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AHRI Comments â€™ Title 24-2022 15-Day Express Terms [Docket No 21-BSTD-01]

Please see attached comments.

Additional submitted attachment is included below.



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July 28, 2021

California Energy Commission
Docket Unit, MS-4
Re: Docket No. 19-BSTD-03
1516 Ninth Street
Sacramento, California 95814-5512

(submitted electronically to Docket 21-BSTD-01)

Re: AHRI Comments – Title 24-2022 15-Day Express Terms *[Docket No. 21-BSTD-01]*

Dear CEC Staff:

The Air-Conditioning, Heating, and Refrigeration Institute (AHRI) respectfully submits comments in response to the California Energy Commission (CEC) 15-day language in the Notice of Proposed Action – Express Terms published on July 13, 2021. AHRI notes an updated version to supersede the July 13th version was docketed on July 14; technically giving the public only 14-days to respond to the revised language.

AHRI represents 332 air-conditioning, heating, and refrigeration equipment manufacturers. In North America, the annual output of the heating, ventilation, air-conditioning, refrigeration (HVACR) and water heating industry is worth more than \$44 billion. In the United States, the industry supports 1.3 million jobs and \$256 billion in economic activity annually. AHRI represents the majority of North American HVACR and water heating equipment manufacturers, all of which impacted by changes to California's Energy Code, California Code of Regulations (CCR), Title 24, Part 6.

AHRI and its members support the reduction of greenhouse gas emissions and welcome opportunities to partner with stakeholders on working toward that goal. AHRI's members continuously review and design new higher efficiency equipment that improves consumer comfort without compromising consumer choice, product quality, or safety. In fact, AHRI members offer the most technologically advanced and efficient HVACR and water-heating equipment available anywhere in the world.

Removal of Prescriptive Path and Performance Path for Certain Equipment Types – Sections 140.4(a)2, 150.1(c) 7 and 8, and 170.2(c)3A and (d)

AHRI notes that minor modifications were made to the 15-day language. For certain commercial spaces (Retail and Grocery) in climate zones 1 and 16 with cooling capacities less than 65,000 Btu/h, the proposed prescriptive compliance path for space conditioning is a furnace with an air conditioner rather than the previously proposed dual fuel heat pump. These modifications do not satisfy AHRI's concerns. We continue to oppose the proposed revisions to the Energy Code that remove certain types of equipment—primarily equipment that utilizes natural gas—from the prescriptive compliance path and pose impermissible barriers to installing this same equipment under the performance compliance path (Proposed Revisions). The Proposed Revisions concern the energy use of products covered by the Energy Policy and Conservation Act (EPCA), 42 U.S.C. § 6201 *et seq.*, and are therefore preempted by federal law. AHRI commented extensively on the legal issues surrounding this section in response to the 45-day language. AHRI stands by those comments and incorporates them here by reference.¹ While we acknowledge that the Commission's intention in enacting the Proposed Revisions may align with state goals, we reiterate that if enacted as written the Proposed Revisions will be legally invalid.

The Proposed Revisions to the Energy Code prohibit the use of certain products under the prescriptive compliance path, which would have a significant impact on the market for those products, reducing consumer choice and potentially forcing consumers to use less effective or less energy efficient products. EPCA's preemption provisions exist to ensure that DOE can make decisions that balance the benefits and burdens of efficiency standards, rather than allowing states to make decisions that could have such unintended market consequences.

Separately, for Californians with limited financial resources, limiting products will increase prices and incentivize the continuous repair of less efficient equipment rather than the purchase of new energy-efficient models. Older existing equipment containing refrigerants will also likely continue to leak as patched equipment continues to be operated. Finally, limiting access to equipment types would increase costs for people given the relative cost of natural gas versus electricity in the California marketplace.

CEC acknowledges that the prescriptive package offers a simpler path than the performance approach.² This simpler design pathway should permit the use of all space heating and water heating options, as required by EPCA. Two recent studies, funded by U.S. Department of Energy (DOE), evaluated various questions regarding compliance with energy codes, including market preferences for the performance path compared to

¹ TN 238322 Air-Conditioning, Heating, and Refrigeration Institute Comments - AHRI Comments – Title 24-2022 45-Day Express Terms [Docket No 21-BSTD-01]. Available at: <https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=21-BSTD-01>.

² See CEC, 2019 Residential Compliance Manual for the 2019 Building Energy Efficiency Standards, pg. 1-19 (acknowledging that “[t]he prescriptive approach . . . is less flexible but simpler than the performance approach” and “[t]he performance approach is more complicated but offers considerable design flexibility.”), available at https://www.energy.ca.gov/sites/default/files/2021-07/2019_Residential_Compliance_Manual-Complete_without_forms_ada.pdf.

the prescriptive path.³ In a recent online survey conducted by the Florida Energy Systems Consortium (FESC) of 907 Energy Code Officials, almost half of questioned respondents estimated that 100 percent of projects use the prescriptive path.⁴ Twenty percent of questioned respondents estimated 60 to 80 percent of projects use the prescriptive path.⁵ The second study, being conducted by Home Innovation Research Labs surveying builders is still underway, but both studies were presented as part of a single session at the Residential Energy Services Network (RESNET) Conference earlier this year. A video recording of the session is available through the RESNET website for registered users. One slide, below, presented data for the Pacific region supports that a large percentage of builders use the prescriptive path.

