ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 82

[EPA–HQ–OAR–2021–0836; FRL–6399–02–OAR]

RIN 2060–AT78

Protection of Stratospheric Ozone: Listing of Substitutes Under the Significant New Alternatives Policy Program in Refrigeration, Air Conditioning, and Fire Suppression

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: Pursuant to the U.S. Environmental Protection Agency's Significant New Alternatives Policy program, this action lists certain substances as acceptable, subject to use conditions, in the refrigeration and air conditioning sector for chillers—comfort cooling, residential dehumidifiers, residential and light commercial air conditioning and heat pumps, and a substance as acceptable, subject to use conditions and narrowed use limits, in very low temperature refrigeration. Through this action, EPA is incorporating by reference standards which establish requirements for electrical air conditioners, heat pumps, and dehumidifiers, laboratory equipment containing refrigerant, safe use of flammable refrigerants, and safe design, construction, installation, and operation of refrigeration systems. Finally, this action lists certain substances as acceptable, subject to use conditions, in the fire suppression sector for certain streaming and total flooding uses.

DATES: This rule is effective May 30, 2023. The incorporation by reference of certain material listed in the rule is approved by the Director of the Federal Register as of May 30, 2023. The incorporation by reference of certain other material listed in the rule was approved by the Director of the Federal Register as of May 11, 2015 and September 7, 2018.

ADDRESSES: EPA has established a docket for this action under Docket ID No. EPA–HQ–OAR–2021–0836. All documents in the docket are listed on the *https://www.regulations.gov* website. Although listed in the index, some information is not publicly available, *e.g.,* Confidential Business Information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the internet and will be publicly available only in hard copy form. Publicly available docket materials are available electronically through *https://www.regulations.gov* or in hard copy at the Air and Radiation Docket, EPA/DC, EPA West, Room 3334, 1301 Constitution Avenue NW, Washington, DC 20460. The Docket Center's hours of operations are 8:30 a.m.–4:30 p.m., Monday–Friday (except Federal Holidays). For further information on EPA Docket Center services and the current status, please visit *https://www.epa.gov/dockets.*

FOR FURTHER INFORMATION CONTACT: Holly Tapani, Stratospheric Protection Division, Office of Atmospheric Protection (Mail Code 6205A), Environmental Protection Agency, 1200 Pennsylvania Ave. NW, Washington, DC 20460; telephone number: 202–564–0679; email address: *tapani.holly@epa.gov.* Notices and rulemakings under EPA's Significant New Alternatives Policy program are available on EPA's SNAP website at *https://www.epa.gov/snap/snap-regulations.*

SUPPLEMENTARY INFORMATION:

Table of Contents

I. General information

A. Executive Summary and Background

This action finalizes listings of new alternatives for the refrigeration and air conditioning (AC) and fire suppression sectors. Specifically, EPA is:

- Listing hydrofluoroolefin (HFO)-1234yf, hydrofluorocarbon (HFC)-32, R–452B, R–454A, R–454B, and R–454C as acceptable, subject to use conditions, for use in chillers used in comfort cooling, including commercial AC and industrial process AC (IPAC);
- Listing HFO–1234yf, HFC–32, R–452B, R–454A, R–454B, and R–454C as acceptable, subject to use conditions, for use in residential dehumidifiers;
- Listing HFC–32 as acceptable, subject to use conditions, for use in self-contained room ACs and heat pumps (HPs);
- Listing R–1150 as acceptable, subject to use conditions and narrowed use limits, for use in very low temperature refrigeration (VLTR);
- Listing 2-bromo-3,3,3-trifluoropropene (2–BTP) as acceptable, subject to use conditions, in streaming—for non-residential use, except home offices and boats—and total flooding—in normally unoccupied spaces under 500 ft³;
- Listing EXXFIRE® as acceptable, subject to use conditions, in total flooding—for normally unoccupied areas; and
- Listing Powdered Aerosol H, also known as Pyroquench-α™, as acceptable, subject to use conditions, in total flooding—for normally unoccupied areas.

EPA is finalizing these new listings after its evaluation of human health and environmental information for these substitutes in the refrigeration and AC sector and the fire suppression sector under the Significant New Alternatives Policy (SNAP) program based on the information that EPA has included in the docket. This action provides additional flexibility for industry by providing new options in specific uses.

SNAP Program Background

The SNAP program implements section 612 of the Clean Air Act (CAA). Several major provisions of section 612 are:

1. Rulemaking

Section 612(c) requires EPA to promulgate rules making it unlawful to replace any class I (chlorofluorocarbon (CFC), halon, carbon tetrachloride, methyl chloroform, methyl bromide, hydrobromofluorocarbon, and chlorobromomethane) or class II (hydrochlorofluorocarbon (HCFC)) ozone depleting substance (ODS) with any substitute that the Administrator determines may present adverse effects to human health or the environment where the Administrator has identified an alternative that (1) reduces the overall risk to human health and the environment and (2) is currently or potentially available.

2. Listing of Unacceptable/Acceptable Substitutes

Section 612(c) requires EPA to publish a list of the substitutes that it finds to be unacceptable for specific uses and to publish a corresponding list of acceptable substitutes for specific uses.

3. Petition Process

Section 612(d) grants the right to any person to petition EPA to add a substance to, or delete a substance from, the lists published in accordance with section 612(c).

4. 90-Day Notification

Section 612(e) directs EPA to require any person who produces a chemical substitute for a class I substance to notify the Agency not less than 90 days before a new or existing chemical is introduced into interstate commerce for significant new use as a substitute for a class I substance. The producer must also provide the Agency with the producer's unpublished health and safety studies on such substitutes.

The regulations for the SNAP program are promulgated at 40 Code of Federal Regulations (CFR) part 82, subpart G, and the Agency's process for reviewing SNAP submissions is described in regulations at 40 CFR 82.180. Under these rules, the Agency has identified five types of listing decisions: acceptable; acceptable, subject to use conditions; acceptable, subject to narrowed use limits; unacceptable; and pending (40 CFR 82.180(b)). Use conditions and narrowed use limits are both considered ''use restrictions,'' as described below. Substitutes that are deemed acceptable with no use restrictions (no use conditions or narrowed use limits) can be used for all applications within the relevant end-uses in the sector. After reviewing a substitute, the Agency may determine that a substitute is acceptable only if certain conditions in the way that the substitute is used are met, to minimize risks to human health and the environment. EPA describes such substitutes as ''acceptable, subject to use conditions'' (40 CFR 82.180(b)(2)). For some substitutes, the Agency may

permit a narrowed range of use within an end-use or sector. For example, the Agency may limit the use of a substitute to certain end-uses or specific applications within an industry sector. EPA describes these substitutes as ''acceptable, subject to narrowed use limits.'' Under the narrowed use limit, users intending to adopt these substitutes ''must ascertain that other alternatives are not technically feasible.'' (40 CFR 82.180(b)(3)).

In making decisions regarding whether a substitute is acceptable or unacceptable, and whether substitutes present risks that are lower than or comparable to risks from other substitutes that are currently or potentially available in the end-uses under consideration, EPA examines the criteria in 40 CFR 82.180(a)(7)(i) through (vii):

> ''(i) Atmospheric effects and related health and environmental impacts; (ii) General population risks from ambient exposure to compounds with direct toxicity and to increased ground-level ozone; (iii) Ecosystem risks; (iv) Occupational risks; (v) Consumer risks; (vi) Flammability; and (vii) Cost and availability of the substitute.''.

Many SNAP listings include ''comments'' or ''further information'' to provide additional information on substitutes. Since this additional information is not part of the regulatory decision under SNAP, these statements are not binding for use of the substitute under the SNAP program. However, regulatory requirements so listed are binding under other regulatory programs (*e.g.,* worker protection regulations promulgated by the U.S. Occupational Safety and Health Administration (OSHA)). The ''further information'' classification does not necessarily include all other legal obligations pertaining to the use of the substitute. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of these substitutes. In many instances, the information simply refers to sound operating practices that have already been identified in existing industry and/or building codes or standards. Thus, many of the statements, if adopted, would not require the affected user to make significant changes in existing operating practices.

For additional information on the SNAP program, visit the SNAP website at *https://www.epa.gov/snap.* The full lists of acceptable substitutes for ODS in all industrial sectors are available at *https://www.epa.gov/snap/snap-substitutes-sector.* For more information on the Agency's process for administering the SNAP program or criteria for evaluation of substitutes, refer to the initial SNAP rulemaking published March 18, 1994 (59 FR 13044), codified at 40 CFR part 82, subpart G. SNAP decisions and the appropriate **Federal Register** citations can be found at: *https://www.epa.gov/snap/snap-regulations.* Substitutes listed as unacceptable; acceptable, subject to narrowed use limits; or acceptable, subject to use conditions, are also listed in the appendices to 40 CFR part 82, subpart G.

B. Does this action apply to me?

The following list identifies regulated entities that may be affected by this rule and their respective North American Industrial Classification System (NAICS) codes:

- Plumbing, Heating, and Air Conditioning Contractors (NAICS 238220)
- All Other Basic Organic Chemical Manufacturing (NAICS 325199)
- Pharmaceutical Preparations (*e.g.,* Capsules, Liniments, Ointments, Tablets) Manufacturing (NAICS 325412)
- Air Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing (NAICS 333415)
- Household Appliances, Electric Housewares, and Consumer Electronics Merchant Wholesalers (NAICS 423620)
- Refrigeration Equipment and Supplies Merchant Wholesalers (NAICS 423740)
- Recyclable Material Merchant Wholesalers (NAICS 423930)
- Appliance Repair and Maintenance (NAICS 811412)
- Fire Protection (NAICS 922160)

This list is not intended to be exhaustive, but rather to provide a guide for readers regarding entities likely to be affected by this action. To determine whether your facility, company, business, or organization could be affected by this action, you should carefully examine the regulations at 40 CFR part 82, subpart G and the revisions below. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the **FOR FURTHER INFORMATION CONTACT** section.

C. What acronyms and abbreviations are used in the preamble?

Below is a list of acronyms and abbreviations used in the preamble of this document:

2–BTP—2-bromo-3,3,3-trifluoropropene
AC—Air Conditioning or Air Conditioner
ACGIH—American Conference of Governmental Industrial Hygienists
AEL—Acceptable Exposure Limit
AHAM—Association of Home Appliance Manufacturers
AHRI—Air-Conditioning, Heating, and Refrigeration Institute
AIHA—American Industrial Hygiene Association AIM Act—American Innovation and Manufacturing Act of 2020
ANSI—American National Standards Institute
ASHRAE—American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASTM—American Society for Testing and Materials
CAA—Clean Air Act
CAS Reg. No.—Chemical Abstracts Service Registry Identification Number
CBI—Confidential Business Information
CFC—Chlorofluorocarbon
CFR—Code of Federal Regulations
CRA—Congressional Review Act
CO_2—Carbon Dioxide
EEAP—Environmental Effects Assessment Panel
EIA—Environmental Investigation Agency
EPA—United States Environmental Protection Agency
FR—Federal Register
GWP—Global Warming Potential
HCFC—Hydrochlorofluorocarbon
HCFO—Hydrochlorofluoroolefin
HFC—Hydrofluorocarbon
HFO—Hydrofluoroolefin
HP—Heat Pump
ICF—ICF International, Inc.
IEC—International Electrotechnical Commission
IPAC—Industrial Process Air Conditioning
IPCC—Intergovernmental Panel on Climate Change
LFL—Lower Flammability Limit
LOAEL—Lowest Observed Adverse Effect Level
MIAQ—Madison Indoor Air Quality
MVAC—Motor Vehicle Air Conditioning
NAAQS—National Ambient Air Quality Standards
NAICS—North American Industrial Classification System
NARA—National Archives and Records Administration
NFPA—National Fire Protection Association
NIOSH—National Institute for Occupational Safety and Health
NPRM—Notice of Proposed Rulemaking
NRTL—Nationally Recognized Testing Laboratories
ODP—Ozone Depletion Potential
ODS—Ozone Depleting Substances
OMB—United States Office of Management and Budget
OSHA—United States Occupational Safety and Health Administration
PFAS—Per- and poly-fluoroalkyl substances
PFCs—Perfluorocarbons
PMS—Pantone® Matching System
ppm—Parts Per Million
PRA—Paperwork Reduction Act
PTAC—Packaged Terminal Air Conditioner
PTHP—Packaged Terminal Heat Pump
RAL—''Reichs-Ausschuß für Lieferbedingungen und Gütesicherung,''

Germany's National Commission for Delivery Terms and Quality Assurance
RCRA—Resource Conservation and Recovery Act
RFA—Regulatory Flexibility Act
SCBA—Self-Contained Breathing Apparatus
SDS—Safety Data Sheet
SIP—State Implementation Plan
SNAP—Significant New Alternatives Policy
TFA—trifluoroacetic acid
TLV–TWA—Threshold Limit Value-Time-Weighted Average
TSCA—Toxic Substances Control Act
TWA—Time Weighted Average
UL—UL, formerly known as Underwriters Laboratories, Inc.
UMRA—Unfunded Mandates Reform Act
VOC—Volatile Organic Compound, Volatile Organic Compounds
VLTR—Very Low Temperature Refrigeration
WCFF—Worst Case of Fractionation for Flammability
WCF—Worst Case of Formulation for Flammability
WEEL—Workplace Environmental Exposure Limit
WMO—World Meteorological Organization

II. What is EPA finalizing in this action?

This section of the preamble describes EPA's final listings for certain refrigerants and fire suppressants in specific end-uses, including final use restrictions. In addition, this section provides responses to comments EPA received on the proposed listings during the public comment period for the proposed rule. One comment was received after the close of the comment period, to which no response from the Agency is required. The regulatory text for new listings is codified in appendix X of 40 CFR part 82, subpart G. The regulatory text for a revised listing is codified in appendix R of 40 CFR part 82, subpart G. The final regulatory text contains listing decisions for the end-uses discussed throughout this section below.

A. Chillers—Listing of HFO–1234yf, HFC–32, R–452B, R–454A, R–454B, and R–454C as Acceptable, Subject to Use Conditions, for Use in New Chiller Equipment Used in Comfort Cooling, Including Both Commercial AC and Industrial Process Air Conditioning (IPAC)

EPA previously listed HFO–1234yf as acceptable, subject to use conditions, in motor vehicle AC, in light-duty vehicles (74 FR 53445; October 19, 2009), in heavy-duty pickup trucks and complete heavy-duty vans (81 FR 86778; December 1, 2016) and in nonroad vehicles and service fittings for small refrigerant cans (87 FR 26276; May 4, 2022). EPA previously listed HFC–32 as acceptable, subject to use conditions, as a substitute in residential and light commercial AC and HPs (80 FR 19454; April 10, 2015) (86 FR 24444; May 6, 2021) and previously listed R–452B, R–454A, R–454B, and R–454C, (hereafter called ''the four refrigerant blends''), as acceptable, subject to use conditions, as substitutes in residential and light commercial AC and HPs (86 FR 24444; May 6, 2021).[1]

This final rulemaking finds HFC–32, HFO–1234yf, and the four refrigerant blends acceptable, subject to use conditions, as substitutes in chillers. The SNAP program divides chillers for comfort cooling into two general types based on the type of compressor used in the system, *i.e.,* centrifugal and positive displacement compressors (including reciprocating, screw, scroll and rotary) chillers. EPA proposed to list HFO–1234yf, R–454A, R–454B, and R–454C as acceptable in all new chillers for comfort cooling and proposed to list HFC–32 and R–452B as acceptable only in new scroll and rotary chillers for comfort cooling. After consideration and evaluation of the comments received by the Agency in response to the July 28, 2022, notice of proposed rulemaking (87 FR 45508; hereafter, ''NPRM''), EPA is finalizing the listings for HFO–1234yf, R–454A, R–454B, and R–454C in chillers for comfort cooling as proposed. After consideration and evaluation of the comments received, EPA is broadening the listings for HFC–32 and R–452B relative to the NPRM, and is listing these alternatives as acceptable with use conditions across all chiller types for all comfort cooling applications, including but not limited to use in commercial AC and IPAC.

Several use conditions finalized for chillers are identical to those finalized for other end-uses (residential dehumidifiers and residential and light commercial AC and HPs) finalized in sections II.B and II.D. below. Because of this similarity, EPA discusses the use conditions that would apply to all three end-uses in detail in section II.E below. For chillers, EPA is also finalizing an additional use condition related to adherence to the ASHRAE 15–2019 standard. In summary, the use conditions for chillers are:

(1) 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.

(2) UL Standard—These refrigerants may be used only in chiller equipment that meet all requirements listed in the 3rd edition, dated November 1, 2019, of UL Standard 60335–2–40, ''Household and Similar Electrical Appliances—Safety—Part 2–40: Particular Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers.'' In cases where this final rule includes requirements different than those of the 3rd edition of UL Standard 60335–2–40, the appliance would need to meet the requirements of this final rule in place of the requirements in UL 60335–2–40, 3rd Edition. See section II.E below for further discussion on the requirements of this standard that EPA is incorporating by reference.

(3) Warning labels—Several warning labels are required as use conditions as detailed in section II.E below. These labels are similar or verbatim in language to those required by UL 60335–2–40, 3rd Edition. The warning labels must be provided in letters no less than 6.4 mm (¼ inch) high and must be permanent.

(4) Markings—Equipment must have distinguishing red (Pantone® Matching System (PMS) #185 or Reichs-Ausschuß für Lieferbedingungen und Gütesicherung[2] (RAL) 3020) color-coded hoses and piping to indicate use of a flammable refrigerant. The chiller equipment shall have marked service ports, pipes, hoses and other devices through which the refrigerant is serviced. Markings shall extend at least 1 inch (25 mm) from the servicing port and shall be replaced if removed.

(5) For chillers, EPA is also finalizing a use condition related to adherence to the ASHRAE 15–2019 standard in addition to those common finalized use conditions for chillers, residential dehumidifiers, and self-contained room ACs. Specifically, EPA is requiring that these refrigerants may only be used in chillers that meet all requirements listed in the American National Standards Institute (ANSI)/ASHRAE Standard 15–2019 (hereafter ''ASHRAE 15–2019''). In cases where this final rule includes requirements different than those of ASHRAE 15–2019,[3] EPA is finalizing that the chiller appliance needs to meet the requirements of this final rule in place of the requirements in the ASHRAE Standard. This additional use

[1] In this final rule, we use the term ''air conditioner'' and ''AC'' to cover equipment that cools air, heats air, or has the function to do both (typically referred to as a ''heat pump''). While such equipment might humidify or dehumidify the air, the term does not include equipment whose purpose is for latent cooling only (*i.e.,* dehumidifiers), which are a separate end-use under SNAP and are addressed in section II.B of this final rule.

[2] Germany's National Commission for Delivery Terms and Quality Assurance.

[3] ASHRAE, 2019b. American National Standards Institute (ANSI)/American Society for Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 15. Safety Standard for Refrigeration Systems. 2019.

condition is discussed further in section II.A.4, below.

EPA notes that there may be other requirements pertaining to the manufacture, use, handling, and disposal of the listed refrigerants that are not included in the information listed in the tables (*e.g.,* the CAA section 608(c)(2) venting prohibition [4] or Department of Transportation requirements for transport of flammable gases). Flammable refrigerants being recovered or otherwise disposed of from chillers are likely to be hazardous waste under the Resource Conservation and Recovery Act (RCRA) (see 40 CFR parts 260–270).

1. Background on Chillers—Commercial AC and IPAC

This rulemaking applies to chillers that are covered by the UL 60335–2–40 standard ''Household and Similar Electrical Appliances—Safety—Part 2–40: Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers'' and ASHRAE Standard 15–2019, ''Safety Standard for Refrigeration Systems.'' EPA understands that UL 60335–2–40 covers chillers used for comfort cooling.

In the initial rule establishing the SNAP program (59 FR 13044; March 18, 1994), EPA included within the refrigeration and AC sector the end-use ''commercial comfort air conditioning'' and then elaborated on that end-use by saying that ''CFCs are used in several different types of mechanical commercial comfort AC systems, known as chillers.'' EPA indicated ''that over time, existing cooling capacity [from chillers] will be either retrofitted or replaced by systems using non-CFC refrigerants in a vapor compression cycle or by alternative technologies.'' EPA also explained in that rule that vapor compression chillers can be categorized by the type of compressor used, including centrifugal, rotary, screw, scroll and reciprocating compressors. These compressor types are also divided into centrifugal and positive displacement chillers, the latter of which includes those with reciprocating, screw, scroll or rotary compressors.

Centrifugal chillers are equipment that utilize a centrifugal compressor in a vapor-compression refrigeration cycle. Centrifugal chillers are typically used for commercial comfort AC, although other uses, that we are not addressing here, do exist. Centrifugal chillers can be found in office buildings, hotels, arenas, convention halls, airport terminals and other buildings. Centrifugal chillers tend to be used in larger buildings.

Positive displacement chillers are those that utilize positive displacement compressors such as reciprocating, screw, scroll or rotary types. Positive displacement chillers are applied in similar situations as centrifugal chillers, again primarily for commercial comfort AC, except that positive displacement chillers tend to be used for smaller capacity needs such as in mid- and low-rise buildings.

A chiller is a type of equipment using refrigerant that typically cools water or a brine solution, which is then pumped to fan coil units or other air handlers to cool the air that is supplied to the occupied spaces transferring the heat to the water. The heat absorbed by the water can then be used for heating purposes, and/or can be transferred directly to the air (''air-cooled''), to a cooling tower or body of water (''water-cooled''), or through evaporative coolers (''evaporative-cooled''). A chiller or a group of chillers could similarly be used for district cooling where the chiller plant cools water or another fluid that is then pumped to multiple locations being served such as several different buildings within the same complex. Chillers may also be used to maintain operating temperatures in various types of buildings, for example, in data centers, server farms, and agricultural/food operations. Chillers are used in other applications, for example, to cool process streams in industrial applications. Chillers are also used for comfort cooling of operators or climate control and protecting process equipment in industrial buildings, for example, in industrial processes when ambient temperatures could approach 200 °F (93 °C) and corrosive conditions could exist. The listing finalized today applies to all types of chillers in comfort cooling applications.

2. What are the ASHRAE classifications for refrigerant flammability?

The ANSI/ASHRAE Standard 34–2019 assigns a safety group classification for each refrigerant which consists of two to three alphanumeric characters (*e.g.,* A2L or B1). The initial capital letter indicates the toxicity, and the numeral denotes the flammability. ASHRAE classifies Class A refrigerants as refrigerants for which toxicity has not been identified at concentrations less than or equal to 400 parts per million (ppm) by volume, based on data used to determine threshold limit value-time-weighted average (TLV–TWA) or consistent indices. Class B signifies refrigerants for which there is evidence of toxicity at concentrations below 400 ppm by volume, based on data used to determine TLV–TWA or consistent indices.

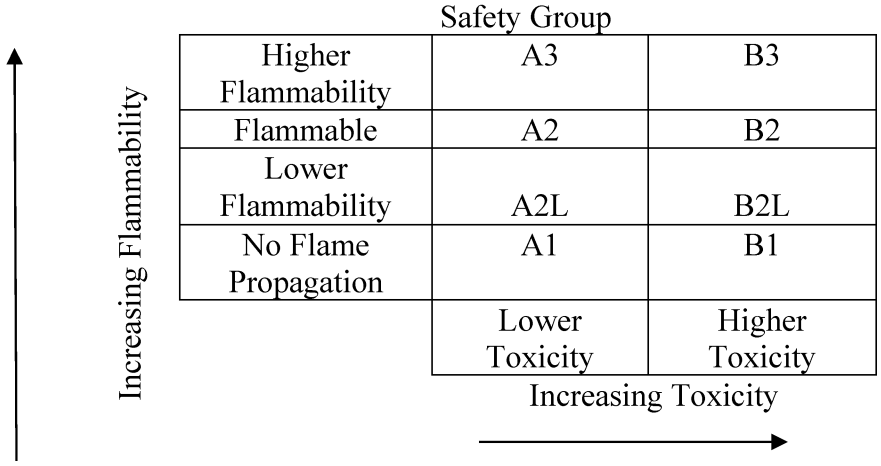
The refrigerants are also assigned a flammability classification of 1, 2, 2L, or 3. Tests for flammability are conducted in accordance with American Society for Testing and Materials (ASTM) E681 using a spark ignition source at 140 °F (60 °C) and 14.7 psia (101.3 kPa).[5] The flammability classification ''1'' is given to refrigerants that, when tested, show no flame propagation. The flammability classification ''2'' is given to refrigerants that, when tested, exhibit flame propagation, have a heat of combustion less than 19,000 kJ/kg (8,169 Btu/lb), and have a lower flammability limit (LFL) greater than 0.10 kg/m^3. The flammability classification ''2L'' is given to refrigerants that, when tested, exhibit flame propagation, have a heat of combustion less than 19,000 kJ/kg (8,169 BTU/lb), have an LFL greater than 0.10 kg/m^3, and have a maximum burning velocity of 10 cm/s or lower when tested in dry air at 73.4 °F (23.0 °C) and 14.7 psi (101.3 kPa). The flammability classification ''3'' is given to refrigerants that, when tested, exhibit flame propagation and that either have a heat of combustion of 19,000 kJ/kg (8,169 BTU/lb) or greater or have an LFL of 0.10 kg/m^3 or lower.

For flammability classifications, refrigerant blends are designated based on the worst case of formulation for flammability and the worst case of fractionation for flammability determined for the blend.

[4] Under section 608(c)(2) of the CAA and EPA's regulations at 40 CFR 82.154(a)(1), it is unlawful for any person, in the course of maintaining, servicing, repairing, or disposing of an appliance or industrial process refrigeration, to knowingly vent or otherwise knowingly release or dispose of any substitute substance for a class I or class II substance used as a refrigerant in such appliance (or industrial process refrigeration) in a manner which permits such substance to enter the environment. As provided in 40 CFR 82.154(a)(1), certain substitutes in certain end-uses have been exempted from this prohibition. References to the venting prohibition throughout this final rule refer to these provisions.

[5] ASHRAE, 2019a. ANSI/ASHRAE Standard 34–2019: Designation and Safety Classification of Refrigerants.

Figure 1. Refrigerant Safety Group Classification



Using these safety group classifications, ANSI/ASHRAE Standard 34–2019 categorizes HFO–1234yf, HFC–32 and the four refrigerant blends in this section of this final rule in the A2L Safety Group.

3. What are HFO–1234yf, HFC–32, R–452B, R–454A, R–454B, and R–454C and how do they compare to other refrigerants in the same end-use?

HFO–1234yf and HFC–32 are lower flammability refrigerants, and the four refrigerant blends are lower flammability refrigerant blends, all with an ASHRAE safety classification of A2L. The respective Chemical Abstracts Service Registry Identification Numbers (CAS Reg. Nos.) of HFO–1234yf, HFC–32 and the components of the four refrigerant blends are listed below.

HFO–1234yf, also known by the trade names ''Solstice® yf'' and ''Opteon™ YF,'' is also known as 2,3,3,3-tetrafluoroprop-1-ene (CAS Reg. No. 754–12–1). HFC–32 is also known as R–32 or difluoromethane (CAS Reg. No. 75–10–5). R–452B, also known by the trade names ''Opteon™ XL 55'' and ''Solstice® L41y,'' is a blend consisting of 67 percent by weight HFC–32; seven percent HFC–125, also known as 1,1,1,2,2-pentafluoroethane (CAS Reg. No. 354–33–6); and 26 percent HFO–1234yf. R–454A, also known by the trade name ''Opteon™ XL 40,'' is a blend consisting of 35 percent HFC–32 and 65 percent HFO–1234yf. R–454B, also known by the trade names ''Opteon™ XL 41'' and ''Puron Advance™,'' is a blend consisting of 68.9 percent HFC–32 and 31.1 percent HFO–1234yf. R–454C, also known by the trade name ''Opteon™ XL 20,'' is a blend consisting of 21.5 percent HFC–32 and 78.5 percent HFO–1234yf.

Redacted submissions and supporting documentation for HFO–1234yf, HFC–32, and the four refrigerant blends are provided in the docket for this final rule (EPA–HQ–OAR–2021–0836) at *https://www.regulations.gov.* EPA performed an assessment to examine the health and environmental risks of each of these substitutes. These assessments are available in the docket for this final rule.[6] [7] [8] [9] [10] [11] [12]

Environmental information: HFO–1234yf, HFC–32, and the four refrigerant blends have ODPs of zero.

HFO–1234yf has a 100-year integrated GWP of less than four.[13] [14] [15] HFC–32 has a GWP of 675. The four refrigerant blends are made up of the components HFC–32, HFC–125, and HFO–1234yf, which have GWPs of 675, 3,500, and less than four, respectively.[16] If these values are weighted by mass percentage, then R–452B, R–454A, R–454B, and R–454C have GWPs of about 700, 240, 470, and 150, respectively.

HFC–32, HFO–1234yf, and the other component of one of the four refrigerant blends, HFC–125, are excluded from EPA's regulatory definition of volatile organic compounds (VOC) (see 40 CFR 51.100(s)) for the purpose of addressing the development of State Implementation Plans (SIPs) to attain and maintain the National Ambient Air Quality Standards (NAAQS). The regulatory definition provides that ''any compound of carbon'' which ''participates in atmospheric

[6] ICF, 2022a. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–32.

[7] ICF, 2022b. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: HFO–123yf.

[8] ICF, 2022c. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–452B.

[9] ICF, 2022d. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–454A.

[10] ICF, 2022e. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–454B.

[11] ICF, 2022f. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–454C.

[12] EPA notes that UL 60335–2–40 uses the Worst Case Formulation of Flammability (WCF) LFL, but that ASHRAE 34–2019 uses the Worst Case Fractionation of Flammability (WCFF) LFL for all of the blends except R–452B, in which case ASHRAE 34 references the WCF LFL. To be conservative, the Agency uses the WCFF LFL values for our flammability risk analysis. ASHRAE 34 plans to update their WCFF LFL values to WCF LFL values in future editions of the standard as a way to standardize LFLs going forward, after which the Agency may also consider switching to using WCF LFL values in the risk screens.

