selected for Code Readiness monitoring.

Version History Log

Version	Effective Date	End Date	Change Description
1.0	July 14, 2023	June 15, 2025	N/A
2.0	June 16, 2025	March 15, 2026	New format, requirements, and checklist
2.2	March 16, 2026	November 8, 2026	Updated code references, formatting changes, revised checklist, and addition of incremental measure cost
2.3	November 9, 2026	November 15, 2026	Updated to the current CEDA HPM format (ME, SDLR, and SDR structure); added an **air-source HRC pathway** with an interim CEDA air-source reference (*Table 2*); defined the Essential qualifying level (**110% of Table 110.2-K**) and the performance quantity (COP_SHC excluding pumps); corrected §140.4(s) references and added tier assignment for code exceptions; added **§140.4(g)** electric resistance limits; added optional utilization enhancements; clarified IMC normalization and linked IMC sources; expanded eligible building types and project scopes; updated the reviewer checklist.
2.4	November 16, 2026	Active	Expanded qualifying recovered-heat receiving loads to include CEH dehumidification reheat, process/industrial, and pool/spa heating, with useful-load, actual-condition, and code-baseline safeguards. Coordinated tier assignment, HPM routing (including Refrigeration Heat Reclaim, High-Performance Dehumidification, and VAV Low-Temperature Hydronic Reheat), documentation, and checklist language. Rebuilt the IMC in the current base/measure material and labor format using **SWHC005-04** and **SWHC052-02** chiller cost data; Essential and Advanced IMCs are unchanged, and the **Premium IMC is corrected to $44/MBH** to normalize the existing cost delta to rated heating output. Efficiency thresholds are unchanged.

***Note**: The version identified as 'Active' is the current published version and remains in effect until superseded by a subsequent published version. CEDA may update, replace, or retire High-Performance Measures without prior notice. End dates are assigned to prior versions once superseded.*