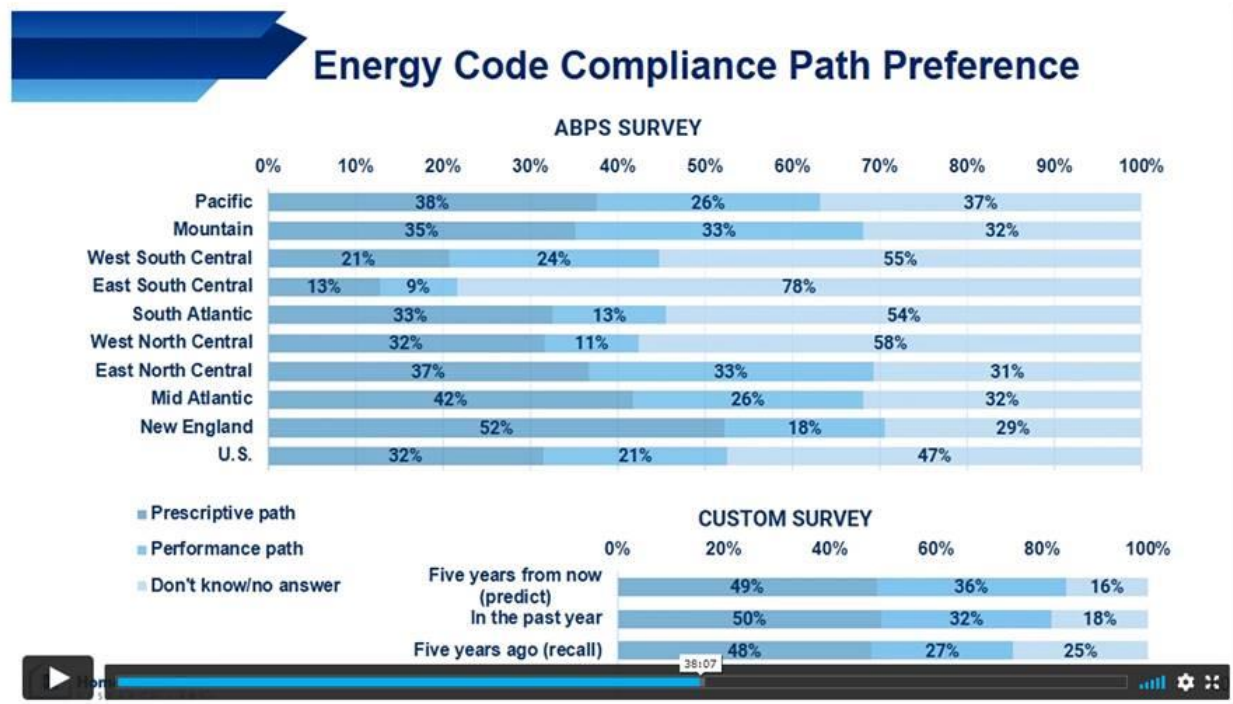


Figure 1 Excerpt slide from 2021 RESNET Conference presentation

Not only is it clear that the prescriptive pathway is preferred nationally, but it is also clear that the prescriptive method is being used in California. The FESC Energy Research Center survey authors sought to understand why the prescriptive pathway is preferred. The most common answer by the survey respondents was that the prescriptive pathway is more clear and easier to comply with.

The legislative history of EPCA makes clear that Congress allowed only “performance-based codes” that “authorize builders to adjust or trade off the efficiencies

³ Fenaughty, Karen, *et al.* FESC Energy Research Center. *Market Driven Residential Energy Codes: Comparing Performance in a Changing Technical Environment Code Official Survey Results*. FSEC-CR-2101-20. Task 2 Final Report. December 10, 2020, available at <https://publications.energyresearch.ucf.edu/wp-content/uploads/2020/12/FSEC-CR-2101-20.pdf>.

⁴ Id.

⁵ Id.

of the various building components so long as an energy objective is met.” S. Rep. No. 100-6 at 10-11 (1987). In doing so, Congress sought to preempt state policies that were “unfairly weighted resulting in undue pressure on builders to install covered products exceeding Federal standards.” *Id.* at 11. The Senate report goes on to emphasize the need for “even-handed” standards that were not “unfairly weighted” to particular products. *Id.* at 10-11. The legislation sought to avoid “the unavailability in the State of a product type or of products of a particular performance class,” *Id.* at 2..

AHRI notes that what CEC has proposed in the Express Terms would not prohibit all “Natural Gas Infrastructure” in new buildings. Nevertheless, by preventing the installation of both a gas-fired furnace and a gas-fired water heater in the same building if using the prescriptive pathway, CEC is seeking to directly regulate either the energy use or energy efficiency of covered consumer and commercial appliances. Given that gas hookups would continue to be permitted in new consumer and commercial construction, there would be no expected reduction in the fossil fuel infrastructure and no significant emissions reductions for the state.

As AHRI noted in the 45-day comments, the Proposed Revisions to the performance compliance approach likewise prohibit the use of certain natural gas equipment. By determining the energy budget for a Standard Design Building “by applying the mandatory and prescriptive requirements to the Proposed Design Building,”⁶ the objectionable requirements of the prescriptive pathway have been inserted into the performance pathway. Builders have estimated that electing to use the performance pathway as proposed to install gas water and space heating products that meet DOE efficiency standards would cost approximately \$2,500 to \$3,000 in additional offsetting efficiency measures. These impacts to builders have not been properly quantified in the analysis or in the Express Terms Financial Impact statement. Additionally, the additional costs and administrative burdens of using the performance approach compared to the prescriptive compliance pathway is analogous to the type of false choice that the court in *Air Conditioning, Heating and Refrigeration Institute v. City of Albuquerque* found did not shield a restrictive local building code standard from federal preemption under EPCA. *Air Conditioning, Heating, and Refrigeration Inst. v. City of Albuquerque*, 835 F.Supp.2d 1133 (D. N. M. 2000) (“The City has not persuaded the Court that a local law is not preempted when it presents regulated parties with viable, non-preempted options.”)

