TITLE 24, PART 6 | 2028 CODE CYCLE

Refrigeration Comment Letter

Codes and Standards Enhancement (CASE) Proposal

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CALIFORNIA ENERGY CODES & STANDARDS
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Proposal Description

- Background Information
- Code Change Proposals
- Benefits

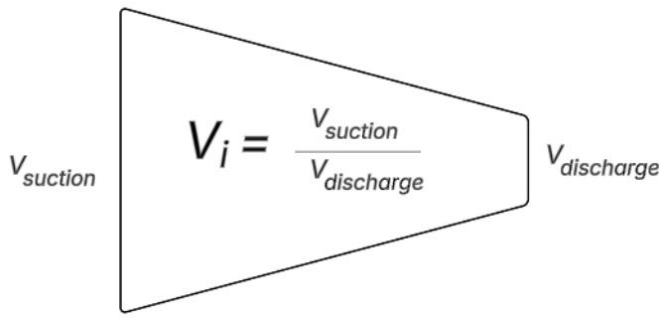
Background

- Refrigeration measures first introduced in 2008 (refrigerated warehouse) and 2013 (commercial refrigeration)
- Two different sections:
  - 120.6(a) – refrigerated warehouses
  - 120.6(b) – commercial refrigeration (retail food)
- Intent is to streamline, eliminate loopholes, increase flexibility, etc.
  - Have heard confusion from vendors and concerns regarding ability to sell into California market
- Any measures ultimately pursued will *not* increase costs or stringency of the code

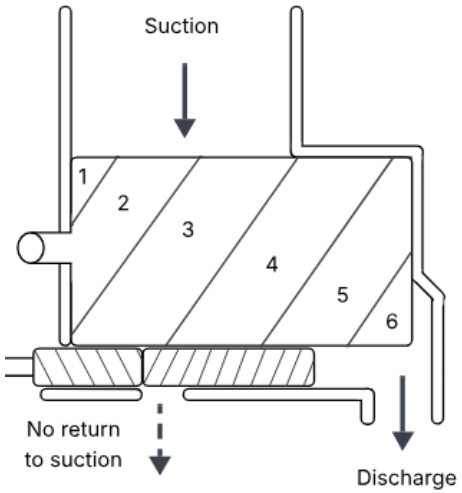
See Title24stakeholders.com for proposal description, justification, draft code language, and requested data

Proposed Code Change – Compressor Variable Vi

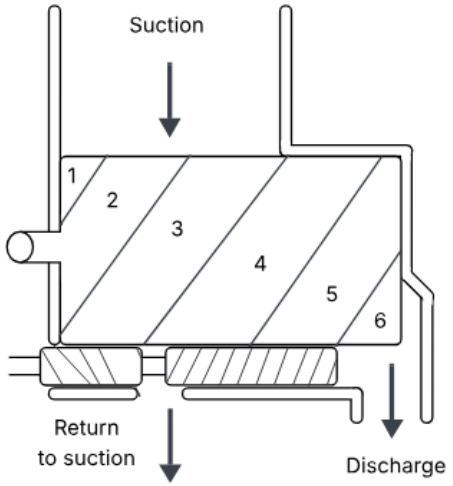
- Currently, screw compressors used for refrigerated warehouses must be able to adjust compressor volume index (Vi) for compressor motors > 150 hp
  - 120.6(a)5D
- 150 hp threshold was originally based on use of ammonia single-stage compressors
- Propose modified code trigger using displacement instead of hp parameter
  - Displacement trigger to be based on representative ammonia system
  - Displacement threshold better reflects compressor size across different refrigerants and application conditions
- Propose to exempt transcritical CO_2 screw compressors—large pressure differential makes technology infeasible
  - Compressors may already be optimized for individual applications