[13] The GWP in World Meteorological Organization (2018) is listed as less than 1. Burkholder *et al.* Appendix A, Table A–1 in *Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project,* Report No. 58, World Meteorological Organization, Geneva, Switzerland, *http://ozone.unep.org/science/assessment/sap.* (WMO, 2018)

[14] Nielsen et al., 2007. Nielsen, O.J., Javadi, M.S., Sulbaek Andersen, M.P., Hurley, M.D., Wallington, T.J., Singh, R. 2007. Atmospheric chemistry of CF3CF=CH2: Kinetics and mechanisms of gas-phase reactions with Cl atoms, OH radicals, and O3. Chemical Physics Letters 439, 18–22. Available online at *http://www.lexissecuritiesmosaic.com/gateway/FedReg/network_OJN_174_CF3CF=CH2.pdf.*

[15] Hodnebrog Ø;. et al., 2013. Hodnebrog Ø;., Etminan, M., Fuglestvedt, J.S., Marston, G., Myhre, G., Nielsen, C.J., Shine, K.P., Wallington, T.J.: Global Warming Potentials and Radiative Efficiencies of Halocarbons and Related Compounds: A Comprehensive Review, *Reviews of Geophysics, 51, 300–378, doi:10.1002/rog.20013,* 2013

[16] Unless otherwise specified, GWP values are 100-year values from Intergovernmental Panel on Climate Change (IPCC) (2007) Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.). Cambridge University Press. Cambridge, United Kingdom 996 pp.

photochemical reactions'' is considered a VOC unless expressly excluded based on a determination of ''negligible photochemical reactivity.'' Under section 608(c)(2) of the CAA and EPA's regulations at 40 CFR 82.154(a)(1), it is unlawful for any person, in the course of maintaining, servicing, repairing, or disposing of an appliance or industrial process refrigeration, to knowingly vent or otherwise knowingly release or dispose of any substitute substance for a class I or class II substance used as a refrigerant in such appliance (or industrial process refrigeration) in a manner which permits such substance to enter the environment.

Flammability information: HFO–1234yf, HFC–32 and the four refrigerant blends are all classified as 2L under ASHRAE Standards reflecting that these compounds are flammable but have lower burning velocity than compounds listed as 2 or 3 under the ASHRAE standard.

Toxicity and exposure data: HFO–1234yf, HFC–32 and the four refrigerant blends have an ASHRAE toxicity classification of A. Potential health effects of exposure to these substitutes include drowsiness or dizziness. The substitutes may also irritate the skin or eyes or cause frostbite. At sufficiently high concentrations, the substitutes may cause irregular heartbeat. The substitutes could cause asphyxiation if air is displaced by vapors in a confined space. These potential health effects are common to many refrigerants.

The American Industrial Hygiene Association (AIHA) has established Workplace Environmental Exposure Limits (WEELs) of 1,000 ppm as an eight-hour time-weighted average (8-hr TWA) for HFC–32 and the component refrigerant HFC–125; the AIHA has established a WEEL of 500 ppm as an 8-hr TWA for HFO–1234yf. The manufacturer of R–452B, R–454A, R–454B, and R–454C recommends Acceptable Exposure Limits (AELs) for the workplace, respectively, of 874, 690, 854, and 615 ppm on an 8-hr TWA for these blends. EPA anticipates that users will be able to meet the AIHA WEELs and manufacturers' AELs and address potential health risks by following requirements and recommendations in the manufacturers' safety data sheet (SDS), the final use conditions (including adherence to ASHRAE Standard 15), and other safety precautions common to the refrigeration and AC industry.[17] [18] [19] [20] [21] [22]

Comparison to other substitutes in this end-use: HFO–1234yf, HFC–32, and the four refrigerant blends all have an ODP of zero, comparable to or lower than some of the acceptable substitutes in these end-uses, such as HFO–1234ze(E) with an ODP of zero. Although HCFC–123 and R–406A (with components HCFC–22 and HCFC–142b) have been listed acceptable in this end-use with ODPs of 0.02 and 0.057, respectively, HCFC–123 (unless used, recovered, and recycled) may not be used as a refrigerant in equipment manufactured on or after January 1, 2020, under 40 CFR 82.15(g)(5)(i).[23] Similarly, components of R–406A (HCFC–22 and HCFC–142b) (unless used, recovered, and recycled) may not be used as a refrigerant for use in chillers manufactured on or after January 1, 2010, under 40 CFR 82.15(g)(2)(i).[24] Under 40 CFR 82.16, EPA has not issued any production and consumption allowances for HCFC–22 and HCFC–142b since 2019.

HFC–32 and the four refrigerant blends' GWPs, ranging from about 150 to 700, are higher than those of some of the acceptable substitutes for new centrifugal and positive displacement chillers, including HCFO–1233zd(E), HFO–1336mzz(Z), and R–515B, with GWPs of 3.7, 9, and 287, respectively. The GWPs of HFO–1234yf, R–454A, R–454B, and R–454C are lower than some of the acceptable substitutes for new centrifugal and positive displacement chillers, such as R–450A and R–513A, with GWPs of approximately 600 and 630, respectively. HFC–32's and R–452B's GWPs of 675 and about 700 are higher than the GWPs of those refrigerants. The GWPs of HFC–32 and R–452B are, however, lower than those of all the refrigerants that EPA listed as unacceptable for chillers as of January 1, 2024, in the final rule issued December 1, 2016, which had GWPs of 1,000 or higher. Further, HFC–32 and HFC–452B can be used in chillers that are designed to be used with refrigerants having higher pressure and higher volumetric capacity, unlike most of the other refrigerants listed acceptable in chillers (*e.g.,* HCFO–1233zd(E), R–450A, and R–513A). Volumetric capacity is important to achieve the cooling capacity needed without increasing equipment sizes, which could lead to weights exceeding code requirements, for instance, when a chiller on top of an existing building is replaced with a new one. Given the wide range of applications, not all refrigerants listed as acceptable under SNAP will be suitable for all equipment in the end-use. To provide additional options to ensure the availability of substitutes for the full range of chiller equipment for comfort cooling, EPA is finalizing the listings for HFC–32 and R–452B for all types of positive displacement chillers, as well as for centrifugal chillers and chillers for IPAC.

HFC–32's and the four refrigerant blends' GWPs, ranging from about 150 to 700, are higher than or comparable to those of some of the acceptable substitutes for new IPAC, including carbon dioxide (CO_2), HFO–1336mzz(Z) and R–515B with GWPs of 1, 9 and 287 respectively. Their GWPs are lower than some of the acceptable substitutes for new IPAC, such as HFC–134a, R–410A, and R–507A with GWPs of 1,430, 2,090 and 3,990 respectively. HFO–1234yf's GWP less than four is comparable to or lower than that of other acceptable substitutes for new IPAC, such as CO_2, HFO–1336mzz(Z) and R–515B with GWPs of 1, 9 and 287, respectively.

Information regarding the toxicity of other available alternatives is provided in the listing decisions previously made (see *https://www.epa.gov/snap/substitutes-chillers*). Toxicity risks of use, determined by the likelihood of exceeding the exposure limit, of HFO–1234yf, HFC–32, and the four refrigerant blends in these end-uses are evaluated in the risk screens referenced above. The toxicity risks of using HFO–1234yf, HFC–32, and the four refrigerant blends in chillers and IPAC are comparable to or lower than toxicity risks of other available substitutes in the same end-uses. Toxicity risks of the refrigerants can be minimized by use consistent with ASHRAE 15–2019—which applies under the use conditions—and other industry standards, recommendations in the manufacturers' SDS, and other safety precautions common in the refrigeration and AC industry.

The flammability risks with HFO–1234yf, HFC–32, and the four refrigerant blends in these end-uses, determined by the likelihood of exceeding their respective lower flammability limits, are evaluated in the risk screens referenced above. In conclusion, while these refrigerants may pose greater

[17] ICF, 2022a. Op. cit.

[18] ICF, 2022b. Op. cit.

[19] ICF, 2022c. Op. cit

[20] ICF, 2022d. Op. cit.

[21] ICF, 2022e. Op. cit.

[22] ICF, 2022e. Op. cit.

[23] The regulations at 40 CFR 82.15(g)(5)(iii) provide a limited exception to the prohibition on use in 82.15(g)(5)(i), for use of HCFC–123 as a refrigerant in equipment manufactured on or after January 1, 2020 but before January 1, 2021 if the conditions of 40 CFR 82.15(g)(5)(iii) are met.

[24] The regulations at 40 CFR 82.15(g)(2)(ii) provide limited exceptions to the prohibitions in 82.15(g)(2)(i), including for HCFC–22 ''for use as a refrigerant in appliances manufactured before January 1, 2012, provided that the components are manufactured prior to January 1, 2010, and are specified in a building permit or a contract dated before January 1, 2010, for use on a particular project.''

flammability risk than other available substitutes in the same end-uses, this risk can be minimized by use consistent with ASHRAE 15–2019—which applies for certain charge sizes under the use conditions—and other industry standards such as UL 60335–2–40—which also applies under the use conditions—as well as recommendations in the manufacturers' SDS and other safety precautions common in the refrigeration and AC industry. EPA is finalizing use conditions to reduce the potential risk associated with the flammability of these alternatives so that they will not pose significantly greater risk than other acceptable substitutes in this end-use.

4. Why is EPA finalizing these specific use conditions?

The UL Standard 60335–2–40 discussed in section II.E indicates that refrigerant charges greater than a specific amount (called ''m_3'' in the UL Standard and based on the refrigerant's LFL) are beyond its scope and that national standards apply, such as ASHRAE 15–2019. Given that depending on the charge size of the equipment, either UL 60335–2–40 or ASHRAE 15–2019 would apply, EPA is including adherence to both standards as use conditions for chillers.

EPA is finalizing that chillers using HFO–1234yf, HFC–32, or one of the four refrigerant blends must adhere to ASHRAE Standard 15–2019, with all addenda published by the date of the NPRM for this rule, including addenda a, b, c, d, e, f, i, j, k, m, n, o, q, and r. Where the requirements specified in this final rule and ASHRAE Standard 15 are different, the requirements of this final rule would apply.

A summary of relevant aspects of ASHRAE 15–2019 is provided here for information only. This is not meant to be a full explanation of the Standard or how it is applied. ASHRAE 15–2019 specifies requirements for refrigeration systems,[25] including chillers, based on the safety group classification of the refrigerant used, the type of occupancy in the location for which the system is used, and whether refrigerant-containing parts of the system enter the space or ductwork and so leakage in the space is deemed ''probable.'' ''High-Probability'' installations are those such that leaks or failures will result in refrigerant entering the occupied space. As explained above, HFO–1234yf, HFC–32 and the four refrigerant blends are all classified as A2L refrigerants. Occupancies are divided into six classifications: institutional, public assembly, residential, commercial, large mercantile, and industrial. Examples of these include jails, theaters, apartment buildings, office buildings, shopping malls, and chemical plants, respectively.

Sections 7.2 and 7.3 of ASHRAE Standard 15 determine the maximum amount of refrigerant allowed in the system, while section 7.4 provides an option to locate equipment outdoors or in a machinery room constructed and maintained under conditions specified in the standard. Section 7.6 of ASHRAE Standard 15 addresses the refrigerants in this proposal when used for human comfort in ''high-probability'' systems, including requirements for nameplates, labels, refrigerant detectors (under certain conditions), airflow initiation and other actions (if a rise in refrigerant concentration is detected), and other restrictions.

In the interest of providing these ODS alternatives to industry quickly, as requested by commenters, and achieving reductions in other, less safe alternatives sooner, the Agency is finalizing use conditions that incorporate by reference the ASHRAE 15–2019 edition, as proposed, rather than a more recent version. EPA recognizes that ASHRAE 15 was recently updated and republished in late 2022. This final rule incorporates by reference all addenda published by the date of the NPRM, as proposed. EPA intends to review the 2022 version of ASHRAE Standard 15 and consider proposing revisions to the use conditions to incorporate by reference the 2022 version of that standard in a future notice and comment rulemaking.

EPA is finalizing the use conditions to ensure safe use of these ODS alternatives regarding their flammability, toxicity, exposure, and environmental effects. As discussed below, commenters generally supported the use conditions. The use conditions identified in this section above are explained below, in section II.E.1, in greater detail.

5. What additional information is EPA including in these final listings?

EPA is providing additional information related to these final listings. Since this additional information is not part of the regulatory decision under SNAP, these statements are not binding for use of the substitute under the SNAP program. See section II.E.2 below for further discussion on what additional information EPA is including in these final listings. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of these substitutes as best practices for safer use.

6. How is EPA responding to comments on chillers?

Comment: Carrier commented expressing their support of listing HFO–1234yf, HFC–32, R–452B, R–454A, R–454B, and R–454C as acceptable in chillers. Daikin described their support for listing HFC–32 and R–452B as acceptable in positive displacement chillers. Daikin agreed with ''EPA's analysis of its application, and strongly supported the Agency's proposal to approve R–32 under the SNAP program for the end uses of new rotary and scroll comfort cooling and industrial process air conditioning chillers.'' Daikin voiced strong support and encouraged EPA to approve HFC–32 quickly.

Response: EPA thanks Carrier and Daikin for their support of these listings in the chillers end-use. In this final rule, EPA is listing HFO–1234yf, R–454A, R–454B, R–454C, HFC–32, and R–452B in all centrifugal and positive displacement chillers for comfort cooling, including both commercial AC and IPAC.

Comment: The Air-Conditioning, Heating, and Refrigeration Institute (AHRI), Carrier, Multistack, and Chemours all commented that EPA should not segment the chillers end-uses further by compressor type. Carrier stated that such segmentation leads to unnecessary complexity, while Multistack said it was likely to produce confusion regarding the application of products. Chemours commented that segmentation by compressor type may stifle innovation and create additional challenges for equipment manufacturers and end users working to adopt lower-GWP refrigerants. Chemours further stated that compressor type differentiation should only occur when necessary, because of technology limitations. Chemours also recommended that EPA remove references to chillers for industrial process refrigeration (IPR) to avoid confusion, as well as not distinguishing IPR equipment by compressor type.

Response: EPA acknowledges the concerns commenters expressed regarding segmenting the current chillers end-uses by compressor types for the proposed listings of HFC–32 and R–452B in scroll and rotary chillers. After consideration of the comments received, in particular, the concerns for innovation and unnecessary complexity

[25] We note that while the ASHRAE 15–2019 purpose indicates ''refrigeration systems,'' EPA believes this includes applications that are typically called ''air conditioning.''

as summarized above, EPA agrees that such segmentation is not necessary and could hinder the technical transition to lower-GWP refrigerants. Moreover, EPA does not view segmentation in this instance as providing any additional environmental benefit. Given EPA's understanding of the comments and the SNAP program's historical precedent of grouping together all positive displacement chillers despite their varying compressor types, EPA is finalizing the listings for HFC–32 and R–452B for all chillers rather than breaking out the listings by compressor type for scroll and rotary chillers.

In response to Chemours's comment referencing IPR for chillers, EPA acknowledges the complexities associated with breaking out IPR by compressor type, similarly to chillers. EPA understands the standard UL 60335–2–40 to apply only to comfort cooling and not to process cooling such as occurs in IPR. EPA may address additional substitutes for use in IPR in future rulemakings. The reference to chillers used for IPR remains in the preamble for this final rule to clarify that IPR is not in the scope of listings in this rule.

Comment: Daikin commented on EPA's statement that ''EPA understands that the UL standard [60335–2–40] applies to chillers used for comfort cooling.'' Daikin went on to say ''that neither the scope statement nor the body of this UL standard make any such restriction as to the purpose of the heat pump, air-conditioner, or dehumidifier. Products evaluated to this UL standard are not limited to applications for human comfort and may also be applied to cool or heat various products or processes.'' They suggested that if EPA has safety concerns for IPAC, the Agency should include an ambient operating temperature limit of 140 °F. Daikin addressed the suitability of HFC–32 in IPAC and IPR, noting that ''EPA states in the preamble (87 FR 45514) that 'HFC–32's . . . GWP [is] higher than those of some of the acceptable substitutes for new industrial process AC . . .', implying that HFC–32 is not suitable for industrial process refrigeration. Regardless of whether Daikin's SNAP information notice requested SNAP approval of HFC–32 in the industrial process refrigeration application, HFC–32 is also suitable for that application.''

Response: EPA acknowledges Daikin's concerns about the scope of UL 60335–2–40. Determining the coverage of UL standards to applications not covered in this rule is outside the scope of this rulemaking. However, for informational purposes in response to Daikin's comment, the Agency is providing some additional information regarding UL 60335–2–40. As described in NOTE 104 in UL 60335–2–40, ''This standard does not apply to. . .

- appliances designed exclusively for industrial processing;
- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas).''

Based on EPA's review of standard UL 60335–2–40 and conversations with UL, it is EPA's understanding that equipment for industrial processing, included in the bullet points above, is not covered by this standard, and instead is covered by UL 60335–2–89. Excluding equipment designed solely for industrial processes limits the scope of UL 60335–2–40 to chillers designed for commercial and industrial comfort cooling. If a chiller in an industrial application is used mostly for comfort cooling and also cools processes or industrial equipment, EPA would consider it to fall under the SNAP end-use IPAC rather than IPR. The listings for HFC–32, described in this section above, will apply to these types of chillers on and after the effective date of this rule.

The discussion of ambient operating temperature for IPAC equipment was included as part of the description of the end-use under SNAP, providing an example of possible operating conditions. Any safety concerns surrounding use of HFC–32 in this end-use are sufficiently addressed by the use conditions that apply as described in section II.E.1, below. EPA agrees with Daikin that HFC–32 is suitable for use in IPAC, given that the Agency proposed to list HFC–32 as acceptable in this end-use in SNAP NPRM 25 and is finalizing this listing in this rulemaking.

Under SNAP, IPAC is considered comfort cooling equipment, as it protects the operators in addition to process equipment. EPA's SNAP program considers IPR equipment to be primarily for cooling of a process or product, not primarily for comfort cooling. EPA has not addressed or implied the suitability of HFC–32 for IPR in the NPRM or in this final rule. Any comments on the suitability of HFC–32 in IPR are outside the scope of the rulemaking. EPA is finalizing the listings for HFC–32 in chillers used in comfort cooling for commercial and industrial uses as described in this section of the preamble above.

Comment: AHRI and Chemours noted that some of EPA's risk screens use the Worst Case of Fractionation for Flammability (WCFF) LFL values for the refrigerant blends rather than the Worst Case of Formulation for Flammability (WCF) when determining the lower flammability limit and requested that EPA uses the WCF LFL values for purposes of refrigerant risk analysis. Both commenters noted that UL 60335–2–40 uses the WCF LFL, but that ASHRAE 34–2019 uses the WCFF LFL for all of the blends, except R–452B, in which case both ASHRAE 34 and EPA reference the WCF LFL. The commenters stated that ASHRAE 34 plans to update their WCFF LFL values to WCF LFL values in future editions of the standard as a way to standardize LFLs going forward.

Response: EPA thanks the commenters for this information regarding WCFF and WCF LFL values. The Agency has added a footnote to this preamble acknowledging that this transition from using WCFF values to WCF values is taking place. EPA will consider updating risk screens for R–454A, R–454B, and R–454C in future rulemakings with more recent versions of the ASHRAE standards, using the WCF LFL values. Given the more conservative nature of WCFF LFL values over WCF LFL values, such an update to the risk screens' flammability analysis would result in a less conversative model. The determination of whether the LFL would be exceeded in a catastrophic refrigerant release scenario may change if using the WCF LFL values, possibly showing no flammability risk where there may have been flammability risk previously.

Comment: Several citizens commented, acknowledging the safety of using A2L refrigerants in terms of their flammability and risk to the environment, especially relative to other alternatives available. These commenters stated that EPA should proceed with listing these refrigerants as acceptable.

Response: EPA thanks the commenters for their support of listing the A2L refrigerants—HFO–1234yf and the refrigerants blends—as acceptable. EPA agrees that these refrigerants pose lower overall risk to human health and the environment, and thus we conclude it is appropriate to move forward with finalizing the listings for these refrigerants as described in the preamble above.

B. Residential Dehumidifiers—Listing of HFO–1234yf, HFC–32, R–452B, R–454A, R–454B, and R–454C as Acceptable, Subject to Use Conditions, for Use in New Residential Dehumidifiers

EPA previously listed HFO–1234yf as acceptable, subject to use conditions in

motor vehicle AC in light-duty vehicles (74 FR 53445; October 19, 2009), in heavy-duty pickup trucks and complete heavy-duty vans (81 FR 86778; December 1, 2016) and in nonroad vehicles and service fittings for small refrigerant cans (87 FR 26276; May 4, 2022). EPA previously listed HFC–32 as acceptable, subject to use conditions, as a substitute in residential and light commercial AC and HPs (80 FR 19454; April 10, 2015 and 86 FR 24444, May 6, 2021) and previously listed R–452B, R–454A, R–454B, and R–454C (hereafter called ''the four refrigerant blends'') as acceptable, subject to use conditions, as substitutes in residential and light commercial AC and HPs (86 FR 24444; May 6, 2021).

This final rulemaking finds HFC–32, HFO–1234yf, and the four refrigerant blends acceptable, subject to use conditions, as substitutes in residential dehumidifiers. After consideration and evaluation of the comments received by the Agency in response to the NPRM, EPA is finalizing the listings for HFC–32, HFO–1234yf, R–452B, R–454A, R–454B, and R–454C in residential dehumidifiers as proposed.

Several use conditions finalized for residential dehumidifiers are common to those for other end-uses in section II.A, above, and II.D, below. Because of this similarity, EPA discusses the use conditions that would apply to all three end-uses in section II.E. For residential dehumidifiers, those are the only use conditions EPA is finalizing and require the following:

(1) 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.

(2) UL Standard—These refrigerants may be used only in residential dehumidifiers that meet all requirements listed in the 3rd edition, dated November 1, 2019, of UL Standard 60335–2–40, ''Household and Similar Electrical Appliances—Safety—Part 2–40: Particular Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers'' (UL Standard). In cases where this final rule includes requirements different from those of the 3rd edition of UL Standard 60335–2–40, the appliance must meet the requirements of the final rule in place of the requirements in UL 60335–2–40, 3rd Edition. See section II.E below for further discussion on the requirements of this standard that EPA is incorporating by reference.

(3) Warning labels—Several warning labels are required as use conditions as detailed in section II.E below. These labels are similar or verbatim in language to those required by the UL Standard. The warning labels must be provided in letters no less than 6.4 mm (¼ inch) high and must be permanent.

(4) Markings—Equipment must have distinguishing red (PMS #185 or RAL 3020) color-coded hoses and piping to indicate use of a flammable refrigerant. The residential dehumidifier shall have marked 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.

EPA notes that there may be other requirements pertaining to the manufacture, use, handling, and disposal of the refrigerants that are not included in the information listed in the tables (*e.g.,* the CAA section 608(c)(2) venting prohibition or Department of Transportation requirements for transport of flammable gases). Flammable refrigerants being recovered or otherwise disposed of from residential dehumidifiers are likely to be hazardous waste under RCRA (see 40 CFR parts 260–270).

1. Background on Residential Dehumidifiers

Residential dehumidifiers are primarily used to remove water vapor from ambient air or directly from indoor air for comfort or material preservation purposes in the context of the home.[26] While AC systems often combine cooling and dehumidification, this end-use only serves the latter purpose and is often used in homes for comfort purposes. This equipment is self-contained and circulates air from a room, passes it through a cooling coil, and collects condensed water for disposal. Residential dehumidifiers fall under the scope of the UL 60335–2–40 standard ''Household and Similar Electrical Appliances—Safety—Part 2–40: Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers.''

Some dehumidifiers for residential or light commercial use are integrated with the space air conditioning equipment, for instance via a separate bypass in the duct through which air is dehumidified, a dehumidifying heat pipe across the indoor coil, or other types of energy recovery devices that move sensible and/or latent heat between air streams (*e.g.,* between incoming air and air vented to the outside). EPA classifies this application as a component of a residential or light commercial AC system or HP. As such, EPA has already listed HFC–32 as acceptable for such uses, subject to the use conditions specified in SNAP Rule 23 (86 FR 24444; May 6, 2021).

This final rulemaking finds HFO–1234yf, HFC–32, and the four refrigerant blends acceptable, subject to use conditions, in self-contained residential dehumidifiers. Note that dehumidifiers for residential or light commercial use that are integrated with AC equipment (*i.e.,* not self-contained) are not addressed in this listing because EPA classifies that type of equipment as residential or light commercial AC and HPs.

2. What are the ASHRAE classifications for refrigerant flammability?

HFO–1234yf and HFC–32 are lower flammability refrigerants, and the four refrigerant blends are lower flammability refrigerant blends, all with an ASHRAE safety classification of A2L. See section II.A.2 above for further discussion on ASHRAE classifications.

3. What are HFO–1234yf, HFC–32, R–452B, R–454A, R–454B, and R–454C and how do they compare to other refrigerants in the same end-use?

See section II.A.3 above for further discussion on the environmental, flammability, toxicity, and exposure information for these refrigerants.

[26] SNAP regulations (see 40 CFR 82.172) define residential use as use by a private individual of a chemical substance or any product containing the chemical substance in or around a permanent or temporary household, during recreation, or for any personal use or enjoyment. Use within a household for commercial or medical applications is not included in this definition, nor is use in automobiles, watercraft, or aircraft.

Redacted submissions and supporting documentation for HFO–1234yf, HFC–32 and the four refrigerant blends are provided in the docket for this proposed rule (EPA–HQ–OAR–2021–0836) at *https://www.regulations.gov.* EPA performed an assessment to examine the health and environmental risks of each of these substitutes. These assessments are available in the docket for this final rule.[27] [28] [29] [30] [31] [32]

Comparison to other substitutes in this end-use: HFO–1234yf, HFC–32, and the four refrigerant blends all have an ODP of zero, comparable to or lower than some of the acceptable substitutes in new residential dehumidifiers, such as HFC–134a, R–410A, and R–513A, with ODPs of zero. HCFC–22 and R–406A (a blend of HCFC–22 and HCFC–142b) have ODPs of 0.055 and 0.057, respectively, and are listed as acceptable in new residential dehumidifiers. However, HCFC–22 and HCFC–142b are controlled substances under Title VI of the CAA and (unless used, recovered, and recycled) may not be used as a refrigerant in equipment manufactured on or after January 1, 2010, under 40 CFR 82.15(g)(2)(i).[33] Under 40 CFR 82.16, EPA has not issued any production and consumption allowances for HCFC–22 and HCFC–142b (which is a component of R–406A, along with HCFC–22) since 2019.

HFO–1234yf, R–454A, R–454B, and R–454C have GWPs ranging up to about 470, lower than all the acceptable substitutes for new residential dehumidifiers, including R–513A and R–410A with GWPs of 630 and 2,090, respectively. HFC–32 and R–452B have GWPs of 675 and 700, respectively, which are lower than some of the other acceptable substitutes for new residential dehumidifiers, such as HFC–134a, R–410A, and R–507A with GWPs of 1,430, 2,090 and 3,990 respectively, but higher than R–513A, with a GWP of about 630.

Information regarding the toxicity of other available alternatives is provided in the previous listing decisions for new residential dehumidifiers (*https://www.epa.gov/snap/substitutes-residential-dehumidifiers*). Toxicity risks of use, determined by the likelihood of exceeding the exposure limit, of HFO–1234yf, HFC–32, and the four refrigerant blends in these end-uses are evaluated in the risk screens referenced above. The toxicity risks of using HFO–1234yf, HFC–32, and the four refrigerant blends in new residential dehumidifiers are comparable to or lower than toxicity risks of other available substitutes in the same end-use. Toxicity risks of the refrigerants can be mitigated by use consistent with ASHRAE 15 and other industry standards, recommendations in the manufacturers' SDS, and other safety precautions common in the refrigeration and AC industry.

The flammability risk with HFO–1234yf, HFC–32, and the four refrigerant blends in the new residential dehumidifiers end-use, determined by the likelihood of exceeding their respective lower flammability limits, are evaluated in the risk screens referenced in this section above. While these refrigerants may pose greater flammability risk than other available substitutes in the new residential dehumidifiers end-use, this risk can be mitigated by use consistent with ASHRAE 15 and UL 60335–2–40—which are applicable under the use conditions—as well as recommendations in the manufacturers' SDS and other safety precautions common in the refrigeration and AC industry. EPA is finalizing use conditions to reduce the potential risk associated with the flammability of these alternatives so that they will not pose significantly greater risk than other acceptable substitutes in the new residential dehumidifiers end-use.

4. Why is EPA finalizing these specific use conditions?

EPA is finalizing listing HFO–1234yf, HFC–32 and the four refrigerant blends as acceptable, subject to use conditions, for use in residential dehumidifiers for new equipment. EPA is finalizing the use conditions to ensure safe use of these ODS alternatives regarding their flammability, toxicity, exposure, and environmental effects. As discussed below, commenters generally supported the use conditions. The use conditions identified in this section above are explained below in section II.E.1 in greater detail.

5. What additional information is EPA including in these final listings?

EPA is providing additional information related to these final listings. Since this additional information is not part of the regulatory decision under SNAP, these statements are not binding for use of the substitute under the SNAP program. See section II.E.2 below for further discussion on what additional information EPA is including in these final listings. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of these substitutes as best practices for safer use.

6. How is EPA responding to comments on residential dehumidifiers?

Comment: Several commenters (AprilAire, the Association of Home Appliance Manufacturers (AHAM), Competition Advocates, GE Appliances/Hair, and Madison Indoor Air Quality (MIAQ)) voiced general support for the proposed listing of HFC–32 as acceptable, subject to use conditions, in residential dehumidifiers. AHAM noted the industry is ''already in the process of transitioning to lower GWP refrigerants for these products and prefers a national regulatory framework under which it can operate with a clear path to compliances.'' Competition Advocates commented on their SNAP application for HFC–32 in residential dehumidifiers and noted the importance of transitioning to lower-GWP alternatives. ''SNAP approval of R–32 use in residential dehumidifiers will allow the direct and indirect climate benefits of this lower GWP and more energy efficient refrigerant to be realized as consumers purchase and use these products.'' GE Appliances commented that they filed a SNAP application for the use of HFC–32 in residential dehumidifiers and noted support for SNAP Rule 25, urging EPA to move quickly in finalizing. MIAQ additionally expressed their support for listing R–454B as acceptable in the end-use.

Response: EPA acknowledges these commenters' general support for the proposed listings for HFC–32 and R–454B in residential dehumidifiers, and appreciates the additional information provided by AHAM and Competition Advocates on the transition to lower-GWP refrigerants. EPA agrees with these comments and is aware that industry has already started this transition. After

[27] ICF, 2022g. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: HFC–32.

[28] ICF, 2022h. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: R–452B.

[29] ICF, 2022i Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: R–454A.

[30] ICF, 2022j. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: R–454B.

[31] ICF, 2022k. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: R–454C.

[32] ICF, 2022l. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: HFO–1234yf.

[33] The regulations at 40 CFR 82.15(g)(2)(ii) provide limited exceptions to the prohibitions in 82.15(g)(2)(i), including for HCFC–22 ''for use as a refrigerant in appliances manufactured before January 1, 2012, provided that the components are manufactured prior to January 1, 2010, and are specified in a building permit or a contract dated before January 1, 2010, for use on a particular project.''

considering all the public comments on this proposal, we are finalizing these listings as described in this section, II.B.