To reinforce AHRI comments submitted in response to the 45-day language proposals, AHRI agrees with CEC’s assessment that moving to an all-electric baseline in 2022 is premature.⁷ On January 26, 2021, CEC correctly identified that neither the market nor the workforce is ready to support electric-only new construction. Technicians installing and servicing heat pumps must be trained to the latest of both technical and professional standards. Title 24 is also not ready for policies limiting a consumer’s choice to freely

⁶ *Id.* at Section 140.1(a).

⁷ As a report prepared for CEC has acknowledged, “changes to mandatory or prescriptive code requirements or to the baselines used in the performance approach must be cost-effective and technically feasible while avoiding issues with Federal preemption.” Roger Hedrick *et al.*, *Heat Pump Baseline for Non-Residential and High-Rise Residential Buildings: Feasibility Analysis*, 2 (May 19, 2021).

select equipment regardless of energy used. Rather than regulations preventing the use of energy sources for space and/or water-heating, CEC should focus on financial incentives for reducing carbon emissions through policies that encourage the installation of equipment that reduces carbon emissions and structural updates that reduce the amount of energy needed for space- and/or water-heating. It is imperative that CEC preserve the flexibility for equipment to use any energy source when it is more practical, economical, and environmentally beneficial to do so. For example, the future benefit of hydrogen or hydrogen blends distributed in the natural gas system allows for the utilization of excess, non-peak electricity to be stored in the system by creating hydrogen gas for later use while increasing overall system resilience. Research is ongoing.

Therefore, in light of EPCA's preempting federal energy standards and the current challenges associated with electric-only new construction, AHRI asks that CEC remove limits on EPCA-covered products like natural gas appliances from both the prescriptive and performance compliance approaches.

Industry Burdens

There are additional industry-wide burdens that CEC should be aware of as it promulgates the state energy code, including state-mandated refrigerant emissions limits, which coincides with a change in the safety standard for HVAC and water heating equipment.

States are also pursuing regulations to reduce the high-global warming potential (GWP) hydrofluorocarbons (HFCs) in stationary air conditioning (AC) equipment to levels where some of the only viable options are mildly flammable. The California Air Resources Board (CARB) will present a regulation for adoption at the December board meeting. CARB is currently targeting a 750 GWP for all stationary AC, to be implemented on January 1, 2025. This regulation, and any other state GWP regulations, will require the development of a second product line for all products using refrigerants. Currently, there are only six low-GWP refrigerant options that have only recently been approved by the Environmental Protection Agency (EPA) in May 2021.

New low-GWP refrigerants will have a significant impact on the HVAC industry. Since nearly all of these new low-GWP refrigerants have been designated lower flammability (A2L), all new safety standards address the application of these new A2L refrigerants and subsequent leak mitigation requirements. Refrigerant sensors may need to be employed with significant redesign for the mitigation capability and all equipment will require certification to these new standards. Compressor manufacturers are working hard to develop full product lines to accommodate A2Ls. As this effort requires significant research and design resources, HVAC manufacturers must prioritize obtaining compliant components for a single complete product line using new refrigerants for jurisdictions limiting GWP. Additional product options will likely take time to bring to market. To conduct all of the product research, design, and testing prior to January 1, 2025, when many new refrigerant options have only very recently received SNAP approval, will be a monumental task.

In addition, the existing safety standard, UL Standard 1995, will sunset on January 1, 2024, and a new safety standard, UL 60335-2-40, will be required for all cooling product distributed in the U.S. and Canada. All products currently listed to UL 1995 will need to be tested and certified to UL Standard 60335-2-40 if any modifications are made. In addition to meeting new codes and standards requirements, manufacturers must also redesign products, amend literature, update all regulatory certification requirements and educate their distributors and customers about the change by January 1, 2024.

The industry is also preparing for new efficiency metrics and levels for residential central air conditioners and heat pumps; new efficiency levels for small, large, and very large commercial package air conditioners and heat pumps and air-cooled, water-cooled, evaporatively-cooled, and water source unitary air conditioners and heat pumps; on January 1, 2023, as well as new efficiency levels for variable refrigerant flow equipment, and computer room air conditioners in California. Many companies manufacture these regulated products, and the impending regulatory changes have absorbed available research and development resources and, even more importantly, laboratory testing time. These burdens highlight the immense pressure on industry merely to meet minimum regulatory compliance. Additional burdens, such as overly stringent requirements on components, tend to keep research and design budgets, staff, and laboratories focused on developing minimally compliant products rather than innovating efficient solutions.

Technical Review of the Express Terms

AHRI completed a technical review of the Express Terms and provides recommendations to address concerns below.

A. Definitions – Section 100.1

AHRI proposed minor modifications to the definitions section in 45-day comments and is disappointed that CEC has not included reasonable changes suggested for the following definitions.

First, commercially available desiccant systems will be available prior to Title 24-2022 coming into force. To more clearly permit desiccant dehumidification in HVAC systems, AHRI recommends modification to INTEGRATED HVAC SYSTEM:

INTEGRATED HVAC SYSTEM is an HVAC system designed to handle both sensible and latent heat removal. Integrated HVAC systems may include, but are not limited to: HVAC systems with a sensible heat ratio of 0.65 or less and the capability of providing cooling, dedicated outdoor air systems, single package air conditioners with either at least one refrigerant circuit providing hot gas reheat or a desiccant dehumidification system, and stand-alone dehumidifiers modified to allow external heat rejection.

Secondly, AHRI recommends a modification to the DX-DEDICATED OUTDOOR AIR SYSTEM UNITS definition to acknowledge that the product is not always supplied with a means to reheat dehumidified air and to be consistent with [AHRI 920 \(I-P/2020\): Performance Rating of Direct Expansion-Dedicated Outdoor Air System Units \(with Addendum 1\)](#).

