

**From:** Ruben Grijalva <ruben@firechiefs.com>  
**Sent:** Monday, September 23, 2019 6:22 PM  
**To:** DES SBCC <sbcc@des.wa.gov>  
**Cc:** Ruben Grijalva <Ruben@firechiefs.com>  
**Subject:** Testimony on the adoption of the 2018 IRC and IMC

This letter is to respectfully request the Washington State Building Council NOT adopt UL 60335-2-40 3rd Edition into the 2018 IRC and 2018 IMC. The Standard is still in its comment and review process and is not yet complete or published.

The Washington Mechanical Code TAG has recommended that Washington update the product safety standard for air conditioning equipment (UL 60335-2-40) to the 2019 edition.

The UL Standard in question would permit the use of flammable refrigerants in residential air conditioning equipment for the first time.

The same proposal has been made to the ICC Residential Code.

**The following organizations have expressed serious concerns about the safe introduction of flammable refrigerants without adequate testing, evaluation, and training:**

*International Association of Fire Fighters*  
*International Association of Fire Chiefs*  
*National Association of Fire Marshals*  
*Air Conditioning Contractors of America*  
*A host of local and state agencies*

If Washington moves forward with this proposal, it will be the first state in the U.S. to do so. Some of the reasons for the opposition should be clearly understood by the decision makers in Washington, including:

The UL standard is a product safety standard; the installation criteria is still under development; therefore, installations will not have the guidance, and inspectors won't have the regulations to effectively manage the additional risk associated with flammable refrigerants.

Research is ongoing, including a validation study to determine if the risk mitigation scheme used for the UL Standard will work. Without validating the risk mitigation scheme, Washingtonians will be at greater risk than other U.S. citizens.

The amounts of refrigerant in these systems may be substantial; the standard allows very large quantities of flammable refrigerant.

For additional information, including the reason statements from various public safety groups, go to: [www.saferefrigerants.com](http://www.saferefrigerants.com)

Ruben Grijalva  
Former California State Fire Marshal / CAL FIRE Director  
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**CAL FIRE LOCAL 2881**  
**IAFF • AFL-CIO**  
*Representing the Professional Firefighters of CAL FIRE*

May 28, 2019

Joseph R. Musso, Chair  
Underwriter's Laboratories  
Standards Technical Panel  
[joseph.r.musso@ul.com](mailto:joseph.r.musso@ul.com)

Dear Mr. Musso:

Refrigerants currently in use have a detrimental effect on the environment. When the industry attempted to create less damaging refrigerants, they turned to hydrocarbon blends (labeled A2L refrigerants) to reduce the impact on the environment. The result has been that almost all of the available replacements that meet the environmental criteria are flammable, so the industry is trading one risk (environmental damage) for another (fire).

Under laboratory conditions, the A2L refrigerants must meet a very strict flame velocity requirement. However, under "worst case" conditions, such as those created by UL during a research project to identify issues related to these gases, it was discovered that these refrigerants can burn violently, causing significant pressure rise in the room of origin. Under some conditions, these refrigerants will expose occupants to severe risk of rapidly developing fire conditions.

In addition to the risk associated with additional fires with greater severity, firefighters must be aware of some of the combustion byproducts that could maim or kill them. The primary risk is the production of hydrofluoric acid (HF), which is one of the most corrosive materials in our environment. According to PubChem, a division of the National Institute of Health, this material may be injurious or fatal if inhaled, ingested, or contacted. Current turnout gear may not provide adequate protection from this particular corrosive. While all fluorinated refrigerants will produce HF when exposed to direct flame, flammable refrigerants that ignite will generate the flame, enhancing the opportunities for the production of HF. We believe this issue can be resolved through training, and it is incumbent upon the industry to assure fire response personnel know and understand this risk.

