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Via Email: Ms. Cynthia Newberg
Docket No. EPA-HQ-OAR-2019-0698

July 27, 2020

Ms. Cynthia Newberg,
Director Stratospheric Protection Division
Environmental Protection Agency

RE: Notice of Proposed Rulemaking on Protection of Stratospheric Ozone: Listing of Substitutes Under Significant New Alternatives Policy Program, Docket I.D. EPA-HQ-OAR-2019-0698, RIN 2060-AU81

Dear Ms. Newberg,

On behalf of the Air Conditioning, Heating and Refrigeration Institute (AHRI), I respectfully submit the following comments to the Environmental Protection Agency's Notice of Proposed Rulemaking on Protection of Stratospheric Ozone: Listing of Substitutes Under Significant New Alternatives Policy Program, Docket I.D. EPA-HQ-OAR-2019-0698, RIN 2060-AU81.

AHRI represents over 300 air-conditioning, heating, and refrigeration equipment manufacturers. In North America, the annual output of the 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.

For over a decade, AHRI worked to support regulations to phase down HFC production and consumption as a proven, predictable, and practical approach to a looming international patchwork of HFC regulations. Our industry worked closely with national and local governments, both foreign and domestic, to prepare and successfully execute the safe and orderly transition to next generation technologies and refrigerants. The successful listing of the proposed refrigerants as acceptable is an important step in that process, not only for compliance with regulations within in individual states that are regulating HFCs, but also in other countries that rely on the EPA's comprehensive comparative analysis of new alternatives before allowing new refrigerant use within their own borders.

AHRI and its members greatly appreciate the EPA Significant New Alternatives Policy (SNAP) Program staff consideration of the 2017 AHRI petition to list certain refrigerants for use in commercial refrigeration as acceptable and the listing of air conditioning refrigerants submitted independently as acceptable. These refrigerants are all needed for compliance with proposed and final state HFC regulations. AHRI concurs with EPA that these refrigerants can be appropriately listed as acceptable using EPA's comparative risk analysis.

EPA proposes to *"list R-452B, R-454A, R-454B, R-454C and R-457A as acceptable, subject to use conditions, for use in residential and light commercial air conditioning (AC) and heat pumps for new equipment and R-32 as acceptable, subject to use conditions, for use in residential and light commercial AC and heat pumps—equipment other than self-contained room air conditioners, for new equipment*

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(Note: R-32 was previously listed as acceptable, subject to use conditions, in self-contained room air conditioners [April 10, 2015; 80 FR 19454])"

The Air Conditioning, Heating and Refrigeration Technical Institute (AHRTI) and Other Research into Next Generation Refrigerants

Over the past five years, AHRI, in cooperation with the Department of Energy (DOE), the California Air Resources Board (CARB) and other concerned stakeholders have invested nearly $7 million in research into the behavior and safe use of next generation refrigerants. Research results are made public at the following website. The table in exhibit one shows the most recent summary of this body of research. This research has been used in the development of the safety standards as well as in development of training and in preparation for the transition.

http://www.ahrinet.org/Resources/Research/AHRI-Flammable-Refrigerants-Research-Initiative

A significant number of tasks were completed within the scope of each research project with important learnings too numerous to list here that were discovered or confirmed. The full reports and learnings are posted on AHRI's website.

Next generation refrigerant blends for air conditioning proposed to be listed as acceptable in SNAP Rule 23 are comprised of components used in refrigerants today[1]. Predictably, most of the basic chemical and physical properties of these new refrigerants are the same as the previous generations (CFC/HCFC/HFC) of refrigerants. The move to more sustainable refrigerants necessitates growth in applications with different flammability characteristics. However, it is important to understand that refrigerants are classified according to flammability by the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Standard 34 & the International Standards Organization (ISO) 817 following test protocols under ASTM E681 as having 1- no flame propagation, 2L – lower flammability, 2- flammable, and 3- higher flammability. There is no ASHRAE classification describing any refrigerant as "non-flammable"[2].

AHRI Safe Refrigerant Transition Task Force

Differences in the properties of next generation refrigerants (e.g., flammability and toxicity) may require changes to current practices to minimize risk while meeting regulations. Some new refrigerants are historic products that have not been used in some time or that will be used with larger charge sizes (e.g.

