



**Tidwell Code Consulting**

September 13, 2019

Washington State Building Code Council  
1500 Jefferson Avenue SE  
Post Office Box 41449  
Olympia, Washington 98504-1449

Members of the Council:

I am Jim Tidwell, and I served in the public service for over 38 years, both as a member of a metro fire department and as senior staff at the International Code Council. I am now an independent consultant, continuing to promote public safety in general and fire fighter safety in particular. My client on this issue is Honeywell, a company with a long history of promoting a “safety first” approach.

I’m before you today because you are being asked to update the Washington State Building Code (Residential Code) to include a new version of a product safety standard (UL/ANCE/CAN 60335-2-40) that would allow the use of flammable refrigerants in air conditioning systems our homes – a practice that is currently restricted to very small charge sizes.

The proponents for this submittal have also proposed the same update to the ICC for the 2021 edition of the IRC, and that proposal has met stiff resistance from the public safety community and others. Attached to this letter are the public comments to the proposal to the ICC – please note that no public comments in support were submitted, only in opposition. The organizations opposing the proposal include the International Association of Fire Chiefs, the International Association of Fire Fighters, the National Association of Fire Marshals, the Air Conditioning Contractors of America, and UL’s own Fire Advisory Board, to name a few. I hope you will take time to read the reasons each of these organizations believe the inclusion of the updated standard is premature. Note that the outcome of the ICC hearings won’t be known until late November.

For multiple safety-related reasons you should avoid updating to this new standard at this point in time in order to protect US consumers. As most of you know, a safe built environment depends upon having a solid regulatory scheme in place. Many refer to the “three-legged stool” of our building regulations:

1. Product Safety Standards to assure the equipment going into buildings are manufactured to exacting specifications that provide the necessary level of safety in the equipment and its contents (in this case, air conditioning equipment with flammable refrigerants)
2. Installation Standards to assure the installation criteria is appropriate to provide the necessary level of safety. In this case, the American Society of Heating, Refrigeration and Air conditioning Engineers (ASHRAE) is working on an installation standard for the use of air conditioning equipment installed in residential settings. Until the movement toward flammable refrigerants,

*11712 wind creek ct.  
aledo, tx., 76008  
817.715.8881*

this standard wasn't necessary. The standard is currently under development and may or may not be published some time in 2020.

3. Code criteria to guide the inspector and installer. Sometimes the code criteria will come from a safety standard; sometimes it will be developed by code officials in conjunction with industry. Having language in the code that clearly sets out the safety requirements is necessary to assure a minimum level of safety.

Remove any of the three legs of the stool, and the regulatory scheme is subject to collapse. In this case, two of the three legs are missing.

You are being asked to include a new, unpublished product safety standard as a stand-alone document to regulate the installation of air conditioning equipment in one- and two- family dwellings. The IRC has not incorporated additional language to address flammable refrigerants, which will be permitted by the standard. Furthermore, the installation standard (ASHRAE 15.2) is under development with no definitive completion date.

You should also know that this issue has already been heard by technical code development committees of the ICC and UMC. Technical changes to the IMC, UMC, and IFC were submitted that, if successful, would have enabled the use of flammable refrigerants. Each of the committees rejected those code changes in favor of allowing the industry to finish the necessary research and develop risk mitigation schemes that would provide the necessary level of safety.

I am asking the Washington State Building Code Council to carefully consider the facts, read the available material, and come to the only logical conclusion – reject the proposal to allow air conditioning equipment using flammable refrigerants until such time as the other parts of the regulatory scheme are complete.

Thank you



Jim Tidwell, Principal  
Representing Honeywell

gkt

Attachments:

Letter to Chair, Mechanical and Ventilation Code TAG  
Position Statement from UL Fire Service Advisory Group  
Published public comments to ICC for upcoming Public Comment Hearing

*11712 wind creek ct.  
aledo, tx., 76008  
817.715.8881*



Tidwell Code Consulting

May 16, 2019

Mr. Eric Vander Mey, Chairman  
Chairman, Mechanical and Ventilation Codes Technical Advisory Group  
RE: 19-IMC17 and 19-IMC18  
Via email

Mr. Vander Mey:

My name is Jim Tidwell; I'm an independent consultant in the codes and standards arena. One of my clients is Honeywell, Inc. and we have an interest in two of the proposals submitted to your TAG for consideration.