When units are installed outdoors, especially in the wildland-urban interface, pressurized systems (compressors located in condensing units) could be exposed to very high heat from a wildfire or embers. We are unaware of any research or testing to determine if these new systems pose an increased risk to the WUI. Regardless of location, consideration for pressure relief devices piped to a safe location should be considered. Otherwise, a rupture of the vessel and ensuing fire could be devastating.

Due to strong environmental concerns, utilization of flammable refrigerants is coming to home and business HVAC systems. Our goal is not to stop or obstruct its implementation, but rather to assure it is implemented safely and provides adequate safeguards to protect occupants of the buildings, installers

(plumbers and pipe fitters), and emergency responders (firefighters). We believe that the attached measures will do just that and request your support to encourage the Office of the State Fire Marshal, the California Air Resources Board, local fire prevention bureaus, and code development processes to address these safety concerns.

Our request is three-fold:

- 1) Support the attached Public Safety Perspective on the Introduction of Flammable Refrigerants.
- 2) Support any efforts for the HVAC Industry to provide funding for firefighter training regarding the introduction of flammable refrigerants.
- 3) Coordinate your support with the United Association (UA), Union of Plumbers, Fitters, Welders, and Service Techs who have similar safety concerns about the introduction of flammable refrigerants.

We would be happy to meet with you, or your representatives, to discuss this matter further or answer any questions you may have.

Sincere regards,

A handwritten signature in black ink, appearing to read "Tim Edwards". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Tim Edwards, President  
CAL FIRE Local 2881

The Air Conditioning Contractors of America (ACCA) is a non-profit trade association representing mechanical contractors who install, maintain, and service heating, cooling, ventilation, and refrigeration equipment in residential and commercial buildings. Our membership includes more than 60,000 professionals.

ACCA members believe that proposed code changes adding A2L flammable refrigerants for use in residential applications for the 2021 editions of the ICC and IAPMO model codes are premature for the following reasons:

- **Standards:** Product safety standards (UL 2-40) and application standards (proposed ASHRAE 15.2) are currently being revised and probably have one or more years to go until the public review process is completed.
- **Training:** Contractor and technician training for safely handling, transporting, installing, servicing, and maintaining products that contain flammable refrigerants has not been developed ... let alone launched for residential applications.
- **Equipment application:** It is unclear what design and safety considerations are needed when flammable equipment are to be installed in varied housing types and configurations.
- **Field practices:** It is unclear as to how field servicing practices and maintenance procedures may need to be revised for flammable refrigerants.
- **Special tools:** It is unknown what special tools, instrumentation, sensors, and safety equipment may be needed in the field to work on, and around, equipment that contains flammable refrigerants.
- **Cross-contamination:** Today, contractors are routinely recovering refrigerants in the field that have been cross-contaminated by other refrigerants. This is indicative that today's servicing practices and prohibitions are not robust enough to keep the right refrigerant in the right system.

These concerns all have undefined varying impacts on occupant health and safety, and worker health and safety, as well as on the ultimate costs to ensure a safe infrastructure.



## **CALIFORNIA STATE FIREFIGHTERS' ASSOCIATION**

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Underwriter's Laboratories  
Standards Technical Panel  
Joseph R. Musso, Chair  
[joseph.r.musso@ul.com](mailto:joseph.r.musso@ul.com)

Attention: Alan T. McGrath, Project Manager ([alan.t.mcgrath@ul.com](mailto:alan.t.mcgrath@ul.com))

January 18, 2019

**RE: UL 60335-2-40 (Edition 3) - *Standard for Household and Similar Electrical Appliances – Safety***

The California State Firefighters Association (**CSFA**) has only recently become aware of the modifications to the standard relating to refrigeration equipment that would allow significant charge sizes for flammable refrigerants in systems used in homes and small commercial establishments. CSFA has had this standard reviewed by our Fire and Life Safety Committee Chairman and we are very concerned with this standard.

