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California Energy Commission

Attention: Docket No. 12-BSTD-1
Dockets Office
1516 Ninth Street, MS-4
Sacramento, CA 95814

Subject: EVAPCO's response to the Revisions to the California Building Energy Efficiency Standards, California Code of Regulations, Title 24, Part 1 and Part 6 2013 Building Energy Efficiency Standards

To the Energy Commissioner:

EVAPCO recognizes and appreciates the efforts to increase energy and water efficiency for the commercial building and refrigeration industry with the proposed 2013 California Title 24. However, we have concerns regarding several new sections of the code. The sections are posted below along with our comments, suggested code modifications and justification.

First and foremost, setting the efficiency levels for evaporative condensers at 350 btuh/Watt for outdoor (axial fan) evaporative condensers and 160 btuh/Watt for indoor (centrifugal) condensers, as presented in the CASE Study for Refrigerated Warehouses dated October 31, 2011 and in the new 2013 code are unreasonably inflated efficiency values for a starting point in a new code. CEC's CASE report dated February 2007 for Refrigerated Warehouses quotes a survey of contractors on "Evaporative Condenser Fan and Pump Power" that Refrigerated Warehouse condensers operate in the **200 btuh/Watt efficiency level.**

These proposed values will have an immediate negative impact on our industry and will restrict the use of 30-50% of the evaporative condenser product lines available in the market place. EVAPCO suggests lowering the efficiency values to a more realistic starting level. We respectfully propose the following specific efficiency for Outdoor/Indoor Evaporative Cooled Condensers:

Description	Specific Efficiency[1]
Vane-Axial/Outdoor	225 Btuh/Watt
Centrifugal/Indoor	150 Btuh/Watt

[1]**The specific efficiency above is based on 100°F condensing temperature at 70°F entering air wet bulb design condition.**

These unrealistically high specific efficiencies are further magnified when compared to air cooled condenser specific efficiencies that are in the range of 65-75 Btuh/Watt. If the true goal of the California Investor Owned Utilities and California Energy Commission is to achieve significant energy savings in refrigerated warehouses then disparate specific efficiencies appear to be contradictory.

It will take an air cooled condenser 4.66 times the amount of energy to reject the heat load compared to an evaporative-cooled condenser based on the recommended specific efficiencies [(350 btuh/W) / (75 btuh/W)]. Furthermore, the higher condensing temperature specified for the air-cooled condenser specific efficiency significantly increases the compressor's power consumption therefore increasing the overall energy consumption of the system, the opposite goal of the IOU's and CEC's energy savings strategy.

In addition, the evaporative condenser design conditions are based on lower condensing temperatures than the 105°F condensing temperature used to evaluate air cooled condensers. Therefore, an evaporative cooled refrigeration system will be inherently more efficient due to the lower condensing temperature and the resulting lower horsepower consumption of the compressor.

EVAPCO is not trying to eliminate the use of air-cooled condensers as a viable means of condensing but would like to understand why evaporative-cooled products are being held to such a high energy efficiency requirement. Should air-cooled condensing systems and evaporative-cooled condensing systems be lumped into the same program? The concern we have is that the specific efficiency requirements proposed for evaporative-cooled condensers will restrict the number of models provided by manufacturers of evaporative cooled condensers and the code is more flexible for air-cooled condensers. Note, even the least efficient evaporative-cooled condenser is significantly more efficient than the specified air cooled condenser specific efficiency of 75 Btuh/Watt. Why limit design engineers from using an evaporative-cooled condenser that is still more energy efficient than an air-cooled condenser?

The CEC's proposed efficiency will require manufacturers to obsolete existing models resulting in the inability to effectively optimize selections, address project specific layout issues and offer the most cost effective solutions. Placing restrictions on evaporative cooled equipment will potentially drive the market to more inefficient technologies. This is not in the best interest of the California Energy Commission.

We believe Evapco's proposed specific efficiencies shown above offer a reasonable baseline for this section of the code at this time. Future code revisions will likely include thermal performance certification and higher minimum specific efficiencies. This will be a challenge for all manufacturers of both evaporative and air cooled condensers.