Representatives from Chemours (Mr. Klein) and ASHRAE (Ms. Reiniche) have submitted proposals to update certain standards in three codes: International Fire Code, International Mechanical Code and the International Residential Code. We have no objection to the proposals to update to the current standards; however, we have serious concerns about the proposed adoption of a product safety standard that isn't finished, that has over 150 comments to the latest draft currently under consideration, and isn't complemented by installation criteria either in the code or in a separate installation standard. This is the case with UL/CSA/ANCE 60335-2-40 – 2019, which is being proposed as an amendment to the International Residential Code.

The standard in question isn't a "simple update" as described. The draft standard has one purpose, and that is to enable the use of flammable refrigerants in direct systems for comfort cooling. These systems are primarily used in homes, apartments, hotels, and small commercial buildings. In direct systems, the refrigerant is piped throughout the building, where indirect systems' refrigerant is contained to a refrigeration equipment room. The codes and standards use the terms "low probability" and "high probability" to describe these systems; another way to describe them is "low risk" and "high risk" systems.

The flammable refrigerant being addressed is classified by ASHRAE 34 as "A2L", which means it isn't toxic, but is "mildly flammable". While these refrigerants may not pack the punch of propane, tests indicate that they will ignite and burn rapidly enough to cause a pressure rise in a room; many will refer to this as a deflagration (see *Report No. 9007-01 BENCHMARKING RISK BY WHOLE ROOM SCALE LEAKS AND IGNITIONS TESTING OF A2L REFRIGERANTS Final Report June 2017*). From the executive summary of that report:

*11712 wind creek ct.  
aledo, tx., 76008  
817.715.8881*

- The low burning velocity of 2L refrigerants does not prevent rapid flame spread under many conditions we observed. Moreover, ignitions can occur even when the local air velocity is much higher than the laminar burning velocity. This observation may require further investigation as it may be related to ignition source energies used.
- For some classes of refrigeration equipment (reach-in coolers, walk-in coolers, etc.) medium or large leaks can cause refrigerant accumulation in the cold storage compartment. Since these 2L refrigerants are heavier than air, flammable concentrations can be reached fairly easily in such confined spaces. When a door is opened, there is a spill of refrigerant to floor level leading to possible ignition.
- cursory evaluation of hazard mitigation systems suggests refrigerant detection systems will need to have a faster response time than the 30 second response time that had been originally envisioned. More investigation is needed.
- Some of the applications evaluated looked good for typical “nominal” refrigerant charges. Larger charges, up to the maximum allowed by guidance of current draft standards, were not Necessarily validated with data and could well present a greater hazard.

While the initial research provides some guidance to the industry representatives working on the standard, much more research is either underway or planned. The additional research includes:

- Investigate the Proper Basis for Setting Charge Limits of A2L, A2, and A3 Refrigerants for Various Types of Products (ORNL)
- Assess Refrigerant Detector Characteristics (AHRTI)
- Flammable Refrigerants Post-Ignition Risk Assessment (ASHRAE)
- Effectiveness of Mitigation Strategies for Air Conditioning and Refrigeration Systems (AHRTI)

Considering the difficulty the working group is experiencing in their attempt to provide reasonable safety measures, and considering the fact that the most comprehensive research project to date indicates significant shortcomings in the available knowledge relating to this risk, and considering the number and breadth of research projects either underway or pending, we believe most rational people will agree that it’s premature to develop a regulation unique to Washington State that would enable the use of flammable refrigerants in homes.

Rather than update the Washington Codes to an unpublished standard, please consider updating to the 2017 edition of UL 60335-2-40. That standard is complete and manufacturers are currently manufacturing equipment to these criteria; this is consistent with the action taken by both the International Mechanical Code Development Committee, the Uniform Mechanical Code Development Committee and the ICC membership. Note that, while the Administrative Committee of ICC has recommended the inclusion of the standard in the 2021 IRC, that vote was based only upon the fact that the document meets the administrative policies and procedures of the ICC; no technical issues are not considered by the committee for administrative updates. Before the standard will be included in the code, the membership will need to act. The membership is authorized to hear technical arguments such as those made here.