Normally, when an industry embarks upon a mission that includes changes in the level of fire safety, the fire service is considered a critical component of the process. The introduction of widespread use of flammable refrigerants is such a change. Unfortunately, fire service participation has not been sought by the refrigeration industry or UL regarding the risks associated with flammable refrigerants and the mitigation schemes that would be appropriate to protect the public and responding firefighters.

We believe the omission of fire service participants has been a gross oversight on the part of the refrigeration industry and UL. We would welcome the opportunity to participate at a level commensurate with our responsibilities relating to public safety.

In the meantime, our only option is to provide comments during the period available through the American National Standards Institute (ANSI) process.

We have reviewed the proposed standard (Edition 3) and find it lacking in a number of ways. When we see a product safety standard, we anticipate the standard may have minor instructions related to installation and use. Normally, the installation criteria are the domain of the installation standards organization, in this case, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

To expect installers to purchase this complex standard, and to understand the concepts, formulae, and other criteria contained in this document is not reasonable.

While we have not had the time to conduct a comprehensive analysis, we have discovered a number of issues we believe should be addressed before the standard is finalized, including:

1. The standard does not contemplate systems installed in facilities within wildland urban interface areas. These areas require consideration of protection of the equipment from exterior fires. Wildland fires reaching urban areas has become commonplace, and without appropriate safeguards, the introduction of refrigeration equipment using flammable refrigerants will compound

the risks to the public, as well as firefighters.

2. We find the requirements for the service manual content confusing and lacking specifics. There is little direction about many of the requirements, such as “Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.”
3. There appear to be several conflicts. Such as; in section 4.7 in which “no ignition sources are permitted while servicing,” but, in 4.8 it refers to “hot work” when speaking to ventilation requirements. Hot work, by its definition, will introduce an ignition source.
4. There is a level of permissiveness in this document that doesn’t meet the normal treatment of risks of this level. For instance:
  - a. In 21.2, the requirement for testing to assure the equipment won’t be damaged during transport does not assure the same level of commitment to safety that UL ordinarily provides. Providing clear, precise criteria is the best way to assure the equipment will function as designed.
  - b. In Annex ADV, Sec. 101.1 provides “A method other than pressure testing at the design pressure may be employed if it can be demonstrated that the alternative test method produces results that are at least equivalent to the pressure test method.” The standard does give criteria for the alternate method or specify who will make the determination that the alternative “produces results that are at least equivalent to the pressure test method”.

There are other examples, but these illustrate the point that this standard should provide clear direction to manufacturers.

5. In Annex FF, it appears the U.S. modification significantly lowers the bar for leak detection.
6. The charge sizes in GG 1.2 have been modified from the IEC; for A2L refrigerants, the maximum charge size without mitigation has been reduced by 50%. While we appreciate the elevated level of safety resulting from that change, we would like to better understand why similar changes weren’t made for appliances with charge sizes large enough to require mitigation. We have a similar question about the changes for other flammable refrigerants – the charge size for appliances not requiring mitigation was reduced by 25%, but none of the other charge sizes were adjusted.
7. In Annex GG, we find the criteria for “connected spaces” and “connected rooms” particularly confusing – if this is to be applied by field technicians, it will be of very little use. Clarification is needed.

Please accept this correspondence with our sincere thanks for all of the work that has been done on this issue, and please consider incorporating fire and public safety officials in the continuing work. We want to do our part to assure the regulations continue the high level of safety we currently enjoy.

Sincerely,



Gene Gantt  
Executive Director



# INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS®

HAROLD A. SCHAITBERGER  
General President

EDWARD A. KELLY  
General Secretary-Treasurer

July 2, 2019

Air-Conditioning, Heating, and Refrigeration Institute (AHRI)  
2311 Wilson Blvd, Suite 400  
Arlington, VA 22201

Re: Flammable Refrigerants

I am writing to express our concerns regarding the lack of engagement with the fire service and now the move by industry and lobbying groups to move forward to introduce flammable refrigerants in the marketplace without adequate public notice, knowledge or safety awareness.