[1] For example, R-410A, the most commonly used air conditioning, is comprised of 50% R-32 and 50% R-125, and one of the refrigerant proposed to be listed as acceptable is R-32.

[2] EPEE "Q&A on HFOs and HCFOs" https://www.epeeglobal.org/wp-content/uploads/2018-11-06-QA-Screen.pdf confirms previous learnings that fluorocarbon refrigerants form hydrogen fluoride during combustion or decomposition regardless of their ASHRAE flammability classification. July 20, 2020
https://www.tandfonline.com/doi/abs/10.1080/00102202.2017.1359166?scroll=top&needAccess=true&journalCode=gcst20De composition of HFC134a Using Arc Plasma shows that 134a à HF
http://iesj.org/IJPEST/01/2/PDF/01-02-159.pdf
Thermal Decomposition Products from Fire Suppression with HFC-227ea in an Electronic Facility
https://journals.sagepub.com/doi/abs/10.1177/1042391504044161

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ammonia and hydrocarbons) or different types of equipment. Other next generation refrigerants such as R-32 are sold in the European Union, Japan and Australia into stationary air conditioning.

More than 25 million residential units sold in Japan in 2018 contained R-32[3], a lower flammability refrigerant. In the United States, more than 80% of model year 2020 light-duty vehicles[4] contain lower flammability refrigerants.

In 2012, an Australian carbon tax of $23 Australian dollars per ton carbon dioxide was the impetus for a very fast conversion to low-GWP refrigerants, resulting in approximately $10 and $20 tax per pound of R-410A and R-404A respectively.[5] Despite the repeal of the carbon tax in 2014, in six years, a significant portion of the air conditioning in Australia has been converted to lower flammability, A2L refrigerants

Members of AHRI note that it has yet to find incidents related to A2L refrigerants, which may be in part attributed to the analysis completed by stakeholders examining the supply chain prior to the transition.

Inspired by the success in Australia, AHRI formed the Safe Refrigerant Transition Task Force in 2019 to evaluate the end-to-end supply chain for conversion readiness for interested stakeholders, to identify needs, and resolve issues or make recommendations to enable the safe use of low-GWP refrigerants in a timely manner to meet regulatory requirements. The Task Force is also leveraging learnings around the world, including the widespread use of A2L refrigerants in HVACR products in the European Union (EU), Japan, India, and Australia, as well as the auto industry in the EU, US, and Canada.

For additional information, see the AHRI Safe Refrigerants Transition Task Force website. http://www.ahrinet.org/SafeRefrigerant

Refrigerant Properties

Next generation refrigerants classified as A2L (low toxicity and lower flammability[6]) are difficult to ignite.

- Per the American Society of Heating and Refrigeration Engineers (ASHRAE) Standards 34, the lower flammability limit of A2L refrigerants is greater than 0.1 kg/m^3 and the concentration needed for ignition of the refrigerants included in the proposed rule is 6% to 14%.

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[3] Samantha Lile in "HVAC Industry Begins Adoption of R-32 Refrigerant," published January 9, 2020, https://www.motili.com/author/samantha-lileicloud-com/; E-Jarn The Global R32 AC Market – 2018 Overview 7/1/19 https://www.ejarn.com/detail.php?id=58679&l_id=

[4] [8] The Chemours Company Service demand for R-1234yf is growing rapidly. Are you prepared? https://www.chemours.com/Refrigerants/en_US/uses_apps/automotive_ac/SmartAutoAC/assets/downloads/opteon-yf-infographic.pdf

[5] "Carbon tax: a timeline of its tortuous history in Australia" https://www.abc.net.au/news/2014-07-10/carbontax-timeline/5569118 October 29, 2019; "The Carbon Tax in Australia" https://www.centreforpublicimpact.org/case-study/carbon-tax-australia/ October 29, 2019; Australian - US Dollar Exchange Rate (AUD USD) - Historical Chart https://www.macrotrends.net/2551/australian-us-dollar-exchangerate-historical-chart October 29, 2020.

[6] EPA may want to update references to "mildly flammable refrigerants" to "refrigerants with lower flammability" to align with ASHRAE definitions.

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- A2L refrigerants have high minimum ignition energies (MIEs) and must be exposed to a very high energy ignition source such as an open flame. Common household products such as toasters, hair dryer, electric heater inserts and others have been shown to be incompetent ignition sources for A2L refrigerants[7].