*11712 wind creek ct.  
aledo, tx., 76008  
817.715.8881*

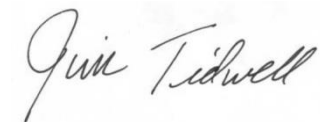
It may be of interest to your committee that the same proposal was made to the Uniform Mechanical Code Committee and was rejected by an overwhelming margin.

If this standard is included in the Washington adoption of the 2018 IRC, it will be the first jurisdiction to do so. We urge the TAG to avoid the “bleeding edge” of technology and embrace the codes and standards that are complete, comprehensive, and meet the needs of the State of Washington.

Please give me a call if you would like to discuss further; I won’t be able to travel to your meeting on the 21<sup>st</sup>, but will attempt to attend via telephone.

Thank you for your earnest consideration.

Sincerely,

A handwritten signature in cursive script that reads "Jim Tidwell". The signature is written in black ink on a light-colored background.

Jim Tidwell

*11712 wind creek ct.  
aledo, tx., 76008  
817.715.8881*

# **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.



---

**Public Comment 10:**

**Proponents:** David Bixby, representing Air Conditioning Contractors of America (bixster1953@yahoo.com) requests Disapprove

**Commenter's Reason:** ACCA opposes the Committee's Action to Approve the updated reference to the 2019 edition of ANCE/ CAN-CSA/UL 60335-2-40, and requests the committee to retain the current reference as found in the 2018 IRC. The 2019 edition of the above standard covers residential equipment for direct systems that use A2L flammable refrigerants. Moreover, previous proposals to add coverage for A2L refrigerants for use in all direct systems for air-conditioning applications were all rejected by the membership and technical committees during the 2018 "Group A" code change cycle for the IMC and the IFC. Therefore, allowing the 2019 edition of this standard to appear in the Admin section for the IRC would create confusion in the field since no approval requirements will exist in the 2021 IRC. It would also be in direct conflict with the IMC and IFC. Currently the IRC has no additional restrictions or code provisions to safely install these new flammable refrigerant systems in homes, schools and offices. Until training is created and provided for installers, inspectors and firefighters, the current research at AHRI is completed and analyzed, and ASHRAE completes the residential air-conditioning standard (15.2), it is very premature to allow these systems in the residential marketplace. ACCA requests disapproval of this proposal and an overturn of the committee recommendation.

**Cost Impact:**

The net effect of the public comment and code change proposal will not increase or decrease the cost of construction

No change to code.

**Public Comment 11:**

**Proponents:** James Narva, representing National Assoc. of State Fire Marshals (jnarva@narvaassociates.com) requests Disapprove

**Commenter's Reason:** The National Association of State Fire Marshals is opposed to updating the standard for air conditioners to accommodate flammable refrigerants – UL/CSA/ANCE 60335-2-40 – 2019. We ask that the ICC membership overturn the Administrative Committee and maintain the protections afforded in the current IRC. This is consistent with actions taken by the IMC committee and the membership during the 2021 Group A cycle.

In addition, when A2L refrigerants are introduced to flame, they will ignite, burn completely and produce significant quantities of hydrofluoric acid. This highly corrosive contact poison can penetrate tissue, readily poisoning firefighters and citizens through exposure of skin or eyes, or when inhaled or swallowed.

We believe that while a lot of work has been accomplished to identify and mitigate the risks associated with these products, much work remains before there is solid scientific justification to support this change.

For instance, we have learned that flammable refrigerant detectors aren't durable enough to serve their intended purpose in these systems; they may only last a few months to a few years at best. These systems, many times, are in service for decades. It's likely, as we have learned with battery powered smoke alarms, that homeowners will find ways to circumvent the detection system if they don't perform as intended for the life of the equipment.

Training for the fire service will also take some time. Without this training, which is vitally necessary to inform responding fire fighters of these new risks, which include flammability, combustion byproduct issues, including the previously mentioned HF poisoning, we place first responders in harm's way needlessly.

We believe introducing a product safety standard as a stand-alone document in the code is an ill-conceived idea. Product safety standards of this type need installation criteria, either in the form of code provisions or an installation standard, to complete the regulatory loop. The code requires many products to be listed, then goes on to say how they should be installed and maintained. We understand that such an installation standard is under development, but perilously, it is not yet available. The update of this standard absent the accompanying installation standard further only further escalates the risks imposed on fire fighters.