DX-DEDICATED OUTDOOR AIR SYSTEM UNITS (DX-DOAS)- a type of air-cooled, water-cooled, or water-source DOAS unit that dehumidifies 100 percent outdoor air and may include reheat capable of controlling the supply dry-bulb temperature of the dehumidified air to the designed supply air temperature.

AHRI urges CEC to make the suggested changes to these definitions to improve the clarity of Title 24.

B. Mandatory Filter Gasketing Requirements – Sections 120.1(c)(1)(D), 150.0(m)(12)(B)(v), and 160.2(b)(1)(B)(v)

AHRI appreciates the modifications presented in the 15-day language for gasketing requirements in Section 120.1(c)(1)(D); however, there is still opportunity for improvement. The draft language still contains unintended compliance concerns, albeit lessened, for systems installed in Nonresidential and Hotel/Motel Buildings. This new section requires filter racks to be gasketed, sealed, or to use other means to prevent air from bypassing the MERV 13 filter. The revised language proposed will still present issues with compliance that AHRI's new suggested language seeks to correct. The use of "prevent" still does not recognize tolerancing in the reduction of air bypass. Rather the goal to ensuring that equipment operates as intended, is to minimize bypass around the filter. Specifying a reduction, rather than an elimination of air bypass will improve the condition without creating an impossible requirement. Therefore, AHRI recommends that this requirement be modified as follows, "Filter racks or grilles shall use gaskets, sealing, or other means to close gap around inserted filters in order to minimize ~~prevent~~ air from bypassing the filter."

The above analysis and recommendation also apply to Sections 150.0(m)(12)(B)(v) and 160.2(b)(1)(B)(v), Air Filtration and System Design.

C. Mandatory Requirements for Fans – Section 120.10

AHRI appreciates modifications to EXCEPTION 1 to Section 120.10(a) in 15-day language that clearly exclude equipment currently in the process of first-time federal regulation, for example, computer room air conditioners (CRAC) and dedicated outdoor air systems (DOAS). Both equipment types are categories of Commercial Air Conditioning and Heating Equipment found at 10 CFR § 431.97 and the modification appropriately excludes both from being subject to double regulation with FEI requirements.

AHRI reiterates, that while an exception to Section 120.10(a)(2), that FEI values for embedded fans do not need to be third party verified is appropriate, AHRI recommends

instead clearly exempting embedded fans. *Embedded fans cannot be accurately and comparably rated to stand-alone fans or to other embedded fans using AMCA 208.* Section 4.4 of AMCA 208-18 and Annex D (informative) includes the entirety of calculation methods for embedded fans. It is not written in mandatory language and cannot be used reliably to rate embedded fans with an FEI. Neither consumers nor regulators are able to determine which products have inextricably embedded fans and which do not. **AHRI strongly urges CEC to exclude all embedded fans** – there is no consistent, clear, uniform, repeatable, and reliable method to determine the FEI of an embedded fan.

To exempt embedded fans and remove the compliance confusion, AHRI recommends deleting 120.10(a)(1) and EXCEPTION 1 to Section 120.10(a), should read, “Embedded fans and fans intended for replacement of embedded fans are exempt” or “Keep in mind that the majority of embedded fan applications are exempted anyway as most equipment categories are covered by energy efficiency metrics”.

D. Fan Power Budget – Sections 140.4(c), 170.2(c)(4)(a)(i)

AHRI appreciates the continued outreach from CEC staff and the CASE team on this complicated and impactful proposal. While AHRI supports the conceptual change to regulating fan system input KW instead of fan bhp, we have outstanding concerns with the 15-day regulatory text that have not been adequately addressed. Most importantly, based on a simplified analysis using motor power, the Fan Power Budget language, as proposed, remains overly stringent – much more so than the proposal introduced to ASHRAE 90.1, particularly for certain applications. The stringency varies considerably by unit size and without modification, *this proposal stands to eliminate larger commercial packaged air conditioners and heat pumps (rooftop units or RTUs) from the California market.*⁸

This proposal impacts more than RTUs; however, large RTUs are space constrained products because of transportation limitations – they must fit on flat-bed trucks. By using the most stringent cases for static pressure allowances in the analysis there will be an increase in unit casing size by approximately 15-percent to accommodate larger fans (for typical job applications). If compliance requires larger fans and cabinets, units will be unable to meet transportation limitations. Similar issues may be present, albeit on a smaller scale, with rooftop air-handlers (RTAH). RTAHs can be split for shipping, whereas packaged RTUs cannot due to electrical wiring and refrigerant piping. We reiterated that there will be few, if any, compliant products over 20 tons available in California if the proposal is not further modified. AHRI recommends creating a category for very large units. Currently, Table 140.4-A: Supply Fan Power Allowances (watts/cfm) includes three capacity categories, with the largest being >10,000cfm. AHRI recommends a 10,00 to 20,000 cfm and the addition of a >20,000 cfm category for both multi-zone VAV and all other fan systems. In the >20,000 cfm category, where there is concern regarding product availability, the external static pressures should be higher to account for longer

⁸ Data from individual manufacturers of constant volume RTUs over 60 Tons complying with January 1, 2023, DOE efficiency standards will not be able to supply enough static pressure to meet application (job) requirements while complying with the proposed fan power limits. Manufacturers will submit data individually to CEC.

ductwork associated with larger units. Other modifications can be made to acknowledge the differences in the application and function of the larger units.

