

DOCKETED

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Comment Received From: Bruce V. Nelson Engineering, LLC
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2025 Building Energy Efficiency Standards Table 120_6-A-2

See attached BVN Engineering letter dated 10 Apr 2026, CV, and Colmac Coil AHRI-420 Memo.

Thank you,
Bruce I. Nelson, P.E.
CEO

Additional submitted attachment is included below.



10 Apr 2026

California Energy Commission

Subject: Docket #: 25-BSTD-03
Project Title: 2028 Energy Code Pre-Rulemaking
Objection to AHRI-420 Test Procedure Requirement in Table 120.6-A-2

To Whom It May Concern,

This letter will serve to inform you of my objection to requiring manufacturers of refrigeration evaporators ("air coolers") to certify and list their equipment according to the requirements of AHRI-420.

This Test Procedure requirement was apparently inserted in the 2025 Energy Code Table 120.6-A-2 by the code committee at the suggestion of the only manufacturer currently able to comply with this requirement, that is, EVAPCO.

I am currently a refrigeration consulting engineer with end user and contractor clients in the State of California. Prior to starting my consultancy in 2021, I worked for many years at another manufacturer of refrigeration evaporators, Colmac Coil (ref. my CV attached). While at Colmac, I wrote a MEMO critiquing AHRI-420 explaining why the company chose not to participate in the certification program. The MEMO is also attached. In short, it is a badly written standard that does not provide value to end users in the industrial refrigeration space.

Inclusion of the AHRI-420 Test Procedure requirement in Table 120.6-A-2 creates a monopoly for one manufacturer, EVAPCO. This severely limits my ability to serve my end user customers by limiting competition, and by limiting my choices of equipment. In some cases, the AHRI-420 requirement could prevent the selection of more energy efficient evaporators, not made by EVAPCO.

My recommendation is simple: remove the Test Procedure column (i.e. AHRI-420 requirement) from Table 120.6-A-2.

Please feel free to contact me in case you have any questions.

Sincerely,

Bruce I. Nelson, P.E.
CEO



CURRICULUM VITAE
Bruce Ian Nelson, P.E.

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Email: bruce.nelson@bvngineering.com

Education: B.S. Agricultural Engineering, Cum Laude, Washington State University, 1980

Professional Experience:

- 2021 – Present **Owner and CEO**, Bruce V. Nelson Engineering, LLC
- Engineering consultancy providing design, analysis, and training services to companies in the commercial and industrial HVAC&R industry.
- 1997 – 2021 **President and C.O.O.**, Colmac Coil Manufacturing, Inc.
- Overall executive management responsibilities for Company operations.
- Company achieved record growth in sales and income during this period.
- Implementation of Lean Manufacturing techniques and practices.
- In-house development of parametric product configuration software.
- Obtained a number of patents related to the field of refrigeration.
- Pioneered the development of low charge DX ammonia systems.
- 1981 - 1997 *Various Engineering Positions*, Colmac Coil Manufacturing, Inc.
- Unique heat exchanger performance model developed in-house to effectively handle new Zeotropic refrigerant mixtures (CFC replacement refrigerants).
- Introduction of stainless steel tube/aluminum fin heat exchangers for industrial ammonia refrigeration systems.
- Introduction of aluminum tube and fin heat exchangers for industrial ammonia refrigeration systems (1985).

Professional Engineer (Mechanical) Licenses:

Wash State:	22890
Oregon:	103196PE
Idaho:	P-22166
Utah:	13417033-2202
Colorado:	0062667
Texas:	149791
Arizona:	79935
Hawaii	PE-20943-0
Alabama	PE55168

Society Activities/Honors:

- Past Chairman IIAR (International Institute of Ammonia Refrigeration)
- Past Chair Research Committee
 - Member of the Year Award
 - Honorary Life Member
- Fellow and Life Member ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers)
- Vice Chair REF-CPCC Committee
 - Member Technical Committee TC1.3 "Heat Transfer and Fluid Flow"
 - Distinguished Service Award (2013)
 - Past President Inland Empire Chapter
- Member IIR (Paris)
Fellow IoR (UK)
Member AIRAH (Australia)



Selected Bibliography:

Nelson, B. 1990. "Design of Evaporators for Liquid Overfeed Systems" ASHRAE Transactions, 1990, vol. 96. Part 1, paper no. AT-90-21-1. pgs 1309-1315.

