



ATMO
sphere





UL Standards and Refrigerants

Mark Skierkiewicz

- Current standards and NH₃ and CO₂
- Current standards and A3's
- Transition to new Safety Standards
- Current A2L research and upcoming standards
- Ongoing A3 research and next steps



Current standards allow for NH₃ and CO₂

- UL1995 5th and UL471 10th Edition have revised fatigue requirements
 - Fatigue Test:
 - 2* with 500,000 cycles
- UL 1995 has revised strength requirements
 - Strength Test:
 - 3* normal/abnormal/design pressure



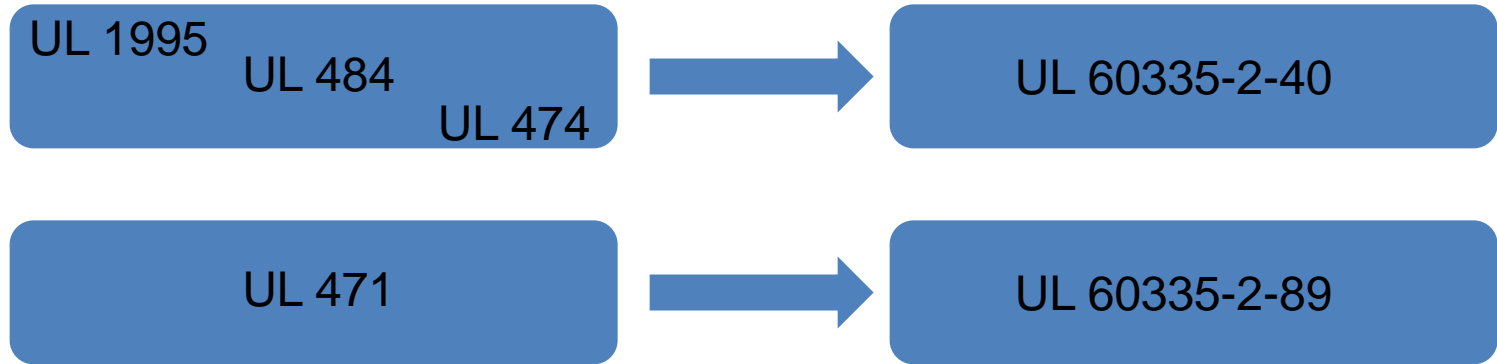


UL JTG Flammable Refrigerants WG2 UL Refrigeration Standards

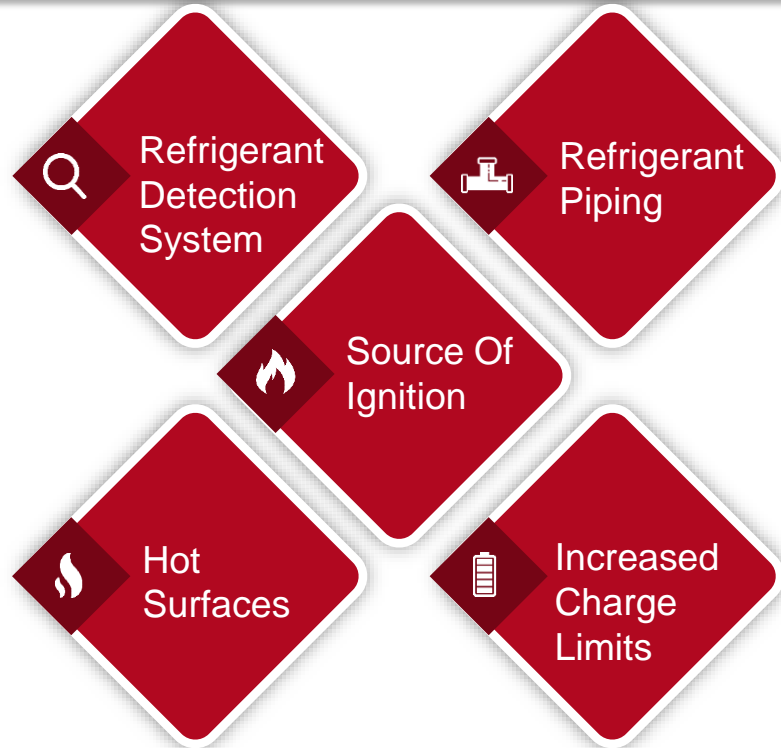
- UL 250 – Household Refrigerators and Freezers; published 57 gram limit
- UL 471 – Commercial Refrigerators and Freezers; published 150 gram limit
- UL 60335-2-24 – Household and Similar Electrical Appliances, Part 2: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers; published 50 gram limit (limit may be changed shortly)
- UL 399 – Drinking Water Coolers; published 60 gram limit
- UL 541 – Refrigerated Vending Machines; published 150 gram limit
- UL 563 – Ice Makers; published 150 gram limit
- UL 621 – Ice Cream Makers; Waiting on proposal from UL JTG