We encourage further evaluation of the overall energy impact associated with operating the refrigeration system at lower condensing temperatures. It is well recognized within the industrial refrigeration industry that the optimum system operating condition is based on lowering the condensing temperature to reduce the horsepower consumption of the compressor.

EVAPCO's suggested efficiency levels are provided in Table 120.6 below:

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~~ 225 Btuh/Watt	100°F Saturated Condensing Temperature (SCT), 70°F Outdoor Wet bulb Temperature
Outdoor Evaporative-Cooled with THR Capacity < 8,000 MBH and Indoor Evaporative-Cooled	All	~~160~~ 150 Btuh/Watt	
Outdoor Air-Cooled	Ammonia	75 Btuh/Watt	105°F Saturated Condensing Temperature (SCT), 95°F Outdoor Drybulb Temperature
	Halocarbon	65 Btuh/Watt	
Indoor Air-Cooled	All	Exempt	

Other items we find problematic in the documents are:

1) In the CASE study on the energy use of Refrigerated Warehouses dated October 31, 2011 a chart is published in Section 2, page 8 and 9 for different climate zones. The chart suggests energy savings for each type of condenser and presents data on the energy savings benefits of *air cooled condensers* compared to indoor evaporative cooled condensers.

For example, in Fresno, CA, it is shown that there is a **7680 kWh** annual energy savings with an air cooled condenser versus **344 kWh** for an indoor evaporative cooled condenser. This appears illogical. Knowing air cooled condenser efficiencies at 75 btuh/watt and centrifugal indoor evaporative condenser efficiencies of 160 btuh/watt, how is this savings figure achieved?

2) In this same study, EVAPCO agrees with **Section 4.4 Allow Air-Cooled Ammonia Condensers** by allowing air-cooled condensers for ammonia applications for greater energy savings versus halocarbons. However, the analysis performed in Appendix G to show the attractiveness of air cooled condensers in cool climates contains an overstated water consumption value for evaporative condensers.

EVAPCO performed its own evaluation of water usage for an evaporative condenser using the data for the Prototype Warehouse #1 from "Appendix A: Load Calculations for Fresno" Calculating the total load of this warehouse:

i) The 35°F cooler space of 1,277,384 btuh
ii) The -10°F freezer space of 1,385,001btuh
iii) The 40°F dock space of 1,107, 846 btuh

Total load is 3,770,231 btuh for this 92,000 sf. warehouse.

Using typical design conditions of 96°F condensing and a 73°F wet bulb (not sure why 70°F SCT was utilized in Appendix G), a selection was made utilizing EVAPCO's custom software program which utilizes up to date global climactic data, a typical load profile for refrigerated warehouses provided by Cascade Energy and an increased value of 5 cycles of concentration which is the California average based on the Cooling Tower Water Savings CASE study of October 2011. Note: 2.4 cycles was used in the Refrigerated Warehouse Appendix G study.

The EVAPCO ATC-305E-1g evaporative condenser is acceptable for this application and only uses **2,400,000** gallons of water annually. The example illustrated an annual water savings of **4,016,431 gallons** of *water* as shown in Appendix G using air cooled condensers.

By the ratio of the specific efficiencies, the air cooled condenser system could consume up to 4.66 times the power of the evaporative system. The additional water consumption required by the power plant to produce this additional power needs to be considered in the evaluation of true water saved.

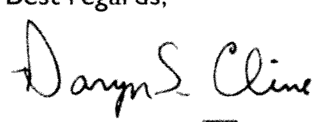
The energy savings realized in cooler climates for air cooled is also confusing, the energy efficiency of evaporative cooled equipment, especially in cooler climates will still exceed air cooled.

Simply stated, the energy and water saving values in Appendix G are inflated, and give the reader the impression that using air cooled condensers can save both water and energy.

3) In Appendix F of the October 31, 2011 Refrigerated Warehouse CASE study, the "Savings by Design" efficiency tables shown in **Figure 71: Axial Fan evaporative cooled ammonia condenser baseline** do not provide a set of design conditions that were used to establish the efficiency levels listed. In addition, the simple average of the values as shown in the table is actually 305 btuh/watt, not 350 as shown and used through the entire study.

EVAPCO, an environmentally focused company, looks forward to participating in the development of the next version of Title 24 Refrigerated Warehouses.

Best regards,



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