Nelson, B. 1998. "Designing Air Coolers for Direct Expansion (DX) with Ammonia". IIAR Annual Meeting Proceedings, 1998, pgs 137-155.

2000. ASHRAE Standard 33-2000. "Method of Testing Forced Circulation Air Cooling and Air Heating Coils", American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE), Atlanta, GA.

Nelson, B. 2010. "Thermodynamic Effects of Water in Ammonia on Evaporator Performance". IIAR Annual Meeting Proceedings, 2010, pgs 201-236.

Nelson, B. 2010, "Refrigeration Air Cooler Rating Methods", ASHRAE Journal, August 2010, pgs 24-28.

Nelson, B. 2015. "Selecting Evaporators for CO2 Refrigeration". RETA Annual Meeting Proceedings, 2015.

Nelson, B. 2015. "Optimizing Evaporator Runtime and Defrost Frequency". IIAR Annual Meeting Proceedings, 2015, TP#4

Nelson, B. 2016. "DX Ammonia Piping Handbook, 4th Edition". Colmac Coil Manufacturing, Inc. Colville, WA

Nelson, B., Struder, G. 2019. "Ammonia Refrigeration Piping Handbook Chapter 1 Pipe Sizing". IIAR. Alexandria, VA

Nelson, B. 2023. "Hygienic Air Handler Engineering Manual, 1st Edition". Colmac Coil Manufacturing, Inc. Colville, WA

Patents:

USA Patent No. 6,843,509, "Coupler For Use with Metal Conduits"

USA Patent No. 7,597,137, "Heat Exchanger System"

USA Patent No. 7,712,327, "Method for Defrosting Heat Exchangers"

USA Patent No. 7,958,738, "Direct Expansion Ammonia System"

Australian Patent No. 2013202295 "Heat Exchanger"

Canadian Patent No. 2,617,566 "Heat Exchanger System"

USA Patent No. 8,474,276 "Direct Expansion Ammonia Refrigeration System and a Method of Direct Expansion Ammonia Refrigeration"

USA Patent No. 8,783,057 "Refrigerant Distributor"

USA Patent No. 8,966,935 "Heat Exchanger"

USA Patent No. 9,689,621 "Heat Exchanger"

USA Patent No. 10,077,933 "Defrost Hoods"

USA Patent No. 10,378,826 "Cascade Heat Exchanger"

MEMO

To: Colmac Coil Sales Group
From: Bruce I. Nelson, P.E.
President
Subject: AHRI Standard 420

Colmac Coil has manufactured commercial and industrial heating and cooling coils including refrigeration evaporators for air-cooling and freezing applications since 1974.

Our coil ratings are based on performance testing conducted at independent third party laboratories such as the Intertec/ETL Laboratory in Cortland, NY, according to the methods described in ASHRAE Standard 33 and AHRI Standard 410.

ASHRAE 33 and AHRI 410 are well-written standards that confirm performance of heating and cooling coils over the wide range of operating conditions found in most HVAC air heating and cooling applications. The standards also allow for completely variable coil dimensions in terms of fin material and thickness, fin spacing, tube material and wall thickness, coil height and width, and rows deep. There are multiple testing laboratories available to participants for certification and random testing. Because ASHRAE 33 and AHRI 410 were written to closely mirror how manufacturers design and produce heating and cooling coils for the HVAC market, these standards have found wide acceptance in the end-user and manufacturing communities.

