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Comments on Pre-Rulemaking Draft Express Terms

Please see attached letter from the ASHRAE TC8.6 Standards Subcommittee on the Pre-Rulemaking Draft Express Terms.

The Adiabatic Fluid Cooler Addendum referenced in the attached letter can be downloaded from:

https://osr.ashrae.org/Online-Comment-Database/ShowDoc2/Table/DocumentAttachments/FileName/4194-90.1-2022q%20PPR1%20Draft.pdf/download/false

Additional submitted attachment is included below.

17 November 2023

To: CEC Staff

Re: **ASHRAE TC8.6 Standards Subcommittee Comments on the Pre-Rulemaking Draft of the Express Terms, Docket 22-BSTD-01**

These comments are being submitted by the ASHRAE TC8.6 Standards Subcommittee in response to the publication and request for comment on the Pre-Rulemaking Draft of the Express Terms, Docket 22-BSTD-01.

ASHRAE Technical Committee (TC) 8.6 is concerned with open and closed-circuit cooling towers, evaporative condensers, adiabatic condensers and fluid coolers, spray ponds, and other contact type liquid-to-air heat rejection equipment along with their application and impact on complete HVAC, Industrial, and Refrigeration systems, including the associated energy and water usage as well as water treatment requirements.

Please feel free to visit our Committee's website at:

https://tc0806.ashraetcs.org/

Note that the TC8.6 Subcommittee had previously submitted detailed comments on both the Draft and Final CASE Reports on Cooling Towers. Our members appreciated the CASE Team's reanalysis and resulting changes to the original proposals in the Final Case Report based on Stakeholder feedback. We continue to support the California Energy Commission's goals to save energy and water which match well with the Technical Committee's goals. We now wish to provide further comments to the Pre-Rulemaking Draft Language in the spirit of considering the interests of all stakeholders and ensuring truly workable long-term solutions that benefit society while avoiding unintended negative consequences.

Our further comments and recommendations on the Pre-Rulemaking Language are as follows:

Cooling Tower Minimum Efficiency

While the Subcommittee appreciated the reduction in the proposed prescriptive minimum efficiency for axial fan open circuit cooling towers, these levels still remove too great a percentage of cooling tower models from consideration. After reviewing the Final Case Report, the Subcommittee believes it is in the best interest of all parties to reduce the required minimum efficiencies further, if possible to a maximum of the current prescriptive minimum of 60 gpm/hp.

Our position is based on the following:

- Maintaining a meaningful number of cooling tower models on the market to allow System Designers adequate freedom to properly select and layout cooling towers,

especially on larger projects, while focusing on the efficiency of the full system, not just a small but particularly important key component.

- Removal of an excessive number of models from the market can be considered a restraint of trade, especially when the models that are removed are already more thermally efficient than most, if not all, competing technologies. Maintaining the current prescriptive minimum efficiency would eliminate this concern, though any reduction from the levels shown in the Express Terms would be appreciated and reduce the restraint of trade concern.
- Evaporative heat rejection uses approximately half of the energy of an air-cooled system. Increasing the cost and size of cooling towers can lead to a market shift to less efficient cooling types which would increase both energy use and emissions in California, negating much, if not all the expected state-wide savings. As the minimum efficiencies of competing classes of equipment (i.e., VRF, rooftops, etc.) have not been increased, this increases the potential for market shifts. The energy saving benefits of higher efficiency cooling towers would be negated on multiple sites with each project that switched from a low-energy water-cooled system to a higher energy air cooled system. While the reduction in the required efficiency levels from those in the Draft CASE Report as well as maintenance of the air-cooled chiller limitation are appreciated, maintaining the current prescriptive minimum, or at least reducing the increase further, would help to avoid any potential market shifts as well as restraint of trade concerns mentioned above.
- Cooling tower thermal design is very close to "Max Tech." Claims in the Final Case Report that this will encourage "innovation" in the Industry are unlikely to be fruitful, especially given the increases that are being requested of the Industry (up to 50% over the current prescriptive limit).
- As most projects do not have unlimited layout space for either larger cooling tower cells or additional cells, System Designers will be forced to place cooling tower cells closer together, increasing the potential for recirculation which can reduce some if not all the gain from the increase in efficiency called for in the proposal. As increasing the "box size" of the cooling tower and lowering the fan motor size is the primary means of increasing efficiency, the fan discharge velocity is reduced, further increasing the potential for recirculation. This is why cooling tower manufacturers will only recommend higher efficiency cooling towers when the project site will allow the proper layout spacing to ensure full thermal capacity per manufacturer's guidelines. This is difficult to achieve in prescriptive language.
- The CEC should consider that by removing a large number of models from the market, the remaining models increase in greater "steps" of efficiency. Often the next viable model over a particular minimum efficiency requirement is 10% to 20% or more higher than required due to the fewer number of available models. Thus the CEC could easily justify / claim that a higher level of efficiency is achieved with a lower prescriptive minimum. Manufacturers have granted access to CEC staff for their selection programs so this phenomenon can be easily checked.
- Many cooling towers are applied on projects requiring performance decreasing options and accessories. Such derates are contained in the product disclosures on the CTI

Certification Directory on the CTI website. These derates can be substantial, such as for certain low sound fans or seismic modifications (which are common in California). These derates can push cell sizes even larger, aggravating the cost, size, and recirculating issues mentioned in the letter. Has the CEC accounted for these derates in the setting of the minimum efficiencies?