AHRI supports the prohibition to retrofit to a higher ASHRAE flammability class refrigerant

"(2) New equipment only—These refrigerants may be used only in new equipment designed specifically and clearly identified for the refrigerant; i.e., none of these substitutes may be used as a conversion or "retrofit" refrigerant for existing equipment."

AHRI strongly supports the continuation of EPA's precedent that refrigerants from a higher ASHRAE flammability classification may not be used to retrofit existing equipment, nor can they be used in products that are not designed for their use. Flammable refrigerants should only be used in systems/applications that are designed and listed by an approved nationally-recognized laboratory to mitigate risks, and where allowed by appropriate codes and standards, or by an Authority Having Jurisdiction (AHJ) as additional equipment and modifications would likely be needed to meet safety standard requirements and minimize risk.

AHRI seeks clarification regarding footnote 33 as to whether the Agency is referring to external piping. Existing external piping must be pressure-tested, leak-checked and vacuum-checked per the safety standards during the installation process. Since the 1990s[8], the building codes have required that If piping is within 1.5 inches of a wall that nail strips are required for protection. If the reference is to external piping, AHRI suggests that the language be modified from "*This is intended to mean a completely new refrigeration circuit containing a new compressor, evaporator, condenser and refrigerant tubing*" to "*This is intended to mean a completely new refrigeration circuit containing a new compressor, evaporator, and condenser.*"

Australia has no retrofit prohibition as included in the EPA proposed regulation. There have been some incidents related to equipment retrofitted from A1 to A3 refrigerants in Australia.

AHRI supports updating training and certification requirements to include A2L refrigerants.

EPA also requested additional comments regarding training and certification requirements. AHRI strongly supports incorporation of new refrigerant and requirements regarding A2L refrigerants into existing certification requirements.

AHRI requests EPA support to better harmonize regulations with the safety standards.

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[7] "AHRI Project 8017 Report: Investigation of Energy Produced by Potential Ignition Sources in Residential Application by D.K. Kim and P.B. Sunderland, 2017" http://ahrinet.org/Resources/Research/Public-Sector-Research/Technical-Results

[8] The International Building Codes have included this requirement since their inception during the 1990s.

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EPA has proposed several use conditions around the labeling and marking of residential and light commercial air conditioning and heat pump systems. The labeling requirements in UL/CSA 60335-2-40 Household and Similar Electrical Appliances – Safety – Part 2-40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers have been reviewed by stakeholders, including fire officials, and found to be sufficient.[9] AHRI requests that EPA consider using the labeling requirements found in UL/CSA 60335-2-40 which also complies with ANSI requirements or that EPA submit a proposal to UL indicating potential modifications to the standard that EPA may deem necessary. AHRI notes that UL product labels will remain on equipment at end-of-life which should be evacuated prior to disposal.

AHRI notes that there is currently an ongoing effort to harmonize the relevant safety standards and recommends that EPA update references to requirements for compliance with product safety standards as new editions and revisions become available. EPA might also consider incorporating relevant application standards such as ASHRAE 15 when the harmonization process is complete. AHRI understands that EPA must evaluate updates to product standards prior to incorporating them into refrigerant use restrictions. Incorporating new and updated standards will become more important as standards sunset in the coming years such as UL 484.

AHRI commends EPA's efforts in the rulemaking to align with the safety standard but notes that additional context from the safety standards might address some errors or confusion. AHRI requests that these be corrected as noted in addendum 1. AHRI specifically notes the following example below.

The proposed rule notes that safety alarms are required. This may be due to the vernacular of the standard describing the mitigation control system as a detector. UL 60335-2-40 does not require alarms in most cases because the sensor/detector initiates mitigation unlike a passive safety device such as a smoke detector. If refrigerant is detected above a certain concentration, fan operation and air circulation or ventilation are activated.

AHRI requests a listing of acceptability for at least R-32 and R-454B for positive displacement chillers.

AHRI notes that this proposed listing does not include an allowance for the use of A2L refrigerants for positive displacement chillers which will be needed for compliance with regulations adopted in several states. AHRI requests a listing of acceptability for these refrigerants for positive displacement chillers realizing that this may need to be completed under a separate regulation.