Comment: AHRI, Carrier, Chemours, Desert-Aire, and MIAQ suggested that ''EPA may wish to incorporate residential and non-residential dehumidifiers into the currently used SNAP category of Residential and Light Commercial Air Conditioning and Heat Pumps,'' as all these products are developed together through UL 60335–2–40 (AHRI). MIAQ also recommended EPA ''revise and clarify the classification of different types of dehumidifiers to align with the definitions in the U.S. Department of Energy (DOE) test procedure at 10 Code of Federal Regulations (CFR) 430, Subpart B, Appendix X1 or in 10 CFR 430.2 and that the CFR definitions take precedence and may be modified by DOE.''

Response: EPA thanks the commenters for their suggestions on how to classify dehumidification equipment. EPA is finalizing the listings for residential dehumidifiers as proposed. For a discussion on how EPA has decided to categorize dehumidification equipment, see the Agency's response to comment included in section II.C.2, below.

C. Non-Residential Dehumidifiers—Decision Not To Finalize the Proposed Listing of HFC–32 as Acceptable, Subject to Use Conditions, for Use in New Non-Residential Dehumidifiers

After review of comments, EPA agrees that a new non-residential end-use is not necessary. Therefore, EPA is not finalizing the proposed listing of HFC–32 as acceptable, subject to use conditions for use in a new end-use for new non-residential dehumidifiers and instead is clarifying that SNAP considers dehumidifiers for non-residential use to fall under the residential and light commercial AC and HPs end-use. HFC–32 has previously been listed as acceptable for use in this end-use.

1. Why is EPA not finalizing the proposal to list HFC–32 as acceptable, subject to use conditions, in new non-residential dehumidifiers?

After review of the comments received relating to the creation of the non-residential end-use, EPA determined finalizing this section of the proposal is unnecessary. Commenters stated that before the NPRM, industry understood dehumidifiers in a commercial, or other non-residential, context to be covered by the end-use residential and light commercial AC and HPs. If EPA were to finalize this new end-use, it would cause unnecessary confusion regarding which end-use certain dehumidification equipment would be covered by under the SNAP program. Given that dehumidifiers are covered by the same UL Standard as equipment included in residential and light commercial AC and HPs, and that charge sizes and room sizes are similar to light commercial AC systems, EPA considers the risk profile of non-residential dehumidifiers when using flammable refrigerants to be similar to that of other equipment in that end-use.[34] Thus, in light of these comments and EPA's reflection on the current listings, standards, and the lack of any additional environmental protection provided by a separate listing for these dehumidifiers, EPA has determined that it is not necessary to list non-residential dehumidifiers as a separate end-use. Instead, with today's action, EPA is clarifying that SNAP considers the equipment described in the non-residential dehumidifier section of the NPRM to be part of the SNAP end-use residential and light commercial AC and HPs, with alternatives listed acceptable previously in that end-use applying to dehumidifiers used in non-residential settings.

2. How is EPA responding to comments on non-residential dehumidifiers?

Comment: Anden, a manufacturer of agricultural dehumidifiers, commented in support of listing HFC–32 as acceptable in the non-residential dehumidifiers end-use. In contrast, AHRI, Carrier, Chemours, Desert-Aire, and MIAQ submitted comments disagreeing with the proposed creation of a new non-residential dehumidifier end-use and the proposed listing of HFC–32 as the only refrigerant acceptable for this type of equipment.

Chemours commented requesting EPA not to finalize creation of the new non-residential dehumidifiers end-use, given that industry has been classifying this type of equipment under residential and light commercial AC and HPs up until SNAP NPRM 25, and that the transition to lower-GWP options for non-residential dehumidifiers relies heavily on the availability of substitutes already listed acceptable in this end-use. Chemours goes on to discuss how it would be a large burden on stakeholders to resubmit SNAP applications for all the alternatives listed in residential and light commercial AC and HPs, and disruption of the current manufacturing of OEMs who had been operating under the assumption that certain refrigerants were allowed for use in their non-residential dehumidifier equipment that will no longer be acceptable if this end-use creation is finalized. MIAQ also suggested classifying non-residential dehumidifiers (or ''non-consumer dehumidifiers'') as part of the residential and light commercial AC and HPs end-use.

AHRI and Desert-Aire commented suggesting EPA to include all dehumidifiers (both for residential and non-residential applications) into the existing residential and light commercial AC and HPs end-use, given that these equipment types are all covered under the same UL 60335–2–40 standard.

As mentioned above in section II.B, AHRI, Carrier, Chemours, Desert-Aire, and MIAQ suggested combining both the residential dehumidifiers and non-residential dehumidifiers end-uses into one end-use, ''dehumidifiers.'' MIAQ commented recommending that EPA adopt DOE's definition of consumer product dehumidifiers, into the two subcategories of ''whole home'' and ''portable.'' MIAQ also suggested defining non-residential dehumidifiers as dehumidifiers that are not consumer products. Carrier, Chemours, Desert-Aire, and MIAQ also suggested that the five refrigerants being finalized in this rulemaking for residential dehumidifiers—HFO–1234yf, R–452B, R–454A, R–454B, and R–454C—should also be listed for non-residential dehumidifiers. Desert-Aire cited similarities in the use-cases of the end-uses as justification for including these refrigerants in both end-uses. MIAQ further suggested allowing all previous refrigerants listed as acceptable under residential dehumidifiers to be applied to all types of dehumidifiers. Chemours and MIAQ cited certain equipment that cannot clearly be placed into either residential and light commercial AC and HPs or non-residential dehumidifiers based on the definitions proposed by EPA, including dehumidifiers that are ducted into an HVAC system and can be run entirely independently of any AC.

Response: EPA acknowledges the commenters' varied suggestions on the best path forward regarding dehumidification equipment classification. It is clear from EPA's review of the myriad comments received that the non-residential dehumidifier end-use as proposed is not necessary and that industry's understanding, previously to the proposed rule, was that non-residential dehumidifiers were part of the residential and light commercial AC and

[34] ICF, 2023a. Risk Screen on Substitutes in Residential and Light Commercial Air Conditioning and Heat Pumps (New Equipment); Substitute: HFC–32 (Difluoromethane).

HPs end-use. Moreover, if EPA had finalized this provision as proposed, it may have resulted in a review of other listed refrigerants to ensure that sufficient refrigerant options were available for this type of equipment. EPA agrees that by including non-residential dehumidifying equipment in an existing end-use, there will be sufficient refrigerant options available for this type of equipment. Thus, EPA has decided not to finalize the proposed creation of a new non-residential dehumidifiers end-use. Instead, EPA concludes that all dehumidifiers for use in non-residential settings are appropriately covered under the existing residential and light commercial AC and HPs end-use. Based on the action EPA is taking today, manufacturers of self-contained dehumidifiers for use in non-residential settings will be able to use HFC–32, as well as other substitutes that are listed as acceptable in the residential and light commercial AC and HPs end-use.

EPA acknowledges the suggestion to combine all dehumidifiers, including the current residential dehumidifiers end-use, with the residential and light commercial AC and HPs end-use. These types of equipment are covered by the same safety standards and also have significant overlap in their risk profiles. EPA notes that the Agency has in the past separated residential dehumidifiers from residential AC, stating that ''While air conditioning systems often combine cooling and dehumidification, this application [residential dehumidifiers] serves only the latter purpose'' (March 18, 1994; 59 FR at 13071) and ''. . . we use the term 'air conditioner' and 'AC' to cover equipment that cools air, heats air, or has the function to do both (typically referred to as a 'heat pump'). While such equipment might humidify or dehumidify the air, the term does not include equipment whose purpose is for latent cooling only (*i.e.,* dehumidifiers), which are a separate end-use under SNAP'' (June 12, 2020; 85 FR at 35880). EPA has not made comparable statements to separate commercial or industrial comfort cooling from commercial or industrial dehumidification, but neither has the Agency said before that these are in the same end-use. EPA may consider combining residential dehumidifiers with the residential and light commercial AC and HPs end-use in a future rulemaking, to give the public sufficient notice and opportunity to comment before potentially making such a change to the existing end-uses.

Similarly, if EPA were to consider combining residential dehumidifiers with non-residential dehumidifiers, creating a general ''dehumidifiers'' end-use, we would also take this action through notice-and-comment rulemaking. Although these equipment types are also similar, EPA believes that the ''light commercial'' aspect of the residential and light commercial AC and HPs end-use better covers the risk profile of non-residential dehumidifiers. These types of equipment are all covered by the UL 60335–2–40 safety standard and have significant overlap in their risk profiles because of similar room sizes and charge sizes required for self-contained ACs and HPs and dehumidifiers used in non-residential settings.

Concerning the suggestion that EPA's SNAP program use DOE's definitions for dehumidifiers, EPA understands that consistency in equipment definitions between agencies is useful for stakeholders. However, EPA and DOE operate under separate authorities and in this context, these authorities have separate goals. Currently, the DOE's definitions of ''whole home'' versus ''portable'' dehumidifiers are similar to the SNAP definitions. EPA describes ''whole home'' dehumidifiers as ducted equipment, covered by the residential and light commercial AC and HPs end-use, while ''self-contained'' dehumidifiers, roughly equivalent to DOE's ''portable'' dehumidifiers, are covered by the residential dehumidifier end-use. DOE also defines equipment by user, describing equipment as either ''consumer'' or ''non-consumer'' products, whereas EPA's definitions reference whether or not the equipment is used in residential contexts. In this final rule, EPA is describing dehumidification equipment independently of DOE. However, EPA may consider taking action through a notice-and-comment rulemaking at a future date to adopt new definitions.

While the suggestion to list the same six refrigerants proposed in the residential dehumidifiers end-use in the non-residential dehumidifiers end-use would provide more than HFC–32 as an option for the equipment, by including non-residential dehumidifiers in the residential and light commercial AC and HPs end-use, many more refrigerant options, beyond the six discussed, will be available.

D. Residential and Light Commercial AC and Heat Pumps (HPs)—Revision of Use Conditions Provided in the Previous Listing of HFC–32 as Acceptable for Use in New Self-Contained Room ACs and HPs

EPA previously listed HFC–32 as acceptable, subject to use conditions, in new self-contained room ACs and HPs in SNAP Rule 19 (80 FR 19461; April 10, 2015). In this action we are finalizing updates to applicable use conditions for new self-contained room ACs and HPs using HFC–32 to be consistent with the use conditions finalized in SNAP Rule 23 (86 FR 24444; May 6, 2021). EPA proposed replacing the previously required use conditions in compliance with UL 484 Standard, 8th Edition, with updated use conditions in compliance with UL 60335–2–40 Standard, 3rd Edition, effective 30 days after publication of the final rule. However, after review of the comments received, EPA has decided that manufacturers will be allowed to manufacture such equipment either according to UL 484, 8th Edition or according to UL 60335–2–40, 3rd Edition on or after the effective date of this final rule up to and including January 1st, 2024. Beginning January 2nd, 2024, UL will sunset UL 484 and only warning labels in compliance with UL 60335–2–40 will be permitted. Equipment manufactured before the effective date of this final action in compliance with the SNAP requirements applicable at the time of manufacture will remain in compliance.

1. Background on Self-Contained Room ACs and HPs

The residential and light commercial AC and HPs end-use includes equipment for cooling air in individual rooms, in single-family homes, and sometimes in small commercial buildings. This end-use differs from commercial comfort AC, which uses chillers that cool water that is then used to cool air throughout a large commercial building, such as an office building or hotel. Examples of equipment for residential and light commercial AC and HPs include:

- Central ACs, also called unitary AC or unitary split systems. These systems include an outdoor unit with a condenser and a compressor, refrigerant lines, an indoor unit with an evaporator, and ducts to carry cooled air throughout a building. Central heat pumps are similar but offer the choice to either heat or cool the indoor space. These systems are not addressed in this rule.[35]
- Multi-split ACs. These systems include one or more outdoor unit(s) with a condenser and a compressor and

[35] EPA has received submissions for HFC–32 and the hydrocarbon blends R–441A and R–443A, and no other flammable refrigerants, in new unitary central air conditioners. This action does not address flammable refrigerants in unitary central air conditioners. Introduction into interstate commerce of refrigerants without giving timely and adequate notice to EPA is in violation of Section 612(e) of the CAA and the SNAP regulations at 40 CFR part 82, subpart G.

multiple indoor units, each of which is connected to the outdoor unit by refrigerant lines. These systems are not addressed in this rule.

- Mini-split ACs. These systems include an outdoor unit with a condenser and a compressor and a single indoor unit that is connected to the outdoor unit by refrigerant lines. Cooled air exits directly from the indoor unit rather than being carried through ducts. These systems are not addressed in this rule.
- Window ACs. These are self-contained units that fit in a window with the condenser extending outside the window. These types of units are regulated under this rule.
- Packaged terminal ACs (PTACs) and packaged terminal HPs (PTHPs). These are self-contained units that consist of a separate, un-encased combination of heating and cooling assemblies mounted through a wall.[36] These types of units are regulated under this rule.
- Portable room ACs. These are self-contained, factory-sealed, single package units that are designed to be moved easily from room to room and are intended to provide supplemental cooling within a room. These units typically have wheels or casters for portability and, under the UL 484 Standard for room ACs, must have a fan which operates continuously when the unit is on. Portable room ACs may contain an exhaust hose that can be placed through a window or door to eject heat to the outside. These types of units are regulated under this rule.

Of these types of equipment, window ACs, PTACs, PTHPs, and portable room ACs are self-contained equipment with the condenser, compressor, evaporator, and tubing all within casing in a single unit. These are the types of equipment for which EPA previously listed HFC–32 as acceptable, subject to use conditions, as codified in appendix R to 40 CFR part 82, subpart G.

2. What are the ASHRAE classifications for refrigerant flammability?

See section II.A.2 above for further discussion on ASHRAE classifications.

3. What is HFC–32 and how does it compare to other refrigerants in the same end-use?

See section II.A.3 above for further discussion on the environmental, flammability, toxicity, and exposure information for HFC–32.

Redacted submissions and supporting documentation for HFC–32 is provided in the docket for this proposed rule (EPA–HQ–OAR–2021–0836) at *https://www.regulations.gov.* EPA performed an assessment to examine the health and environmental risks of HFC–32. This assessment is available in the docket for this final rule.[37]

Comparison to other substitutes in this end-use: HFC–32 has an ODP of zero, the same as other acceptable substitutes in this end-use, such as R–290, HFC–134a, R–410A, and R–513A, with ODPs of zero.

HFC–32 has a GWP of 675, higher than some of the acceptable substitutes for residential and light commercial air conditioning and heat pumps, including ammonia absorption, R–290, and R–454B with GWPs of zero, three, and about 470, respectively. HFC–32's GWP is lower than some of the acceptable substitutes for residential and light commercial air conditioning and heat pumps, such as R–452B, HFC–134a, and R–410A, with GWPs of approximately 700, 1,430, and 2,090, respectively.

Information on the toxicity and flammability risk of HFC–32 in this end-use category was provided in SNAP Rule 19. In summary, EPA found the toxicity risks of HFC–32 to be comparable to or lower than other acceptable alternatives. Although we noted that the flammability risk of HFC–32 may be greater than that of other available, nonflammable substitutes in the same end-use, we found that those risks are not significant even under worst-case assumptions. These risks of HFC–32 are similar to the risks of other flammable refrigerants found acceptable for this end-use category in SNAP Rule 23 (*i.e.,* R–452B, R–454A, R–454B, R–454C, and R–457A). We noted there that this risk can be minimized by use consistent with industry standards such as UL 60335–2–40—which would be required by our proposed revision to the use conditions—and other industry standards, such as ASHRAE 15, as well as recommendations in the manufacturers' SDS and other safety precautions common in the refrigeration and air conditioning industry. The updates to the use conditions proposed maintain the low potential risk associated with the flammability of this alternative so that it will not pose significantly greater risk than other acceptable substitutes in this end-use category.

4. What use conditions previously applied to this refrigerant in this end-use category?

EPA previously found HFC–32 acceptable, subject to use conditions, in new residential and light commercial AC for self-contained room AC units, including PTAC units, PTHPs, window AC and HP units, and portable AC units, designed for use in a single room in SNAP Rule 19 (80 FR 19454; April 10, 2015). Those requirements are codified in appendix R of 40 CFR part 82, subpart G. EPA provided information on the environmental and health properties of HFC–32 and the various substitutes available at that time for use in this end-use. Additionally, EPA's risk screen for this refrigerant is available in the docket for this previous rulemaking (EPA–HQ–OAR–2013–0748).

HFC–32 has an ASHRAE classification of A2L, indicating that it has low toxicity and lower flammability. The flammability risks are of potential concern because residential ACs and HPs traditionally used refrigerants that are not flammable. In the presence of a higher energy ignition source (*e.g.,* lighted match or a cigarette lighter), an explosion or a fire could occur if the concentration of HFC–32 were to exceed the LFL of 144,000 ppm by volume. In the preamble for the original listing for three flammable refrigerants, including HFC–32 and two A3 refrigerants, in self-contained ACs and HPs in SNAP Rule 19, EPA had described lower energy ignition sources (*e.g.,* static electricity, a spark resulting from a closing door, or a cigarette) as possible ignition sources that were appropriate for the two A3 refrigerants, but not for HFC–32. This same description of ignition sources was used in the preamble of the July 2022 NPRM for this rule and it was not revised from the original listing in SNAP Rule 19 to only apply to HFC–32. After considering comments received on the proposal, in this preamble to the final rule, EPA is clarifying that A2Ls such as HFC–32 require greater energy input for ignition than previously described, and that a higher energy source, such as a lighted match, would be necessary.

Previously, to address flammability, EPA listed HFC–32 as acceptable in new self-contained room AC units, subject to use conditions. The previous use conditions addressed safe use of this flammable refrigerant and included incorporation by reference of Supplement SA to the 8th edition (August 2, 2012) of UL Standard 484, refrigerant charge size limits based on cooling capacity and type of equipment, and requirements for markings and

[36] PTACs are intended for use in a single room, or potentially for two rooms next to each other, and use no external refrigerant lines. Typical applications include motel or dormitory air conditioners.

[37] ICF, 2022n. Risk Screen on Substitutes in Residential and Light Commercial Air Conditioning and Heat Pumps (New Equipment); Substitute: HFC–32 (Difluoromethane).

warning labels on equipment using the refrigerant to inform consumers and technicians of potential flammability hazards. Without appropriate use conditions, the flammability risk posed by this refrigerant could be higher than non-flammable refrigerants because individuals may not be aware that their actions could potentially cause a fire, and because the refrigerant could be used in existing equipment that has not been designed specifically to minimize flammability risks. Our assessment and listing decisions in SNAP Rule 19 (80 FR 19454; April 10, 2015) found that with the use conditions, the overall risk of this substitute, including the risk due to flammability, does not present significantly greater risk in the end-use than other substitutes that are currently or potentially available for that same end-use.

5. What updates to the use conditions is EPA finalizing?

EPA is finalizing the proposed updates to the use conditions that apply to HFC–32 in new self-contained room ACs and HPs for equipment manufactured after the effective date of this final rule, with the change from proposal that UL 484 may continue to be used up to and including its official sunset date, per UL, of January 1st, 2024. In the time between the effective date of this final rule and January 1st, 2024, manufacturers will be allowed to follow either UL 484, 8th Edition or UL 60335–2–40, 3rd Edition. The period during which manufacturers may follow either standard provides sufficient time for manufacturers to transition from UL 484 to UL 60335–2–40. EPA is making this change after considering public comment on the timing for the adopting UL 60335–2–40, discussed further below in this section. Several of the updated use conditions finalized for self-contained room ACs and HPs are common to those finalized for other end-uses in sections II.A and II.B above. Because of this similarity, EPA discusses the use conditions that apply to all three end-uses in section II.E. For HFC–32 in self-contained room ACs and HPs, these are the use conditions EPA is finalizing. In summary, with the updates finalized, the use conditions are the following:

(1) New equipment only—This refrigerant may only be used in new equipment designed specifically and clearly identified for the refrigerant, *i.e.,* this substitute may not be used as a conversion or ''retrofit'' refrigerant for existing equipment. This use condition is the same as what currently exists for HFC–32 in this end-use category.

(2) UL Standard—This refrigerant (*i.e.,* in this case, HFC–32) may be used only in equipment (*i.e.,* in this case, self-contained room ACs and HPs) that meet all requirements listed either (a) in the 3rd edition, dated November 1, 2019, of UL Standard 60335–2–40, ''Household and Similar Electrical Appliances—Safety—Part 2–40: Particular Requirements for Electrical Heat Pumps, Air Conditioners and Dehumidifiers'' (UL Standard) or (b) in Supplement SA to the 8th edition, dated August 2nd, 2012, of UL 484, ''Room Air Conditioners.'' In cases where this final rule includes requirements different than those of the 3rd edition of UL Standard 60335–2–40 or of Appendix SA in the 8th edition of UL 484, EPA is requiring that the appliance would need to meet the requirements of this final rule in place of the requirements in the UL Standards. See section II.E below for further discussion on the requirements of the UL 60335–2–40 standard that EPA is incorporating by reference. This change in the use conditions allows the standard to which the equipment must adhere to be either Supplement SA to the 8th edition, dated August 2nd, 2012, of UL Standard 484, ''Room Air Conditioners'' or the 3rd edition of UL 60335–2–40 until the UL 484 standard sunsets on January 1st, 2024. After that date, self-contained room ACs and HPs must follow the 3rd edition of UL 60335–2–40.[38]

(3) Warning labels—Several warning labels were proposed as use conditions as detailed in section II.E below for equipment being designed in compliance with UL 60335–2–40. However, the previously required warning labels in compliance with UL 484 will also be acceptable through January 1st, 2024. Therefore, manufacturers will be allowed to manufacture such equipment either according to UL 484, 8th Edition or according to UL 60335–2–40, 3rd Edition on or after the effective date of this final rule up to and including January 1st, 2024; after this date, UL will sunset UL 484 and only UL 60335–2–40 will apply. Beginning January 2nd, 2024, only warning labels in compliance with UL 60335–2–40 will be permitted. Equipment manufactured before the effective date of this final action in compliance with the SNAP requirements applicable at the time of manufacture will remain in compliance. Equipment designed in compliance with either UL standard will be required to use warning label language that aligns with that standard using the font size specified by SNAP regulatory requirements. These labels are similar in language to those required by UL standards 484, 8th Edition and 60335–2–40, 3rd Edition. The warning labels must be provided in letters no less than 6.4 mm (¼ inch) high and must be permanent. While the font size is the same as in the use conditions that currently apply, several revisions to the labels and the language in them have changed for manufactures opting to adhere with the 3rd edition of UL 60335–2–40.

(4) Markings—Equipment must have distinguishing red (PMS #185 or RAL 3020) color-coded hoses and piping to indicate use of a flammable refrigerant. The equipment shall have marked service ports, pipes, hoses, and other devices through which the refrigerant is serviced. Markings shall extend at least one inch (25 mm) from the servicing port and shall be replaced if removed. This use condition is the same as what currently exists for HFC–32 in this end-use category.

The amendment to the regulatory text in appendix R is to indicate that the use conditions finalized apply to HFC–32 self-contained room AC units manufactured on or after the effective date of this final rule, May 30, 2023. Equipment manufactured before the effective date of the final rule is not affected by this action and is hence subject to the use conditions included in appendix R at the time they were manufactured. The finalized revisions to the current regulatory text update the use conditions that were included in the previous listing decision for HFC–32 in self-contained room ACs and HPs. EPA notes that there may be other requirements pertaining to the manufacture, use, handling, and disposal of the refrigerants that are not included in the information listed in the tables (*e.g.,* the CAA section 608(c)(2) venting prohibition,[4] or Department of Transportation requirements for transport of flammable gases). Flammable refrigerants being recovered or otherwise disposed of from residential and light AC appliances are likely to be hazardous waste under RCRA (see 40 CFR parts 260–270).

6. How do the updated use conditions differ from the previous requirements and why is EPA finalizing the change to the use conditions?

For manufacturers that adhere to UL 60335–2–40, 3rd Edition, the updated use conditions EPA is finalizing are similar to the ones that already exist in

[38] EPA anticipates that we may propose to further update this use condition to more recent editions of the UL 60335–2–40 standard in a future rulemaking and may consider allowing more than one edition to be used during a specified time period.

appendix R of 40 CFR part 82, subpart G for HFC–32 in this end-use category. The final requirements that HFC–32 must be used in new equipment only and must include red markings at service ports are repeated in this final listing. Existing room ACs using HFC–32 manufactured before the effective date of this final rule are not affected by the updated use conditions. In addition, manufacturers may opt to continue to adhere to the requirements in UL 484, 8th Edition up to and including its sunset date of January 1st, 2024. After this date, the use conditions that require adherence solely with UL 60335–2–40, 3rd Edition, described below and in greater detail in section II.E.1, will be mandatory for all relevant equipment.

The warning labels EPA is finalizing for the use of HFC–32 in self-contained room ACs and HPs designed to conform with UL 60335–2–40 are similar to those required as use conditions for the use of HFC–32 in residential and light commercial AC and HPs (excluding self-contained room ACs and HPs) and for R–452B, R–454A, R–454B, R–454C, and R–457A in residential and light commercial AC and HPs (including self-contained room ACs and HPs), included in SNAP Rule 23 in 2021 (86 FR 24463; May 6, 2021). EPA finds that using a common set of labels will aid in compliance, especially for a manufacturer that uses more than one of these refrigerants or produces both self-contained room ACs and HPs and other types of residential and light commercial AC and HPs. The updated label options EPA is finalizing use the word ''WARNING'' in lieu of ''DANGER'' or ''CAUTION'' and change ''Risk of Fire or Explosion'' to just ''Risk of Fire.'' However, the previous wording consistent with UL 484, 8th Edition is allowable up to and including January 1st, 2024 for manufacturers who would prefer transitioning to UL 60335–2–40, 3rd Edition at a date later than the effective date of this final rule. EPA is finalizing that the labels must be provided in letters no less than 6.4 mm (¼ inch) high and must be permanent, which is identical to the current requirement for HFC–32 in self-contained room ACs and HPs. In contrast, for manufacturers choosing to continue to make self-contained room ACs and HPs using R–32 according to Appendix SA and Appendices B through F of the 8th edition of UL 484 up to and including January 1st, 2024, rather than making such equipment according to UL 60335–2–40, the existing labeling requirements in appendix R to 40 CFR part 82, subpart G (listing 10) will continue to apply.

EPA is updating the standard incorporated by reference in the use conditions, requiring users either to follow certain sections of the 2012 version of UL 484 or to adhere to the 3rd edition of UL 60335–2–40. Both UL Standard 484 and UL Standard 60335–2–40 were developed in an open and consensus-based approach, with the assistance of experts in the refrigeration and AC industry as well as experts involved in assessing the safety of products. The revision cycle for the 3rd edition, including final recirculation, concluded with its publication on November 1, 2019. The 2019 UL Standard overlaps with, and eventually will replace, the previously published version of several standards, including UL Standard 484, 8th Edition on January 2nd, 2024. EPA was aware of the continuing progress of UL Standards to address flammable refrigerants more appropriately. In the 2021 SNAP Rule (SNAP Rule 23) listing HFC–32 for other categories within the residential and light commercial AC and HPs end-use, we stated, ''EPA understands that the standard we relied on in [SNAP] Rule 19 might 'sunset' in the future. Therefore, we will continue to evaluate the market for the equipment addressed in that rule, including HFC–32 in self-contained room ACs, and whether to establish new or revised use conditions that reference UL 603352–40'' (86 FR 24463; May 6, 2021). Today, we are finalizing such a change knowing that UL is replacing the standard to which such equipment is certified from UL 484 to the newer UL 60335–2–40 standard as of January 2nd, 2024. In addition, in order to allow manufacturers more time to transition their product lines from the earlier UL 484 standard to the UL 60335–2–40 standard, while still ensuring the safety of equipment manufactured with flammable refrigerants, EPA is allowing self-contained room ACs and HPs manufactured with HFC–32 to follow either standard up to and including January 1st, 2024.

Updating the UL standard incorporated as a use condition will allow more consistency among the products within this end-use and between HFC–32 and the five A2L refrigerants listed as acceptable, subject to use conditions, for this end-use including those listed for self-contained room ACs and HPs in SNAP Rule 23. This change will allow the industry to focus on the more recent standard. The change will be helpful in implementing any transitions needed or planned for manufacturers, installers, and technicians. A manufacturer, who may offer different products within this end-use with different refrigerants, could use similar processes, such as in developing and applying the warning labels required. Installers and technician, likewise, would not need to reference different standards depending on the type of equipment and the particular A2L refrigerant being used in that equipment, when putting in a new piece of equipment or servicing that equipment.

Another revision to the use conditions is charge sizes. In the 2019 SNAP Rule, charge sizes from both UL 484, 8th Edition, and those stipulated by tables within the rule needed to be followed. These will both continue to be requirements for equipment designed according to UL 484, 8th Edition. However, for equipment designed according to the 3rd edition of UL 60335–2–40, rather than requiring examination of both items and determining which charge size is lower, the updated use conditions will rely on a single document, UL 60335–2–40, 3rd Edition. As stated above, manufacturers will be allowed to select which standard they would like their equipment to follow, up to and including the UL 484, 8th Edition sunset date of January 1st, 2024, and equipment will be considered in compliance if their charge sizes are determined either by UL 60335–2–40, 3rd Edition or by UL 484, 8th Edition in combination with the tables in 40 CFR part 82, subpart G, appendix R.

7. What is the acceptability status of HFC–32 in self-contained room ACs and HPs?

The use conditions finalized in this action apply to new self-contained room ACs and HPs using HFC–32 manufactured on or after the effective date of this final rule (30 days after publication in the **Federal Register**). This final rule does not apply to or affect equipment manufactured before the effective date of this action and manufactured in compliance with the SNAP requirements applicable at the time of manufacture. For the purposes of the SNAP program, EPA views equipment to be manufactured when the appliance's refrigerant circuit is complete, the appliance can function, the appliance holds a full refrigerant charge, and the appliance is ready for use for its intended purposes. Self-contained room ACs and HPs are factory charged, meaning manufacture happens in the factory and thus prior to distribution in U.S. commerce. For such products manufactured between May 11, 2015, and the effective date of this final rule, the applicable use conditions under SNAP would be those in SNAP

Rule 19 (which took effect May 11, 2015) and as listed in appendix R of 40 CFR part 82, subpart G (listing 6. Such products are permitted to be warehoused and sold in U.S. commerce, as long as the products were manufactured (*i.e.,* the refrigerant circuit was complete) before May 30, 2023. For self-contained room ACs and HPs using HFC–32 manufactured on or after the effective date of this final rule and through January 1, 2024, the use conditions finalized and listed in the revisions to appendix R (either listing 6, if following UL 484, or listing 8 if following UL 60335–2–40) would apply under SNAP. For self-contained room ACs and HPs using HFC–32 manufactured on or after January 2, 2024, the use conditions finalized in listing 8, including following UL 60335–2–40, will apply under SNAP, recognizing that UL intends to sunset UL 484 as of January 1, 2024.