Industry decided to risk developing the regulations for the use of flammable refrigerants without input from the public safety community. We have offered our expertise to industry and remain committed to working toward a safe solution for the implementation of more environmentally palatable refrigerants. Yet, we are disappointed that the industry has resisted our overtures while attempting to use an administrative update procedure to achieve their goal after being turned down during the normal code development process.

Overturning the committee action will provide the time to develop reasonable installation criteria, identify and repair any flaws in the current standard, and implement training programs for fire fighters.

**Cost Impact:**

The net effect of the public comment and code change proposal will not increase or decrease the cost of construction  
Since the public comment maintains the current code language, there is no increase or decrease in cost.

**Public Comment 12:**

**Proponents:** Paul Armstrong, representing JCI (paul.armstrong@pacodeservices.com) requests Disapprove

**Commenter's Reason:** This Public Comment is submitted specifically to ask for the disapproval of the update of UL60335-2-40 to the 2019 edition. The code change update proposal would allow flammable refrigerants to be used in direct HVAC systems installed in residential construction covered by only the International Residential Code. Please note that in all model mechanical codes there is currently a prohibition against the use of such flammable refrigerants in residential construction in direct HVAC systems, so this is a major change. This revision was previously heard during the Group A Code Development Cycle last year in a more comprehensive manner and was disapproved by the code committee and the ICC membership. Also, the 2019 edition of this UL Standard is supposed to have completed its review and ANSI approval process but no ICC technical committee has been given the opportunity to review it in its final form to date. Also, note that this is only proposed for the IRC, a more complete proposal is needed to completely cover all types of projects covered by both the IRC and IMC to eliminate confusion between the two model codes.

While the move to more climate friendly refrigerants is ideal, we also need a complete review considering all aspects of the installation of flammable refrigerants in the IRC. Other Public Comments will address the, to date, known issues in the 2019 edition of the UL standard, other concerns need to be addressed as follows:

1. There is an assumption that highly trained contractors will be installing HVAC systems but the IRC is intended for use by all levels of construction experience. As such, there are no safety measures addressed for people to attempt to do this installation themselves. There isn't even a limitation proposed that would require certified installers.

2. Significant training would be required for both professional and volunteer fire department personnel, building inspectors or even home inspectors in dealing with these systems in both emergency and non-emergency situations. Again, nothing has been proposed either through this code development process or heard of outside of it. Home owners would also need much more than just an owner's guide to be safe.
3. Lastly, no evaluation has been provided on the impacts to both new and existing construction under the IRC for the effects of fires involving HVAC systems using flammable refrigerants. The IRC was developed with the current code limitations in mind and further protection may be required of the structure and/or for safety of the occupants as a result.

Please understand that while this seems as if it is a minor change, it really is a big shift in IRC related construction and should be completely evaluated by all facets of industry, especially emergency responders, to understand its impacts on the bulk of the projects that occur in jurisdictions across the United States. Please disapprove the update to the 2019 edition of UL 60335-2-40 so a more thorough review can be completed next code development cycle.

**Cost Impact:** The net effect of the public comment and code change proposal will not increase or decrease the cost of construction. However the effect of the original proposal will increase the cost of construction based on the use of the 2019 edition of UL 60335-2-40.

### **Public Comment 13:**

**Proponents:** James Dominik, representing UL Fire Advisory Board on behalf of Public Safety and Emergency Responders requests Disapprove

**Commenter's Reason:** Requesting disapproval of the update of UL/CSA/ANCE standard 60335-2-40 to the 2019 edition.

UL created a Fire Services Advisory group to evaluate flammable refrigerants and the standards being created. This group is comprised of:

- International Association of Firefighters
- International Association of Fire Chiefs
- National Association of State Fire Marshals
- Fire Department New York City
- Chicago Fire Department
- Boston Fire Department
- Plano Fire Department

This group feels that inclusion of flammable refrigerants in the IRC update is premature and should not be included in the proposed IRC update. This recently was not approved in the update to the UMC code.