EPA proposes to "*List R-448A, R-449A and R-449B as acceptable, subject to narrowed use limits, for use in retail food refrigeration—medium-temperature stand-alone units for new equipment; subject to narrow use conditions.*" Users "*must ascertain that other alternatives are not technically feasible*" and "*must document the results of their evaluation and retain the results on file for the purpose of demonstrating compliance. This documentation shall include descriptions of substitutes examined and rejected, processes or products in which the substitute is needed, reason for rejection of other*

[9] UL/CSA 60335-2-89 will soon enter its public comment period and perhaps EPA could consider commenting if there are inconsistencies in labeling or other requirements of concern.

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alternatives, e.g., performance, technical or safety standards, and the anticipated date other substitutes will be available and projected time for switching to other available substitutes.''

AHRI requests that R-448A, R-449A, and R-449B be approved without restrictions until additional alternatives become available. AHRI further requests clarification of the narrowed use requirements in that compliance with the Americans with Disabilities Act (ADA) would not be the only reason that would allow for the use of these products.

As this documentation will create some additional regulatory requirements, AHRI members would like clarification as to whether a document could be developed for a group of alternatives or if documentation would be required for each piece of equipment using these substitutes. AHRI members would also appreciate further clarification as to whether a description of the enabling regulations needed plus a period of time for preparation might be sufficient documentation (e.g. higher charge limits allowed for A2L refrigerant plus three years to prepare for the transition).

Again, AHRI and its members greatly appreciate the EPA Significant New Alternatives Policy (SNAP) Program staff efforts to continue to complete their comparative analysis for new refrigerants. This will enable compliance with proposed and final state HFC regulations. As noted earlier, AHRI concurs with EPA that these refrigerants can be appropriately listed as acceptable using EPA's comparative risk analysis.

If you need additional information or have any questions, please contact Helen Walter-Terrinoni at hwalter-terrinoni@ahrinet.org

Sincerely,

Helen Walter-Terrinoni

Helen Walter-Terrinoni
VP Regulatory Affairs
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Exhibit-1: The following launched projects were developed as the result of the survey of safety standard community. They were prioritized among other identified research needs and considered as high priority projects by a group of experts including industry experts, major safety standard committee chairmen and members, and representatives from U.S. Department of Energy (DOE), Environmental Protection Agency (EPA) and National Institute of Standards and Technology (NIST).

Launched High Priority Projects	Funding Organization	Project Description	Status
AHRTI-9007-01: Benchmarking Risk by Whole Room Scale Leaks and Ignitions Testing of A2L Refrigerants	AHRI	A2L refrigerants leak and ignition testing under whole room scale conditions was conducted to develop data and insight into the risks associated with the use of A2L refrigerants versus A1 refrigerants while considering ambient conditions (temperature and humidity) and refrigerant lubricants.	Completed
AHRTI-9007-02: Benchmarking Risk by Whole Room Scale Leaks and Ignitions Testing of A3 Refrigerant	CARB	This project is to conduct A3 refrigerant leaks and ignitions testing under whole room scale conditions, understand the risk associated with the use of A3 refrigerants, and provide test data to support future revisions of relevant safety standards associated with using A3 refrigerants.	Completed
AHRTI-9008: Investigation of Hot Surface Ignition Temperature for A2L Refrigerants	AHRI	The objective of this work is to develop a test methodology to assist in the evaluation of the propensity of A2L refrigerants (R32, R1234ze, and R452B) to ignite on hot surfaces, and to carry out testing per the new test methodology.	Completed
AHRTI-9009: Leak Detection of A2L Refrigerants in HVACR Equipment	AHRI	A thorough review of sensor technologies was conducted to evaluate available technologies that can be used to meet safety standards requirements of detecting A2L refrigerants and easily integrated into air-	Completed