Transitions to New Standards



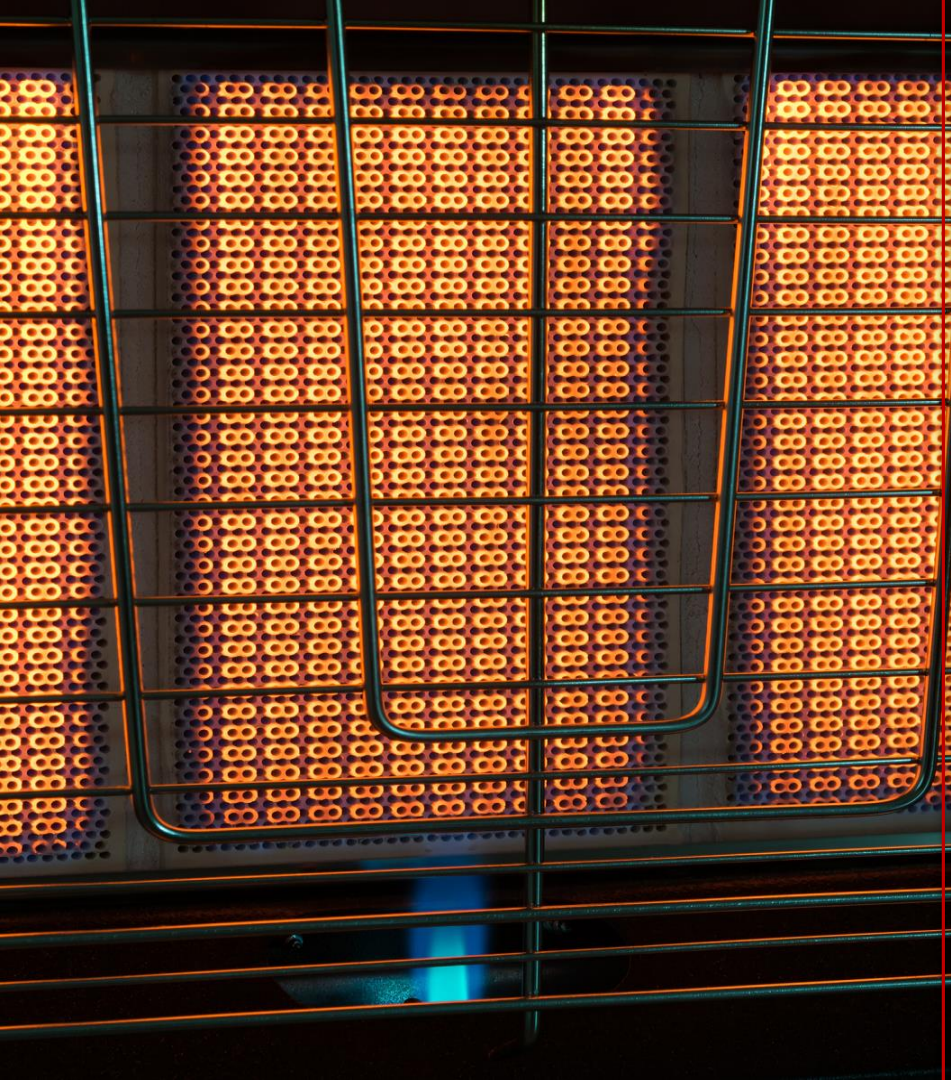
Key Proposed Requirements for UL 60335-2-40 the Safety Standard for Air Conditioning Equipment



AHRTI 9007 - Objective

- Conduct A2L refrigerant leak and ignition testing under whole-room conditions
- Investigate control limits and safety factors that are proposed by draft versions of IEC 60335-2-40, IEC 60335-2-89
- Determine main effects that impact the severity of 2L refrigerant thermal events
- Document the refrigerant concentration profiles versus previous CFD models
- Document any thermal events for future deflagration modeling
- Investigate other factors that may drive variability or that have been overlooked by safety standards





AHRTI-9008: Investigation of Hot Surface Ignition Temperatures for A2L Refrigerants

The objective of this project is to establish a standard Hot Surface Ignition Temperature (HSIT) test method, and conduct the HSIT testing for various A2L refrigerants at various ambient conditions.

AHRTI-9009: Refrigerant Leak Detector Long-Term Reliability Assessment



AHRTI 9009, Leak Detection of A2L Refrigerants in HVACR Equipment.

The objective of this project is to conduct a thorough review of sensor technologies that can be used to detect A2L refrigerants and can easily be integrated into our equipment.

NFPA – Evaluation of the Fire Hazard of ASHRAE Class A3 Refrigerants

- Evaluate the hazard of refrigeration appliances used in a commercial retail and kitchen settings.
- Determine leak locations and rates
- Establish severity of ignition events

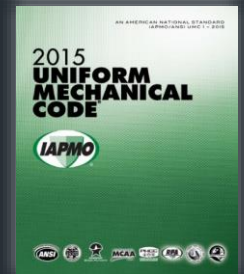
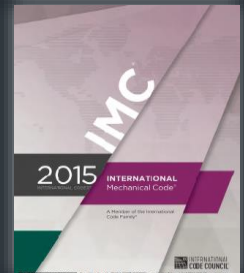


Model Codes Addressing Refrigerants

The ICC International Mechanical Code (IMC) and IAPMO Uniform Mechanical Code (UMC) are the major building codes

- These two codes are used in 48 states
- Two states are anomalies, Maine and Hawaii

National Fire Protection Association, NFPA 1
– Fire Code



Next Steps

Now

Current Standards allow use of some natural refrigerants

End of 2017

2nd edition of UL60335-2-40 to be published.

Ongoing

Research to mitigate hazards associated with A2L, A2 and A3 refrigerants

Future

Update Standards to address additional hazards associated with A3 refrigerants and update Codes.





ATMO
sphere

Thank you very much!