8. What additional information is EPA including in these final listings?

EPA is providing additional information related to these final listings. Since this additional information is not part of the regulatory decision under SNAP, these statements are not binding for use of the substitute under the SNAP program. See section II.E.2 below for further discussion on what additional information EPA is including in these final listings. EPA notes that the additional information is similar to, but not identical with, the additional information in the listing for HFC–32 in self-contained room ACs and HPs in SNAP Rule 19. EPA is finalizing additional information consistent with that included in the other final listings for air conditioning equipment in this rule and consistent with that included in the listings for four A2L refrigerant blends listed as acceptable subject to use conditions in self-contained room ACs and HPs in SNAP Rule 23. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of these substitutes as best practices for safer use.

9. How is EPA responding to comments on updating use conditions for HFC–32 in self-contained room ACs and HPs?

Comment: AHAM, GE Appliances, and LG Electronics all submitted comments that the omission of a transition period between the use conditions requiring the UL 484 standard and the UL 60335–2–40 standard is inappropriate, and they request an overlapping timeframe when either of the two standards may be used. GE Appliances stated that manufacturers need time to convert products and manufacturing facilities when moving from compliance with one standard to the other. Similarly, AHAM stated that, regardless of the final rule's effective date, EPA must ''allow for some overlap of acceptable use conditions to allow for product conversion because the absence of this overlap places exceptional burden on appliance manufacturers,'' and noted that there are currently home comfort products on the market based on prior use conditions under SNAP Rule 19. In AHAM's words, ''EPA needs to keep multiple versions of these standards available for products to allow manufacturers time to transition from one standard to another as they do under the current standards certification process.'' GE Appliances noted that the phaseout of UL 484 and transition to the new standard has already been determined by UL to be January 1st, 2024. Competition Advocates requested that EPA revise its proposed SNAP Rule 25 use conditions to allow for an extended implementation time. LG Electronics supported EPA's action but noted that there is no time for product conversion from UL 484 to UL 60335–2–40 under the proposed SNAP Rule 25. LG Electronics suggested that EPA should allow for some overlap of use conditions to allow for product conversion, so that manufacturers can comply with relevant safety standards.

AHRI suggested that EPA may want to consider an example of the process for sunsetting standards used by nationally recognized testing laboratories (NRTLs). They said that NRTLs will test and list equipment to various versions of standards starting at an agreed-upon date, and that there may be a transition period of several years until an older standard is sunset. AHRI also stated that existing equipment remains listed to existing safety standards until the manufacturer requests to have it changed, that equipment with major revisions is treated as ''new'' equipment, and that equipment with minor revisions does not require re-evaluation. AHRI stated that this would ensure that equipment can still be listed to these standards, taking care to avoid creating a cumbersome additional process to re-harmonize among companies and all of the NRTLs.

Daikin commented that they fully support the provision of the proposal to update use conditions for HFC–32 to allow warning labels in line with UL 60335–2–40 to eliminate the disparity between the warning use condition for HFC–32 PTACs (listed in SNAP Rule 19) and the other SNAP-approved A2L PTACs, listed in SNAP Rule 23.

Response: EPA thanks the commenters for bringing to our attention the necessity of a transition period where either UL 484, 8th Edition or UL 60335–2–40, 3rd Edition could apply. EPA agrees with commenters that only allowing 30 days to transition from one standard to another is insufficient, given equipment production timelines and challenges associated with updating equipment on short notice. Further, we note that both standards address the potential hazards of using flammable refrigerants, allowing HFC–32 to be used as safely as other refrigerants in this end-use. Therefore, to offer manufacturers time for product conversion, we are providing a transition period where either standard may be used. EPA is finalizing that, as of the effective date of this final rule, both compliance with UL 484 and compliance with the 3rd edition of UL 60335–2–40 will be acceptable until January 1st, 2024, when the UL 484 standard sunsets. The overlap of these standards will provide manufacturers time to transition from one standard to the next, including the different warning labels. This differs from the proposed use conditions, which proposed compliance with only UL 60335–2–40 warning labels as of this final rule's effective date. Beginning January 2nd, 2024, compliance with UL 60335–2–40 will apply, given that January 1st, 2024, is the official sunset date of UL 484 per UL. After that date, only the UL 60335–2–40 standard applies under SNAP.

EPA appreciates the information provided by AHRI on the process for ''sunsetting standards used by NRTLs,'' and we agree that it is important to have a pathway to compliance as new standards become available. EPA believes that adopting the same sunset date as UL will provide the greatest clarity for industry on how long UL 484 will be applicable under SNAP.

EPA acknowledges Daikin's support of the proposal to update the warning label use conditions for the existing listing of HFC–32 in self-contained room ACs and HPs, originally listed in SNAP Rule 19.

Comment: Daikin submitted comment on ignition sources for self-contained HFC–32 AC and HP units referenced in SNAP Rule 19 use conditions, stating that ''The ignition source examples that EPA cites in the quoted language [*e.g.,* static electricity, a spark resulting from a closing door, or a cigarette] in the preceding sentence are incorrect.''

Response: EPA acknowledges Daikin's comment regarding ignition sources for

self-contained HFC–32 AC and HP units referenced in the preamble for the original listing published in SNAP Rule 19. The examples of ignition sources that Daikin cites were appropriate for certain ASHRAE 34 classified A3 hydrocarbon refrigerants in the context of SNAP Rule 19 listings. Given that HFC–32 is classified as an A2L, Daikin is correct that static electricity, a spark resulting from a closing door, or a cigarette are not considered sufficient to be ignition sources for it. HFC–32 and other A2L refrigerants require a higher amount of energy to ignite than A3 refrigerants. Examples of ignition sources with enough energy to ignite an A2L refrigerant, found empirically, are a hot wire at 800 °C or open flames such as from a butane lighter or a lit candle coming into contact directly with a refrigerant leak (Kim and Sunderland, 2018).[39] This experiment also found that many other potential ignition sources are insufficient to ignite HFC–32 and certain other A2L refrigerants, such as cigarettes, electric plug and receptacle, friction sparks, hair dryers, and space heaters. In response to Daikin's comment, EPA has changed the language in the preamble for this final rule from the July 2022 NPRM for HFC–32 in new self-contained room ACs and HPs in section II.D, above, to reflect more appropriate ignition sources for HFC–32. We are now clarifying the characterization of the A2L ignition source that we provided in the preamble for the original listing in SNAP Rule 19 and the NPRM for this final rulemaking. That clarification does not affect EPA's view that the final use conditions for HFC–32 described above are appropriate.

E. Use Conditions and Further Information in Final Listings for Chillers, Residential Dehumidifiers, and HFC–32 in Self-Contained Room ACs and HPs

1. What use conditions is EPA finalizing and why?

As described above, EPA is listing:

- HFO–1234yf, HFC–32, R–452B, R–454A, R–454B, and R–454C as acceptable, subject to use conditions, for use in centrifugal and positive displacement chillers for new equipment in comfort cooling applications, including commercial AC and IPAC
- HFO–1234yf, HFC–32, R–452B, R–454A, R–454B, and R–454C as acceptable, subject to use conditions, for use in residential dehumidifiers for new equipment

In addition, EPA is finalizing revisions to the use conditions that apply to the listing of:

- HFC–32 as acceptable, subject to use conditions, for use in self-contained room ACs and HPs for new equipment

These use conditions are summarized in the listings under subheadings II.A and II.B and the revisions to the use conditions are summarized under subheading II.D, above, and are explained here in greater detail. The use conditions EPA is finalizing (either as new listings or revisions to a previous listing) 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, 3rd Edition, including testing, charge sizes, ventilation, usage space requirements, and certain hazard warnings and markings; and requirements for warning labels and markings on equipment to inform consumers and technicians of potential flammability hazards. The listings with specific use conditions are intended to allow for the use of these lower flammability refrigerants in a manner that will ensure they do not pose a greater overall risk to human health and the environment than other substitutes in these end-uses.

New Equipment Only; Not Intended for Use as a Retrofit Alternative

EPA is finalizing that these refrigerants may be used only in new equipment which has been designed to address concerns unique to flammable refrigerants—*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment. The information that EPA has considered in our review of flammability risks of this refrigerant in this end-use is based on designing and testing new equipment and not on mitigation methods specific to retrofitting of existing equipment designed for non-flammable refrigerants. Neither the submitters nor public commenters suggested that EPA should consider listing the refrigerants covered by this rule for chillers, dehumidifiers, or self-contained room ACs and HPs for retrofit use. Therefore, EPA is finalizing that they may only be used in new equipment which can be properly designed for their use. This use condition does not affect the ability to service a system using the refrigerant once installed, including the adding of refrigerant or replacing components.

This use condition would not affect the ability to service a system using one of these refrigerants once installed, including the adding of refrigerant or replacing components.

Standards

EPA is finalizing that the flammable refrigerants may be used only in equipment that meets all requirements in UL Standard 60335–2–40, 3rd Edition.

Those participating in the UL 60335–2–40 consensus standards process have tested equipment for flammability risk and evaluated the relevant scientific studies. Further, UL has developed safety standards including requirements for construction and system design, for markings, and for performance tests concerning refrigerant leakage, ignition of switching components, surface temperature of parts, and component strength after being scratched. Certain aspects of system construction and design, including charge size, ventilation, and installation space, and greater detail on markings, are discussed further below in this section. The UL 60335–2–40 Standard was developed in an open and consensus-based approach, with the assistance of experts in the AC industry as well as experts involved in assessing the safety of products. While similar standards exist from other bodies such as the International Electrotechnical Commission (IEC), we are finalizing to rely on specific UL standards that are most applicable and recognized by the U.S. market. This approach is the same as that in our previous rules on flammable refrigerants (*e.g.,* 76 FR 78832; December 20, 2011, 80 FR 19454; April 10, 2015, and 86 FR 24444; May 6, 2021).

A summary of the requirements of UL 60335–2–40 as they affect the refrigerants and end-use addressed in this section of our rule follows. This summary is offered for information only and does not provide a complete review of the requirements in this standard.

Among the provisions in UL 60335–2–40 are limits on the amount of refrigerant allowed in each type of appliance based on several factors explained in that standard. The requirements in UL 60335–2–40 reduce the risk to workers and consumers. Annex GG of the standard provides the charge limits, ventilation requirements and requirements for secondary circuits. The standard specifies requirements for installation space of an appliance (*i.e.,* room floor area) and/or ventilation or other requirements that are determined according to the refrigerant charge used

[39] Dennis Kim and Peter Sunderland, ''Viability of Various Ignition Sources to Ignite A2L Refrigerant Leaks,'' 17th International Refrigeration and Air Conditioning Conference at Purdue University, July, 2018. Available online at: *https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2885&context=iracc.*

in the appliance, the installation location and the type of ventilation of the location or of the appliance. Within Annex GG, Table GG.1 provides guidance on how to apply the requirements to allow for safe use of flammable refrigerants. UL 60335–2–40, 3rd Edition contains provisions for safety mitigation. These mitigation requirements were developed to ensure the safe use of flammable refrigerants over a range of appliances. In general, as larger charge sizes are used, more stringent mitigation requirements are required by the standard. In certain applications, refrigerant detection systems (as described in Annex LL, *Refrigerant detection systems for A2L refrigerants*) and refrigerant sensors (as described in Annex MM, *Refrigerant sensor location confirmation tests*) such as safety alarms are required by the standard. Where air circulation (*i.e.,* fans) is required in accordance with Annex GG or Annex 101.DVG, it must be initiated by a separate refrigerant detection system either as part of the appliance or installed separately. In a room with no mechanical ventilation, Annex GG provides requirements for openings to rooms based on several factors, including the charge size and the room area. The minimum opening is intended to be sufficient so that natural ventilation would reduce the risk of using a flammable refrigerant. The standard also includes specific requirements covering construction, instruction manuals, allowable charge sizes, mechanical ventilation, safety alarms, and shut off valves for A2L refrigerants.

In addition to Annex GG and Table GG.1 mentioned above, UL 60335–2–40 has a requirement for the maximum charge for an appliance using an A2L refrigerant. Additional requirements exist for charge sizes exceeding three times the LFL.

Table GG.1 of the UL standard indicates that systems with refrigerant charges exceeding certain amounts are outside the scope of the standard, stating that ''National standards apply.'' Specifically, if the refrigeration circuit with the greatest mass of a flammable refrigerant is more than 260 times the lower flammability limit (in kg/m^3), such equipment is outside the scope. For example, HFC–32 has an LFL of approximately 0.307 kg/m^3 (0.0192 lb/ft^3); therefore, equipment with charge sizes of a single circuit exceeding 79.82 kg (176.0 lb) would fall outside the scope of the UL Standard. EPA expects that many chillers could exceed these charge thresholds and therefore is proposing that an additional safety standard would apply for all chillers, as discussed in section II.A.4, above. EPA does not expect this situation to occur for residential dehumidifiers or self-contained room ACs and HPs because of their smaller charge sizes.

EPA recognizes that an updated edition of this standard, Edition 4, was published on December 17, 2022. Nevertheless, EPA is finalizing this rulemaking to the 3rd Edition of this standard because the 4th Edition was not available ahead of the issuance of the proposed rule for the Agency to consider. Therefore, since the 4th Edition was published several months after the proposed rule and after the close of the comment period, EPA could not have reviewed the standard for inclusion in the proposal and there was no opportunity for public comment on whether to incorporate it into the use conditions for these listings. EPA intends to review the 4th edition and if appropriate, EPA will propose to update the use conditions contained in this final rule in a subsequent rulemaking.

Warning Labels

EPA is requiring labeling of chillers and residential dehumidifiers. In addition, EPA is modifying the previously promulgated use conditions for HFC–32 self-contained room ACs and HPs (''equipment'') to update the warning label text. EPA is finalizing that the following labels, or the equivalent, must be provided in letters no less than 6.4 mm (¼ inch) high and must be permanent (except for HFC–32 self-contained equipment opting to follow the current use conditions in compliance with UL 484, 8th Edition up to and including its sunset date of January 1st, 2024):

i. On the outside of the equipment: ''WARNING—Risk of Fire. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing''

ii. On the outside of the equipment: ''WARNING—Risk of Fire. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used''

iii. On the inside of the equipment near the compressor: ''WARNING—Risk of Fire. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting to Service This Product. All Safety Precautions Must Be Followed''

iv. For any equipment pre-charged at the factory, on the equipment packaging or on the outside of the equipment: ''WARNING—Risk of Fire due to Flammable Refrigerant Used. Follow Handling Instructions Carefully in Compliance with National Regulations''

1. If the equipment is delivered packaged, this label shall be applied on the packaging
2. If the equipment is not delivered packaged, this label shall be applied on the outside of the appliance

EPA expects that all residential dehumidifiers and all self-contained room ACs and HPs would be packaged, and hence this label would be placed as stipulated in item 1 above. For self-contained room ACs and HPs that are opting to continue being manufactured according to UL 484, 8th Edition, the existing labeling requirements apply until the standard sunsets on January 1, 2024, and are described in the section below. EPA expects that chillers could be provided packaged or not, and this label would be placed as stipulated in item 1 or 2, respectively.

v. On the equipment near the nameplate:

1. At the top of the marking: ''Minimum installation height, X m (W ft).'' This marking is only required if the similar marking is required by the 3rd Edition of UL 60335–2–40. The terms ''X'' and ''W'' shall be replaced by the numeric height as calculated per the UL Standard. Note that the formatting here is slightly different than the UL Standard; specifically, the height in Inch-Pound units is placed in parentheses and the word ''and'' has been replaced by the opening parenthesis.
2. Immediately below v.1. above or at the top of the marking if v.1. is not required: ''Minimum room area (operating or storage), Y m^2 (Z ft^2).'' The terms ''Y'' and ''Z'' shall be replaced by the numeric area as calculated per the UL Standard. Note that the formatting here is slightly different than the UL Standard; specifically, the area in Inch-Pound units is placed in parentheses and the word ''and'' has been replaced by the opening parenthesis.

vi. For non-fixed equipment, including residential dehumidifiers and self-contained room ACs and HPs, on the outside of the product: ''WARNING—Risk of Fire or Explosion—Store in a well-ventilated room without continuously operating flames or other potential ignition.'' EPA expects that this label would be required on residential dehumidifiers, non-residential dehumidifiers, and HFC–32 self-contained room ACs (*e.g.,* including portable ACs, window ACs, PTACs and PTHPs).

vii. For fixed equipment that is ducted, near the nameplate: ''WARNING—Risk of Fire—Auxiliary devices which may be ignition sources shall not be

installed in the ductwork, other than auxiliary devices listed for use with the specific appliance. See instructions.''

The text of the warning labels, above in i. through iv., vi., and vii., is exactly the same as that required in UL 60335–2–40, while the text of the label identified in v. is similar to that in the UL Standard. The major difference between this rule's warning label requirements and the requirements in Table 101.DVF.1 of UL 60335–2–40 is that the markings for A2L refrigerants, including HFO–1234yf, HFC–32 and the four refrigerant blends, are required to be no less than 3.2 mm (⅛ inch) high in the standard instead of 6.4 mm (¼ inch) as EPA is finalizing in this action. EPA considers it difficult to see warning labels with the minimum lettering height requirement for A2L refrigerants of 3.2 mm (⅛ inch) in the UL Standard. Therefore, as in the requirements in our previous flammable refrigerants rules (*e.g.,* 76 FR 78832; December 20, 2011 and 80 FR 19454; April 10, 2015 and 86 FR 24444; May 6, 2021), EPA is finalizing that the minimum height for lettering must be 6.4 mm (¼ inch) as opposed to 3.2 mm (⅛ inch), which will make it easier for technicians, consumers, retail storeowners, first responders, and those disposing the appliance to view the warning labels.

For those manufacturers of new self-contained room ACs and HPs opting to follow the UL 484, 8th Edition standard up to and including its sunset date of January 1st, 2024, EPA is finalizing that the following markings, or the equivalent, must be provided in letters no less than 6.4 mm (¼ inch) high and must be permanent:

(a) On the outside of the air conditioner: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.''

(b) On the outside of the air conditioner: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.''

(c) On the inside of the air conditioner near the compressor: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must Be Followed.''

(d) On the outside of each portable air conditioner: ''WARNING: Appliance shall be installed, operated and stored in a room with a floor area larger the ''X'' m^2 (Y ft^2).'' The value ''X'' on the label must be determined using the minimum room size in m^2 calculated using Appendix F of UL 484, 8th Edition.

However, after the sunset of UL 484 on January 1st, 2024, the use conditions described above, related to the 3rd edition of UL 60335–2–40, will apply for all self-contained room ACs and HPs under SNAP.

Markings

Our understanding of the UL Standard is that red markings, similar to those EPA has applied as use conditions in past actions for flammable refrigerants (76 FR 78832; December 20, 2011 and 80 FR 19454; April 10, 2015 and 86 FR 24444; May 6, 2021), are required by the UL Standard for A2 and A3 refrigerants but not A2L refrigerants. EPA is finalizing that such markings apply to these A2L refrigerants as well, to establish a common, familiar and standard means of identifying the use of a flammable refrigerant.

These red markings will help technicians immediately identify the use of a flammable refrigerant, thereby potentially reducing the risk of using sparking equipment or otherwise having an ignition source nearby. The AC and refrigeration industry currently uses red-colored hoses and piping as means for identifying the use of a flammable refrigerant based on previous SNAP listings. Likewise, distinguishing coloring has been used elsewhere to indicate an unusual and potentially dangerous situation, for example in the use of orange-insulated wires in hybrid electric vehicles. Currently under the SNAP listings, as applicable, color-coded hoses or pipes must be used for ethane, HFC–32, R–452B, R–454A, R–454B, R–454C, R–457A, isobutane, propane, and R–441A in certain types of equipment where these are listed acceptable, subject to use conditions. All such tubing must be colored red PMS #185 or RAL 3020 to match the red band displayed on the container of flammable refrigerants AHRI Guideline N, ''2017 Guideline for Assignment of Refrigerant Container Colors.'' The intent of this requirement is to provide adequate notice for technicians and others that a flammable refrigerant is being used within a particular piece of equipment or appliance. Another goal is to provide adequate notification of the presence of flammable refrigerants for personnel disposing of appliances containing flammable refrigerants. As explained in a previous SNAP rule, one mechanism to distinguish hoses and pipes is to add a colored plastic sleeve or cap to the service tube. (80 FR 19465; April 10, 2015). Other methods, such as a red-colored tape could be used. The colored plastic sleeve, cap, or tape would have to be forcibly removed in order to access the service tube and would have to be replaced if removed. This would signal to the technician that the refrigeration circuit that she/he was about to access contained a flammable refrigerant, even if all warning labels were somehow removed. This sleeve, cap or tape would be of the same red color (PMS #185 or RAL 3020) and could also be boldly marked with a graphic to indicate the refrigerant was flammable. This could be a cost-effective alternative to painting or dyeing the hose or pipe.

EPA is finalizing the use of color-coded hoses or piping as a way for technicians and others to recognize that a flammable refrigerant is used in the equipment. This would be in addition to the proposed use of warning labels discussed above. EPA considers having two such warning methods to be reasonable and consistent with other general industry practices. This approach is the same as that adopted in our previous rules on flammable refrigerants (*e.g.,* 76 FR 78832; December 20, 2011 and 80 FR 19454; April 10, 2015 and 86 FR 24444; May 6, 2021).

2. What additional information is EPA including in these final listings?

For chillers, residential dehumidifiers, and self-contained room ACs and HPs, EPA is including additional information, found in the ''Further Information'' column of the regulatory text at the end of this document, to protect personnel from the risks of using flammable refrigerants. Similar to our previous listings of flammable refrigerants, EPA is including information on the OSHA requirements at 29 CFR part 1910, proper ventilation, personal protective equipment, fire extinguishers, use of spark-proof tools and equipment designed for flammable refrigerants, and training. Since this additional information is not part of the regulatory decision under SNAP, these statements are not binding for use of the substitute under the SNAP program. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of these substitutes as best practices for safer use.

3. How is EPA responding to comments on use conditions and further information for chillers, residential dehumidifiers, and HFC–32 self-contained room ACs and HPs?

Comment: Several commenters (AHRI, the Alliance for Responsible Atmospheric Policy (the Alliance), Anden, AprilAire, AHAM, ATMOsphere, Carrier Global Corporation, Competition Advocates, Daikin, Diversified CPC International, the Environmental Investigation Agency (EIA), GE Appliances/Haier, LG Electronics U.S.A., Chemours, Trane, UL Solutions) commented in support of incorporating by reference the industry standards UL 60335–2–40 and ASHRAE 15 into the use conditions for chillers, residential dehumidifiers, and self-contained room AC and HPs, but expressed concerns on the Agency's timing of referencing specific editions of these standards.

AHRI, Chemours, and UL stated that a new version of UL 60335–2–40, the 4th edition, may soon be published. Carrier and Daikin recommended using the 4th edition of UL 60335–2–40 instead of the proposed 3rd edition of that standard if the 4th edition is published before EPA issues a final rulemaking. EIA, an environmental group, stated that the 4th Edition of UL 60335–2–40 should be used in the final rule's use conditions if published before EPA takes final action on this rule. Trane recommended delaying approval of SNAP Rule 25 as it relates to chillers, until it can incorporate by reference the 4th Edition of UL 60335–2–40. UL stated that the 4th edition has many improvements over the 3rd edition, including updates requested by the fire service community. Anden and AprilAire both suggested EPA allow for use of the 3rd edition ''in addition to'' the 4th edition, rather than ''in lieu of'' the 4th edition, as EPA proposed. Chemours and Carrier suggested that EPA update previous rules with older editions of standards (*e.g.,* SNAP Rule 23).

Some commenters, such as Daikin and Chemours, noted that the 2022 version of ASHRAE 15 was likely to be published a few months after the NPRM and before the final rule would be issued. UL mentioned the pending publication of ASHRAE 15–2022, in addition to the May of 2022 version of ASHRAE 15.2, a new residential version of the standard. Chemours and Carrier also stated that once the new versions of the UL 60335–2–40 and ASHRAE 15 standards are published, the use conditions of the proposed rule should be updated.

AHRI stated that it will be important to have a pathway to compliance as each new edition becomes available. LG Electronics and AHAM stated that NRTLs do not have a required date to comply with the 3rd edition and expressed concern that this will cause issues in obtaining proper testing for the products. AHAM commented, particularly with respect to the use of HFC–32 in self-contained room ACs and HPs, that the Agency must allow for transition periods within the rule so that manufactured products can comply with relevant safety standards. The Alliance commented on their support for dealing with codes and standards issues raised by AHAM and AHRI. They noted this is a critical issue and has been a critical issue for several years now, but that integration of the codes and standards will allow transition schedules for alternatives. Competition Advocates ''encourage[d] EPA to revise its proposed SNAP Rule 25 use conditions to allow for an extended implementation time.'' Trane commented that there should be an expedited process for updating the linked standards to allow for ease of compliance and ensure the availability of the latest technologies.

GE Appliances noted support for SNAP Rule 25 and urged EPA to move quickly in finalizing. AHAM urged the Agency to ''expedite finalizing this rule,'' referencing regulations in California limiting refrigerant options in dehumidifiers as of the start of 2023.

Response: EPA thanks the commenters for their support of including ASHRAE 15 and UL 60335–2–40 standards in the use conditions for chillers, residential dehumidifiers, and self-contained ACs and HPs in SNAP Rule 25. EPA acknowledges the information on further developments in the UL 60335–2–40 standard and ASHRAE standards processes and realizes that new editions of both standards have been published since the issuance of the proposed rule and after the close of the comment period. After considering all the public comments on this proposal, we are finalizing the editions of relevant standards required by the use conditions for chillers, dehumidifiers, and self-contained ACs and HPs as proposed. EPA is incorporating by reference the 3rd edition of UL 60335–2–40 and the 2019 edition of ASHRAE 15. The 3rd edition of UL 60335–2–40 includes extensive revisions specifically to address flammability risks of A2L refrigerants and reach industry-wide consensus. We conclude that the 3rd edition adequately addresses the use of these A2L refrigerants in the equipment proposed and as discussed below, if the Agency determines changes are warranted, the Agency can do so in a future rulemaking.

EPA is aware of the new 4th edition of UL 60335–2–40 and the ASHRAE 15–2022 standards that have recently been published. However, these editions were not available in advance of the development of the proposed rule and thus were not considered. In addition, the public did not have the opportunity to review and comment on a proposed rule that reflected those new editions. EPA recognizes that the UL standards are under continuous maintenance—as are ASHRAE Standards 15 and 15.2—and hence may change again, even though the mentioned editions are newly published. Past experience suggests it is difficult to align the regulatory development process with these standard-setting processes. EPA concluded that rather than wait for the issuance of a new edition (which could be replaced with a subsequent edition), it was important for EPA to act on the SNAP submissions and propose listings based on the best available information, which included the available editions of the relevant UL and ASHRAE standards. Furthermore, now that a 4th edition of the UL Standard and the 2022 version of ASHRAE 15 are released, EPA will review the relevant changes and may develop a subsequent rulemaking, allowing for a notice and comment period for the public to provide their opinions on the updates.

Some commenters supported moving forward with the rule using the 3rd edition of UL 60335–2–40 consistent with EPA's proposal. EPA concludes that reliance on the 3rd edition of the UL Standard, the 2019 version of ASHRAE 15, and other use conditions allows applicable products to be used safely. Given the comments received expressing desire for quick finalization of the rule, EPA's understanding that the 3rd edition provides many desired improvements on the 2nd edition, and environmental benefits to providing these ODS alternatives as quickly as possible, EPA is finalizing to the 3rd edition of UL 60335–2–40.

Regarding Trane's comment requesting an expedited updating process for standards, EPA does not have an automatic process or a process with fewer steps, as each particular iteration of a standard must be reviewed by the Agency. Additionally, updating the standard involves a change to regulations, and the Agency typically uses a notice-and-comment process to change the standard that is incorporated into regulations. In response to comments from Chemours and Carrier

that EPA should also update previous rules with older editions of standards, EPA notes that this is outside the scope of this rulemaking. EPA will continue to consider changes to relevant standards, both for this rule and for previous rules addressing flammable refrigerants, and the Agency may consider whether any revisions to the SNAP program regulations should be proposed at a future date.

Comment: Several commenters noted concerns regarding the proposed use conditions (AHRI, the Alliance, Anden, AprilAire, Competition Advocates, Daikin, Diversified CPC International). Anden commented on EPA's proposed use condition requiring ''marked service ports, pipes, hoses, and other devices through which the refrigerant is serviced'' and requested ''EPA to clarify in the final rule that this particular use condition does not apply to equipment that does not have service ports.'' Similar to Anden, AprilAire commented on ''marked service ports'' and requested ''EPA to clarify in the final rule that this particular use condition does not apply to equipment that does not have service ports.'' AprilAire noted that their products generally do not contain service ports.

Daikin noted that ''EPA inaccurately characterized the operation of chillers in its general description of warning label use conditions ''vii. For fixed equipment that is ducted, including chillers. . . .'' 87 F.R. at 45523 (emphasis added).''

Diversified CPC International, a producer of specialty gases, including hydrocarbon refrigerants, commented on the use of hydrocarbon refrigerants and noted it has ''been limited within the United States due to refrigerant charge limitations that are much lower than most regions in the world. For example, the IEC Standard IEC 60335–2–40 allows for 1,000 grams charge size for indoor air conditioning units and a 5 kg limit for outdoor air conditioning units.'' They stated that EPA should consider modifying use conditions to allow compliance for larger A3 charge sizes for various types of equipment that falls under the scope of UL 60335–2–40, 3rd Edition and UL 60335–2–89, 2nd Edition. ATMOsphere, a trade group, stated that the next step for revising North American safety standards will be to form a CANENA Technical Harmonization Committee (THC) to discuss possibly adopting changes from the 7th and most recent edition of the IEC into a future edition 5 of UL 60335–2–40, with larger charge sizes for hydrocarbons.

Response: The Agency acknowledges support for the proposed listings covered by the use conditions in this section of the preamble. After considering all the public comments on the proposal, we are finalizing these use conditions, with modifications in response to the comments received. A few commenters requested clarification on use conditions requiring ''marked service ports, pipes, hoses, and other devices through which the refrigerant is serviced.'' EPA considers the marked service port use condition to apply to equipment without service ports, as servicing or recovery occurs through their pipes, hoses, or other devices. Technicians will still need information provided by the service port markings in these circumstances. After considering all the public comments on this proposal, we are finalizing this use condition as proposed.

EPA agrees with comments provided by Daikin indicating that EPA may have inadvertently mischaracterized the operation of chillers in its general description of warning label use conditions. In response to this comment, EPA has edited the warning label description for fixed equipment to keep the reference to ducted equipment and to remove the reference to chillers.