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		conditioning and refrigeration equipment. Infrared (IR) and Metal Oxide Semiconductor (MOS) sensors were found to be the most promising sensor technologies.	
AHRTI-9014: Assess Refrigerant Detector Characteristics for Use in HVACR Equipment	AHRI	The objective of the project is to assess refrigerant sensor and refrigerant detector performance requirements for class 2L, 2, 3 flammable refrigerants for use with indoor HVACR equipment, whether in an occupied space or a machinery room.	Ongoing
AHRTI-9015: Assessment of Refrigerant Leakage Mitigation Effectiveness for Air-Conditioning and Refrigeration Equipment	AHRI	The objective of this project is to demonstrate the efficacy of refrigerant leakage mitigation strategies contained within residential split-systems, packaged air-conditioning equipment and commercial refrigeration products.	Ongoing
ASHRAE-1806: Flammable Refrigerants Post-ignition Risk Assessment	ASHRAE	The objective of this project is to understand the severity of events where flammable refrigerants are ignited under different scenarios for various HVAC&R products.	Ongoing
ASHRAE-1807: Guidelines for flammable refrigerant handling, transporting, storing and equipment servicing and installation	ASHRAE	This project accessed flammable refrigerant safety guidelines and/or requirements that exist domestically and internationally. The assessment will be used to propose requirements/guidelines for the safe handling, storing and transporting of flammable refrigerants	Completed
ASHRAE-1808: Servicing and Installing Equipment Using Flammable Refrigerants:	ASHRAE	This project tested the leak-tightness of various types of field-made joints used to	Completed

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Assessment of Field-made Mechanical Joints		connect refrigerant piping and system components in HVAC&R equipment. The results of this project provided necessary data to suggest whether or not common types of joints, other than brazed or soldered joints, should be permissible for use in equipment containing flammable refrigerants.	
ASHRAE-1855: Determination of the Impact of Combustion byproducts on the Safe Use of Flammable Fluorinated Refrigerants	ASHRAE	The overall objective of the project is to understand the HF and COF2 exposure risk if ignitions of flammable halogenated refrigerants occur and how to clean up following a variety of ignition events, as well as to identify knowledge gaps.	Report under review
ORNL: Determination of setting charge limits for various types of equipment employing flammable refrigerants	DOE	The primary objective of the project is to examine the currently imposed limits for flammable refrigerant alternatives (A2L, A2, and A3) and identify reasonable adjustments to these limits as appropriate.	Completed
ORNL: Experimental Evaluation of Refrigerant Leak Characteristics for Different HVAC&R Equipment Types	DOE	The objective of the project was to quantify actual leak rates and duration for various pieces of equipment by conducting refrigerant leak tests under operating conditions representative of actual applications.	Completed
NIST: Modeling Tools for Flammability Ranking of Low-GWP Refrigerant Blends	DOE	The project is to develop modeling tools that can predict the burning velocity of arbitrary mixtures of R32, R125, R134a, R152a, 1234yf, and 1234ze(E), so that flammability of a blend can	ongoing

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		be minimized, while simultaneously maximizing performance related to other parameters.	

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Exhibit 2- **Summary of Exhibit 2 the Work of the Safety Standard Working Group of the OEM Safe Transition Task Force – 3/20/20:**

The AHRI Original Equipment Manufacturer (OEM) Task Force member companies provided a technical and a policy representative to discuss the air conditioning (AC) safety standards with AHRI staff and representatives from UL and ASHRAE. The group noted that there are no unresolvable conflicts or differences between the ASHRAE 15 (2019), UL/CSA 650335-2-20 (2019) and ASHRAE 15.2(P). The group focused on direct (residential and light commercial, but not applied) applications and concluded that there are differences between the safety standards. However, there was agreement that the most stringent requirement must be followed as identified in the attached spreadsheet. No issues were identified as being unresolvable.

There is a reconciliation process underway to align the standards as much as possible. The list generated by this working group will be provided to the AHRI standards review group to assist in their reconciliation process. It will be helpful to align the standards as much as possible, but since they are all updated on different schedules and they serve different functions, it is unlikely under the current structure that they will ever be exactly the same. Therefore, the most stringent requirements will always need to be followed.

On March 20, 2020, there were only 7 additional requirements in ASHRAE 15.2 (that were not included in the other two safety standards) which were found to be of "no practical significance." There is currently debate regarding additional requirements for piping. AHRI notes that existing external piping must be pressure-tested, leak-checked and vacuum-checked per the safety standards during the installation process. Since the 1990s[10], the building codes have required that if piping is within 1.5 inches of a wall that nail strips are required for protection. More details can be found in the attachment titled "Summary of the Work of the Safety Standard Working Group of the OEM Safe Transition Task Force" – 3/20/20..