Specifically, the International Association of Fire Fighters (IAFF) has serious questions about the mitigation of incidents involving now-flammable appliances, tactical considerations for homes and buildings containing flammable appliances, identification of hazards prior to tactical consideration and the combustion byproducts of these new refrigerants.

The IAFF was only made aware of the issues involving these flammable refrigerants late in 2018 and brought up to speed on the testing aspects of these flammable refrigerants in early 2019.

In 2016, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) submitted a request for eight research projects on flammable refrigerants to be completed in 2017 and the findings used to update standards and codes that govern the safe use of flammable refrigerants. During this time, ASHRAE did not contact the IAFF or any fire service organization for input and insight or to assist with the ongoing research.

The fire service needs to be fully engaged in the following research projects – some of which are underway:

- Investigate the Proper Basis for Setting Charge Limits of A2L, A2, and A3 Refrigerants for Various Types of Products (in progress – Oak Ridge National Laboratory)
- Assess Refrigerant Detector Characteristics (just starting – AHRI)
- Flammable Refrigerants Post-Ignition Risk Assessment (ASHRAE) Determination of the Impact of Combustion Byproducts on the Safe Use of Flammable Fluorinated Refrigerants (ASHRAE)
- Effectiveness of Mitigation Strategies for Air Conditioning and Refrigeration Systems (AHRI) to evaluate the effectiveness of the currently proposed sensing and mitigation strategies in standards that are in process and scheduled for completion before the research is completed.
- Ignition Potential From Electrical Devices in Commercial and Residential Application Using A2L Refrigerants (ASHRAE)



# INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS®

HAROLD A. SCHAITBERGER  
General President

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General Secretary-Treasurer

The push to move away from the current nonflammable global warming potential (GWP) refrigerants to climate-friendly alternatives is not based on new laws or rules but on criteria rumored to eventually be disseminated by the Environmental Protection Agency (EPA). Currently, there are no new standards or rules requiring this change.

Based on the amount of pending research and the apparent lack of knowledge on some of these issues, the development of regulations enabling the use of flammable refrigerants is premature. If conducted now, without careful thought and consideration, the consequences could be catastrophic.

We know that this change is inevitable, and the IAFF stands ready to participate and assist industry in the research necessary to develop risk mitigation strategies that will result in a level of safety our communities have come to expect.

The IAFF supports the migration toward more environmentally responsible refrigerants. We are offering our time, knowledge and experience to the industry to avoid a decline in fire safety as a result of these products. Unfortunately, the knowledge base isn't currently comprehensive enough for us to support unproven and uninformed risk mitigation techniques.

The health and safety of our members is the IAFF's highest priority. Therefore, we are opposed to the development and adoption of any model regulations (i.e., codes and standards) that would increase the use of flammable refrigerants until the public safety community is fully engaged and the research is available to generate knowledgeable risk-mitigation strategies. Currently, neither of these conditions exists.

Respectfully,

Rick Swan | Director  
Health and Safety Operational Services  
International Association of Fire Fighters



## NATIONAL ASSOCIATION OF STATE FIRE MARSHALS

### Resolution 2019-2

#### RESOLUTION OF THE NATIONAL ASSOCIATION OF STATE FIRE MARSHALS

TO RAISE AWARENESS OF THE POTENTIALLY CATASTROPHIC RESULTS OF ADOPTION OF THE CURRENTLY PROPOSED UL STANDARD 60335-2-40 ALLOWING FLAMMABLE REFRIGERANTS

*Whereas* the US Environmental Protection Agency (EPA) commitment to reduce the production and use of products that contribute to global warming now includes refrigerants, and;

*Whereas* industry is proactively working to meet anticipated EPA guidelines through the development and testing of both highly and mildly flammable refrigerants for use in commercial and residential settings, and;

*Whereas* industry has instituted a self-imposed deadline of January 1, 2023 for the transition to mildly flammable refrigerants despite the absence of any EPA rulemaking on the issue, and;