EPA is aware of the larger charge sizes for hydrocarbon refrigerants allowed in updated versions of UL standards, such as UL 60335–2–89, 2nd Edition and UL 60335–2–40, 3rd Edition. EPA did not propose to increase the charge sizes of A3 refrigerants, thus this request is beyond the scope of this rulemaking. Additionally, EPA did not consider equipment covered by the UL 60335–2–89 standard in this rulemaking. Any changes to use conditions for listings not included in the proposal are beyond the scope of this final rule, and if EPA concludes that proposing changes to the listings is warranted, it would typically initiate a separate rulemaking process. The Agency is familiar with the process of forming a CANENA THC to discuss proposals for adopting the changes in IEC 60335–2–40 Edition 7 into the next edition of the North American safety standards, including the 5th edition of UL 60335–2–40. If a 5th edition of UL 60335–2–40 is released, EPA can consider any relevant changes such as allowing for larger charge sizes for hydrocarbon refrigerants in a future rulemaking.

F. Very Low Temperature Refrigeration (VLTR)—Listing of R–1150 as Acceptable, Subject to Use Conditions and Narrowed use limits, for Use in New VLTR

In the NPRM, EPA proposed to list R–1150 as acceptable, subject to use conditions and narrowed use limits, for use in new VLTR equipment. No comments were received in regard to this listing. Therefore, EPA is finalizing the listing of R–1150 in VLTR as proposed.

1. Background on VLTR

The very low temperature refrigeration (VLTR) end-use includes a wide range of equipment types. VLTR equipment is intended to maintain temperatures considerably lower than for refrigeration of food (below −62 °C or −80 °F). Examples of very low temperature refrigeration equipment include medical freezers and freeze-dryers, which generally require extremely reliable refrigeration cycles to maintain low temperatures and must meet stringent technical standards. In some cases, VLTR equipment may use a refrigeration system with two stages, each with its own refrigerant loop. This allows a greater range of temperatures and may reduce the overall refrigerant charge.

For this rulemaking, only equipment designed to reach temperatures lower than −80 °C (−112 °F) is addressed. See sections II.E.6 and II.E.7 below for a discussion of the narrowed use limits describing the reasoning for this temperature requirement. Examples of equipment covered by this final rule in the VLTR end-use include:

- Freeze dryers. This equipment typically includes a two-stage system, with a VLTR stage being addressed by this rule and a warmer stage, usually classified as IPR, not addressed in this final rule. The primary application of this equipment is for freeze drying material in a laboratory setting.
- Cold traps required to operate below −80 °C or −112 °F. This equipment is used during laboratory evaporation to condense vapors to prevent them from entering and damaging the pump, or leaking into the environment, ensuring a closed system within the vacuum pump.

• Very low temperature freezers designed to reach temperatures below −80 °C or −112 °F.

This final listing decision for R–1150 addresses these types of equipment, as well as other types of VLTR equipment not mentioned that fit within the narrowed use limits described in section II.F.6, under SNAP. This listing addresses all types of VLTR equipment that meet the requirements of the UL Standard 61010–2–011, 2nd Edition, and for all applications of such equipment under EPA's final use conditions and narrowed use limits. Because UL Standard 61010–2–011 only applies to laboratory equipment, we understand that only VLTR equipment that is also laboratory equipment is eligible to use R–1150 under the use condition.

2. What is EPA's final listing decision for R–1150?

EPA is listing R–1150 as acceptable, subject to use conditions and narrowed use limits, for use in VLTR equipment, including freeze-dryers, cold traps, and very low temperature freezers.

3. What is R–1150 and how does it compare to other refrigerants in the same end-use?

R–1150, also known as ethene or ethylene (CAS Reg. No. 75–85–1), is an unsaturated hydrocarbon. It is a flammable refrigerant with the ASHRAE safety classification A3. You may find a copy of the applicants' submissions, with CBI redacted, providing the required health and environmental information for this substitute in this end-use in Docket EPA–HQ–OAR–2021–0836 at *https://www.regulations.gov* under the names ''Supporting Materials for Rule 25 Listing of R–1150 in Refrigeration and Air Conditioning. SNAP Submission Received December 3, 2018'' and ''Supporting Materials for Rule 25 Listing of R–1150 in Refrigeration and Air Conditioning. SNAP Submission Received January 21, 2021.'' EPA performed an assessment to examine the health and environmental risks of this substitute. This assessment is available in Docket EPA–HQ–OAR–2021–0836: ''Risk Screen on Substitutes in Very Low Temperature Refrigeration (New Equipment). Substitute: R–1150.'' [40]

Environmental information: R–1150 has an ODP of zero and a GWP of four.

In addition to ODP and GWP, EPA evaluated potential impacts of R–1150 and other hydrocarbon refrigerants on local air quality. R–1150 is considered a VOC and is not excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)) for the purpose of addressing the development of SIPs to attain and maintain the NAAQS. As described below, EPA estimates that potential emissions of R–1150, when used in the refrigeration and AC sector in the VLTR end-use consistent with this listing under the SNAP program, would not have a significant impact on local air quality.[41] [42]

In response to the increased market share of hydrocarbon refrigerants, particularly in VLTR applications, EPA conducted additional analysis of various scenarios to consider the potential impacts on local air quality if hydrocarbon refrigerants were used in further applications.[43] In particular, use of R–1150 in very low temperature freezers, including VLTR equipment with an IPR stage using propylene, and the use of R–1150 in retail food refrigeration systems [44] were investigated for ground-level ozone effects. The analysis first considers highly conservative modeling scenarios where a specific hydrocarbon would be used widely across all end-uses in the refrigeration and AC sector. Scenario 1b** estimates propylene's emissions using EPA's Vintaging Model (VM) and Community Multi-stage Air Quality (CMAQ) model,[45] and Scenario 1b estimates R–1150's emissions using the same VM and CMAQ versions as in Scenario 1b**.

Additionally, the analysis also considers the more realistic scenarios (Scenario 2, Scenario 3a, and Scenario 3b) where hydrocarbons are modeled only in the end-uses where the SNAP program has already listed them as acceptable, or for which SNAP submissions or international market trends indicate HCs soon could be used. Scenario 2 examines the likely emissions of lower maximum incremental reactivity (MIR) hydrocarbons, propane, isobutane, and ethane, in the residential and light commercial AC, residential dehumidifiers, retail refrigeration, and household refrigeration end-uses. Scenarios 3a and 3b also consider the use of higher MIR refrigerants propylene and R–1150 in laboratory equipment (IPR and VLTR end-uses, respectively) and R–1150 in small retail food refrigeration equipment (*e.g.,* stand-alone units) in addition to the hydrocarbon refrigerants used in Scenario 2. Scenarios 3a and 3b differentiate based on whether propylene and R–1150 would be subject to the venting prohibition under CAA section 608(c)(2). For further information on the specific assumptions, see the docket for this rulemaking.[46]

In highly conservative Scenario 1b, examining widespread R–1150 adoption across the entire refrigeration and AC sector, modeling predicts that the single 8-hour average ground-level ozone concentration could increase by 11.7 percent in Los Angeles, which is the area with the highest level of ground-level ozone pollution in the United States. However, the assumptions modeled in 1b are highly unrealistic, given the significantly smaller number of applications in which R–1150 has been requested for use or is currently being used globally. VLTR, the only end-use being addressed in this listing, represents a very small segment of the refrigeration and AC sector.

In the more realistic scenarios 3a and 3b, where use of propylene and R–1150 in laboratory equipment and R–1150 in small retail food refrigeration equipment are included, the 8-hour ground-level ozone concentration in Los Angeles was found to increase by a maximum of 0.017 percent relative to the NAAQS on the worst modeled day. For purposes of this SNAP determination, this is not a significant increase in ground-level ozone. The modeling is also conservative by assuming a one-for-one substitution of hydrocarbons for current refrigerants because an actual transition would likely introduce less than one kilogram of hydrocarbon for each kilogram replaced. As a result of this analysis, EPA determined that the use of R–1150 consistent with the use conditions and narrowed use limits finalized in this rulemaking will not result in significantly greater risk to people's health or the environment than other alternatives available for the same use.

Ecosystem effects from R–1150 are expected to be small, as compared to the effects of other acceptable substitutes in

[40] ICF, 2022o. Risk Screen on Substitutes in Very Low Temperature Refrigeration (New Equipment); Substitute: R–1150.

[41] ICF, 2014. Assessment of the Potential Impact of Hyddrocarbon Refrigerants on Ground Level Ozone Concentrations. February 2014.

[42] ICF, 2022p. Additional Assessment of the Potential Impact of Hydrocarbon Refrigerants on Ground Level Ozone Concentrations. May 2020.

[43] Ibid.

[44] EPA is aware that such refrigeration equipment exists in Europe. Thus, EPA evaluated R–1150 in retail food refrigeration—stand-alone units as well as in VLTR and other hydrocarbon refrigerants, to consider the greatest impact that reasonably could occur when using increasing amounts of such refrigerants.

[45] VM IO file_v5.1_10.01.19 and CMAQ 5.2.1 with carbon bond 06 (CB06) mechanism, as cited in ICF, 2022p. Additional Assessment of the Potential Impact of Hydrocarbon Refrigerants on Ground Level Ozone Concentrations. May 2020.

[46] ICF, 2014. Op. cit.

this end-use. R–1150 is highly volatile and typically evaporates or partitions to air, rather than contaminating ground or surface waters, and thus R–1150's effects on aquatic life are expected to be small. Based on these considerations, R–1150 is not expected to pose a greater risk of ecosystem effects than other alternatives for these uses.

Flammability information: ASHRAE Standard 34 classifies R–1150 as a Class A3 refrigerant.[47] R–1150 is flammable when its concentration in the air is in the range of 2.7 percent to 36 percent by volume (27,000 ppm to 360,000 ppm).[48] [49]

Toxicity and exposure data: Exposure to R–1150 may be hazardous if inhalation, skin contact, or eye contact with the proposed substitute occurs at sufficiently high levels. The most likely pathway of exposure is through inhalation, which can cause symptoms of asphyxiation. Exposures of R–1150 to the skin may cause frostbite. Exposures of R–1150 to the eyes could cause eye irritation. These potential health effects are common to many refrigerants.

The American Conference of Governmental Industrial Hygienists (ACGIH) has established a TLV of 200 ppm as an 8-hour TWA for R–1150. EPA anticipates that users will be able to meet the TLV and address potential health risks by following the use condition limiting charge sizes to 150 g and the requirements and recommendations in the manufacturer's SDS, ASHRAE Standard 15, UL Standard 61010–2–011, 2nd Edition, and other safety precautions common to the refrigeration and AC industry.[50] [51]

Comparison to other substitutes in this end-use: R–1150 has an ODP of zero, comparable to or less than other listed substitutes in this end-use with ODPs ranging from zero to 0.098. For new VLTR equipment, R–1150's GWP of four is comparable to that of other acceptable substitutes such as ethane and CO_2, with respective GWPs of 5.5 and one, and lower than other acceptable substitutes such as R–410A, R–507A, and HFC–23 with respective GWPs of 1,890, 3,990, and 14,800.

R–1150 is a VOC that is more photochemically reactive and more likely to cause ground-level ozone pollution than acceptable refrigerants in this end-use. For example, R–1150 has a MIR of 9.07 g-O_3/g-substance, which is higher than propane's MIR of 0.56 g-O_3/g-substance or ethane's MIR of 0.28 g-O_3/g-substance.[52] EPA addresses this potential risk through a narrowed use limit, restricting use of this refrigerant to VLTR equipment designed to reach temperatures lower than −80 °C (−112 °F). See section II.F.6 below for a discussion of the finalized narrowed use limits.

Flammability risks of R–1150 are comparable to flammability risks of other available substitutes in the same end-use, such as ethane, while R–1150's flammability risks are higher than those of nonflammable refrigerants such as R–410A, CO_2, or HFC–23. Flammability risks can be addressed by following the finalized use conditions, such as use only in new equipment that is designed and tested to meet the UL Standard 61010–2–011. See section II.F.4 below for a discussion of the use conditions.

Toxicity risks are comparable to or lower than toxicity risks of other available substitutes in the same end-use. Toxicity risks can be minimized by use consistent with the TLV issued by the ACGIH, ASHRAE Standard 15, UL 61010–2–011—which applies under the final use conditions—and other industry standards, recommendations in the manufacturer's SDS, and other safety precautions common in the refrigeration and AC industry.

Although R–1150 presents a higher risk to local air quality than other available alternatives for this end-use, other alternatives such as ethane, propane, and most HFOs or HFCs, that are less photochemically reactive than R–1150 are not able to attain temperatures as low as those attainable by R–1150 because of their higher boiling points. Thus, EPA is finalizing listing this substitute as acceptable subject to use conditions and narrowed use limits in VLTR.

4. What use conditions is EPA finalizing?

(1) EPA is finalizing the following use conditions to address flammability risks of R–1150: New equipment only—R–1150 may be used only in new equipment designed specifically and clearly identified for the refrigerant, *i.e.,* the substitute shall not be used as a conversion or ''retrofit'' refrigerant for existing equipment.

(2) UL Standard—R–1150 may be used only in laboratory equipment that meet all requirements listed in the 2nd edition, dated May 13th, 2021, of UL Standard 61010–2–011, ''Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use—Part 011: Particular Requirements for Refrigerating Equipment.'' In cases where this final rule includes requirements different than those of UL 61010–2–011, 2nd Edition, EPA is requiring that the equipment meet the requirements of this final rule in place of the requirements in the UL Standard. Requirements of note include:

- Warning labels—The following markings, or the equivalent, must be provided in letters no less than 6.4 millimeter (¼ inch) high and must be permanent:

i. Attach near the machine compartment: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing''

ii. Attach near the machine compartment: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must Be Followed.''

iii. Attach on the exterior of the refrigeration equipment: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.''

iv. Attach near all exposed refrigerant tubing: ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.''

v. Attach on the exterior of the refrigeration equipment: ''This equipment is intended for use in commercial, industrial, or institutional occupancies as defined in the Safety Standard for Refrigeration Systems, ANSI/ASHRAE 15.''

vi. Attach on the exterior of the shipping carton: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations.''

vii. The instructions shall include the following warnings as necessary:

a. ''WARNING: Ensure all ventilation openings are not obstructed.''

b. ''WARNING: Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.''

c. ''WARNING: Do not damage the refrigerant circuit.''

[47] ASHRAE, 2019a. Op. cit.

[48] Ibid.

[49] ICF, 2022o. Op. cit.

[50] ASHRAE, 2019b.

[51] ICF, 2022o. Op. cit.

[52] In addition to being an acceptable refrigerant in very low temperature refrigeration, ethane's MIR is one threshold that EPA considers in deciding whether a compound makes a negligible contribution to tropospheric ozone formation and should be excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)) for the purpose of addressing the development of SIPs to attain and maintain the NAAQS.

• Markings—Equipment must have distinguishing red (PMS #185 or RAL 3020) color-coded hoses and piping to indicate use of a flammable refrigerant. The laboratory equipment shall have marked service ports, pipes, hoses and other devices through which the refrigerant is serviced. Markings shall extend at least 1 inch (25 mm) from the servicing port and shall be replaced if removed.

(3) Charge size—Equipment must use no more than 150 g of R–1150 in each refrigerant circuit using this refrigerant.

EPA notes that there may be other legal obligations pertaining to the manufacture, use, handling, and disposal of the proposed refrigerant that are not included in the information listed in the tables included in the regulatory text (*e.g.,* the CAA section 608(c)(2) venting prohibition,[4] or Department of Transportation requirements for transport of flammable gases). Flammable refrigerants being recovered or otherwise disposed of from VLTR appliances are likely to be hazardous waste under RCRA (see 40 CFR parts 260–270).

5. Why is EPA finalizing these specific use conditions?

EPA is finalizing listing R–1150 as acceptable, subject to use conditions, for use in the VLTR end-use for new equipment reaching temperatures lower than −80 °C (−112 °F). The use conditions are identified in the listing under subheading II.F.4, above, and are explained here in greater detail. The use conditions EPA is finalizing include conditions requiring use of R–1150 in new equipment, which can be specifically designed for the refrigerant; use consistent with UL 61010–2–011, 2nd Edition, including testing, charge sizes, ventilation, usage space requirements, and certain hazard warnings and markings; and limiting charge size to 150 g of R–1150 per refrigerant circuit. The finalization of these use conditions is intended to allow for the use of R–1150, a flammable refrigerant, in a manner that will ensure it does not pose a greater overall risk to human health and the environment than other substitutes in this end-use.

New Equipment Only; Not Intended for Use as a Retrofit Alternative

EPA is finalizing that R–1150 may be used only in new equipment [53] which has been designed to address concerns unique to flammable refrigerants—*i.e.,* this substitute may not be used as a conversion or ''retrofit'' refrigerant for existing equipment. The information that EPA has considered in our review of flammability risks of this refrigerant in this end-use is based on designing and testing new equipment, and not on mitigation methods specific to retrofitting of existing equipment designed for non-flammable refrigerants. Neither the submitters nor public commenters suggests that EPA should consider listing R–1150 for retrofit use. Therefore, EPA is finalizing that R–1150 can only be used in new equipment properly designed for its use. This requirement does not affect the ability to service equipment using R–1150 once installed, including the adding of refrigerant or replacing components.

Standards

EPA is finalizing that R–1150 may be used only in equipment that meets all requirements in UL 61010–2–011, 2nd Edition. This UL standard indicates that refrigerant charges greater than 150 g are beyond its scope and that additional requirements apply, such as for instance ASHRAE 15–2019. EPA has only evaluated equipment that fits within the scope of UL 61010–2–011.

UL has developed safety standards including requirements for construction and system design, for markings, and for performance tests concerning refrigerant leakage, ignition of switching components, surface temperature of parts, and component strength after being scratched. Certain aspects of system construction and design, including charge size, ventilation, and installation space, and greater detail on markings, are discussed further below in this section. The UL Standard was developed in an open and consensus-based approach, with the assistance of experts in the laboratory equipment industry as well as experts involved in assessing the safety of products. While similar standards exist from other bodies such as the IEC, we are finalizing to rely on a specific UL standard that is most applicable and recognized by the U.S. market. This approach is the same as that in our previous rules on flammable refrigerants (*e.g.,* 76 FR 78832, December 20, 2011; 80 FR 19454, April 10, 2015; 86 FR 24444, May 6, 2021).

A summary of the requirements of UL 61010–2–011, 2nd Edition as they affect R–1150 and the end-use addressed in this section of the rule follows. This summary is offered for information only and does not provide a complete review of the requirements in this standard. UL 61010–2–011, 2nd Edition requires the warning labels on the equipment to contain letters at least ¼ inch high. The label must be permanently affixed to the equipment. Warning label language requirements are described in section II.F.4 of this proposed rule. Additionally, red markings, similar to those EPA has applied as use conditions in past actions for flammable refrigerants (76 FR 78832, December 20, 2011; 80 FR 19454, April 10, 2015; 86 FR 24444, May 6, 2021), are required by UL 61010–2–011, 2nd Edition for A2 and A3 refrigerants to establish a common, familiar and standard means of identifying the use of a flammable refrigerant.

These red markings will help technicians immediately identify the use of a flammable refrigerant, thereby potentially reducing the risk of using sparking equipment or otherwise having an ignition source nearby. The colored plastic sleeve or cap would have to be forcibly removed in order to access the service port, hose, or pipe. This would signal to the technician that the refrigeration circuit that she/he was about to access contained a flammable refrigerant, even if all warning labels were somehow removed. This sleeve would be of the same red color (PMS #185 or RAL 3020) and could also be boldly marked with a graphic to indicate the refrigerant was flammable. The use of a colored plastic sleeve or cap that is boldly marked with a graphic could be a cost-effective alternative to painting or dyeing the service port, hose, or pipe.

Charge Size Limitation

Among the provisions in UL 61010–2–011, 2nd Edition are limits on the amount of refrigerant allowed in each appliance. The limitations on refrigerant charge size for VLTR are consistent with UL 61010–2–011, 2nd Edition to reduce the risk to workers and consumers. EPA is requiring a charge size limit of 150 g for each refrigerant circuit or stage for the proposed refrigerant. Section 1.1.1 of the UL Standard states, ''This document details all the requirements when up to 150 g of FLAMMABLE REFRIGERANT are used per stage of a REFRIGERATING SYSTEM. Additional requirements beyond the current scope of this document apply if a REFRIGERANT charge of FLAMMABLE REFRIGERANT exceeds this amount.'' Thus, in order to ensure the standard's provisions apply and sufficiently address flammability risk, EPA is requiring that each refrigerant circuit must contain no more than 150 g of R–1150.

In addition to the general requirement that each refrigerant circuit must contain no more than 150 g of R–1150,

[53] This is intended to mean a completely new refrigeration circuit containing a new compressor, evaporator, and condenser.

UL 61010–2–011, 2nd Edition has a requirement for the maximum charge for remote condensing unit using a flammable refrigerant in Annex DD and Table DD.1. Section DD.2.4 of Annex DD sets requirements for the minimum associated room area for a given charge, based on a maximum refrigerant concentration of 0.38 lb/1000 ft^3, 5200 ppm, or 6 g/m^3 for R–1150.

6. What narrowed use limits is EPA finalizing?

EPA is finalizing the following narrowed use limits for use of R–1150 in VLTR:

(1) Temperature range—R–1150 may only be used in equipment designed specifically to reach temperatures lower than −80 °C (−112 °F).

(2) The manufacturers of new very low temperature equipment must demonstrate that other alternatives are not technically feasible. They must document the results of their evaluation that showed the other alternatives to be not technically feasible and maintain that documentation in their files. This documentation, which does not need to be submitted to EPA unless requested to demonstrate compliance, ''shall include descriptions of substitutes examined and rejected, processes or products in which the substitute is needed, reason for rejection of other 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.'' (40 CFR 82.180(b)(3)).

7. Why is EPA finalizing these specific narrowed use limits?

The boiling point (b.p.) of a refrigerant determines the coldest temperature it can reach within its refrigerating capabilities. R–1150 has a b.p. of −104 °C, allowing it to refrigerate as cold as −104 °C. There are a limited number of refrigerants that are capable of reaching temperatures below −80 °C, such as the ODSs CFC–13 (b.p., −81.4 °C) and R–503 (b.p., −88.9 °C), and among the acceptable refrigerants in this end-use, ethane (b.p., −88.3 °C) and the high GWP refrigerants HFC–23 (b.p., −84.4 °C), R–508A (b.p., −87.4 °C) and R–508B (b.p., −87.4 °C).[54] Given the limited refrigerant options available for equipment designed to reach the sub −80 °C temperature range, EPA understands there is a need for listing R–1150. However, EPA believes that limiting the use of R–1150 to VLTR equipment designed to reach temperatures lower than −80 °C (−112 °F) is necessary to mitigate local air quality concerns discussed in section II.F.3 that could occur with broad use, given the reactivity of VOC and its potential to contribute to ground-level ozone in areas like Los Angeles. If R–1150 were used without limitation across the refrigeration and AC sector, it could have significant impacts on local air quality. For equipment in this end-use designed to reach temperatures higher than −80 °C (−112 °F), other alternatives with lower reactivities are widely available, *e.g.,* CO_2, ethane, propane, and R–410A. There are sufficient refrigerant options available to fill the need in VLTR equipment designed to reach temperatures higher than −80 °C (−112 °F) without allowing the use of refrigerants as photochemically reactive as R–1150. By including narrowed use limits, EPA is only allowing the use of R–1150, a refrigerant with higher reactivity, when it is the only technically feasible option available.

8. What additional information is EPA including in this final listing?

EPA is providing additional information related to this listing. Since this additional information is not part of the regulatory decision under SNAP, these statements are not binding for use of the substitute under the SNAP program. See section II.E.2 above for further discussion on what additional information EPA is including in this final listing. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of these substitutes as best practices for safer use.

9. How is EPA responding to comments on VLTR?

No comments were received relating to the proposed listing of R–1150 in VLTR. For the reasons explained above, EPA is finalizing this section of the rule as proposed.

G. Streaming and Total Flooding Fire Suppression—Listing of 2-bromo-3,3,3 trifluoropropene (2–BTP) as Acceptable, Subject to Use Conditions, as a Streaming Agent in Non-Residential Applications and as a Total Flooding Agent in Normally Unoccupied Spaces Under 500 ft^3

1. Background on Streaming and Total Flooding Fire Suppression

The fire suppression and explosion protection end-uses addressed in this action are total flooding and streaming. Total flooding systems, which historically employed halon 1301 as a fire suppression agent, are used in both normally occupied and unoccupied areas. In the United States, approximately 90 percent of installed total flooding systems protect anticipated hazards from ordinary combustibles (*i.e.,* Class A fires), while the remaining ten percent protect against applications involving flammable liquids and gases (*i.e.,* Class B fires).[55] It is also estimated that approximately 75 percent of total flooding systems protect electronics (*e.g.,* computers, telecommunications, process control areas), while the remaining 25 percent protect other applications, primarily in civil aviation (*e.g.,* engine nacelles/auxiliary power units, cargo compartments, lavatory trash receptacles), military weapons systems (*e.g.,* combat vehicles, machinery spaces on ships, aircraft engines and tanks), oil/gas and manufacturing industries (*e.g.,* gas/oil pumping, compressor stations), and maritime (*e.g.,* machinery space, cargo pump rooms). Streaming applications, which have historically used halon 1211 as an extinguishing agent, include portable fire extinguishers designed to protect against specific hazards.

2. What is EPA's final listing decision for 2–BTP?

As proposed, EPA is finalizing listing 2–BTP as acceptable, subject to use conditions. The use conditions are for use in normally unoccupied spaces under 500 ft^3 in total flooding fire suppression systems, and as a streaming agent for use in non-residential applications, except for commercial home office and personal watercraft. EPA received one comment on the proposed listing of 2–BTP, and the commenter supported finalizing the rule as proposed. 2–BTP was previously listed as acceptable, subject to use conditions, for use in engine nacelles and auxiliary power units on aircraft in total flooding fire suppression systems and for use in aircraft as a streaming agent (81 FR 86778, December 1, 2016).

The redacted submission and supporting documentation for 2–BTP are provided in the docket for this proposed rule (EPA–HQ–OAR–2021–0836) at *https://www.regulations.gov.* EPA performed assessments to examine the health and environmental risks of this substitute during equipment production operations and the filling of

[54] Engineering ToolBox, 2005. *Refrigerants—Physical Properties.* Available online at: *https://www.engineeringtoolbox.com/refrigerants-d_902.html* Accessed October 28, 2021.

[55] Wickham, 2002. Status of Industry Efforts to Replace Halon Fire Extinguishing Agents. March 2002.

fire extinguishers as well as in the case of an inadvertent discharge of the system during maintenance activities on the fire extinguishing system. These assessments are available in the docket for this rule.[56] [57]

3. What is 2–BTP and how does it compare to other fire suppressants in the same end-uses?

a. Total Flooding

Environmental information: 2–BTP has an ODP of 0.0028 [58] [59] [60] and a GWP of 0.23–0.26.[61] 2–BTP is considered a VOC and is not excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)) for the purpose of addressing the development of SIPs to attain and maintain the NAAQS.

Flammability information: 2–BTP is non-flammable.

Toxicity and exposure data: EPA assessed potential health risks from exposure to the proposed substitute as a total flooding agent in normally unoccupied spaces up to 14.2 m^3 (500 ft^3) during manufacture, installation, and servicing of 2–BTP total flooding systems, consistent with the use description provided by the submitter. According to the SDS, exposure to 2–BTP following a discharge may be hazardous if inhalation, skin contact, or eye contact with the proposed substitute occurs at sufficiently high levels. However, the most likely pathway of exposure is through inhalation, which may cause central nervous system effects, such as dizziness, confusion, physical incoordination, drowsiness, anesthesia, or unconsciousness. The cardiotoxic Lowest Observed Adverse Effect Level (LOAEL) for this agent is 1.0 percent (10,000 ppm), at which level exposure may cause increased sensitivity of the heart to adrenaline, which might cause irregular heartbeats and possibly ventricular fibrillation or death.

2–BTP vapors may reduce oxygen available for breathing, causing asphyxiation in high concentrations. Such vapors pose a potential hazard if large volumes are trapped in enclosed or low places. In addition, as noted above, if person(s) are exposed to high concentrations, the person(s) may experience central nervous system effects, such as drowsiness and dizziness, which may result in the person(s) not realizing that he/she is suffocating. These health effects after exposure are similar for other common fire suppressants.

To assess potential health risks from exposure to the proposed substitute for personnel during manufacturing, EPA developed an AEL of 2 ppm for 2–BTP based on review of available toxicity studies.[62] The AEL represents the maximum 8-hour TWA at which personnel in an occupational environment can be exposed regularly without adverse effects. The estimated exposure values provided by the submitter are greater than the occupational AEL. To effectively mitigate potential occupational exposure and maintain average exposure levels below the occupational AEL of 2 ppm, the manufacturing space should be equipped with specialized engineering controls and well ventilated with a local exhaust system and low-lying source ventilation. The sampling data provided by the submitter demonstrate that local exhaust ventilation greatly reduces exposure concentration inside the fill booth and in the filling area.

Exposure to the substitute is not likely during installation or servicing of 2–BTP total flooding systems for normally unoccupied spaces. The risk of accidental activation of the fire extinguishing system while personnel are present near the protected space is highly unlikely if proper procedures are followed. Proper instructions on system installation and servicing included in manuals for the 2–BTP systems should be adhered to. In the case of accidental release, engineering controls in accordance with the National Fire Protection Association (NFPA) 2001 Standard on Clean Agent Fire Extinguishing Systems to limit personnel exposure to discharges should be employed with 2–BTP systems.

EPA provides additional information on safe use of this substitute for establishments manufacturing, installing and maintaining equipment using this agent in the ''Further Information'' column of the regulatory listing. EPA recommends that a discharge time delay of 30 to 60 seconds is programmed in accordance with the NFPA 2001 standard. Although exposure is highly unlikely during installation and maintenance activities, exposure is possible upon reentry into a space after a system has been discharged. In the event of an accidental release, the space should be adequately ventilated. EPA recommends that personnel wear protective clothing, goggles, gloves, and particulate-removing respirators with National Institute for Occupational Safety and Health (NIOSH) type N95 or better filters while performing installation or maintenance, and a self-contained breathing apparatus (SCBA) while performing clean-up activities to reduce the risk of exposure. Since this additional information is not part of the regulatory decision under SNAP, these statements are not binding for use of the substitute under the SNAP program. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of this substitute as best practices for safer use.

2–BTP is not expected to cause a significant risk to human health in the general population when used in total flooding systems in normally unoccupied areas. The use in spaces under 500 ft^3 requires a smaller amount of fire suppressant, reducing potential exposures to workers and the general public and reducing potential toxicity risks. Disposal of 2–BTP total flooding systems is subject to local, State, and Federal regulations, which ensure that 2–BTP and water contaminated with 2–BTP are not to be dumped into sewers, on the ground, or into any body of water, but rather taken to a wastewater treatment facility or disposed of properly. 2–BTP is not considered to be hazardous waste under EPA regulations implementing RCRA at 40 CFR part 261.