Full Load & Low V_i



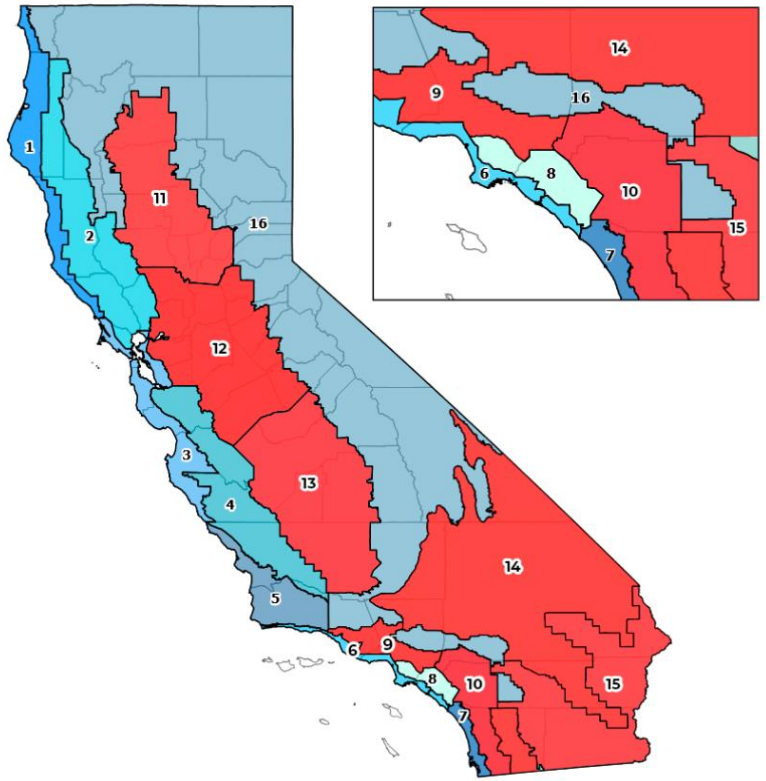
Part Load & High V_i



Proposed Code Change – CO_2 Gas Coolers

- Air-cooled prohibition first added in 2022.
  - Functionally, this is a requirement to use adiabatic gas coolers in warmer climate zones.
  - 120.6(a)(8), 120.6(b)(5)
- Propose to allow for alternatives to adiabatic gas cooler for transcritical CO_2 systems.
  - Would create multiple options for complying with mandatory requirement.
  - Would increase flexibility, reduce system costs.
  - Could include use of larger surface area or emerging technologies such as ejectors and parallel compression.
  - Would cover remote and integral gas coolers.
- Considering setting a size threshold for adiabatic and other gas cooler requirements.
  - Availability at smaller sizes can be problematic.
- Currently modeling to set energy-equivalent alternative requirements.

Refrigerated Warehouses: CZs 9-15
Commercial: CZs 10-15



Source: Adapted from CEC, "Building Climate Zones: California," 2020

Proposed Code Change – Acceptance Testing

- Propose to modify acceptance testing requirements to align with field conditions
- Current tests are often impractical to conduct
  - Cannot fully validate control sequences
- Methodology needed to account for test day weather and load conditions vs. design day weather and load conditions

Proposed Code Change – RWH Condenser Requirements

- Table 120.6-B (fan power condenser minimum efficiency requirements) has led to some confusion
  - Propose to add a footnote to clarify definition of condenser efficiency
  - Also propose to clarify "condenser efficiency is defined as the total heat of rejection (THR) capacity divided by all electrical input power including power of all fans at 100% fan speed, and power of spray pumps for evaporative condensers"

2025 Title 24—Refrigerated Warehouses

Table 120.6-B FAN-POWERED CONDENSERS – MINIMUM EFFICIENCY REQUIREMENTS

CONDENSER TYPE	REFRIGERANT TYPE	MINIMUM EFFICIENCY	RATING CONDITION
Outdoor Evaporative-Cooled with THR Capacity > 8,000 MBH	All	350 Btuh/watt	100°F Saturated Condensing Temperature (SCT), 70°F Outdoor Wetbulb Temperature
Outdoor Evaporative-Cooled with THR Capacity < 8,000 MBH and Indoor Evaporative-Cooled	All	160 Btuh/watt	100°F Saturated Condensing Temperature (SCT), 70°F Outdoor Wetbulb Temperature
Outdoor Air-Cooled	Ammonia	75 Btuh/watt	105°F Saturated Condensing Temperature (SCT), 95°F Outdoor Drybulb Temperature
Outdoor Air-Cooled	Halocarbon	65 Btuh/watt	105°F Saturated Condensing Temperature (SCT), 95°F Outdoor Drybulb Temperature
Adiabatic Dry Mode	Halocarbon	45 Btuh/watt	105°F Saturated Condensing Temperature (SCT), 95°F Outdoor Drybulb Temperature
Indoor Air-Cooled	All	No requirement	No requirement

Benefits of the Proposed Changes

- Changes would maintain energy savings while:
  - Allowing use of new energy efficient technologies
  - Making it easier to understand and comply with requirements
  - Improving acceptance tests
  - Improving compliance with code

Marked-up Code Language

See Title24stakeholders.com for marked-up code language

The following sections would be modified

Title 24, Part 1	Title 24, Part 6	Reference Appendices
▪ No changes	▪ Section 100.1(b) – Definitions ▪ Section 120.6(a) – Refrigerated Warehouses ▪ Section 120.6(b) – Commercial Refrigeration	▪ NA7.10 (Refrigerated Warehouses Acceptance Tests) ▪ NA7.20 (Transcritical CO_2 Acceptance Tests

Stakeholder Outreach

- Current outreach efforts

Outreach Efforts

- CASE Team has met with some vendors that would be affected by these changes
- CASE Team is planning further outreach to include additional vendors, design/build contractors, and other stakeholders
- If you haven’t been contacted or would like to speak, please reach out
  - Contact information available at end of presentation

Energy and Energy Cost Savings

- Using CEC's methodology and metrics.
- Adiabatic gas cooler alternatives:
  - Currently modeling systems to propose energy equivalent alternative compliance options
  - Model uses prototypes from previous CASE Report (Refrigeration System Opportunities, 2022)
- Other code changes:
  - Would increase flexibility
  - Are not expected to impact energy use
  - Are not expected to increase costs

Compliance

- Key Aspects of Compliance Verification
- Revisions to Compliance Software

Key Aspects of Compliance Verification

- Compliance forms will need updates:
  - NRCC, NRCI, NRCA
- Acceptance testing is performed by field technician (part of installation team)
- Goal is to streamline acceptance testing to reduce compliance burden
- No implications for compliance modeling software

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More information on
CEC's 2028 proceeding website.

We want to hear from you!

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