*Whereas* these refrigerants are considered mildly flammable because they exhibit a lower flame velocity and they produce a higher heat of ignition when compared with existing refrigerants, and;

*Whereas* industry has initiated UL Standard revisions to allow these refrigerants for use without the input or expertise of the fire service, culminating in an unsubstantiated risk management scheme absent full scientific justification, and;

*Whereas* the industry proposed risk management scheme is largely based on research that is either still in progress or planned for the future, and;

*Whereas* the introduction of un-odorized, mildly flammable refrigerants under high pressure into the residential setting exposes the public and first responders to significant harm without the protections and implementation of a well-developed and defensible risk management plan;

Now, *therefore*, be it resolved that the National Association of State Fire Marshals:

1. Strongly advises UL to curtail development of Standard 60335-2-40 until all pertinent research is available to assure the current level of safety is maintained, and;
2. Staunchly resist any proposals to national codes and standards that would result in the widespread installation of equipment using flammable refrigerants until such time as the knowledge is available to assure the current level of safety is maintained, and;
3. Urges appropriate state authorities with jurisdiction over building and housing construction and inspections to include requirements within their rules, regulations and codes for the restriction of the installation of refrigeration systems using flammable refrigerants until such time as a risk

mitigation plan is developed and implemented that will assure the current level of safety is maintained, and;

4. Encourage state authorities to educate members of the public, fire service, relevant building and housing officials, and construction professionals on the dangers associated with the installation of refrigeration systems using flammable refrigerants.

# Fire Service Position Statement - Flammable Refrigerants Underwriters Laboratories - Fire Service Work Group

## Members:

International Association of Firefighters  
International Association of Fire Chiefs  
National Association of State Fire Marshals  
FDNY  
Chicago Fire  
Boston Fire  
Plano Fire

## **Background:**

The United States Environmental Protection Agency (EPA) commitment to reduce the production and use of products that contribute to global warming now includes residential refrigerants. No new standards have been codified via federal rule making nor is there a consensus as to how to proceed. Yet, industry is developing several potential replacements to meet the criteria rumored to eventually be promulgated by the EPA. The refrigerant solutions, devised by industry, that will be in every home and eventually every landfill are **almost all flammable**. Industry is not blind to the catastrophic potential of having multiple appliances relying on and charged with flammable materials in every home; and has expended substantial resources in attempts to reduce the flammability of these refrigerants. As of this writing, only one of viable replacement refrigerant has achieved non-flammable status.

The vast majority of the mainstream refrigerant replacements are considered, by industry, “mildly flammable”, **odorless, and colorless** (these are designated as A2L by the standards organization charged with classifying refrigerants-ASHRAE). There is no definition of “mildly flammable” in the Emergency Response Guidebook (ERG) or the NIOSH Pocket Guide. Industry, industry professional organizations, and industry lobbyists contend that “mildly flammable” refrigerants have a lower flame velocity. In reality, these new “mildly flammable” products have a higher heat of ignition, resulting in the **introduction of a new risk to society**. Industry is working with codes & standards organizations in an attempt to gain acceptance of these risks, as acceptable. Until now, **the public safety community has not been involved in the testing of these products and policy discussions as to long term impacts.**

## **Issues:**

### 1. Risk Management

There is a complete lack of knowledge, analysis and consideration as to:

- Mitigation of incidents involving now flammable appliances
- Tactical considerations for homes containing flammable appliances
- Identification of this hazard prior to determining the risk vs. reward of committing personnel to an interior attack

Research that is currently underway and more research needs to be proposed and needs to be collaborative between the fire service and industry. This collaboration will likely bridge the knowledge gap so that the fire service and industry experts can collaborate to adequately address any risks posed by these new refrigerants.