Since the public safety/emergency responder community has been involved it is apparent there still is much research that is not complete. Until the planned research can be completed and the code creation process can have involvement from all stakeholders this is premature and potentially putting the public and its emergency responders at increased risk. Industry agrees there has been a failure to involve the public safety/emergency responder community in the creation of these standards at this time.

<https://img1.wsimg.com/blobby/go/253af947-bd2c-4f8b-9959-e817c041d781/downloads/UL%20Fire%20Service%20Position%20Statement%20-%20Flammable.pdf?ver=1566757294047>

**Cost Impact:** The net effect of the public comment and code change proposal will not increase or decrease the cost of construction. No change to code.

### **Public Comment 14:**

**Proponents:** Chris Forth, Johnson Controls, representing Johnson Controls (chris.m.forth@jci.com) requests Disapprove

**Commenter's Reason:** JCI requests that the committee disapprove the update of UL 60335-2-40 to the 2019 version to allow for the completion of all testing, training and standards updates and for a thorough review to be completed during the code development cycle.

- **Proposed change has a substantive impact.** Although characterized as an administrative update to the UL60335-2-40 2019 edition, this is a substantive change that would allow flammable refrigerants in residential and commercial air conditioning and heat pump systems.
- **Proposed change has been rejected by the membership in the Group A cycle (IMC and IFC hearings).** Both the technical committee and the voting ICC membership rejected the proposed change during the IMC and IFC Group A code development hearings in Richmond, Virginia.
- **Training Not In Place to Support Proposed Change.** The proposed change to allow flammable refrigerants in residential and commercial air conditioning and heat pump systems, where such provisions have never been allowed and where licensing requirements and training does not presently exist, should not be rushed. OEM's such as JCI depend on independent contractors to properly and safely install our equipment. These independent contractors need a uniform, nationwide training curriculum fully developed and executed prior to any new flammable equipment being released to the

market. Given that the training materials for the safe handling, transportation and storage of flammable refrigerants are not complete, as well as the absence of a nationwide licensing system to ensure compliance, dictates that the industry is not ready for such provisions. Given adequate time we feel such issues can be addressed but it will require further stakeholder input and study.

- **Uniform Model Codes Not In Place to Support Proposed Change.** The HVAC industry needs both universal models codes (IMC and UMC) to be in alignment in regards to the allowance of flammable refrigerants to ensure consistent safety standards across the country and avoid interstate border compliance gaps. At this time, the UMC has rejected any proposal to allow flammable refrigerants in residential and commercial air conditioning and heat pump systems.
- **Research Designed to Inform Decision Making Not Complete.** In addition to the training and licensing risk, there are critical safety standards (ASHRAE 15.2) and research testing (AHRI, ASHRAE, etc.) which remain incomplete or have yet to even be started as follows:

#### **AHRI/AHRTI Research Projects**

1. 9012: Refrigerant Leak Characterization: Evaluates the impact of A2L flammable refrigerant leaks on concentrations in the spaces to which they are connected. Project currently delayed and not expected to be complete until 2020.
2. 9014: Assess Refrigeration Detector Characteristics for Use in HVACR Equipment. Work underway. Not expected to be completed until early 2020.
3. 9015: Assessment of Refrigerant Leakage Mitigation Effectiveness for Air Conditioning and Refrigeration Equipment. Work not started. Uncertain as to when the project will be completed.

#### **ASHRAE Research Projects**

4. RP-1806: Post-Ignition Risk Assessment of Flammable Refrigerants. Work has started but has been suspended. Results not expected until the end of 2020.
5. RP-1808: Evaluation of Mechanical Field Joints. Testing is complete but results have not been reviewed for incorporation into standards.
6. WS-1855: Evaluation of Combustion By-Products for HFO Refrigerants. Testing has not started and is not expected to be complete until ~2020

#### **Standards**

7. ASHRAE Standard 15.2P: Safety Standard for Air-conditioning and Heat Pump Systems in Residential Applications. In the proposal stage. Not likely to be complete until ~2021 or later. This standard is critical for contractors and inspectors to understand the specific installation, sizing and safety requirements for residential applications.