Comparison to other fire suppressants: 2–BTP has an ODP of 0.0028, comparable to or lower than other acceptable substitutes in this end-use, with ODPs ranging from zero to 0.048. 2–BTP has a GWP of 0.23–0.26 that is lower than or comparable to that of other acceptable substitutes for total flooding agents, with GWPs that range from about zero to 22,800.[63] 2–BTP is

[56] ICF, 2022q. Risk Screen on Substitutes in Total Flooding Systems in Normally Unoccupied Spaces. Substitute: 2-bromo-3,3,3-trifluoropropene (2–BTP).

[57] ICF, 2022r. Risk Screen on Substitutes as Streaming Agents in Non-Residential Applications. Substitute: 2-bromo-3,3,3-trifluoropropene (2–BTP).

[58] Patten, et al., 2011. OH, reaction rate constant, IR absorption spectrum, ozone depletion potentials and global warming potentials of 2-bromo-3,3,3-trifluoropropene, J. Geophys. Res., 116 (D24), D24307, doi: 10.1029/2011JD016518, 2011.

[59] Orkin, V. L. 2004. Photochemical Properties of 2-bromo-3,3,3-trifluoropropene and semi-empirical kinetic estimates of its Global Impacts on the Atmosphere. Prepared by the National Institute of Standards and Technology Physical and Chemical Properties Division for American Pacific Corporation. July 2004.

[60] The ODP in this rulemaking remains as it was originally listed by SNAP (see 81 FR 86778).

[61] Patten et al., 2012. Correction to ''OH reaction rate constant, IR absorption spectrum, ozone depletion potentials and global warming potentials of 2-bromo-3,3,3-trifluoropropene,'' J. Geophys. Res., 117, D22301, doi:10.1029/2012JD019051.

[62] ICF, 2022r. Risk Screen on Substitutes in Total Flooding Systems in Normally Unoccupied Spaces. Substitute: 2-bromo-3,3,3-trifluoropropene (2–BTP).

[63] For SF_6, the substitute with the highest GWP, the SNAP listing finds SF_6 as ''acceptable subject to narrowed use limits.''

considered a VOC and is not excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)) for the purpose of addressing the development of SIPs to attain and maintain the NAAQS. Other acceptable fire suppression agents currently in use in this end-use are also VOC (*e.g.,* C_6-perfluoroketone), and 2–BTP is anticipated to pose no greater risk than other alternatives listed as acceptable in this end-use. Emissions of 2–BTP should be controlled by adhering to standard industry practices. Toxicity risks can be minimized by use consistent with the NFPA 2001 standard, recommendations in the SDS, and other safety precautions common in the fire suppression industry. The potential toxicity risks due to inhalation exposure are common to many total flooding agents, including those already listed as acceptable under SNAP for this same end-use. 2–BTP post-activation products are nonflammable, as are all other available total flooding agents.

EPA is finalizing listing 2–BTP as acceptable, subject to use conditions, as a total flooding agent for use in normally unoccupied spaces under 500 ft^3 because the overall environmental and human health risk posed by the substitute is lower than or comparable to the overall risk posed by other alternatives listed as acceptable in the same end-use.

b. Streaming Uses

Environmental information: The environmental information for this substitute is set forth in the ''Environmental information'' section in listing II.G.3.a above.

Flammability information: 2–BTP is non-flammable.

Toxicity and exposure data: Toxicity and personal protective equipment (PPE) information is described above under total flooding applications. EPA evaluated occupational and general population exposure at manufacture and at end-use to ensure that the use of 2–BTP as a streaming agent will not pose unacceptable risks to workers or the general public. For the occupational exposure assessment, EPA has evaluated the risks associated with potential exposures to 2–BTP during equipment production operations and the filling of fire extinguishers as well as in the case of an inadvertent discharge of the fire extinguisher during maintenance activities.

2–BTP is not expected to pose a risk to workers during manufacture of 2–BTP fire extinguishers when the engineering controls and PPE requirements as referenced in the SDS for this substitute are followed. The potential health risks from exposure to the substitute for personnel during manufacturing is described above under total flooding applications.

EPA also assessed potential end-use exposure scenarios at 7.5-minute and 15-minute TWA exposures for 2–BTP following potential release of agent from the handheld extinguisher in confined spaces (*e.g.,* electronics and server rooms).[64] These exposures were then compared with the cardiotoxic LOAEL for 2–BTP. All but one modeled 7.5-minute and 15-minute exposures for varying ventilation rates were lower than the LOAEL of 10,000 ppm for 2–BTP. The estimated exposures were derived using conservative assumptions (*i.e.,* no mechanical ventilation) and represent a worst-case scenario with a low probability of occurrence. Because anticipated exposures could exceed the exposure limit for 2–BTP, EPA recommends that standard safety techniques to ensure safety during the use of 2–BTP fire extinguishers be followed in non-residential locations. 2–BTP handheld extinguishers should follow required minimum room volumes established by UL 2129, Halocarbon Clean Agent Fire Extinguishers,[65] when discharged into a confined space. This standard prohibits the exceedance of the cardiotoxic LOAEL for any fire suppressant (*i.e.,* 10,000 ppm or 1.0% for 2–BTP). Therefore, per UL 2129, a warning label for 2–BTP extinguishers will mitigate use in confined spaces. Based on the above results, 2–BTP is not expected to pose significant risk to end users when used as a streaming fire extinguishing agent in non-residential applications, except for commercial home office and personal watercraft. EPA provides additional information on safe use of this substitute for establishments manufacturing, installing and maintaining equipment using this agent in the ''Further Information'' column of the regulatory listing. Since this additional information is not part of the regulatory decision under SNAP, these statements are not binding for use of the substitute under the SNAP program. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of this substitute as best practices for safer use.

Comparison to other fire suppressants: 2–BTP has an ODP of 0.0028, comparable to other listed substitutes in this end-use, with ODPs ranging from zero to 0.022. 2–BTP has a GWP of 0.23–0.26, which for streaming agents is lower than or comparable to that of other acceptable substitutes, with GWPs that range from about zero to 9,810. 2–BTP is considered a VOC and is not excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)) for the purpose of addressing the development of SIPs to attain and maintain the NAAQS. Other acceptable fire suppression agents currently in use in this end-use are also VOC (*e.g.,* C_6-perfluoroketone), and 2–BTP is anticipated to pose no greater risk than other alternatives listed as acceptable in this end-use. Toxicity risks can be minimized by use consistent with the NFPA 10 Standard for Portable Fire Extinguishers, recommendations in the SDS, and other safety precautions common in the fire suppression industry.

EPA is finalizing listing 2–BTP as acceptable, subject to use conditions, as a streaming agent for use in non-residential applications, except for commercial home office and personal watercraft, because the overall environmental and human health risk posed by the substitute is lower than or comparable to the overall risk posed by other alternatives listed as acceptable in the same end-use.

4. What use conditions is EPA finalizing?

EPA is finalizing listing 2–BTP as acceptable, subject to use conditions. The use conditions are for use in normally unoccupied spaces under 500 ft^3 in total flooding fire suppression systems, and as a streaming agent for use in non-residential applications, except for commercial home offices and personal watercraft.

5. Why is EPA finalizing these specific use conditions?

EPA is finalizing listing 2–BTP as acceptable, subject to use conditions, for use only in normally unoccupied spaces under 500 ft^3 in total flooding fire suppression systems. These space limitations are consistent with additional information submitted to EPA. The limitations correspond to use in small, enclosed spaces, such as an electrical closet. Such spaces would require a smaller amount of fire suppressant, reducing potential exposures to workers and the general public and reducing potential toxicity risks.

Additionally, EPA is finalizing listing 2–BTP as acceptable subject to use conditions as a streaming agent for use

[64] ICF, 2022r. Risk Screen on Substitutes as Streaming Agents in Non-Residential Applications. Substitute: 2-bromo-3,3,3-trifluoropropene (2–BTP).

[65] UL, 2017. Standard 2129—Halocarbon Clean Agent Fire Extinguishers. Edition 3. This document is accessible at: *https://www.shopulstandards.com/ProductDetail.aspx?UniqueKey=32182.*

in non-residential applications, except for commercial home office and personal watercraft. The definition of ''residential use'' in the SNAP regulations at 40 CFR 82.172 is use by a private individual of a chemical substance or any product containing the chemical substance in or around a permanent or temporary household, during recreation, or for any personal use or enjoyment. Use within a household for commercial or medical applications is not included in this definition, nor is use in automobiles, watercraft, or aircraft. Use in a commercial home office or in personal watercraft could result in exposure to members of the general public, including sensitive individuals such as children or the elderly. In addition, air exchange is often lower in a commercial home office or a personal watercraft than in industrial or other commercial applications, potentially resulting in higher exposure levels than in those other non-residential applications. Because of the more sensitive populations and potentially higher exposures associated with those applications, EPA is finalizing listing 2–BTP for use in non-residential applications other than commercial home office and personal watercraft.

6. How is EPA responding to comments on 2–BTP?

EPA received one comment on the 2–BTP section of the proposed rule. The commenter supported finalizing the rule as proposed.

Comment: American Pacific, the manufacturer of 2–BTP, indicated they ''[s]upport [the proposed rule] findings and conclusions with respect to the 2–BTP clean fire extinguishant.''

Response: EPA acknowledges the support for this proposed listing, and for the reasons discussed above, we are finalizing this listing as proposed.

H. Total Flooding Fire Suppression—Listing of EXXFIRE® as Acceptable, Subject to Use Conditions, for Use in Normally Unoccupied Spaces

1. What is EPA's final listing decision for EXXFIRE®?

As proposed, EPA is finalizing listing EXXFIRE® as acceptable, subject to use conditions, for use in total flooding fire suppression systems in normally unoccupied spaces. EPA received no comments relating to the proposed listing of EXXFIRE®. Prior to activation, the EXXFIRE® formulation is in solid form and contained within a hermetically sealed steel container. Upon detection of a fire, nitrogen gas is released from the unit. The nitrogen gas dilutes the oxygen level within the enclosure, and consequently suppresses the fire. After activation, only gas components exit the casing. All solid products remain inside the casing before, during and after activation. Use of this agent should be in accordance with the safety guidelines in the latest edition of the NFPA 2001 standard.

The redacted submission and supporting documentation for EXXFIRE® are provided in the docket for this proposed rule (EPA–HQ–OAR–2021–0836) at *https://www.regulations.gov.* EPA performed an assessment to examine the health and environmental risks of each of this substitute. This assessment is available in the docket for this rule.[66]

2. What is EXXFIRE® and how does it compare to other fire suppressants in the same end-use?

Environmental information: According to the submitter, the active ingredients for this technology are nonvolatile solids before activation so the ODP, atmospheric lifetime, and GWP are all zero. The gaseous post-activation products that are released upon activation of the fire suppressant with GWPs are carbon monoxide (CO), CO_2, and various hydrocarbons with GWPs ranging from less than one to 25; however, these compounds are present in trace amounts, together making up less than 0.5 percent of the total weight of the post-activation products. The majority of the post-activation constituents of EXXFIRE® are either not organic (*e.g.,* nitrogen, oxygen, water, hydrogen) or are excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)), for the purpose of addressing the development of SIPs to attain and maintain the NAAQS. Some constituents of EXXFIRE® are considered VOC and are not excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)), including a variety of hydrocarbons; however, these compounds are present in trace amounts.

Flammability information: EXXFIRE® post-activation products are non-flammable, except for certain hydrocarbons that are present in trace amounts.

Toxicity and exposure data: EPA assessed potential health risks from exposure. Most post-activation products for EXXFIRE® are not expected to result in adverse health effects; however, due to the potential presence of lithium fluoride, which is acutely toxic upon inhalation or ingestion and can cause serious skin, eye, and respiratory tract irritation, the use of this system is only recommended for use in normally unoccupied spaces. Although expected to be maintained inside the generator, the potential presence of lithium fluoride in the post-activation particulate products, justifies the necessity for personnel to wear proper PPE (*i.e.,* particulate-removing respirator with NIOSH type N95 or better filters) upon reentry into the space following a discharge of the system to mitigate those risks. The submitter indicates that the proposed substitute can reduce oxygen levels to 10 to 12 percent, which can cause a potential asphyxiation hazard.

EPA evaluated occupational and general population exposure at manufacture of EXXFIRE® systems and at end use to ensure that the use of EXXFIRE® will not pose unacceptable risks to workers or the general public. Exposure is possible upon reentry into a space after a system has been discharged. Protective gloves, tightly sealed goggles, protective work clothing, and particulate-removing respirators should be worn for installation and servicing activities, to protect workers in any event of potential discharge of the substitute, accidental or otherwise. Filling or servicing operations should be performed in well-ventilated areas. Toxicity risks can be minimized by use consistent with the NFPA 2001 standard, recommendations in the SDS, and other safety precautions common in the fire suppression industry. EPA provides additional information on safe use of this substitute for establishments manufacturing, installing and maintaining equipment using this agent in the ''Further Information'' column of the regulatory listing. Since this additional information is not part of the regulatory decision under SNAP, these statements are not binding for use of the substitute under the SNAP program. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of this substitute as best practices for safer use.

Comparison to other fire suppressants: EXXFIRE® has an ODP of zero, comparable to other listed substitutes in this end-use, with ODPs ranging from zero to 0.048. For total flooding agents, EXXFIRE® has a GWP of zero prior to activation (and one to 25 for certain post-activation products present in trace amounts), which is comparable to or lower than that of other acceptable substitutes, such as HFC–227ea and other substitutes with

[66] ICF, 2022s. Risk Screen on Substitutes in Total Flooding Systems in Normally Unoccupied Spaces; Substitute: EXXFIRE®.

GWPs up to 22,800.[67] The majority, approximately 99.5 percent, of the post-activation constituents of EXXFIRE ® are either not organic or are excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)), for the purpose of addressing the development of SIPs to attain and maintain the NAAQS. EXXFIRE ® is anticipated to pose no greater risk than other alternatives listed as acceptable in this end-use. Toxicity risks can be minimized by use consistent with the NFPA 2001 standard, recommendations in the SDS, and other safety precautions common in the fire suppression industry. The potential toxicity risks due to inhalation exposure are common to many total flooding agents, including those already listed as acceptable under SNAP for this same end-use. EXXFIRE ®'s post-activation products are nonflammable, as are all other available total flooding agents.

EPA is finalizing listing EXXFIRE ® as acceptable, subject to use conditions, in the end-use listed above because it does not pose greater overall environmental and human health risk than other available substitutes in the same end-use.

3. What use conditions is EPA finalizing and why?

Consistent with the request by the submitter, and information we have available at this time for our review, the use condition requires that EXXFIRE ® be used in total flooding fire suppression systems only in areas that are not normally occupied. EPA conducted this evaluation for use only in unoccupied spaces, and information was provided by the submitter in the SNAP application specific for this type of space based on EPA guidance.[68] EPA needs additional information, such as additional toxicity test information, to issue a listing for normally occupied spaces, compared to a listing for normally unoccupied spaces. This is because of the greater risk that workers or members of the general public may be exposed if a fire suppressant is used in normally occupied spaces. In the absence of such information, as described in EPA's guidance, EPA issues listings for powdered aerosol fire suppressants as acceptable subject to use conditions for use in normally unoccupied spaces only.

4. How is EPA responding to comments on EXXFIRE ®?

No comments were received regarding EPA's proposed listing for EXXFIRE ®, and for the reasons explained above EPA is finalizing this listing as proposed.

I. Total Flooding Fire Suppression—Listing of Powdered Aerosol H (Pyroquench-α™) as Acceptable, Subject to Use Conditions, for Use in Normally Unoccupied Spaces

1. What is EPA's final listing decision for Powdered Aerosol H?

As proposed, EPA is finalizing listing Powdered Aerosol H, also known as Pyroquench-α™, as acceptable, subject to use conditions, for use in total flooding fire suppression systems in normally unoccupied spaces. EPA received no comments relating to the proposed listing of Powdered Aerosol H. Prior to activation, the Powdered Aerosol H formulation is contained as a solid disk of chemicals in insulated and dual-sealed casings. In response to heat and lack of oxygen, the formulation undergoes a chemical reaction; once the Powdered Aerosol H system is activated, it generates and discharges a homogenous mixture of gas and particulates into a space containing a fire hazard or directly on the hazard itself, extinguishing the fire. In the ''Further Information'' column of the tables at the end of this document, we state that use of this agent should be in accordance with the safety guidelines in the latest edition of the NFPA 2010 Standard for Fixed Aerosol Fire Extinguishing Systems.

The redacted submission and supporting documentation for Powdered Aerosol H are provided in the docket for this final rule (EPA–HQ–OAR–2021–0836) at *https://www.regulations.gov.* EPA performed an assessment to examine the health and environmental risks of each of this substitute. This assessment is available in the docket for this final rule.[69] [70]

2. What is Powdered Aerosol H and how does it compare to other fire suppressants in the same end-use?

Environmental information: According to the submitter, the active ingredients for this technology are nonvolatile solids before activation so the ODP, atmospheric lifetime, and GWP are all zero. The gaseous post-activation products that are released upon activation of the fire suppressant with GWPs are nitrogen dioxide (NO_2) and CO_2, with GWPs of close to zero [71] [72] and one, respectively. The post-activation constituents of Powdered Aerosol H are excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)), for the purpose of addressing the development of SIPs to attain and maintain the NAAQS.

Flammability information: Powdered Aerosol H post-activation products are non-flammable.

Toxicity and exposure data: EPA assessed potential health risks from exposure to the proposed substitute as a total flooding agent in normally unoccupied spaces. Because the pre-activation components of the fire suppressant are prepared in tablets that are non-reactive and do not crumble or flake, there is no concern regarding inhalation or ingestion of the pre-activation compounds. The discharge of the powdered aerosol after activation results in temporary reduced visibility in the protected space due to the uniform distribution of the particulate generated and may cause ocular, dermal, and respiratory irritation. EPA recommends that workers not enter the space following discharge until all particles have settled and the gases released by the total flooding system have dissipated. Use according to the NFPA 2010 Standard will reduce any safety risks due to reduced visibility. The use of proper PPE, such as protective clothing, gloves, goggles, and particulate-removing respirators, during manufacturing, at installation, maintenance, and clean-up, minimizes personnel exposure from inhalation of the substitute. EPA provides additional information on safe use of this substitute for establishments manufacturing, installing and maintaining equipment using this agent in the ''Further Information'' column of the regulatory listing. Since this additional information is not part of the regulatory decision under SNAP, these

[67] For SF_6, the substitute with the highest GWP, the SNAP listing finds SF_6 as ''acceptable subject to narrowed use limits.''

[68] EPA, 2004. A Guide to Completing a Risk Screen: Collection and Use of Risk Screen Data. Fire Suppression Sector. April 2004.

[69] ICF, 2022t. Risk Screen on Substitutes in Total Flooding Systems in Normally Unoccupied Spaces; Substitute: Pyroquench-α™.

[70] ICF, 2023b. Risk Screen on Substitutes in Total Flooding Systems in Normally Unoccupied Spaces; Substitute: Pyroquench-α™.

[71] Myhre, et.al., 2013: Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available online at: *https://www.ipcc.ch/report/ar5/wg1/.*

[72] In the proposal for this rule, EPA incorrectly noted the GWP for NO_2 as 120. EPA is correcting the GWP and citation in this final rule. This correction does not change EPA's listing of acceptable, subject to use conditions, as set forth in the rule, for use of Powdered Aerosol H in fire protection.

statements are not binding for use of the substitute under the SNAP program. While the items listed are not legally binding under the SNAP program, EPA encourages users of substitutes to apply all statements in the ''Further Information'' column in their use of this substitute as best practices for safer use.

EPA expects that procedures identified in the SDS for Powdered Aerosol H and good manufacturing practices will be adhered to, and that the appropriate safety and personal PPE consistent with OSHA guidelines will be used during installation, servicing, post-discharge clean-up and disposal of total flooding systems using Powdered Aerosol H. The manufacturer guidance upon installation of the system provides the appropriate time after which workers may re-enter the area for disposal to allow the maximum settling of all particulates.

Comparison to other fire suppressants: The post-activation products of Powdered Aerosol H have an ODP of zero, comparable to or lower than other listed substitutes in this end-use, with ODPs ranging from zero to 0.048. For total flooding agents, Powdered Aerosol H's GWP of zero prior to activation (and close to zero and one for certain post-activation products) is comparable to or lower than that of other acceptable substitutes, such as HFC–227ea and other substitutes with GWPs up to 22,800.[73] Other acceptable substitutes in this end-use have comparable GWPs ranging from zero to one, such as water, inert gases, and other powdered aerosol fire suppressants. Toxicity risks can be minimized by use consistent with the NFPA 2010 standard, recommendations in the SDS, and other safety precautions common in the fire suppression industry. The potential toxicity risks due to inhalation exposure are common to many total flooding agents, including those already listed as acceptable under SNAP for this same end-use. Powdered Aerosol H's post-activation products are nonflammable, as are all other available total flooding agents.

EPA is finalizing listing Powdered Aerosol H as acceptable, subject to use conditions, in the end-use listed above because it does not pose greater overall environmental and human health risk than other available substitutes in the same end-use.

3. What use conditions is EPA finalizing and why?

Consistent with the submitter's request, and information we have available at this time for our review, EPA finalizes the use condition that Powdered Aerosol H be used in total flooding fire suppression systems only in areas that are not normally occupied. EPA conducted this evaluation for use only in unoccupied spaces, and information was provided by the submitter in the SNAP application specific for this type of space based on EPA guidance.[74] EPA needs additional information, such as additional toxicity test information, to issue a listing for normally occupied spaces, compared to a listing for normally unoccupied spaces. This is because of the greater risk that workers or members of the general public may be exposed to if a fire suppressant is used in normally occupied spaces. In the absence of such information, as described in EPA's guidance, EPA issues listings for powdered aerosol fire suppressants as acceptable subject to use conditions for use in normally unoccupied spaces only.

4. How is EPA responding to comments on Powdered Aerosol H?

No comments were received regarding EPA's proposed listing for Powdered Aerosol H, and for the reasons discussed above, EPA is finalizing this section of the rulemaking as proposed.

J. How is EPA responding to other comments?

Comment: Several commenters (AHRI, the Alliance, AHAM, Carrier, EIA, Brigett Griffin, LG Electronics, Chemours, and Trane) noted general support for this rulemaking. Additionally, the Alliance and AHAM stressed a desire for the Agency to issue a final rule in a timely manner to ensure that lower GWP alternatives are available. Trane noted their support for a transition to lower flammability ''A2L'' refrigerants.

Response: EPA acknowledges the commenters' support of the listings in this rulemaking. The Agency acknowledges Trane's support for listing A2L refrigerants. EPA is finalizing many listing decisions as proposed and is finalizing other listing decisions with relatively minor changes that address and incorporate information provided in comments as described throughout the preamble above.

Comment: EIA commented on the GWP of HFC–32 and noted that refrigerants like HFC–32 have lower GWPs than the chemicals they replace and are near-term solutions which help facilitate the reduction in demand for HFCs under the American Innovation and Manufacturing (AIM) Act of 2020. EIA urged that EPA should consider restricting these refrigerants in the future, once additional ultra-low GWP refrigerants become more widely adopted.

Response: EPA acknowledges EIA's concern for the GWPs of various refrigerants and recognition that new alternatives will be more widely adopted in the future. EPA plans to continue to review the GWPs of substitutes consistent with the SNAP program criteria. EIA's comment on the AIM Act is beyond the scope of this action.

Comment: Diversified CPC International stated that EPA should consider listing the ASHRAE A3 refrigerants R–290, R–600, R–600a, R–601a, R–1270, and blends (*i.e.,* propane, butane, isobutane, isopentane, propylene, and blends) as acceptable to align with UL 60335–2–89, 2nd Edition and UL 60335–2–40, 3rd Edition. Additionally, Diversified CPC International and EIA stated that they hoped EPA will prioritize adoption of revised use conditions for refrigeration equipment in a future rule to take into account UL 60335–2–89, 2nd Edition, which would include expanded charge limits for hydrocarbons up to 500 g in self-contained equipment. EIA also stated that modernizing standards for commercial refrigeration will open a pathway for companies to significantly reduce climate impacts while maintaining safe systems. ATMOsphere urged that EPA consider the impending use of hydrocarbons in chillers, ACs and HPs and stated that such systems are becoming widely used in Europe.

Response: EPA acknowledges these comments expressing support for hydrocarbons in the refrigeration and AC sector. EPA did not propose to revise the current use conditions for R–290 or the hydrocarbon blend R–441A for use in self-contained room ACs and HPs. The Agency also did not propose to list R–290, R–600, R–600a, R–601a, R–1270, and blends for use in other end-uses. Therefore, these comments are beyond the scope of this rulemaking. The Agency may consider proposing additional listings, including listings for hydrocarbons and other lower-GWP refrigerants in commercial refrigeration in future rulemakings, in addition to updating use conditions for existing hydrocarbon listings. EPA

[73] For SF_6, the substitute with the highest GWP, the SNAP listing finds SF_6 as ''acceptable subject to narrowed use limits.''

[74] EPA, 2004. A Guide to Completing a Risk Screen: Collection and Use of Risk Screen Data. Fire Suppression Sector. April, 2004.

acknowledges that in other countries, refrigerants used in chillers may differ from the United States. The Agency's review of substitutes relies on the SNAP program criteria and the conditions in the United States, not on whether a substitute is in use elsewhere.

Comment: ATMOsphere urged the use of refrigerants such as hydrocarbons, CO_2, and ammonia in split-system AC, household refrigerators, supermarket cases, HPs, HP water heaters, and chillers.

Response: EPA acknowledges the increasing use of both fluorinated and non-fluorinated alternatives to ODS. In this action, EPA did not propose to list hydrocarbons, CO_2, or ammonia and thus is not finalizing such a listing in this final rule. The Agency intends to consider proposing additional listings, including listings for non-fluorinated alternatives, in future rulemakings.

Comment: Savannah River Nuclear Solutions stated that EPA needs to exempt the flammable refrigerants identified as being exempt from the venting prohibition contained in 40 CFR 82.l54(a) from RCRA by adding language to 40 CFR 261.2 and/or 40 CFR 261.4. This commenter stated that the lack of exemption in 40 CFR 261.2 and/or 40 CFR 261.4 has resulted in confusion on EPA's position with respect to RCRA regulation of flammable refrigerants that are exempted under 40 CFR 82.154(a) from the venting prohibition. Savannah River Nuclear Solutions noted that the refrigerants in the end-uses described at Subpart G, Appendix R, Items l, 2, 5 and 6 in the July 28, 2022 NPRM are exempt from the venting prohibition contained in 40 CFR 82.l54(a) and in this text, there is no indication the recovery or disposal of these refrigerants in these end uses are hazardous waste under RCRA even when venting occurs in a non-household setting. This commenter cited from multiple rulemakings that exempted certain refrigerants from the venting prohibition under CAA section 608(c)(2).

Response: EPA did not open for comment the listings 1 through 6 in appendix R to 40 CFR part 82, subpart G mentioned by the commenter. Rather, those entries were republished ''to bring the table in line with the Office of the Federal Register's general requirement for orderly codification by: adding entry numbers, replacing prohibited language, and properly formatting the footnotes.'' (87 FR at 45509; July 28, 2022). Similarly, EPA did not reopen the regulations at 40 CFR 261.2 and 40 CFR 261.4 through the NPRM. For these reasons, EPA considers the comment to be outside of the scope of this rulemaking.

In light of the commenter's statement about confusion regarding the RCRA regulation of flammable refrigerants that are exempted under 40 CFR 82.154(a) from the venting prohibition, we note that we have already addressed the applicability of RCRA to spent refrigerants in a previous SNAP rule, which states, for example, that ''propane and other HCs being recovered, vented, released, or otherwise disposed of from commercial and industrial appliances are likely to be hazardous waste under RCRA (see 40 CFR parts 261 through 270).'' (*See* 81 FR at 86799–86800, December 1, 2016, for additional information).

Comment: ATMOsphere, EIA, and an anonymous member of the public commented on the atmospheric decomposition of HFC–134a and HFO–1234yf into trifluoroacetic acid (TFA). ATMOsphere stated that TFA is collecting in the environment, and EIA claimed that ''the presence of persistent fluorinated by-products of HFCs and HFOs is increasing in the environment,'' citing studies finding increasing levels of TFA in ice cores,[75] rainwater,[76] groundwater,[77] and leaf samples.[78] All three commenters expressed concern about the potential risks TFA might pose to human health and the environment. EIA asserted, ''it is reasonable to conduct a complete review of these chemicals rather than allow their continued proliferation,'' and suggested that EPA should evaluate the potential risks from TFA through future SNAP regulations.