Colmac Coil provides customers with software programs for the selection and rating of coils and refrigeration unit coolers. CoilPRO software is used to select and rate heating and cooling coils based on ASHRAE 33 and AHRI 410 test data. A+Pro software is used to select and rate refrigeration unit coolers and uses the same heat transfer data and algorithms as CoilPRO.

AHRI Standard 420 for forced-circulation free-delivery unit coolers for refrigeration, on the other hand, in our opinion is a badly written standard that does not accomplish the goal of providing the industry with a performance certification program that covers the type and range of equipment configurations and operating conditions commonly found in industrial refrigeration systems.

Fundamental problems with AHRI-420:

1. **AHRI-420 ratings are limited to standard models only.** Any change to a certified model's dimensions, fin spacing, number of rows, airflow, etc., causes the rating to no longer be certified. No allowance is made in the standard for rating non-standard models. Example: If certification is based on a model with fin spacing of 4 fpi, the rating for a change to 4.3 fpi would not be considered certified.
2. **AHRI-420 ratings only apply to five "Standard Rating Conditions".** These operating conditions are shown in the table below and are the basis for "Standard Ratings". Unit coolers are tested only at the Standard Rating Conditions. If "Applications Ratings" (ratings at other than Standard

Rating Conditions) are published, the ratings must be accompanied by the statement: "Outside the scope of AHRI Standard 420". Note that none of the five standard rating conditions include frost or latent effects at freezer temperatures, i.e. only dry coil conditions are used for ratings below freezing. This system of fixed rating conditions is NOT realistic and does not reflect how unit coolers are actually selected and applied.

Condition Number	Coil Condition	Entering Air			Refrigerant Saturation Temperature		Temperature Difference	
		Dry-bulb temperature		Relative humidity				
		Deg F	Deg C	%	Deg F	Deg C	Deg F	Deg C
1	Wet	50	10	75	35	1.7	15	8.3
2	Dry	50	10	<45	35	1.7	15	8.3
3	Dry	35	1.7	<50	25	-3.9	10	5.6
4	Dry	10	-12.2	<46	0	-17.8	10	5.6
5	Dry	-10	-23.3	<43	-20	-28.9	10	5.6

3. ***AHRI-420 ratings do not apply to glycols or brines.*** Only certain volatile refrigerants can be certified by the standard. Also, any refrigerant with temperature glide of over 2 deg F (basically most of the R-4XX series refrigerants) cannot be certified.
4. ***AHRI-420 ratings cannot be applied to gravity flooded evaporators.*** Only DX and pump recirculated evaporators can be certified.
5. ***Unit cooler configurations that can be certified under AHRI-420 is limited.*** Only the following types of unit coolers can be certified:
 - DX R-404a, DX R-507a, DX R-717, and Recirc R-717
 - Aluminum fins
 - Single vertical coil
 - Horizontal airflow only with no changes in airflow direction
 - Axial fans only

This means that the following unit cooler configurations CANNOT be certified under AHRI-420:

 - Penthouse air discharge
 - 45 deg down air discharge
 - Units with return air defrost hoods
 - Units with centrifugal fans
 - Dual coil units
 - Above rail units
 - Galvanized steel coil construction
 - Copper or CuNi fin coil construction
6. ***The number of AHRI-420 participants and certification laboratories is limited.*** At this time there is only one participant in the AHRI-420 certification program (Evapco). Also at this time there is only one laboratory certified by AHRI for AHRI-420 testing (Evapco).

Conclusion:

Colmac Coil has chosen not to participate in the AHRI-420 certification program because in our opinion it is a badly written standard which does not provide our customers with any value.

Our performance ratings are based on measured heat transfer performance taken at reputable independent third party laboratories according to the requirements of ASHRAE Standard 33 and AHRI Standard 410. These are widely accepted, well written standards which have added value for our customers and provided us with validation and verification of our coil rating software. As mentioned above, we use the same heat transfer data and algorithms in our software for rating both our heating and cooling coils and our refrigeration unit coolers.

Sincerely,

Bruce I. Nelson, P.E.
President