The results of this new research testing needs to be evaluated and if deemed appropriate incorporated into the multiple standards (ASHRAE 15 / 15.2 – UL 60335-2-40) as well as into future contractor training materials which presently do not exist. Due to the complexity of the multiple standards which have overlapping and in some cases conflicting requirements, inspectors will also need sufficient time to study and digest the standard in order to provide proper enforcement.

For these reasons, JCI reiterates its request that the committee disapprove the update of UL 60335-2-40 to the 2019 version.

**Bibliography:** Johnson Controls

**Cost Impact:** The net effect of the public comment and code change proposal will not increase or decrease the cost of construction. However the effect of the original proposal would increase the cost of compliance based on the use of the 2019 edition of UL 60335-2-40 which would require the addition of special refrigerant sensors, dedicated control schemes and dedicated piping requirements for specific applications.

### **Public Comment 15:**

**Proponents:** Joe Holomy, **Illinois Fire Advisory Commission**, representing Illinois Fire Advisory Commission requests Disapprove

**Commenter's Reason:** Requesting disapproval of the update of UL/CSA/ANCE standard 60335-2-40 to the 2019 edition.

The Illinois Fire Advisory Commission (FAC) has determined the vast majority of the mainstream refrigerant replacements being proposed by industry are odorless and colorless and have a higher heat ignition resulting in the introduction of a new risk to the general public. The FAC has formally voted on and adopted Resolution 01-19 which is attached.



## Resolution 01-19

### ILLINOIS FIRE ADVISORY COMMISSION RELATING TO INDUSTRY FLAMMABLE REFRIGERANTS

1. Whereas the Illinois Fire Advisory Commission (FAC) is a statutorily created organization that is charged with advising the Office of the State Fire Marshal in the exercise of its duties which includes fire prevention and life safety subject matter (20 ILCS 2905/3);
2. Whereas the FAC is a fire service member organization that promotes progress of all major fire service organizations as it relates to the life, health, and safety of the citizens of the State of Illinois while also being the common voice on behalf of the fire service members in communicating with the Illinois General Assembly Fire Caucus, with membership including the Associated Firefighters of Illinois, the City of Chicago Fire Department, Illinois Chapter of the International Association of Arson Investigators, Illinois Association of Fire Protection Districts, Illinois Fire Chiefs Association, Illinois Fire Inspectors Association, Illinois Fire Safety Alliance, Illinois Fire Service Institute, Illinois Firefighters Association, Illinois Professional Firefighters Association, Illinois Society of Fire Service Instructors, Mutual Aid Box Alarm System, and the Northern Illinois Alliance of Fire Protection Districts and;
3. Whereas it has come to the attention of the FAC that the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) representing manufacturers of the Heating, Ventilation, Air Condition, Refrigeration and Water Heating equipment (HVAC&R) within the global industry is proposing a change to the International Residential Building Code allowing for a new refrigerant that has been determined to be highly flammable and;
4. Whereas the FAC has further determined the vast majority of the mainstream refrigerant replacements being proposed by industry are odorless and colorless and have a higher heat ignition resulting in the introduction of a new risk to the general public and;
5. Whereas the FAC has discovered until now, the public safety community has not been involved in the testing of these products and policy discussions as to the long-term impacts;

It is hereby Resolved that the FAC:

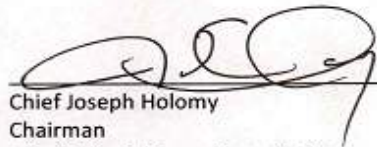
1. Formally objects to the proposed industry action relating to flammable refrigerants as it is currently being introduced;

2. Urges industry representatives to withdraw any current proposals to National Codes and Standards that would result in the widespread installation of equipment using flammable refrigerants;

3. Urges industry representatives to fully research the actual and potential consequences of their proposed action relative to public and firefighter safety prior to implementing such action; and

4. Urges industry representatives to formally meet with the FAC prior to the implementation of any such proposed action for the specific purpose of discussing the proposed industry action and any alternative actions that could be implemented which address public and firefighter safety.

We further certify that the FAC is duly organized and existing, and that the members have voted, authorized, and called for the foregoing resolution.



---

Chief Joseph Holomy  
Chairman  
Illinois Fire Advisory Commission

**Cost Impact:** The net effect of the public comment and code change proposal will not increase or decrease the cost of construction  
No change to code.