As detailed above, manufacturers are facing significant regulatory burdens and RTU manufacturers are already well into the redesign process to bring products into compliance with DOE's January 1, 2023 efficiency standards.⁹ To bring a product line to market to address new regulatory requirements, not only must the product be redesigned, but it must also be retested, have its components recertified, and the entire product must be recertified to safety and efficiency standards.¹⁰ To expand, first manufacturers must design the new cabinet and fan, then test fan performance. Next, additional performance and safety tests can largely be conducted in parallel. These include performance testing DX systems and furnaces to comply with federal efficiency standards and safety testing the product. Furnace and electric heat testing take approximately one year to conduct. Next, and only after performance and safety tests are substantially complete, acoustical, wind and seismic tests must be conducted, which takes approximately one year. To further complicate the design cycle for these products, manufacturers are also planning for the introduction of entirely new products, also complying with DOE 2023 efficiency standards, while using A2L refrigerants to comply with California Air Resource Board regulations. In all, the process to comply with the fan power budget requirement will take five years.

While the CASE team responsible for developing this proposal made many presentations on this new approach, critical inputs necessary to analyze the impact of the different approach were not communicated. For example, stakeholders could not obtain the static pressure allowance used in the analysis. Without this information, many additional hours of stakeholder review of the proposal were required. Stakeholders have also questioned certain assumptions for being overly stringent. For example, the fan

⁹ Direct final rule to establish amended energy conservation standards for small, large, and very large air-cooled commercial package air conditioning and heating equipment and commercial warm air furnaces. [81 FR 2420](#) (January 15, 2016). TABLE 3 TO § 431.97—UPDATES TO MINIMUM COOLING EFFICIENCY STANDARDS FOR AIR CONDITIONING AND HEATING EQUIPMENT. [Note: Does not include single package vertical air conditioners and single package vertical heat pumps, packaged terminal air conditioners, and packaged terminal heat pumps, computer room air conditioners, and variable refrigerant flow multi-split air conditioners and heat pumps.]

¹⁰ CEC staff has been aware of the 2023 compliance timeline since well before the Direct Final Rule was published January 15, 2016. Although States were not direct signatories to the Term Sheet, the ASRAC Committee approving the Working Group's recommendations included California Energy Commission staff. The Term Sheet with the negotiated timeline was signed in 2015. For CEC to propose including such a significant provision with only one year compliance is not feasible. Principles of administrative law and due process dictate that a government agency cannot require stakeholders to dedicate resources to comply with any regulation until it is final, in this case January 1, 2022. CEC could have made a proposal final in the 2019 edition of Title 24 with a compliance date of January 1, 2023, to give manufacturers sufficient time to comply. CEC is also aware that CARB in the middle of promulgating a major regulation impacting the refrigerants used in affected equipment. This regulation is an excellent example of why due process requires clear notice. Manufacturers must design to prescribed standards and requirements. As of the date of this submission, no parties—neither CEC, CARB nor manufacturers—have adequate notice of what the prescribed safety standards will be in California. Stakeholders have no notice of their regulatory requirements, and therefore a 2023 compliance date for fan power requirements contravenes basic due process. A 2025 compliance date for refrigerants could suffer from the same inadequacies if the prescribed design requirements are amended upon adoption into the building code and manufactures lack time to react.

requirement was set for a 15-percent higher FEI than new minimum requirements for stand-alone fans. This situation was present for nearly every component within the units, leading to an overly stringent proposal with compliance nearly impossible at actual job static pressures for larger tonnage units. To improve this proposal, AHRI recommends adding a benefit for two-stage fans and reducing stringency of other provisions. The preferred approach would be to harmonize with fan efficiency proposals within Title 24 by implementing an FEI of either 1.0 or 0.95 (depending on the system). No supporting information has been presented in the CASE report to justify the increase in fan efficiency beyond those levels. Consultants have cited a review and analysis, but neither study details, nor outcomes, have been shared with stakeholders. Manufacturers have been unable to replicate such a study. The 90.1 proposal is for an increase of 1.06. If CEC insists on moving forward with this approach, the agency should use the same increase. If CEC intends to adopt the proposal without modification, AHRI maintains that compliance should begin no earlier than January 1, 2028.

We recognize that products are not compliant or non-compliant in and of themselves; however, if they cannot comply at the customers' required external static pressure requirements, then the products essentially are non-compliant. AHRI members have submitted data directly to CEC outlining the proposal's impact on products. The 15-day language does not address the manufacturer concerns.

As a follow up to a meeting with the CASE team, AHRI requested the Case Team to confirm that the calculation is reflective of Title 24-2019. The CASE team confirmed that the analysis does not include 0.5 in static allowance for return ducts and 0.5 in static for exhaust return control, which AHRI assumed to be an economizer. The CASE team cited the Title 24-2019 compliance manual's explanation of the credit and disagreed that the exhaust return control was an economizer.¹¹ To summarize, the User's Manual explains that credit may be taken when some spaces are served by an air handler have exhaust airflow devices and other spaces do not and the exhaust airflow control device is typically modulated to maintain a negative or positive space pressure relative to the surrounding space. This describes an economizer. AHRI noted in comments to the CASE team that by not including the static allowances, they may have underestimated the impact of the proposal. AHRI contends these static allowances are appropriate and notes that the ASHRAE 90.1 User's Manual explains that the allowance for the return is based on an open plenum.

AHRI appreciates revisions to address issues raised with larger fans and cabinets on replacement applications with the addition of a conversion curb credit to Table 141; however, the credit was only applied to VAV systems. No information has been provided that supports excluding constant volume (CV) systems. Those CV systems would also require a curb adapter in many replacement projects. AHRI reiterates that if replacement rooftops require a completely new support structure, rather than a curb adapter, then the cost to building owners will be significant. This cost has not been accounted for in the

¹¹ Title 24-2019 User's Manual. Page 4-133 https://www.energy.ca.gov/sites/default/files/2020-05/04_MechanicalSystems.pdf

CASE report.¹² AHRI recommends extending the curb adapter pressure allowance to all other fan systems in replacement applications to allow for the continued use of cost-effective conversion curbs and to account for existing ductwork.