Response: EPA appreciates the information provided by EIA on the atmospheric decomposition of HFO–1234yf to TFA. We note that several studies and reports provide further information about this topic. A 2014 study by Kazil, et al. analyzed TFA deposition in the United States assuming 100 percent of all motor vehicle air conditioning (MVAC) systems use HFO–1234yf, which was the largest use of HFO–1234yf at that time.[79] The results indicated that rainwater TFA concentrations, while varying strongly geographically, will on average be low compared to the levels at which toxic effects are observed in aquatic systems. Similarly low TFA concentrations were estimated for emissions of HFO–1234yf from Asia in a 2021 study by David, et al.[80] The World Meteorological Organization also provided a summary of key information pertaining to TFA in their 2022 report to the Montreal Protocol.[81] The report states:

> The formation in the atmosphere of trifluoroacetic acid (TFA) is expected to increase in the coming decades due to increased use of HFOs and HCFOs. TFA, a breakdown product of some HFCs, HCFCs, HFOs and HCFOs, is a persistent chemical with potential harmful effects on animals, plants, and humans. The concentration of TFA in rainwater and ocean water is, in general, significantly below known toxicity limits at present. Potential environmental impacts of TFA require future evaluation due to its persistence. (p. 14)

Most TFA currently found in the environment resulting from decomposition of refrigerants likely derived from HFC–134a, which is being phased down and the use of which is anticipated to decrease in end-uses where safer alternatives are found acceptable under the SNAP program. EPA also notes that the modeling studies referenced generally assume a one-to-one substitution of HFO–1234yf for HFC–134a to be conservative;

[75] Chemical and Engineering News, May 1, 2020. ''CFC replacements are a source of persistent organic pollution in the Arctic.'' K. Bourzic. Available online at: *https://cen.acs.org/environment/persistent-pollutants/CFC-replacements-source-persistent-organic/98/web/2020/05.*

[76] Freeling et al., 2020. F. Freeling, D. Behringer, F. Heydel, M. Scheurer, T. Ternes, and K. Nödler. ''Trifluoroacetate in Precipitation: Deriving a Benchmark Data Set'' *Environ. Sci. Technol.* 2020, 54, 18, 11210–11219. August 17, 2020. Available online at: *https://pubs.acs.org/doi/10.1021/acs.est.0c02910.*

[77] Zihan Zhai et al., 2015. Zihan Zhai, Jing Wu, Xia Hu, Li Li, Junyu Guo, Boya Zhang, Jianxin Hu, and Jianbo Zhang. ''A 17-fold increase of trifluoroacetic acid in landscape waters of Beijing, China during the last decade,'' *Chemosphere.* 2015 Jun; 129:110–7. doi: 10.1016/j.chemosphere.2014.09.033. Abstract available online at *https://pubmed.ncbi.nlm.nih.gov/25262947/.*

[78] Freeling et al., 2022. F. Freeling, M. Scheurer, J. Koschorreck, G. Hoffmann, T.A. Ternes, and K. Nödler. ''Levels and Temporal Trends of Trifluoroacetate (TFA) in Archived Plants: Evidence for Increasing Emissions of Gaseous TFA Precursors over the Last Decades,'' *Environ. Sci. Technol. Lett.* 2022, 9, 5, 400–405. April 18, 2022. Available online at: *https://pubs.acs.org/doi/10.1021/acs.estlett.2c00164.*

[79] Kazil et al., 2014. ''Deposition and rainwater concentrations of trifluoroacetic acid in the United States from the use of HFO–1234yf'' J. Kazil, S. McKeen, S.-W. Kim, R. Ahmadov, G.A. Grell, R.K. Talukdar, A.R. Ravishankara. *JGR Atmospheres.* Volume 119, Issue 24. December 27, 2014. Pages 14,059–14,079. October 31, 2014. Available online at *https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2014JD022058.*

[80] David et al., 2021. ''Trifluoroacetic acid deposition from emissions of HFO–1234yf in India, China, and the Middle East,'' Volume 21, issue 19. *Atmos. Chem. Phys.,* 21, 14833–14849, 2021. *https://doi.org/10.5194/acp-21-14833-2021.* Available online at *ttps://acp.copernicus.org/articles/21/14833/2021/.*

[81] World Meteorological Organization (WMO), 2022. Executive Summary. Scientific Assessment of Ozone Depletion: 2022, GAW Report No. 278, 56 pp.; WMO: Geneva, 2022. Available online at *https://ozone.unep.org/system/files/documents/Scientific-Assessment-of-Ozone-Depletion-2022-Executive-Summary.pdf.*

however, none of the end-uses in this final rule where HFO–1234yf is being listed as acceptable are anticipated to cause a one-for-one transition from HFC–134a to HFO–1234yf. Any increase in TFA deposition due to this rule is expected to be less than the modeled increases in TFA from studies that found the levels of TFA in the environment remained, ''too small to be a risk to the environment over the next few decades.'' Use of HFO–1234yf and concerns about TFA in applications not addressed by this final rule are outside the scope of this rulemaking.

There are ongoing evaluations of the potential risks of TFA exposure. In 2020, the Environmental Effects Assessment Panel (EEAP) to the Montreal Protocol released an update [82] to its report on the environmental effects of stratospheric ozone depletion, UV radiation, and interactions with climate change, including the potential effects of TFA from ODS and their substitutes. That report noted that TFA ''has a no-observed-effect-concentration (NOEC) for aquatic species, which is typically >10,000 µg/L,'' while ''analysis of 1187 samples of rainwater collected in eight locations across Germany in 2018–2019 showed median and a precipitation-weighted mean concentration of TFA of 0.210 µg/L and 0.335 µg/L, respectively,'' and ''another recent paper reported TFA . . . in precipitation in the low µg/L range across 28 cities in mainland China.'' These studies and others led the EEAP to state, ''Trifluoroacetic acid continues to be found in the environment, including in remote regions, although not at concentrations likely to have adverse toxicological consequences.''

In its 2021 Summary Update for Policymakers,[83] the EEAP stated:

> TFA likely has natural geochemical sources, is widely used in industry and research laboratories, and is a by-product of the synthesis and degradation of fluorinated and perfluorinated compounds (PFCs). . . . TFA has recently been found in precipitation, surface waters, and indoor dust in China . . ., although concentrations are below those considered toxic. No additional studies on the toxicity of TFA to organisms have been reported, but prior research has shown that this compound is not highly toxic to mammals and aquatic organisms, although some plants and algae may be sensitive. . . . At present, it is not possible to quantify the proportion of anthropogenic sources of TFA resulting from substances not falling under the purview of the Montreal Protocol, but available evidence indicates that this breakdown product is of minimal risk to human health. (p. 10; references in the text omitted here)

In response to EIA's suggestion that EPA evaluate potential risks from TFA through future SNAP rules, EPA notes that it does consider ecotoxicity as a criterion when evaluating alternatives under SNAP's comparative risk framework, and the Agency has considered the potential impacts of TFA in past actions that found HFO–1234yf acceptable in certain end-uses. For example, EPA studied the potential generation of TFA when first listing neat (*i.e.,* 100%, not in blends) HFO–1234yf as acceptable, subject to use conditions, in motor vehicle air conditioning. The myriad studies EPA referenced all concluded that the additional TFA from HFO–1234yf did not pose a significant additional risk, even if it were assumed to be used as the only refrigerant in all refrigeration and air conditioning equipment (76 FR 17492–17493, March 29, 2011). The Agency intends to continue its approach to evaluating the potential risks from TFA in future SNAP regulations. Based on current information, EPA does not consider the overall risk to human health and the environment due to the listings in this final rule to be significantly greater than for other available or potentially available substitutes for the same uses.

Comment: Three commenters (ATMOsphere, EIA, and an anonymous commenter) expressed concern about per- and poly-fluoroalkyl substances (PFAS). Commenters noted that under some definitions of PFAS, HFCs and HFOs discussed in this rule are considered PFAS, and two of the commenters suggested EPA should adopt a particular definition of PFAS. The commenters noted that some PFAS chemicals, *e.g.,* perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS), present risks to human health and the environment.

Response: EPA understands that currently, there is no single commonly agreed definition of PFAS, and whether or not HFCs or HFOs are classified as PFAS depends on the definition being used. EPA's PFAS roadmap, available at *https://www.epa.gov/pfas,* sets timelines for specific actions and outlines EPA's commitments to new policies to safeguard public health, protect the environment, and hold polluters accountable. This rule does not in any way establish a definition of PFAS, nor do the listing decisions depend on a specific definition. In evaluating alternatives using its comparative risk framework, SNAP already considers potential risks to human health and the environment. Regardless of what definition of PFAS is used, not all PFAS are the same in terms of toxicity or any other risk. Some PFAS have been shown to have extremely low toxicity, for example. If a chemical has been found to present lower overall risk to human health or the environment, it might be found acceptable under SNAP regardless of whether or not it falls under a particular definition of PFAS. Likewise, SNAP might not find a potential alternative acceptable if it presented greater overall risk, regardless of whether or not it falls under a particular definition of PFAS. As described in the risk screens for alternatives found in the docket for this rulemaking, potential risk to human health or the environment has been considered directly for each chemical, and the risks are not assumed to follow from a chemical falling into any particular category of substances.

III. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

This action is not a significant regulatory action and was therefore not submitted to the Office of Management and Budget (OMB) for review.

B. Paperwork Reduction Act (PRA)

OMB has previously approved the information collection activities contained in the existing regulations and has assigned OMB control number 2060–0226. The approved Information Collection Request includes five types of respondent reporting and recordkeeping activities pursuant to SNAP regulations: submission of a SNAP petition, filing a Toxic Substances Control Act (TSCA)/SNAP Addendum, notification for test marketing activity, recordkeeping for substitutes acceptable subject to use restrictions, and recordkeeping for small volume uses. This action does not impose a new information collection burden under the PRA because the existing Information Collection Request already includes recordkeeping for substitutes acceptable subject to use restrictions—*i.e.,* acceptable subject to

[82] EEAP, 2020. ''Environmental effects of stratospheric ozone depletion, UV radiation, and interactions with climate change: UNEP Environmental Effects Assessment Panel, Update 2020.'' Photochemical & Photobiological Sciences *https://doi.org/10.1007/s43630-020-00001-x.* Available online at: *https://engineering.case.edu/centers/sdle/sites/engineering.case.edu.centers.sdle/files/neale_et_al._-_2021_-_environmental_effects_of_stratospheric_ozone_deple.pdf.*

[83] EEAP, 2021. ''Summary Update 2021 for Policymakers'' UNEP Environmental Effects Assessment Panel. Available online at: *https://ozone.unep.org/sites/default/files/assessment_panels/EEAP-summary-update-2021-for-policymakers.pdf.*

use conditions or acceptable subject to narrowed use limits.

C. Regulatory Flexibility Act (RFA)

I certify that this action will not have a significant economic impact on a substantial number of small entities under the RFA. In making this determination, EPA concludes that the impact of concern for this rule is any significant adverse economic impact on small entities and that the agency is certifying that this rule will not have a significant economic impact on a substantial number of small entities because the rule has no net burden on the small entities subject to the rule. This action adds the additional options under SNAP of using HFC–32, HFO–1234yf, R–452B, R–454A, R–454B, R–454C, R–1150, 2–BTP, EXXFIRE®, and Powdered Aerosol H, in the specified end-uses, but does not mandate such use. Users who choose to avail themselves of this flexibility for R–1150 must make a reasonable effort to ascertain that other substitutes or alternatives are not technically feasible and must document and keep records of the results of such investigations. Because equipment for HFC–32, HFO–1234yf, R–452B, R–454A, R–454B, and R–454C is not manufactured yet in the U.S. for the chillers and residential dehumidifiers end-uses, no change in business practice is required to meet the use conditions, resulting in no adverse impact compared with the absence of this rule. Similarly, R–1150, 2–BTP, EXXFIRE®, and Powdered Aerosol H are listed as acceptable with use conditions consistent with industry standards and with the intended uses described by the submitters, also requiring no change in business practices and resulting in no adverse impact compared with the absence of this rule. The new use conditions for HFC–32 in self-contained room ACs and HPs were requested by industry and allow use consistent with the more recent standard, UL 60335–2–40, while also allowing continued use with another existing standard, UL 484, until the consensus standard setting organization sunsets that older standard; these would allow for greater consistency in business practices for different types of equipment using the same refrigerant while giving industry time to transition between two industry standards. Equipment for HFC–32 already manufactured prior to the effective date of this final rule would not be affected. Self-contained room ACs and HPs using HFC–32 have been subject to similar use conditions, and thus the updated requirements result in no adverse impact compared with the absence of this rule. Thus, the final rule will not impose new costs on small entities. We have therefore concluded that this action will have no net regulatory burden for any directly regulated small entities.

D. Unfunded Mandates Reform Act (UMRA)

This action does not contain any unfunded mandate as described in UMRA, 2 U.S.C. 1531–1538, and does not significantly or uniquely affect small governments. The action imposes no enforceable duty on any State, local or Tribal governments or the private sector.

E. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have Tribal implications as specified in Executive Order 13175. It will not have substantial direct effects on Tribal governments, on the relationship between the Federal government and Indian tribes, or on the distribution of power and responsibilities between the Federal government and Indian tribes, as specified in Executive Order 13175.Thus, Executive Order 13175 does not apply to this action. EPA periodically updates Tribal officials on air regulations through the monthly meetings of the National Tribal Air Association and will share information on this rulemaking through this and other formats.

G. Executive Order 13045: Protection of Children From Environmental Health and Safety Risks

This action is not subject to Executive Order 13045 because it is not economically significant as defined in Executive Order 12866, and because EPA does not believe the environmental health or safety risks addressed by this action present a disproportionate risk to children. While EPA has not conducted a separate analysis of risks to infants and children associated with this rule, the rule does contain use conditions that would reduce exposure risks to the general population, with the reduction of exposure being most important to the most sensitive individuals. This action's health and risk assessments are contained in the comparisons of toxicity for the various substitutes, as well as in the risk screens for the substitutes that are listed in this rule. The risk screens are in the docket for this rulemaking.

H. Executive Order 13211: Actions That Significantly Affect Energy Supply, Distribution, or Use

This action is not subject to Executive Order 13211, because it is not a significant regulatory action under Executive Order 12866.

I. National Technology Transfer and Advancement Act and 1 CFR Part 51

This action involves technical standards. EPA has decided to use and incorporate by reference three technical safety standards in the use conditions for the types of refrigeration and air conditioning equipment addressed in this action: two standards developed by UL and one developed by ASHRAE.

EPA incorporates by reference the 2019 edition of UL Standard 60335–2–40, which establishes requirements for the evaluation of commercial and residential AC and dehumidifier equipment and safe use of flammable refrigerants, among other things. Additionally, EPA uses and incorporates by reference the 2021 edition of UL Standard 61010–2–011, which establishes requirements for the evaluation of laboratory equipment and safe use of flammable refrigerants, among other things. These standards are discussed in greater detail in sections II.E and II.F.4 of this preamble.

The 2019 UL Standard 60335–2–40 and 2021 UL Standard 61010–2–011 are available at *http://www.shopulstandards.com/ProductDetail.aspx?UniqueKey=36463* and may be purchased by mail at: COMM 2000, 151 Eastern Avenue, Bensenville, IL 60106; Email: *orders@shopulstandards.com;* phone: 1–888–853–3503 in the U.S. or Canada (other countries dial 1–415–352–2178); website: *http://ulstandards.ul.com/* or *www.comm-2000.com.* The cost of each of the 2019 UL Standard 60335–2–40 and 2021 UL Standard 61010–2–011 is $440 for an electronic copy and $550 for hardcopy. UL also offers a subscription service to the Standards Certification Customer Library that allows unlimited access to their standards and related documents. The cost of obtaining this standard is not a significant financial burden for equipment manufacturers and purchase is not necessary for those selling, installing, and servicing the equipment. Therefore, EPA concludes that the UL standards incorporated by reference is reasonably available.

EPA is also incorporating by reference ANSI/ASHRAE Standard 15–2019,

Safety Standard for Refrigeration Systems, in the use conditions for six refrigerants listed for use in chillers. This standard concerns the safe design, construction, installation, and operation of refrigeration systems. This standard is available at *https://www.ashrae.org/resources-publications/bookstore/standards-15-34* and may be purchased by mail at: 6300 Interfirst Drive, Ann Arbor, MI 48108; by phone: 1–800–527–4723 in the U.S. or Canada; website: *http://www.techstreet.com/ashrae/ashrae_standards.html?ashrae_auth_token=.* The cost of ASHRAE Standard 15–2019 is $159.00 for an electronic copy or hardcopy. The cost of obtaining this standard is not a significant financial burden for equipment manufacturers or for those selling, installing and servicing the equipment. Therefore, EPA concludes that the ASHRAE standard incorporated by reference is reasonably available.

EPA is incorporating by reference the following addenda to ANSI/ASHRAE Standard 15–2019, available at *https://www.ashrae.org/technical-resources/standards-and-guidelines/standards-addenda:*

- Addendum a, ANSI-approved February 6, 2020, concerning updates to providing capacity factors for overpressure protection and introducing a method for calculating pressure relief capacity factors for refrigerants not included in the standard.
- Addendum b, ANSI-approved February 6, 2020, concerning updates to the definition of ''listed,'' and adding the term ''labeled.''
- Addendum c, ANSI-approved September 1, 2020, concerning updates to allow the use of equipment using small amounts of non-A1 refrigerants if they are listed to appropriate safety standards.
- Addendum d, ANSI-approved April 29, 2022, concerning clarification that the standard does not apply to residential refrigeration systems.
- Addendum e, ANSI-approved January 27, 2022, concerning revisions to requirements related to refrigerant piping.
- Addendum f, ANSI-approved September 30, 2020, concerning the addition of a new appendix providing clarifying, nonmandatory information, movement of mandatory information into the body of the standard, and updates to references.
- Addendum i, ANSI-approved July 31, 2020, concerning the modification of the standard by deferring regulation of ammonia refrigeration to ANSI/IIAR 2 and removal of erroneous references to ammonia.
- Addendum j, ANSI-approved October 30, 2020, concerning the replacement of the terms ''flammable'' and ''nonflammable'' with the specific refrigerant class.
- Addendum k, ANSI-approved October 30, 2020, concerning the modification of the existing listing requirement in the standard by clarifying the acceptable product safety listing standards.
- Addendum m, ANSI-approved June 30, 2022, concerning the modification of allowances for the use of mechanical ventilation to expand this mitigation strategy for human comfort applications using A2L refrigerants, helping to harmonize the standard with UL 60335–2–40, 3rd Edition.
- Addendum n, ANSI-approved May 31, 2022, concerning the address of a continuous maintenance proposal to clarify wording about airflow face velocity.
- Addendum o, ANSI-approved April 29, 2022, concerning the clarification of notification requirements.
- Addendum q, ANSI-approved May 31, 2022, concerning the modification of requirements for mechanical ventilation in machinery rooms using only 2L classified refrigerants, updates to the graphical method for determining required ventilation rates, and addition of an alternate calculation method for compliance.
- Addendum r, ANSI-approved May 31, 2022, concerning the modification of the definition of machinery rooms.

EPA has already incorporated the following standards into appendix R: UL 471 (November 24, 2010); UL 484 (December 21, 2007, with changes through August 3, 2012); UL 541 (December 30, 2011); and UL 60335–2–24 (April 28, 2017).

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 (59 FR 7629, February 16, 1994) directs Federal agencies, to the greatest extent practicable and permitted by law, to make environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations (people of color and/or Indigenous peoples) and low-income populations.

EPA believes that the human health or environmental conditions that exist prior to this action result in or have the potential to result in disproportionate and adverse human health or environmental effects on people of color, low-income populations and/or indigenous peoples. This action's health and environmental risk assessments are contained in the comparison of health and environmental risks for HFC–32, HFO–1234yf, R–452B, R–454A, R–454B, R–454C, R–1150, 2–BTP, EXXFIRE®, and Powdered Aerosol H, as well as in the risk screens that are available in the docket for this rulemaking. EPA's analysis indicates that other environmental impacts and human health impacts of HFC–32, HFO–1234yf, R–452B, R–454A, R–454B, R–454C, R–1150, 2–BTP, EXXFIRE®, and Powdered Aerosol H are comparable to or less than those of other substitutes that are listed as acceptable for the same end-use. Because adoption of the new substitutes listed in this final rule is voluntary, the Agency is unable to quantify when, where, and how much of the listed substitutes will be produced and used. Thus, EPA cannot determine the extent to which this rule will exacerbate or reduce existing disproportionate adverse effects on communities of color and low-income people as specified in Executive Order 12898 (59 FR 7629, February 16, 1994).

EPA believes that it is not practicable to assess whether this action is likely to result in new disproportionate and adverse effects on people of color, low-income populations and/or indigenous peoples. However, the listings for HFC–32, HFO–1234yf, R–452B, R–454A, R–454B, R–454C, R–1150, 2–BTP, EXXFIRE®, and Powdered Aerosol H in the end-uses addressed in this action provide additional lower-GWP and ODP or comparable alternatives in their respective end-uses. By providing lower-GWP and ODP or comparable alternatives for these end-uses, this rule is anticipated to reduce the use and eventual emissions of potent greenhouse gases in these end-uses, which could help to reduce the effects of climate change, including the public health and welfare effects on people of color, communities of low-income and/or Indigenous peoples. The Agency will continue to evaluate the impacts of this program on communities with environmental justice concerns and consider further action, as appropriate.

K. Congressional Review Act (CRA)

This action is subject to the CRA, and EPA will submit a rule report to each House of the Congress and to the Comptroller General of the United States. This action is not a ''major rule'' as defined by 5 U.S.C. 804(2).

IV. References

Unless specified otherwise, all documents are available electronically through the Federal Docket Management System at *https://www.regulations.gov,* Docket number EPA–HQ–OAR–2021–0836.

ASHRAE, 2019a. ANSI/ASHRAE Standard 34–2019: Designation and Safety Classification of Refrigerants.

ASHRAE, 2019b. ANSI/ASHRAE Standard 15–2019: Safety Standard for Refrigeration Systems. 2019.

Chemical and Engineering News, 2020. ''CFC replacements are a source of persistent organic pollution in the Arctic.'' Katherine Bourzac. May 21, 2020. Available online at: *https://cen.acs.org/environment/persistent-pollutants/CFC-replacements-source-persistent-organic/98/web/2020/05.*

David et al., 2021. ''Trifluoroacetic acid deposition from emissions of HFO–1234yf in India, China, and the Middle East,'' Volume 21, issue 19. *Atmos. Chem. Phys.,* 21, 14833–14849, 2021. *https://doi.org/10.5194/acp-21-14833-2021.* Available online at *https://acp.copernicus.org/articles/21/14833/2021/.*

''Environmental effects of stratospheric ozone depletion, UV radiation, and interactions with climate change: UNEP Environmental Efects Assessment Panel, Update 2020.'' Photochemical & Photobiological Sciences Available online at: *https://ozone.unep.org/sites/default/files/assessment_panels/EEAP-summary-update-2021-for-policymakers.pdf.*

EEAP, 2021. Environmental Effects of Stratospheric Ozone Depletion, UV Radiation, and Interactions with Climate Change: UNEP Environmental Effects Assessment Panel, Update 2021. Available online at: *https://ozone.unep.org/sites/default/files/assessment_panels/EEAP-summary-update-2021-for-policymakers.pdf.*

Engineering ToolBox, 2005. *Refrigerants—Physical Properties.* Available online at: *https://www.engineeringtoolbox.com/refrigerants-d_902.html* Accessed October 28, 2021.

EPA, 2004. A Guide to Completing a Risk Screen: Collection and Use of Risk Screen Data. Fire Suppression Sector. April 2004.

Freeling et al., 2020. Finnian Freeling, David Behringer, Felix Heydel, Marco Scheurer, Thomas A. Ternes, and Karsten Nödler. ''Trifluoroacetate in Precipitation: Deriving a Benchmark Data Set'' *Environ. Sci. Technol.* 2020, 54, 18, 11210–11219. August 17, 2020. Available online at *https://pubs.acs.org/doi/10.1021/acs.est.0c02910.*

Freeling et al., 2022. Finnian Freeling, Marco Scheurer, Jan Koschorreck, Gabriele Hoffmann, Thomas A. Ternes, and Karsten Nödler. ''Levels and Temporal Trends of Trifluoroacetate (TFA) in Archived Plants: Evidence for Increasing Emissions of Gaseous TFA Precursors over the Last Decades,'' *Environ. Sci. Technol. Lett.* 2022, 9, 5, 400–405. April 18, 2022. Available online at: *https://pubs.acs.org/doi/10.1021/acs.estlett.2c00164.*

Hodnebrog, et al., 2013. Hodnebrog, Ø., Etminan, M., Fuglestvedt, J.S., Marston, G., Myhre, G., Nielsen, C.J., Shine, K.P., and Wallington, T.J. (2013). Global Warming Potentials and Radiative Efficiencies of Halocarbons and Related Compounds: A Comprehensive Review, Reviews of Geophysics, 51, 300–378. Available online at *doi.org/10.1002/rog.20013.*

ICF, 2014. Assessment of the Potential Impact of Hydrocarbon Refrigerants on Ground Level Ozone Concentrations. February 2014.

ICF, 2022a. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–32.

ICF, 2022b. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: HFO–123yf.

ICF, 2022c. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–452B.

ICF, 2022d. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–454A.

ICF, 2022e. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–454B.

ICF, 2022f. Risk Screen on Substitutes in Chillers and Industrial Process Air Conditioning (New Equipment); Substitute: R–454C.

ICF, 2022g. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: HFC–32.

ICF, 2022h. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: R–452B.

ICF, 2022i. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: R–454A.

ICF, 2022j. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: R–454B.

ICF, 2022k. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: R–454C.

ICF, 2022l. Risk Screen on Substitutes in Residential Dehumidifiers (New Equipment); Substitute: HFO–1234yf.

ICF, 2022m. [Reserved—not referenced in this document.].

ICF, 2022n. Risk Screen on Substitutes in Residential and Light Commercial Air Conditioning and Heat Pumps (New Equipment); Substitute: HFC–32 (Difluoromethane).

ICF, 2022o. Risk Screen on Substitutes in Very Low Temperature Refrigeration (New Equipment); Substitute: R–1150.

ICF, 2022p. Additional Assessment of the Potential Impact of Hydrocarbon Refrigerants on Ground Level Ozone Concentrations. May 2020.

ICF, 2022q. Risk Screen on Substitutes in Total Flooding Systems in Normally Unoccupied Spaces. Substitute: 2-bromo-3,3,3-trifluoropropene (2–BTP).

ICF, 2022r. Risk Screen on Substitutes as Streaming Agents in Non-Residential Applications. Substitute: 2-bromo-3,3,3-trifluoropropene (2–BTP).

ICF, 2022s. Risk Screen on Substitutes in Total Flooding Systems in Normally Unoccupied Spaces; Substitute: EXXFIRE®.

ICF, 2022t. Risk Screen on Substitutes in Total Flooding Systems in Normally Unoccupied Spaces; Substitute: Pyroquench-α™.

ICF, 2023a. Risk Screen on Substitutes in Residential and Light Commercial Air Conditioning and Heat Pumps (New Equipment); Substitute: HFC–32 (Difluoromethane).

ICF, 2023b. Risk Screen on Substitutes in Total Flooding Systems in Normally Unoccupied Spaces; Substitute: Pyroquench-α™.

IPCC, 2007. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M., and Miller, H.L. (eds.). Cambridge University Press. Cambridge, United Kingdom and New York, NY, USA. Available online at: *www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html.*

Kazil et al., 2014. J. Kazil, S. McKeen, S.-W. Kim, R. Ahmadov, G.A. Grell, R.K. Talukdar, A.R. Ravishankara. ''Deposition and rainwater concentrations of trifluoroacetic acid in the United States from the use of HFO–1234yf,'' *JGR Atmospheres.* Volume 119, Issue 24. Pages 14,059–14,079. October 31, 2014. Available online at: *https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2014JD022058.*

Kim and Sunderland, 2018. Dennis Kim and Peter Sunderland, ''Viability of Various Ignition Sources to Ignite A2L Refrigerant Leaks,'' 17th International Refrigeration and Air Conditioning Conference at Purdue University, July, 2018. Available online at: *https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2885&context=iracc.*

Myhre, et al., 2013. Myhre, G., D. Shindell, F.-M. Bréon, W. Collins, J. Fuglestvedt, J. Huang, D. Koch, J.-F. Lamarque, D. Lee, B. Mendoza, T. Nakajima, A. Robock, G. Stephens, T. Takemura and H. Zhang, 2013: Anthropogenic and Natural Radiative Forcing. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available online at: *https://www.ipcc.ch/report/ar5/wg1/.*

National Fire Protection Agency (NFPA). 2018. NFPA 10: Standard for Portable

Fire Extinguishers. Available online at: *https://www.nfpa.org/.*

National Fire Protection Agency (NFPA). 2018. NFPA 2001: Standard on Clean Agent Fire Extinguishing Systems. Available online at: *https://www.nfpa.org/.*

National Fire Protection Agency (NFPA). 2018. NFPA 2010. Standard for Fixed Aerosol Fire Extinguishing Systems. Available online at: *https://www.nfpa.org/.*

Nielsen et al., 2007. Nielsen, O.J., Javadi, M.S., Sulbaek Andersen, M.P., Hurley, M.D., Wallington, T.J., Singh, R. (2007). Atmospheric chemistry of CF3CF=CH2: Kinetics and mechanisms of gas-phase reactions with Cl atoms, OH radicals, and O3. Chemical Physics Letters 439, 18–22. Available online at *http://www.lexissecuritiesmosaic.com/gateway/FedReg/network_OJN_174_CF3CF=CH2.pdf.*

Orkin, V.L. 2004. Photochemical Properties of 2-bromo-3,3,3-trfluoropropene and semi-empirical kinetic estimates of its Global Impacts on the Atmosphere. Prepared by the National Institute of Standards and Technology Physical and Chemical Properties Division for American Pacific Corporation. July 2004.

Patten, et al., 2011. Patten, K.O., V.G. Khamaganov, V.L. Orkin, S.L. Baughcum, and D.J. Wuebbles (2011), OH reaction rate constant, IR absorption spectrum, ozone depletion potentials and global warming potentials of 2-bromo-3,3,3-trifluoropropene, *J. Geophys. Res.,* 116, D24307, doi:10.1029/2011JD016518.

Patten, et al., 2012. Patten, K.O., V.G. Khamaganov, V.L. Orkin, S.L. Baughcum, and D.J. Wuebbles (2012), Correction to ''OH reaction rate constant, IR absorption spectrum, ozone depletion potentials and global warming potentials of 2-bromo-3,3,3-trifluoropropene,'' *J. Geophys. Res.,* 117, D22301, doi:10.1029/2012JD019051.

UL 2129, 2017. UL Standard 2129—Halocarbon Clean Agent Fire Extinguishers. Edition 3. January 5, 2017.

UL 60335–2–40, 2019. Household And Similar Electrical Appliances—Safety—Part 2–40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers. Third Edition. November 1, 2019.

UL Standard 61010–2–011, 2021. Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use—Part 011: Particular Requirements for Refrigerating Equipment. Second edition. May 13, 2021.

Wickham, 2002. Status of Industry Efforts to Replace Halon Fire Extinguishing Agents. March 2002. Available online at: *https://www.epa.gov/snap/status-industry-efforts-replace-halon-fire-extinguishing-agents.*

World Meteorological Organization (WMO), 2018. Burkholder *et al.* Appendix A, Table A–1 in *Scientific Assessment of Ozone Depletion: 2018, Global Ozone Research and Monitoring Project,* Report No. 58, WMO, Geneva, Switzerland, *http://ozone.unep.org/science/assessment/sap.*

World Meteorological Organization (WMO), 2022. Executive Summary. Scientific Assessment of Ozone Depletion: 2022, GAW Report No. 278, 56 pp.; WMO: Geneva, 2022. Available online at *https://ozone.unep.org/system/files/documents/Scientific-Assessment-of-Ozone-Depletion-2022-Executive-Summary.pdf*

Zihan Zhai et al., 2015. Zihan Zhai, Jing Wu, Xia Hu, Li Li, Junyu Guo, Boya Zhang, Jianxin Hu, and Jianbo Zhang. ''A 17-fold increase of trifluoroacetic acid in landscape waters of Beijing, China during the last decade,'' *Chemosphere.* 2015 Jun; 129:110–7. *doi: 10.1016/j.chemosphere.2014.09.033.* Abstract available online at: *https://pubmed.ncbi.nlm.nih.gov/25262947/*

List of Subjects in 40 CFR Part 82

Environmental protection, Administrative practice and procedure, Air pollution control, Incorporation by reference, Stratospheric ozone layer.