## **Public Comment 16:**

**Proponents:** Michael O'Brian, Fire and Life Safety Section of the International Association of Fire Chiefs, representing **Fire and Life Safety Section of the International Association of Fire Chiefs** (mobrian@brightonareafire.com) requests Disapprove

**Commenter's Reason:** Requesting disapproval of the update of UL/CSA/ANCE standard 60335-2-40 to the 2019 edition.

During the Group A code development process, several proposals to allow air conditioning equipment using increased quantities of flammable refrigerants were discussed at length, and the committee voted against those proposals. Public comments were filed, and the membership considered those same proposals. Those proposals failed again, so the 2021 IMC will not change its current restrictions on flammable refrigerants.

The proposal to administratively update the standard for air conditioning equipment is a "back door" for the industry to achieve what they couldn't during the IMC debates.

Regardless of the process, the flaws in the proposal remain, including:

- Wildland fire potential has not been considered during the development of this standard
- This is a product safety standard; we also need installation criteria for this new risk
- Training for fire fighters so that they are aware of the risks associated with flammable refrigerants is imperative. This would include ignition/fire risks as well as the risks associated with the combustion byproducts of these gases.
- Serious consideration should be given to finding a way to odorize this material.
- The risk mitigation scheme proposed (detection/ventilation) should be validated through a comprehensive study before the standard is used.

As one person said "So, someone wants to run flammable, unodorized gas through your home at high pressure through copper tubing . . . what could go wrong?"

We urge the ICC membership to overturn the committee and keep the current standard until the concerns over flammable refrigerants are addressed.

**Cost Impact:** The net effect of the public comment and code change proposal will not increase or decrease the cost of construction. No change to code.

## **Public Comment 17:**

**Proponents:** Matthew Perez, **Illinois State Fire Marshal**, representing Illinois State Fire Marshal requests Disapprove

**Commenter's Reason:** UL should curtail development of Standard 60335-2-40 until all pertinent research is available to assure the current level of safety is maintained and resist any proposals to national codes and standards that would result in the widespread installation of equipment using flammable refrigerants. UL should take into consideration the input and expertise of the fire service as well as acquire complete scientific justification in order to fully address risk management..

**Cost Impact:** The net effect of the public comment and code change proposal will not increase or decrease the cost of construction. No change to code.

## **Public Comment 18:**

**Proponents:** Richard Swan, representing **IAFF** requests Disapprove

**Commenter's Reason:** Requesting disapproval of the update of UL/CSA/ANCE standard 60335-2-40 to the 2019 edition.

The International Association of Fire Fighters represents over 317,000 fire fighters and paramedics in the United States and Canada and these are the bulk of the responders that will be facing this issue. There are many issues of concern with the proposal; no definition of the word "mildly flammable", the marketing department came up with this because it is quickly tied to "when compared to hydrocarbons", A2L must only be used in A2L equipment- we all know this won't happen, what are the combustion byproducts of these new refrigerants, questions related to the detection systems and detectors, using non-standard DOA and NFPA symbols, 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.

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.

**Cost Impact:** The net effect of the public comment and code change proposal will not increase or decrease the cost of construction. No change to code.

## Public Comment 19:

**Proponents:** Jim Tidwell, representing Honeywell (jimtidwell@tccfire.com) requests Disapprove

**Commenter's Reason:** This public comment is for disapproval of the proposed update of UL 60335-2-40. This is a product safety standard that covers air conditioning equipment.

The proposal to update the standard for air conditioning systems to allow for the use of flammable refrigerants is premature and in direct conflict with actions taken by the membership in the Group A cycle (IMC and IFC hearings). This is especially relevant for direct systems where a flammable refrigerant can leak in the occupied space. Whether it's a small commercial system or a residential system, the safety issues are the same. The IMC committee rejected each and every proposal to allow increased quantities of flammable refrigerants and their rejections were upheld by the membership. Now, the proponents would have the membership negate that process through an administrative update of the standard. We don't believe it was ever the intent of the ICC Board of Directors to allow an administrative standard update to circumvent the normal code development process, which will be the result if the standard is allowed to be updated.