These comments also apply to the proposal included in Section 170.2, which addresses high-rise residential buildings. While AHRI is not opposed to the introduction of new sections to address multifamily buildings if this change helps designers, builders, and code officials, we are concerned with the possibility for diverging requirements in future editions of Title 24. If any of AHRI's proposed revisions to Section 140.4(c) are not made to Section 170.2, AHRI requests that CEC maintain and make public a table to track conflict/divergence between sections of similar requirements.

E. Prescriptive Requirements for Space Conditioning Systems – Section 140.4(e)

Section 140.4(e) proposes the reduction of the economizer threshold to apply to equipment from 54,000 Btu/h to 33,000 Btu/h. While the requirement appears to offer energy savings, we question how cost effective it would be in practice. AHRI's concerns persist regarding (1) cost effectiveness with the proposed decoupled DOAS when paired with terminal equipment such as variable refrigerant flow (VRF), water source heat pumps, and small chilled-water coils; and (2) the limitation of implementation options with certain types of equipment, mainly VRF. The required inclusion of a DOAS or higher-airflow capability in an energy recovery ventilator in conjunction with the terminal heating and cooling equipment stands to increase the cost of the system. VRF systems with heat recovery modules are also able to facilitate exchange of energy between different individual space conditioning zones to provide simultaneous cooling and heating, thereby increasing energy use effectiveness for this product. The use of economizers compromises this energy recovery from individual zones, and therefore is unable to deliver that same level of effectiveness and efficiency. The 15-day language continues to disallow for an integrated outside air approach to be used with space-conditioning systems. For regions (climate zones) and applications that do not need 100-percent dedicated outside air to be brought into the space-conditioning zone, it would make sense for CEC to consider providing an option for an integrated outside air approach to be used.

Economizers were designed to be implemented on outdoor equipment, whereas challenges exist in indoor implementation. AHRI would not oppose limiting the requirement to extend economizer requirement down to 33,000 Btu/h if it was only applied to outside units.

AHRI reiterates it requests to CEC to remove the proposal to require economizers on indoor fan coils and to limit the expansion of economizer requirements to outdoor products.

Additionally, AHRI notes that language newly proposed in 15-day Express Terms in Section 140.4(e), references requirements in Section 140.4(q)(2) for bypass or control

¹² TN237695_20210506T095207_High Performance Ducts and Fan Systems CASE Report

to disable energy recovery. Section 140.4(q)(2) does not address the pressure drop of the wheel and also could be improved with more specific control language. As currently written, requirements in Section 140.4(q)(2) could be met by simply shutting off the energy recovery wheel. Addendum cd to ASHRAE 90.1-2016 (approved, but not yet published) serves primarily to clarify the original intention for bypass and control to permit economizer operation.¹³ The bypass working group of ASHRAE 90.1 evaluated several systems and found that a clearer control strategy is required where energy recovery systems are installed. Controls are already required by the standard; however, in some cases, compliance with the existing standard may result in less than optimum economizer operation and increased fan energy use. Pressure drop requirements are also included for bypass on the return and exhaust in ASHRAE 90.1. AHRI recommends including provisions from the following language into Section 140.4(q)(2):

6.5.6.1.2.2 Provision for Air Economizer or Bypass Operation

Provision shall be made for both *outdoor air* and exhaust air to bypass or control the *energy recovery system* to enable economizer operation as required by Section [6.5.1.1](#). The bypass or *control* shall meet the following criteria:

- a. For *energy recovery systems* where the transfer of *energy* cannot be stopped, bypass provision shall prevent the total airflow rate rates of either both *outdoor air* or and exhaust air through the energy recovery exchanger from exceeding 10% of the full design airflow rate.
- b. The pressure drop of the outdoor air through the energy recovery system shall not exceed 0.4 in. H₂O (100 Pa); the pressure drop of the exhaust air through the energy recovery exchanger shall not exceed 0.4 in. H₂O (100 Pa).

Exceptions to 6.5.6.1.2.2

1. Energy recovery *systems* with 80% or more *outdoor air* at full design airflow rate and not exceeding 10,000 CFM (4.72 m³/s).

F. Data Center Requirements – Sections 140.9 and 141.1

AHRI is concerned that proposed, late-stage changes to data center requirements are both unachievable and a breach of the California Administrative Procedure Act (APA).¹⁴ The data center proposal as written in the 45-day comments – prescriptively including refrigerant economizers – was correctly implemented, technology neutral, and good for California consumers. In the 45-day comments, CEC rightly recognized inherent differences between air and water/refrigerant economizers and AHRI agreed with the agency’s decision to establish different temperature thresholds for these technologies.

In Sections 140.9 (and 141.1) of the 15-day language, however, CEC has introduced the problematic and unforeseeable requirements of Minimum NSenCOP values imposed on the Pumped Refrigerant Economizer by Climate Zone. The Net

¹³ Addendum available, here: <https://www.ashrae.org/technical-resources/standards-and-guidelines/standards-addenda/addenda-to-standard-90-1-2019>

¹⁴ Government Code § 11340 et seq

Sensible Coefficient of Performance (NSenCOP) is defined within AHRI Standard 1360-2017 as “A ratio of the Net Sensible Cooling Capacity in kilowatts to the total power input in kilowatts (excluding reheaters and humidifiers) at any given set of Rating Conditions.” The inserted tables have no indication of what the input metrics are for a refrigerant economizer manufacturer to calculate their equipment’s corresponding NSenCOP value for compliance. Furthermore, there is a difference in the NSenCOP values in the tables provided in sections 140.9 and 141.1 with the only noted difference written into the draft language as being the economizer temperature threshold which has no bearing on how the NSenCOP metric is calculated. As noted within the definition, the NSenCOP is calculated at any given set of Rating Conditions, but the Rating Conditions in the standard’s input tables 2 through 4 do not have an input value for the economizer temperature. There is no justification for different tables of values since the economizer temperature is not part of the NSenCOP calculation.