Exhibit 3 Discussion on Trifluoroacetic acid (TFA)

The atmospheric fate of some fluorocarbons (e.g. HFC-134a and HFO-1234yf) includes trifluoroacetic acid (TFA) which is persistent in the environment. TFA is naturally occurring and is largely deposited in the world's oceans. An analysis was completed several years ago regarding the use of HFO-1234yf and the impact to TFA concentrations globally. This information has been summarized by the United Nations Montreal Protocol Environmental Assessment Panel 2018 Assessment Report which can be found at this link.

https://ozone.unep.org/sites/default/files/2019-04/EEAP_assessment-report-2018%20%282%29.pdf

[10] The International Building Codes have included this requirement since their inception during the 1990s.

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The panel concluded in 2018:

"Estimates of production of TFA in China, the USA, and Europe84 and assuming no dilution, would be several orders of magnitude less than the chronic "no observable effect concentration" (NOEC) of 10,000,000 ng L–1 for TFA-Na salt from a microcosm study.[11]

Overall, there is no new evidence that contradicts the conclusion of our previous Assessments that exposure to current and projected concentrations of salts of TFA in surface waters present a minimal risk to the health of humans and the environment. A recent review of this topic56 reached a similar conclusion."

Additional Documents:

- AHRI CalFIRE Disccussion May 21, 2020
- AHRI presentation for A2L Work Group Jan 28 2020
- Hughes Associates DTL Paper
- May AHRI CalFIRE A2L refrigerant discussion
- Quick view- Direct AC systems
- Safety Standard Review Summary for OEM Task Force Final
- SRTTF_AHRI FAQs Safe Refrigerant Transition Task Force
- SRTTF Clean Research project for low GWP v7
- The Changing World of Refrigerants Webinar Nov 2019
- Thermal Decomposition of Lower-GWP Refrigerants
- VRF-VRV 7-7-20
- Ch 1 - The Changing World of HFC Refrigerants
- Ch2 – Chemical Physical and Environmental Properties of A2L Refrigerants
- AHRI_SRTTF_Low GWP Refrigerants FAQs
- Differenes in safety standards for discussion March 19 v7

Additional information can be found at AHRI's SRTTF website and AHRTI's AHRI Flammable Refrigerants Research Initiative website

http://www.ahrinet.org/SafeRefrigerant#:~:text=AHRI's%20Safe%20Refrigerant%20Transition%20Task,low%20global%20warming%20potential%20refrigerants.

http://www.ahrinet.org/Resources/Research/AHRI-Flammable-Refrigerants-Research-Initiative

[11] 9 Hanson ML, Sibley PK, Mabury SA, Solomon KR and Muir DCG, 2002, Trichloroacetic acid (TCA) and trifluoroacetic acid (TFA) mixture toxicity to the macrophytes Myriophyllum spicatum and Myriophyllum sibiricum in aquatic microcosms, Sci. Tot. Environ., 285, 247–259.

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Addendum 1 AHRI Requested Upgrades to the Proposed Rule 23

AHRI recommends that references to "mildly flammable refrigerants" be replaced with the ASHRAE terminology "lower flammability refrigerants" throughout the rule.

AHRI notes that the proposed rule states that safety alarms are required. This may be due to the vernacular of the standard identifying the mitigation control system a detector. UL 60335-2-40 does not require alarms in most cases because the sensor/detector initiates mitigation unlike a passive safety device such as a smoke detector. If refrigerant is detected above a certain concentration fan operation and air circulation or ventilation are activated.

Page 35881, left column, item 4 – SNAP rule 23 proposed to require red pantone 185 color marking on tubing. The first sentence indicates that red color houses and piping be used with flammable refrigerants. The requirements then go on to require that service ports, pipes, hoses and other devices through which the refrigerant is serviced. Markings shall extend at least 1 inch (25mm) from the servicing port and shall be replaced if removed.

AHRI seeks clarification as the first sentence seems to require all red tubing, but we believe the intent was just to mark service ports. All red tubing was not adopted by UL due to the possible durability of the red tubing. The standard instead requires a label. Section 7.1 of UL 60335-2-40 requires the following;

"If not already visible when accessing a SERVICE PORT and if a SERVICE PORT is provided, the SERVICE PORT shall be marked to identify the type of refrigerant. If the refrigerant is flammable, symbol ISO 7010-W021 (2011-05) shall be included, without specifying the color . When an A2L REFRIGERANT is used, the flamesymbol ISO 7010-W021 (2011-05) shall be replaced with the A2L symbol described in 7.6."

The UL labeling approach for service ports which informs of the presence of an A2L and also defines what A2L refrigerant should be used.