## 2. Engagement

Examples of current research projects proposed or currently underway that the fire service needs to become fully engaged with, if not already, include:

- Investigate the Proper Basis for Setting Charge Limits of A2L, A2, and A3 Refrigerants for Various Types of Products (in progress – Oak Ridge National Laboratory)
- Assess Refrigerant Detector Characteristics (just starting - AHRI)
- Flammable Refrigerants Post-Ignition Risk Assessment (ASHRAE)
- Effectiveness of Mitigation Strategies for Air Conditioning and Refrigeration Systems (AHRI)
  - *goal is to evaluate the effectiveness of the currently proposed sensing and mitigation strategies in standards that are in process and scheduled for completion before the research is completed.*
- Ignition Potential from Electrical Devices in Commercial and Residential Application using A2L Refrigerants (ASHRAE)
- Determination of the Impact of Combustion Byproducts on the Safe Use of Flammable Fluorinated Refrigerants (ASHRAE)

## 3. Policy

Based upon these products, which are deemed necessary and driven by industry and not yet mandated, it would appear that **any new standard for equipment using flammable refrigerants is premature**. As a result, a policy conversation is necessary to consider the following:

1. How can the fire service possibly be comfortable with charge limits allowing up to several hundred pounds of flammable materials?
2. What is the basis for the charge limits in the proposed standard?
3. Consumers and the fire service have been provided with no justification for the charge sizes in proposed UL standard or the IEC standard that it was based upon.
4. The fire service has many questions related to the detection systems and detectors, without more information on how detectors will behave under the adverse conditions of small residential and commercial systems, it isn't possible to develop detection requirements with any confidence.
5. **Post ignition research is very important to firefighters.** This is the environment that the fire service works.
6. What are the combustion byproducts of these new refrigerants so the fire service can develop training and procedures to mitigate the risk. For example, fluorine gases contain some hazardous materials, an issue for which fire departments currently plan. Furthermore, without this knowledge, fire departments are only guessing what kind of precautions firefighters should take before entering a structure with these products, and precautions necessary for post-fire operations
7. Industry has proposed risk mitigation strategies that include detection and ventilation. However, what if any research exists supporting the efficacy of this strategy for this issue.
8. How is knowledge gained from research involving electrical ignition sources integrated within the overall research agenda? What effect should other projects, such as charge size and mitigation strategies have on this product discussion?

## **Conclusion:**

Based upon the amount of research pending, and the apparent lack of knowledge around some of these issues, the development of regulations enabling the use of flammable refrigerants is premature. If done now without careful thought and consideration the consequences could be catastrophic. That being written, we know that this change is inevitable and stand ready to participate and assist industry in the research necessary to provide the knowledge necessary to develop risk mitigation strategies that will result in a level of safety our communities have come to expect.

The fire service supports the migration toward more environmentally responsible refrigerants. We are offering our time, knowledge and experience to the industry in an attempt to avoid a reduction in fire safety resulting from these products. Unfortunately, the knowledge base isn't comprehensive enough at this point in time for us to be able to agree to risk mitigation techniques that aren't proven or well informed. Therefore, we are opposed to the development and adoption of any model regulations (codes and standards) that would enhance the proliferation of flammable refrigerants until such time as the public safety community is fully engaged and the research is available to generate knowledgeable risk mitigation strategies; at this time, neither of these conditions exist. As a result, this group suggests follow through on the action items below.

## **Action Items**

1. Curtail development of safety criteria until the available knowledge is adequate to assure the high level of safety that we currently enjoy. Do not finalize any standards until such time as this is the case.
2. Withdraw any current proposals to national codes and standards that would result in the widespread installation of equipment using flammable refrigerants until such time as the knowledge is available to assure the current level of safety is maintained.
3. Involve the public safety community in as many activities as possible, understanding the limitations of that community to fund significant projects of this type.
4. **Understand that the public safety community has only one goal related to this issue, and that is the safety of the public and responders.** This community has no other stake in the outcome of the regulations and appreciates the opportunity to voice our concerns.