The proposed efficiency tables by climate zone are a misapplication of AHRI 1360 and should be deleted. Section 110.2 was updated to include mandatory equipment efficiencies, consistent with ASHRAE 90.1-2019, based off of the AHRI Standard 1360 test method. In ASHRAE 90.1-2019, existing equipment efficiencies were increased, and many new product equipment types were added. Major faults with the NSenCOP values contained in the Prescriptive tables in sections 140.9 and 141.1 compared to the Mandatory minimum efficiency requirements of Section 110.2 are that some climate zones fall below the Mandatory requirements, the Climate Zone metrics are not differentiating between the varying efficiency requirements broken down by Net Sensible Cooling Capacity (NSCC) as seen with the Mandatory requirements, and the inputs to generate the compliance performance is not defined. Including an unvetted efficiency requirement, based off an annualized energy model, by climate zone, on top of new performance requirements based on standard rating conditions is excessive regulation.

Data centers are essential to public and private business operations and are considered to be mission critical. The introduction of these new requirements in 15-day language for these products was not reasonably foreseeable based on the NOPA and constitutes a substantial change, which requires the publication of another 45-day notice in the Notice Register or a reversion to the 45-day language for the August Commission vote.

It is noted that the inserted language for all economizer types now requiring “partial cooling even when additional mechanical cooling is required and capable of providing...” is identical language seen for air and water economizers from the Prescriptive Requirements for Space Conditioning Systems in section 140.4 intended only to further clarify what an “integrated” economizer is.

G. Insulation for Piping and Tanks – Section 150.0(j)(1) and Section 160.4(f)

AHRI appreciates CEC’s modifications to Sections 150.0(j)(1) and 160.4(f), which address concerns raised regarding the lack of justification for increasing the insulation to R-16 in the CASE report. As we noted, this change will yield only a small benefit, when

calculated using time dependent valuation (TDV), perhaps not enough to cost justify the burden of the installation. As such, we also recommending striking the requirement in Section 110.3(c)(3)(B). We also note that in Sections 110.3(c)(3) and 110.8(d)(2) unfired hot water storage tanks (UFHWST) are called unfired service water heater storage tanks. This is not correct and should be fixed prior to adoption. Finally, the federal standard is R-12.5, and CEC's proposed additional requirements are more stringent than the federal standard and subject to preemption.

H. Ventilation and IAQ – Section 150.0(o)(1)(K), Section 150.0(o)(3), Section 120.1(b)(2)(C), and Section 160.2(b)(2)(A)(x)(b)

AHRI appreciates CEC's reconsideration of implementing measures that would ban the use of federally compliant appliances in buildings. Modifications proposed in 15-day language in Section 150.0(o)(1)(K) resolve AHRI's concern and we are pleased California homeowners in smaller homes will continue to be able to install the most common type of residential gas water heaters, an atmospherically vented furnace or water heater, a pellet stove, or even a wood-burning fireplace.

AHRI reiterates our suggestion that it would be easier for stakeholders to review code changes and for builders to comply with indoor air quality requirements if relevant sections from ASHRAE 62.2 were included in Title 24, rather than readers being required to purchase the ASHRAE standard. It is not possible to assess the code proposal, "all dwelling units shall meet the requirements of ASHRAE Standard 62.2, Ventilation and Acceptable Indoor Air Quality in Residential Buildings subject to amendments specified in Section 150.0(o)" without purchasing ASHRAE 62.2. Likewise, a builder would be unable to comply with mandatory requirements in Title 24 without having purchased this standard.

I. Prohibition of Electric Resistance Heating for Single and Multi-family Residential Buildings, Additions and Alterations – Sections 150.2(b)(1)(G) and 180.2(b)(2)(A)(v)

AHRI appreciates CEC revisiting the language proposed in EXCEPTION 1 to Section 150.2(b)(1)(G) (and 180.2(b)(2)(A)(v) in the new multifamily section). Language proposed in 15-day Express Terms make clear that electric resistance heating in heat pumps is excluded, avoiding the inadvertent elimination of back-up and supplementary heat. It is common for strip heat to be installed as emergency backup in the event the heat pump becomes inoperable during the heating season. In freezing temperatures, emergency strip heat would prevent pipes from bursting.

AHRI also appreciates edits to EXCEPTION 2 into Section 150.2(b)(1)(G) that permit the in-kind replacement of electric resistance heating systems in alterations. AHRI noted in its 45-day comments that nearly all manufactured housing heating systems are electric furnaces. Duct work in mobile homes is too small to allow a regularly sized furnace to be installed or safely used. As complicated ties exist between Title 24 and CCR Title

25, Housing and Community Development, this modification will continue to allow the replacement of electric resistance heating systems in manufactured housing.

J. Expected 15-day language clarification for Multifamily Buildings – Additions – Section 180.1 – Exceptions

AHRI appreciates the addition of EXCEPTION 7 to Section 180.1, consistent with CEC's May 27th presentation, which clarifies, "that new systems serving additions can be a heat pump or gas heating system."¹⁵ AHRI continues to encourage CEC to also include an option to allow gas water heaters through the prescriptive approach for new systems serving additions. Per Section 170.2(d), the only options are 240-volt heat pump water heaters (HPWH) and instantaneous water heaters. There are cases where the gas line would need to double in size to accommodate a new instantaneous gas water heater and a 240-volt HPWH may require an electrical upgrade. In these cases, a gas water heater would be the most cost-effective solution. AHRI questions if these costs were considered in the cost justification for the proposal. If this measure has not been cost justified for additions, gas water heaters must continue to be permitted to be installed.

ANSI/CTA-2045-B proposed requirements conflict with Section 110.12(a), which provides more flexibility to manufacturers to meet the standard.