In addition to the philosophical issues, we believe the update of this product safety standard is premature for the following reasons:

- A product safety standard such as UL-60335-2-40, even if it is appropriate, is only part of the regulatory solution. In addition to the product safety standard, installation criteria are necessary for the safe installation and use of any equipment - and that criteria doesn't currently exist. At this time, ASHRAE is in the process of developing the installation standard for this equipment in residential occupancies (ASHRAE 15.2). In the current ASHRAE draft, there are requirements for outdoor equipment to be located a minimum distance from a structure; requirements for protection of piping containing flammable refrigerants and other requirements to attempt to address the additional risks involved with the use of flammable refrigerants. These are not included in the UL standard, as it's only addresses product safety, not installation.
- There are several studies (ASHRAE, AHRI, DOE, etc. ) in various stages to validate the requirements set by these standards. These studies will likely uncover deficiencies in the standards that will need to be addressed before equipment is actually installed. Note that approximately 8 million air conditioning units are installed in the U.S. each year; getting this right is of paramount importance.
- The UL Standard has not received a review from any ICC technical committee; the Administrative Committee did not debate the technical issues related to the standard, although several members of the ICC attempted to address them. The Administrative Committee chose to move the standard forward based on the fact that the procedural issues were all satisfied.

In addition to these facts, the membership should be aware that the standard has a number of gaps/issues that many believe are critical and need to be corrected including:

- The standard doesn't require risk mitigation unless the equipment exceeds a certain amount of refrigerant; a formula is used to calculate the maximum amount allowed without mitigation rather than a fixed weight or volume of refrigerant. A research project is currently underway by the Oak Ridge National Laboratory to investigate the proper basis for setting charge limits of all flammable refrigerants; when that study is complete, the results should be used to determine the appropriate amount of flammable refrigerant allowed in the equipment.
- Once triggered, the risk mitigation scheme is to detect any leaking refrigerant and activate mechanical air movement (either circulation or ventilation). There is a study proposed by AHRI to evaluate the detection and mitigation strategies in this standard. It hasn't begun as of this writing, and may identify gaps in the standard in need of attention.
- The standard does not require listed detectors; rather, it requires sensors to be "evaluated" with the air conditioning equipment being listed. This is a significant difference. UL staff testified in the Group A hearings that there is a UL listing standard for these devices, so there should be no reason to allow anything other than listed detectors. The requirements in the latest draft of the standard for evaluation of detectors doesn't address calibration drift, which is a known problem with existing detectors that could render them useless.
- In determining the maximum charge size, the standard assumes that any leak will diffuse completely and immediately throughout the room into which it leaks – this is a false assumption; no gas or liquid diffuses immediately and completely in the atmosphere. If the leak is in liquid form, the situation worsens. In tests at UL, leaks of this fluid actually pooled on the floor and off-gassed for some period of time. We don't believe this is addressed in the standard.
- The standard allows unlimited quantities of refrigerant where the system is installed with shutoff valves activated by refrigerant detectors to limit the amount of refrigerant released. Neither the valves nor the detectors are required to be listed. This may be a substantial safety risk, but more research is needed to make that determination.
- Many of the requirements of the standard are based upon complex computer modeling. During actual tests, it was found that turbulence had a significant and dangerous effect on the ignitability and burning characteristics of these refrigerants. Turbulence isn't a condition that can be adequately predicted using computer models.
- The standard only requires detection inside equipment. Any failure of piping that results in leaked refrigerant outside the equipment will not result in detection and mitigation.
- In the current draft of the standard, notification of occupants is by a "series of flashing lights", which will not produce adequate information for occupants to react to a leak.

Overturning the committee for this single standard will allow the industry and public safety officials the opportunity to address these important issues; updating to the new standard presents unnecessary and inordinate risks to our communities. Please vote to overturn the committee.

Here is the link to the AHRI report:

[http://www.ahrinet.org/App\\_Content/ahri/files/RESEARCH/Technical%20Results/AHRI\\_9007-01\\_Final\\_Report.pdf](http://www.ahrinet.org/App_Content/ahri/files/RESEARCH/Technical%20Results/AHRI_9007-01_Final_Report.pdf)



**Cost Impact:** The net effect of the public comment and code change proposal will not increase or decrease the cost of construction  
No change to code.

---