The use of red markings and the use of red hoses may cause some confusion. Typical HVAC gage sets currently use red, blue and yellow houses where the red is high-side pressure, blue low-side pressure and yellow for connection to the refrigerant cylinder. Some are supplied with conversion fittings for use with new automotive fittings.

Page 35882 Right column, item 2 – The proposal defines an A2L refrigerant with an LFL >0.10 kg/m2, a heat of combustion <19,000 kJ/kg, and a burning velocity <10 cm/s with test in dry air at 23 C and 14.7 psia. Tests are run at 23°C per the ASTM 681 procedure but the final determination is done at 60°C and is what is listed in ASHRAE 34 as the requirements for A2L. ASHRAE 34 in section 6.1.3.5 states:

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*For those Class 2L, Class 2, or Class 3 refrigerants or refrigerant blends that show no flame propagation when tested at 73.4°F (23.0°C) and 14.7 psia (101.3 kPa) (i.e., no LFL), an elevated temperature flame limit at **140°F (60°C)** (ETFL60) shall be used in lieu of the LFL for determining their flammability classifications.*

Page 35884 Left Column, Use Restrictions - The use conditions EPA proposes include conditions requiring use of each refrigerant in new equipment, which can be specifically designed for the refrigerant; use consistent with the UL 60335–2–40 industry standard, including testing, charge sizes, ventilation, usage space requirements, and certain hazard warnings and markings; and revisions to the requirements for warnings and markings on equipment to inform consumers and technicians of potential flammability hazards.

It may be helpful to clarify that this is not an exhaustive list of requirements that the industry has proposed thru UL 60335-2-40, ASHRAE 15, and ASHRAE 15.2. Some examples of additional mitigation required in the standards are below.

- Air circulation: For almost all applications air circulation will be sufficient to dilute the refrigerant concentration in the event of a catastrophic leak to below 25% of the LFL. Only in rare case will ventilation be used to introduce outside air.
- Control of ignition sources and hot surface temperatures
- Additional requirements for portable units, ductless and VRF and appliances.

Page 35883 left and center column, use restrictions: The proposed rule indicates that all the requirements of UL 60335-2-40 must be met. Note that products must be listed and approved by a 3rd party organization including UL and CSA.

- Alarms are not required in most cases by UL 60335-2-40 because the sensor/detector is not a passive safety device like smoke detectors. Instead they initiate mitigation such as air circulation or ventilation if needed.
- The standard is complex and it appears some of the text from UL 60335-2-40 is taken out of context. Depending on the type of equipment, if the equipment includes a sensor, if the unit is ducted the requirements are different. Safety shut-off valves are an option only for VRF products. There are also specific requirement for connected spaced for duct free products but they are not applicable for ducted products with sensors/detectors.
- The rule notes that for portable appliances for a charge less than 3 times LFL no room area, ventilation or risk mitigation is required. This is not correct as mitigation requirements for labeling, ignition source controls and other features are required.
- This same rule also applies to fixed appliances but the charge level is 6 times LFL

Page 35884 right column Detector Requirements – The rules seems to indicate that detector systems may be used in certain applications. This is somewhat misleading and detectors are required to be factory installed, qualified and listed with the product for any unit with a charge above m1 which is about 3.5-4 lbs for most A2L refrigerants. The rule also mentions safety alarms which are not required by UL 60335-2-40 for most applications because the detector enables active mitigation.

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- The detectors, if required, must be factory installed rather than installed separately.
- The rule also talks about ventilation as mitigation, but the requirements in most cases are circulation of the air to dilute the refrigerant which is why the minimum room area is confirmed and defined. Only in a few cases is ventilation (outside) air required and used.

Page 35885 right column item 5 – The rule mentions that use of spark-proof tools and equipment design for flammable refrigerants as defined in OSHA 29 CRF are required. Spark-free tools are not required for A2L refrigerants as these refrigerants have a high minimum ignition energy and sparks from tools and even some electrical devices is not a competent ignition source for an A2L refrigerant due to their higher minimum ignition energies (MIEs).

Page 35885 right column – Competence of service personnel – The rule notes that the recommendations in UL 60335-2-40 are informational, but this is somewhat misleading. The UL 60335-2-40 standard requires installation and service instructions to be include with the product and part of the approval process. The installation instructions will include the annex HH recommendations but tailor them to the specific requirements of the product.