Subchapter 11 Multifamily Buildings, Section 170.2(d), includes prescriptive installation requirements for central HPWHs rather than providing flexibility for the manufacturer to optimize system performance. These requirements also fail to consider that this technology is nascent and there are new requirements for installation, service, and maintenance due to it being a more complex system and creating a need for more qualified distributors and contractors.

Section JA13 indicates a misunderstanding of the standards that are referenced when considering the requirements in this appendix. Specifically, standards UL 60730-1, ASSE 1082, and ASSE1084 are mentioned. The first pertains to electrical controls but does not limit outlet water temperature like a thermostatic mixing valve. ASSE 1082 and 1084 only control water temperature to specific limits (i.e., within a certain tolerance under certain conditions), but they do not necessarily limit the water to a safe temperature.

Similar to the comments above about 170.2(d), the requirements for central HPWH systems at Section JA14 are overly prescriptive and raise federal preemption concerns. They require a significant amount of additional testing that is not harmonized with the federally prescribed test procedure. In addition, the defined test procedure does not align with the federal testing with multiple new combinations and conditions.

Other AHRI Issues

A. CEC should remove barriers to the installation of space heat pumps

¹⁵ Slide 101 of May 27 Presentation, TN238043_20210528T132836_May 27, 2021, Staff Presentation at the Lead Commissioner Hearing

AHRI is disappointed that CEC has not considered recommendations that CEC staff evaluate certain provisions within Title 24 to further increase the adoption of space heat pumps. Residential Appendix Rated Heat Pump Capacity Verification, RA 3.4.4.3(i), imposes requirements for verification of system performance based on 350 cfm per *nominal* ton (300 cfm/ton of nominal cooling capacity for altered systems); however, AHRI has consistently and continues to advocate for these requirements to be based on *rated* capacity. The 350 cfm per nominal ton minimum airflow requirement is not an accurate representation of airflow rates at which systems operate. While most residential HVAC systems do operate in the 350-450 cfm per rated ton range, and most HVAC manufacturers do design their systems to operate somewhere in that range, there are some outliers to this nominal range. The optimal airflow rate for an HVAC system depends on many factors, such as the option for several different indoor coils, which can change the rated airflow for the system. Certified capacity and airflow rates are publicly available on the AHRI Certification Directory. Inspectors can easily find rated capacity and airflow rates in the AHRI Certification Directory, the same place CEC permits for the look up of heat pump capacity at 17 °F. CEC should allow airflow rates that are utilized to achieve federally mandated minimum efficiency performance.

AHRI also continues to urge CEC to address the artificially low performance required when modeling variable capacity heat pumps (VCHP) in the Alternative Calculation Method (ACM) Reference Manual and the residential California Building Energy Code Compliance (CBECC-Res) performance compliance software used for demonstrating compliance with the Performance Standards specified in Title 24, Part 6, Section 150.1(b). CEC responded to five years of AHRI advocacy by adopting modest credits for heating and cooling; however, modeling ductless heat pumps as marginally more efficient than a split system equivalent to the standard design with default duct conditions (minimum efficiency) is misrepresentative and presents a barrier to California consumers to adopt more efficient technologies. CEC should consider permitting the use of rated efficiencies for these products in the ACM and CBECC-Res performance compliance software program.

Lastly, in response to CEC's December 14, 2020 Flexible Demand Appliance Standards stakeholder workshop,¹⁶ AHRI noted that harmonization with industry standards, such as AHRI Standard 1380 (I-P/2019): Demand Response through Variable Capacity HVAC Systems in Residential and Small Commercial Applications (AHRI 1380), will allow manufacturers to produce heat pumps for a broader market. Again, AHRI urges CEC's efforts to be geared towards incentivizing the adoption of DR-products (e.g., performance compliance credits) rather than limiting product availability for consumers.

B. Refrigeration Systems Opportunities

¹⁶ AHRI Comments in Response to the December 14, 2020, Lead Commissioner Workshop on Senate Bill 49 Flexible Demand Appliance Standards and December 9, 2020 Staff Paper, Introduction to Flexible Demand Appliance Standards [Docket Number 20-FDAS-01]

AHRI appreciates CEC's update of *TABLE 110.2-G PERFORMANCE REQUIREMENTS FOR HEAT REJECTION EQUIPMENT* to completely harmonize with ASHRAE 90.1-2019, as follows:

Table 110.2 G, *Performance Requirements for Heat Rejection Equipment* as follows:

Equipment Type	Total System Heat Rejection or Rated Conditions	Subcategory or Rating Condition	Performance Required^c	Test Procedure
<u>Propeller or axial fan dry coolers (air-cooled fluid coolers)</u>	<u>All</u>	<u>115°F entering water</u> <u>105°F leaving water</u> <u>95°F entering air</u> <u>db</u>	<u>≥4.5 gpm/hp</u>	<u>CTI ATC-105DS</u>

This addition, along with the addition of footnote “c” from ASHRAE 90.1, completely harmonizes Title 24 with ASHRAE 90.1-2019 Table 6.8.1-7 Performance Requirements for Heat Rejection Equipment—Minimum Efficiency Requirements, adding requirements for dry cooler minimum efficiency and test procedures.

AHRI notes there may be an editorial mistake in the 15-day language – Table 110-2-G appears to have been relabeled as Table 110.2-E; however, the preceding table, with packaged terminal air conditioners (PTAC) and packaged terminal heat pumps (PTHP) minimum efficiency requirements, remains Table 110.2-E, as it is today. Lastly, AHRI recommends adding single package vertical units to the title of the PTAC and PTHP efficiency table, as they are two distinct products.

AHRI appreciates CEC consideration of these technical comments and again urges the Commission to withdraw proposals that exceed its statutory authority. If you have any questions regarding this submission, please do not hesitate to contact me.

Sincerely,



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