- The Subcommittee would like to remind the CEC that the use of the efficiency metric (gpm/hp) is valid only at the thermal condition of 95°F entering water, 85°F leaving water, and 75°F entering air wet bulb. This metric is useful as a comparison point between cooling tower models. The metric cannot be used to set the fan horsepower for a cooling tower at any other thermal condition or be used in Energy Models at other than the stated temperature conditions.
- Lastly, the Subcommittee continues to be aware that by generating an energy model and following a performance-based approach, the requirements of the first two measures can be overridden. However, this path adds cost, time, and effort when designing a water-cooled system and as such cooling towers should be able to be applied properly using the prescriptive path without these unfair burdens.

Blowdown Controls

The TC is supportive of the new language for cooling tower blowdown requirements. While the method has been modified as compared to that found in ASHRAE Standard 189.1, the resulting cycles of concentration values will be similar. The Subcommittee does suggest that the term "of the entering make-up water" be added to each parameter in 110.2 (e) 2. For instance – "A. 2970 divided by the conductivity of the entering make-up water". This would be similar for 2) B. through 2) I (pages 104 and 105 of the Express Terms). While this may be obvious to water treatment practitioners, such clarity is called for in Standards language.

We also recommend that the Commission consider adding a specific requirement for the overflow alarm that calls for the alarm to be active whenever the cooling tower basin contains water, regardless of the operating state of the cooling tower. This would avoid the case where the cooling system is turned off (cooling tower fans and condenser pumps are "off") as well as the overflow alarm system, which could potentially allow an overflow through a valve failure during such downtime. This recommendation is based on the real-world experience of our members.

The Subcommittee will continue to follow the development of this proposal closely through the CEC process and will continue to provide additional input to CEC Staff should the need arise.

Additional Suggestions for Energy Savings

TC8.6 has reviewed Standard 90.1 and respectfully offers the following suggestions for Title 24:

- TC8.6 has recently worked with SSPC 90.1 on a proposal to include a minimum efficiency and CTI test code for adiabatic fluid coolers in the heat rejection efficiency table (Table 110.2E in Title 24-2025 and Table 6.8.1-7 in Standard 90.1-2022). While

the proposal has not yet completed public review (review period closes December 3, 2023), we respectfully suggest that the CEC consider including the changes from this Addendum in 2025 Title 24 language (see Addendum q attached with this letter). Adiabatic fluid coolers offer more efficient heat rejection than air-cooled fluid coolers (aka dry coolers) with lower water usage than conventional cooling towers. These adiabatic heat rejection devices are becoming increasingly popular in HVACR applications.

- We also suggest that the fan speed control section for heat rejection devices be updated as follows:

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Section 140.4

(h) **Heat rejection systems.** Heat rejection equipment used in comfort cooling systems, such as air-cooled condensers, dry coolers, adiabatic fluid coolers and condensers, open cooling towers, closed-circuit cooling towers and evaporative condensers shall include the following:

1.**Fan speed control.** ~~Each fan powered by a motor of 7.5 hp (5.6 kW) or larger~~ The fan *system* on a heat-rejection device powered by an individual motor or an array of motors with a connected power, including the motor service factor, totaling 5 hp or more shall have the capability to operate the ~~that~~ fans at two thirds of full speed or less and shall have controls that automatically modulate ~~change~~ the fan speed to control the leaving fluid temperature or condensing temperature or pressure of the heat rejection device.

Exception1 to Section 140.4(h)1: Heat rejection devices included as an integral part of the equipment listed in Tables 110.2-A through 110.2D and 110.2-F through 110.2-N.

Exception 2 to Section 140.4(h)1: Condenser fans serving multiple refrigerant circuits.

Exception 3 to Section 140.4(h)1: Condenser fans serving flooded condensers.

~~**Exception 4 to Section 140.4(h)1:** Up to one third of the fans on a condenser or tower with multiple fans where the lead fans comply with the speed control requirement.~~

The above changes bring Title 24 in line with Standard 90.1-2022, paragraph 6.5.5.2.1 and will enable additional energy savings in the State of California. The changes in (h) recognize the additional heat rejection types covered by this requirement. The changes in (h) 1.) reduce the threshold for variable speed to a total of 5 HP for a fan system on a given heat rejection device, rather than 7.5 hp per fan. Exception 1 could be interpreted as excluding heat rejection devices from these requirements so the Heat Rejection Efficiency Table (110.2E) has been removed from the exception. Exception 4 originally was implemented when variable speed devices were very expensive. Now that variable speed devices are very reasonable in cost, all fans that meet the threshold above should be controlled by variable speed to achieve the maximum energy savings and enabling the requirements of (h) 4.) on multi-cell heat rejection fan speed control requirements.

The ASHRAE TC 8.6 Subcommittee on Standards again appreciates the opportunity to comment on the Pre-Rulemaking Language and looks forward to providing further input as the process proceeds towards the 2025 Edition.

Please feel free to contact the Subcommittee with any questions regarding our comments and recommendations.

Best regards,

Frank T. Morrison
Chair, Standards Subcommittee
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