Michael S. Regan,

Administrator.

For the reasons set forth in the preamble, EPA amends 40 CFR part 82 as follows:

PART 82—PROTECTION OF STRATOSPHERIC OZONE

■ 1. The authority citation for part 82 continues to read as follows:

Authority: 42 U.S.C. 7414, 7601, 7671–7671q.

Subpart G—Significant New Alternatives Policy Program

■ 2. Amend appendix R to subpart G of part 82 by:

■ a. Revising the heading;

■ b. Revising the table entitled ''Substitutes That Are Acceptable Subject to Use Conditions'' and amending the ''Note'' immediately following the table by removing the last two undesignated paragraphs.

The revisions read as follows:

Appendix R to Subpart G of Part 82—Substitutes Subject to Use Restrictions Listed in the December 20, 2011, Final Rule, Effective February 21, 2012, and in the April 10, 2015 Final Rule, Effective May 11, 2015, and in the April 28, 2023 Final Rule, Effective May 30, 2023

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS

End-use	Substitute	Decision	Use conditions	Further information
1. Household refrigerators, freezers, and combination refrigerators and freezers (New equipment only).	Isobutane (R–600a) Propane (R–290) R–441A.	Acceptable subject to use conditions.	As of September 7, 2018: 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 designed for a different refrigerant). These refrigerants may be used only in a refrigerator or freezer, or combination refrigerator and freezer, that meets all requirements listed in UL 60335–2–24.[126]	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), 1910.157 (portable fire extinguishers), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing hydrocarbon refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated and re-entry should occur only after the space has been properly ventilated.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
				Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling these refrigerants. Special care should be taken to avoid contact with the skin since these refrigerants, like many refrigerants, can cause freeze burns on the skin. A Class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on refrigerators and freezers with these refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Any refrigerant releases should be in a well-ventilated area, such as outside of a building. Only technicians specifically trained in handling flammable refrigerants should service refrigerators and freezers containing these refrigerants. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely.
2. Retail food refrigerators and freezers (stand-alone units only) (New equipment only).	Isobutane (R–600a) Propane (R–290) R–441A.	Acceptable subject to use conditions.	As provided in clauses SB6.1.2 to SB6.1.5 of UL 471,[1 2 3] the following markings must be attached at the locations provided and must be permanent: (a) On or near any evaporators that can be contacted by the consumer: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. Do Not Use Mechanical Devices To Defrost Refrigerator. Do Not Puncture Refrigerant Tubing.'' (b) Near the machine compartment: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.'' (c) Near the machine compartment: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.'' (d) On the exterior of the refrigerator: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.'' (e) Near any and all exposed refrigerant tubing: ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.'' All of these markings must be in letters no less than 6.4 mm (¼ inch) high. The refrigerator or freezer must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, and other devices through which the refrigerant is serviced, typically known as the service port, to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (*e.g.,* process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then retail food refrigerators and freezers using these refrigerants should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (*i.e.,* right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor.
3. Very low temperature refrigeration Non-mechanical heat transfer (New equipment only).	Ethane (R–170).	Acceptable subject to use conditions.	This refrigerant may be used only in new equipment specifically designed and clearly identified for the refrigerant (*i.e.,* the substitute may not be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). This refrigerant may only be used in equipment that meets all requirements in Supplement SB to UL 471.[1 2 3] In cases where listing 3 of this table includes requirements more stringent than those of UL 471, the appliance must meet the requirements of listing 3 of this table in place of the requirements in UL 471. The charge size for the equipment must not exceed 150 g (5.29 oz) in each circuit. As provided in clauses SB6.1.2 to SB6.1.5 of UL 471,[1 2 3] the following markings must be attached at the locations provided and must be permanent: (a) On or near any evaporators that can be contacted by the consumer: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. Do Not Use Mechanical Devices To Defrost Refrigerator. Do Not Puncture Refrigerant Tubing.''	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), 1910.157 (portable fire extinguishers), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing hydrocarbon refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated and re-entry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling ethane. Special care should be taken to avoid contact with the skin since ethane, like many refrigerants, can cause freeze burns on the skin. A Class B dry powder type fire extinguisher should be kept nearby.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
			(b) Near the machine compartment: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.'' (c) Near the machine compartment: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.'' (d) On the exterior of the refrigerator: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.'' (e) Near any and all exposed refrigerant tubing: ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.'' All of these markings must be in letters no less than 6.4 mm (¼ inch) high. The refrigeration equipment must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, and other devices through which the refrigerant is serviced, typically known as the service port, to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (*e.g.,* process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	Technicians should only use spark-proof tools when working on equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Any refrigerant releases should be in a well-ventilated area, such as outside of a building. Only technicians specifically trained in handling flammable refrigerants should service equipment containing ethane. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely. Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then refrigeration equipment using this refrigerant should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (*i.e.,* right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor. Example of non-mechanical heat transfer using this refrigerant would be use in a secondary loop of a thermosiphon.
4. Vending Machines (New equipment only).	Isobutane (R–600a) Propane (R–290) R–441A.	Acceptable subject to use conditions.	These refrigerants may be used only in new equipment specifically designed and clearly identified for the refrigerants (*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). Detaching and replacing the old refrigeration circuit from the outer casing of the equipment with a new one containing a new evaporator, condenser, and refrigerant tubing within the old casing is considered ''new'' equipment and not a retrofit of the old, existing equipment. These substitutes may only be used in equipment that meets all requirements in Supplement SA to UL 541.[1 2 5] In cases where listing 4 of this table includes requirements more stringent than those of UL 541, the appliance must meet the requirements of listing 4 of this table in place of the requirements in UL 541 The charge size for vending machines must not exceed 150 g (5.29 oz) in each circuit. As provided in clauses SA6.1.2 to SA6.1.5 of UL 541,[1 2 5] the following markings must be attached at the locations provided and must be permanent: (a) On or near any evaporators that can be contacted by the consumer: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. Do Not Use Mechanical Devices To Defrost Refrigerator. Do Not Puncture Refrigerant Tubing.'' (b) Near the machine compartment: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.'' (c) Near the machine compartment: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.'' (d) On the exterior of the refrigerator: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.'' (e) Near any and all exposed refrigerant tubing: ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.'' All of these markings must be in letters no less than 6.4 mm (¼ inch) high.	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), 1910.157 (portable fire extinguishers), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing hydrocarbon refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated and re-entry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling these refrigerants. Special care should be taken to avoid contact with the skin since these refrigerants, like many refrigerants, can cause freeze burns on the skin. A Class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on refrigeration equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Any refrigerant releases should be in a well-ventilated area, such as outside of a building. Only technicians specifically trained in handling flammable refrigerants should service refrigeration equipment containing these refrigerants. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely. Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then refrigeration equipment using this refrigerant should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (*i.e.,* right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
			The refrigeration equipment must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, and other devices through which the refrigerant is serviced, typically known as the service port, to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (*e.g.,* process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	
5. Residential and light-commercial air conditioning and heat pumps—self-contained room air conditioners only (New equipment only).	Propane (R–290) R–441A.	Acceptable subject to use conditions.	These refrigerants may be used only in new equipment specifically designed and clearly identified for the refrigerants (*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). These refrigerants may only be used in equipment that meets all requirements in Supplement SA and Appendices B through F of UL 484.[1 2 4] In cases where listing 5 includes requirements more stringent than those of UL 484, the appliance must meet the requirements of listing 5 of this table in place of the requirements in UL 484. The charge size for the entire air conditioner must not exceed the maximum refrigerant mass determined according to Appendix F of UL 484 for the room size where the air conditioner is used. The charge size for these three refrigerants must in no case exceed 1,000 g (35.3 oz or 2.21 lbs) of propane or 1,000 g (35.3 oz or 2.21 lb) of R–441A. For portable air conditioners, the charge size must in no case exceed 300 g (10.6 oz or 0.66 lbs) of propane or 330 g (11.6 oz or 0.72 lb) of R–441A. The manufacturer must design a charge size for the entire air conditioner that does not exceed the amount specified for the unit's cooling capacity, as specified in table A, B, C, D, or E of this appendix R. As provided in clauses SA6.1.2 to SA6.1.5 of UL 484,[1 2 4] the following markings must be attached at the locations provided and must be permanent: (a) On the outside of the air conditioner: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.'' (b) On the outside of the air conditioner: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.'' (c) On the inside of the air conditioner near the compressor: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.'' (d) On the outside of each portable air conditioner: ''WARNING: Appliance shall be installed, operated and stored in a room with a floor area larger the ''X'' m^2 (Y ft^2).'' The value ''X'' on the label must be determined using the minimum room size in m^2 calculated using Appendix F of UL 484. For R–441A, use a lower flammability limit of 0.041 kg/m^3 in calculations in Appendix F of UL 484. All of these markings must be in letters no less than 6.4 mm (¼ inch) high. The air conditioning equipment must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, and other devices through which the refrigerant is serviced, typically known as the service port, to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (*e.g.,* process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), 1910.157 (portable fire extinguishers), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing hydrocarbon refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated and re-entry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling these refrigerants. Special care should be taken to avoid contact with the skin since these refrigerants, like many refrigerants, can cause freeze burns on the skin. A Class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on air conditioning equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Any refrigerant releases should be in a well-ventilated area, such as outside of a building. Only technicians specifically trained in handling flammable refrigerants should service refrigeration equipment containing these refrigerants. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely. Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then air conditioning equipment using this refrigerant should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (*i.e.,* right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor. Air conditioning equipment in this category includes: Window air conditioning units. Portable room air conditioners. Packaged terminal air conditioners and heat pumps.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
6. Residential and light-commercial air conditioning and heat pumps—self-contained room air conditioners only (New equipment only) manufactured from May 10, 2015 and up to but not including May 30, 2023.	HFC–32	Acceptable subject to use conditions.	This refrigerant may be used only in new equipment specifically designed and clearly identified for the refrigerant (*i.e.,* this substitute may not be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). This refrigerant may only be used in equipment that meets all requirements in Supplement SA and Appendices B through F of UL 484.[1 2 4] In cases where this listing 6 of this table includes requirements more stringent than those of UL 484, the appliance must meet the requirements of listing 6 of this table in place of the requirements in UL 484. The charge size for the entire air conditioner must not exceed the maximum refrigerant mass determined according to Appendix F of UL 484 for the room size where the air conditioner is used. The manufacturer must design a charge size for the entire air conditioner that does not exceed the amount specified for the unit's cooling capacity, as specified in table A, B, C, D, or E of this appendix. For equipment following this listing 6, and as provided in clauses SA6.1.2 to SA6.1.5 of UL 484,[1 2 4] the following markings must be attached at the locations provided and must be permanent: (a) On the outside of the air conditioner: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.'' (b) On the outside of the air conditioner: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.'' (c) On the inside of the air conditioner near the compressor: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.'' (d) On the outside of each portable air conditioner: ''WARNING: Appliance shall be installed, operated and stored in a room with a floor area larger the ''X'' m^2 (Y ft^2).'' The value ''X'' on the label must be determined using the minimum room size in m^2 calculated using Appendix F of UL 484. All of these markings must be in letters no less than 6.4 mm (¼ inch) high. The air conditioning equipment must have red, Pantone® Matching System (PMS) #185 marked pipes, hoses, and other devices through which the refrigerant is serviced, typically known as the service port, to indicate the use of a flammable refrigerant. This color must be present at all service ports and where service puncturing or otherwise creating an opening from the refrigerant circuit to the atmosphere might be expected (*e.g.,* process tubes). The color mark must extend at least 2.5 centimeters (1 inch) from the compressor and must be replaced if removed.	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), 1910.157 (portable fire extinguishers), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing hydrocarbon refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated and re-entry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling these refrigerants. Special care should be taken to avoid contact with the skin since these refrigerants, like many refrigerants, can cause freeze burns on the skin. A Class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on air conditioning equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Any refrigerant releases should be in a well-ventilated area, such as outside of a building. Only technicians specifically trained in handling flammable refrigerants should service refrigeration equipment containing these refrigerants. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely. Room occupants should evacuate the space immediately following the accidental release of this refrigerant. If a service port is added then air conditioning equipment using this refrigerant should have service aperture fittings that differ from fittings used in equipment or containers using non-flammable refrigerant. ''Differ'' means that either the diameter differs by at least 1/16 inch or the thread direction is reversed (*i.e.,* right-handed vs. left-handed). These different fittings should be permanently affixed to the unit at the point of service and maintained until the end-of-life of the unit, and should not be accessed with an adaptor. Air conditioning equipment in this category includes: Window air conditioning units. Portable room air conditioners. Packaged terminal air conditioners and heat pumps.
7. Residential and light-commercial air conditioning and heat pumps—self-contained room air conditioners only (New equipment only) manufactured from May 30, 2023 through January 1, 2024.	HFC–32	Acceptable subject to use conditions.	This refrigerant may only be used in equipment that meets all requirements in either: (1) Supplement SA and Appendices B through F of UL 484[1 2 4] and listing 6 of this table, or (2) UL 60335–2–40[1 2 7] and listing 8 of this table.	
8. Residential and light-commercial air conditioning and heat pumps—self-contained room air conditioners only (New equipment only) manufactured on or after January 2, 2024.	HFC–32	Acceptable Subject to Use Conditions.	This refrigerant may be used only in new equipment specifically designed and clearly identified for the refrigerant (*i.e.,* this substitute may not be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). This substitute may only be used in air conditioning equipment that meets all requirements in UL 60335–2–40[1 2 7] and this listing 8 of this table. In cases where this listing 8 includes requirements more stringent than those of UL 60335–2–40, the appliance must meet the requirements of this listing 8 in place of the requirements in UL 60335–2–40. The following markings must be attached at the locations provided and must be permanent:	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing flammable refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated, and reentry should occur only after the space has been properly ventilated.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
			(a) On the outside of the equipment: ''WARNING—Risk of Fire. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.'' (b) On the outside of the equipment: ''WARNING—Risk of Fire. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.'' (c) On the inside of the equipment near the compressor: ''WARNING—Risk of Fire. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting to Service This Product. All Safety Precautions Must be Followed.'' (d) For any equipment pre-charged at the factory, on the equipment packaging or on the outside of the equipment: ''WARNING—Risk of Fire due to Flammable Refrigerant Used. Follow Handling Instructions Carefully in Compliance with National Regulations.'' a. If the equipment is delivered packaged, this label shall be applied on the packaging. b. If the equipment is not delivered packaged, this label shall be applied on the outside of the equipment near the control panel or nameplate. (e) On the equipment near the nameplate: a. At the top of the marking: ''Minimum Installation height, X m (W ft).'' This marking is only required if required by the UL 60335–2–40. The terms ''X'' and ''W'' shall be replaced by the numeric height as calculated per UL 60335–2–40. Note that the formatting here is slightly different than UL 60335–2–40; specifically, the height in Inch-Pound units is placed in parentheses and the word ''and'' has been replaced by the opening parenthesis. b. Immediately below marking (a) of this listing 8 or at the top of the marking if marking (a) is not required: ''Minimum room area (operating or storage), Y m^2 (Z ft^2).'' The terms ''Y'' and ''Z'' shall be replaced by the numeric area as calculated per UL 60335–2–40. Note that the formatting here is slightly different than UL 60335–2–40; specifically, the area in Inch-Pound units is placed in parentheses and the word ''and'' has been replaced by the opening parenthesis. (f) For non-fixed equipment, on the outside of the product: ''WARNING—Risk of Fire or Explosion—Store in a well-ventilated room without continuously operating flames or other potential ignition.'' (g) All of these markings must be in letters no less than 6.4 mm (¼ inch) high. The equipment must have red Pantone® Matching System (PMS) #185 or RAL 3020 marked service ports, pipes, hoses, or other devices through which the refrigerant passes, to indicate the use of a flammable refrigerant. This color must be applied at all service ports and other parts of the system where service puncturing or other actions creating an opening from the refrigerant circuit to the atmosphere might be expected and must extend a minimum of one (1) inch (25 mm) in both directions from such locations and shall be replaced if removed.	Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling flammable refrigerants. Special care should be taken to avoid contact with the skin which, like many refrigerants, can cause freeze burns on the skin. A class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on air conditioning equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Only technicians specifically trained in handling flammable refrigerants should service refrigeration equipment containing this refrigerant. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely. Room occupants should evacuate the space immediately following the accidental release of this refrigerant. Personnel commissioning, maintaining, repairing, decommissioning and disposing of appliances with this refrigerant should obtain training and follow practices consistent with Annex HH of UL 60335–2–40.[2] [7] CAA section 608(c)(2) prohibits knowingly venting or otherwise knowingly releasing or disposing of substitute refrigerants in the course of maintaining, servicing, repairing or disposing of an appliance or industrial process refrigeration. Department of Transportation requirements for transport of flammable gases must be followed. Flammable refrigerants being recovered or otherwise disposed of from residential and light commercial air conditioning appliances are likely to be hazardous waste under the Resource Conservation and Recovery Act (RCRA) (see 40 CFR parts 260 through 270).

[1] The Director of the Federal Register approves this incorporation by reference (5 U.S.C. 552(a) and 1 CFR part 51). You may inspect a copy at the U.S. EPA or at the National Archives and Records Administration (NARA). Contact the U.S. EPA at: EPA Docket Center, WJC West Building, Room 3334, 1301 Constitution Avenue NW, Washington, DC 20004, *www.epa.gov/dockets,* (202) 202–1744. For information on the availability of this material at NARA, visit *www.archives.gov/federal-register/cfr/ibr-locations.html* or email *fr.inspection@nara.gov.*

[2] You may obtain the material from: Underwriters Laboratories Inc. (UL) COMM 2000; 151 Eastern Avenue; Bensenville, IL 60106; email: *orders@comm-2000.com;* phone: 1–888–853–3503 in the U.S. or Canada (other countries +1–415–352–2168); website: *https://ulstandards.ul.com/* or *www.comm-2000.com.*

[3] UL 471. Commercial Refrigerators and Freezers. 10th edition. Supplement SB: Requirements for Refrigerators and Freezers Employing a Flammable Refrigerant in the Refrigerating System. November 24, 2010.

[4] UL 484. Room Air Conditioners. 8th edition. Supplement SA: Requirements for Room Air Conditioners Employing a Flammable Refrigerant in the Refrigerating System and Appendices B through F. December 21, 2007, with changes through August 3, 2012.

[5] UL 541. Refrigerated Vending Machines. 7th edition. Supplement SA: Requirements for Refrigerated Venders Employing a Flammable Refrigerant in the Refrigerating System. December 30, 2011.

[6] UL 60335–2–24. Standard for Safety: Requirements for Household and Similar Electrical Appliances—Safety—Part 2–24: Particular Requirements for Refrigerating Appliances, Ice-Cream Appliances and Ice-Makers, Second edition, dated April 28, 2017.

[7] UL 60335–2–40, Standard for Safety: Household And Similar Electrical Appliances—Safety—Part 2–40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, 3rd edition, Dated November 1, 2019.

* * * * *

■ 3. Add appendix X to subpart G of part 82 to read as follows:

Appendix X to Subpart G of Part 82—Substitutes Listed in the April 28, 2023 Final Rule—Effective May 30, 2023

REFRIGERANTS—SUBSTITUTES ACCEPTABLE SUBJECT TO NARROWED USE LIMITS

End-use	Substitute	Decision	Narrowed use limits	Further information
1. Very low temperature refrigeration (new only).	R–1150	Acceptable Subject to Use Conditions and Narrowed Use Limits.	• Temperature range—R–1150 may only be used in equipment designed specifically to reach temperatures lower than −80 °C (−112 °F). • The manufacturers of new very low temperature equipment need to demonstrate that other alternatives are not technically feasible. They must document the results of their evaluation that showed the other alternatives to be not technically feasible and maintain that documentation in their files. This documentation, which does not need to be submitted to EPA unless requested to demonstrate compliance, ''shall include descriptions of substitutes examined and rejected, processes or products in which the substitute is needed, reason for rejection of other 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.'' (40 CFR 82.180(b)(3)).	

REFRIGERANTS—SUBSTITUTES ACCEPTABLE SUBJECT TO USE CONDITIONS

End-use	Substitute	Decision	Use conditions	Further information
1. Centrifugal Chillers for comfort cooling and Industrial Process Air Conditioning. Positive Displacement Chillers for comfort cooling and Industrial Process Air Conditioning.	HFC–32, HFO–1234yf, R–452B, R–454A, R–454B, R–454C.	Acceptable Subject to Use Conditions.	These refrigerants may be used only in new equipment specifically designed and clearly identified for the refrigerant (*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). These substitutes may only be used in air conditioning equipment that meets all requirements in UL 60335–2–40.[1 3 5] In cases where this listing 1 includes requirements more stringent than those of UL 60335–2–40, the appliance must meet the requirements of this listing 1 in place of the requirements in the UL 60335–2–40. These refrigerants may be used in chillers if and only if such chiller meets all requirements listed in ASHRAE 15–2019.[1 2 4] In cases where this listing 1 includes requirements different than those of ASHRAE 15–2019, the appliance must meet the requirements of this listing 1 in place of the requirements in ASHRAE 15–2019. Where similar requirements of ASHRAE 15–2019 and UL 60335–2–40 differ, the more stringent or conservative condition shall apply unless superseded by this listing 1. The following markings must be attached at the locations provided and must be permanent: (a) On the outside of the equipment: ''WARNING—Risk of Fire. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel, Do Not Puncture Refrigerant Tubing.'' (b) On the outside of the equipment: ''WARNING—Risk of Fire. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.''	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing flammable refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated, and reentry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling flammable refrigerants. Special care should be taken to avoid contact with the skin which, like many refrigerants, can cause freeze burns on the skin. A class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on air conditioning equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Only technicians specifically trained in handling flammable refrigerants should service refrigeration equipment containing this refrigerant. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely.

REFRIGERANTS—SUBSTITUTES ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
			(c) On the inside of the equipment near the compressor: ''WARNING—Risk of Fire. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting to Service This Product. All Safety Precautions Must be Followed.'' (d) For any equipment pre-charged at the factory, on the equipment packaging or on the outside of the equipment: ''WARNING—Risk of Fire due to Flammable Refrigerant Used. Follow Handling Instructions Carefully in Compliance with National Regulations'' a. If the equipment is delivered packaged, this label shall be applied on the packaging. b. If the equipment is not delivered packaged, this label shall be applied on the outside of the equipment near the control panel or nameplate. (e) On the equipment near the nameplate: a. At the top of the marking: ''Minimum Installation Height, X m (W ft).'' This marking is only required if required by UL 60335–2–40. The terms ''X'' and ''W'' shall be replaced by the numeric height as calculated per UL 60335–2–40. Note that the formatting here is slightly different than UL 60335–2–40; specifically, the height in Inch-Pound units is placed in parentheses and the word ''and'' has been replaced by the opening parenthesis. b. Immediately below marking (a) of this listing 1or at the top of the marking if marking (a) is not required: ''Minimum room area (operating or storage), Y m^2 (Z ft^2).'' The terms ''Y'' and ''Z'' shall be replaced by the numeric area as calculated per UL 60335–2–40. Note that the formatting here is slightly different than UL 60335–2–40; specifically, the area in Inch-Pound units is placed in parentheses and the word ''and'' has been replaced by the opening parenthesis. (f) For non-fixed equipment, on the outside of the product: ''WARNING—Risk of Fire or Explosion—Store in a well-ventilated room without continuously operating flames or other potential ignition.'' (g) For fixed equipment that is ducted, near the nameplate: ''WARNING—Risk of Fire—Auxiliary devices which may be ignition sources shall not be installed in the ductwork, other than auxiliary devices listed for use with the specific appliance. See instructions.'' (h) All of these markings must be in letters no less than 6.4 mm (¼ inch) high. The equipment must have red Pantone® Matching System (PMS) #185 or RAL 3020 marked service ports, pipes, hoses, or other devices through which the refrigerant passes, to indicate the use of a flammable refrigerant. This color must be applied at all service ports and other parts of the system where service puncturing or other actions creating an opening from the refrigerant circuit to the atmosphere might be expected and must extend a minimum of one (1) inch (25 mm) in both directions from such locations and shall be replaced if removed.	Room occupants should evacuate the space immediately following the accidental release of this refrigerant. Personnel commissioning, maintaining, repairing, decommissioning and disposing of appliances with this refrigerant should obtain training and follow practices consistent with Annex HH of UL 60335–2–40, 3rd edition.[35] CAA section 608(c)(2) prohibits knowingly venting or otherwise knowingly releasing or disposing of substitute refrigerants in the course of maintaining, servicing, repairing or disposing of an appliance or industrial process refrigeration. Department of Transportation requirements for transport of flammable gases must be followed. Flammable refrigerants being recovered or otherwise disposed of from residential and light commercial air conditioning appliances are likely to be hazardous waste under the Resource Conservation and Recovery Act (RCRA) (see 40 CFR parts 260 through 270).

REFRIGERANTS—SUBSTITUTES ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
2. Residential Dehumidifiers.	HFO–1234yf, HFC–32, R–452B, R–454A, R–454B, and R–454C.	Acceptable Subject to Use Conditions.	These refrigerants may be used only in new equipment specifically designed and clearly identified for the refrigerant (*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). These substitutes may only be used in dehumidifier equipment that meets all requirements in UL 60335–2–40.[1 3 5] In cases where this listing 2 includes requirements more stringent than those of UL 60335–2–40, the appliance must meet the requirements of this listing 2 in place of the requirements in UL 60335–2–40. The following markings must be attached at the locations provided and must be permanent: (a) On the outside of the equipment: ''WARNING—Risk of Fire. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing.'' (b) On the outside of the equipment: ''WARNING—Risk of Fire. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.'' (c) On the inside of the equipment near the compressor: ''WARNING—Risk of Fire. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting to Service This Product. All Safety Precautions Must be Followed.'' (d) For any equipment pre-charged at the factory, on the equipment packaging or on the outside of the equipment: ''WARNING—Risk of Fire due to Flammable Refrigerant Used. Follow Handling Instructions Carefully in Compliance with National Regulations'' a. If the equipment is delivered packaged, this label shall be applied on the packaging. b. If the equipment is not delivered packaged, this label shall be applied on the outside of the equipment near the control panel or nameplate. (e) On the equipment near the nameplate: a. At the top of the marking: ''Minimum Installation Height, X m (W ft).'' This marking is only required if required by UL 60335–2–40. The terms ''X'' and ''W'' shall be replaced by the numeric height as calculated per UL 60335–2–40. Note that the formatting here is slightly different than UL 60335–2–40; specifically, the height in Inch-Pound units is placed in parentheses and the word ''and'' has been replaced by the opening parenthesis. b. Immediately below marking (a) of this listing 2 or at the top of the marking if marking (a) is not required: ''Minimum room area (operating or storage), Y m^2 (Z ft^2).'' The terms ''Y'' and ''Z'' shall be replaced by the numeric area as calculated per UL 60335–2–40. Note that the formatting here is slightly different than UL 60335–2–40; specifically, the area in Inch-Pound units is placed in parentheses and the word ''and'' has been replaced by the opening parenthesis. (f) On the outside of the product: ''WARNING—Risk of Fire or Explosion—Store in a well-ventilated room without continuously operating flames or other potential ignition.'' (g) All of these markings must be in letters no less than 6.4 mm (1/4 inch) high. The equipment must have red Pantone® Matching System (PMS) #185 or RAL 3020 marked service ports, pipes, hoses, or other devices through which the refrigerant passes, to indicate the use of a flammable refrigerant. This color must be applied at all service ports and other parts of the system where service puncturing or other actions creating an opening from the refrigerant circuit to the atmosphere might be expected and must extend a minimum of one (1) inch (25 mm) in both directions from such locations and shall be replaced if removed.	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing flammable refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated, and reentry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling flammable refrigerants. Special care should be taken to avoid contact with the skin which, like many refrigerants, can cause freeze burns on the skin. A class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on air conditioning equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Only technicians specifically trained in handling flammable refrigerants should service refrigeration equipment containing this refrigerant. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely. Room occupants should evacuate the space immediately following the accidental release of this refrigerant. Personnel commissioning, maintaining, repairing, decommissioning and disposing of appliances with this refrigerant should obtain training and follow practices consistent with Annex HH of UL 60335–2–40.[3 5] CAA section 608(c)(2) prohibits knowingly venting or otherwise knowingly releasing or disposing of substitute refrigerants in the course of maintaining, servicing, repairing or disposing of an appliance or industrial process refrigeration. Department of Transportation requirements for transport of flammable gases must be followed. Flammable refrigerants being recovered or otherwise disposed of from residential and light commercial air conditioning appliances are likely to be hazardous waste under the Resource Conservation and Recovery Act (RCRA) (see 40 CFR parts 260 through 270).

REFRIGERANTS—SUBSTITUTES ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
3. Very Low Temperature Refrigeration.	R–1150	Acceptable Subject to Use Conditions.	R–1150 may be used only in new equipment specifically designed and clearly identified for the refrigerant (*i.e.,* none of these substitutes may be used as a conversion or ''retrofit'' refrigerant for existing equipment designed for other refrigerants). R–1150 may only be used in laboratory equipment that meet all requirements in UL 61010–2–011.[1 3 6] In cases where this listing 3 includes requirements more stringent than those of UL 61010–2–011, the appliance must meet the requirements of this listing 3 in place of the requirements in UL 61010–2–011. Requirements of note include: (a) Warning labels—The following markings, or the equivalent, must be provided in letters no less than 6.4 mm (¼ inch) high and must be permanent: (b) Attach near the machine compartment: ''DANGER—Risk of Fire or Explosion. Flammable Refrigerant Used. To Be Repaired Only By Trained Service Personnel. Do Not Puncture Refrigerant Tubing'' (c) Attach near the machine compartment: ''CAUTION—Risk of Fire or Explosion. Flammable Refrigerant Used. Consult Repair Manual/Owner's Guide Before Attempting To Service This Product. All Safety Precautions Must be Followed.'' (d) Attach on the exterior of the refrigeration equipment: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations. Flammable Refrigerant Used.'' (e) Attach near all exposed refrigerant tubing: ''CAUTION—Risk of Fire or Explosion Due To Puncture Of Refrigerant Tubing; Follow Handling Instructions Carefully. Flammable Refrigerant Used.'' (f) Attach on the exterior of the refrigeration equipment: ''This equipment is intended for use in commercial, industrial, or institutional occupancies as defined in the Safety Standard for Refrigeration Systems, ANSI/ASHRAE 15.'' (g) Attach on the exterior of the shipping carton: ''CAUTION—Risk of Fire or Explosion. Dispose of Properly In Accordance With Federal Or Local Regulations.'' (h) The instructions shall include the following warnings as necessary: a. ''WARNING: Ensure all ventilation openings are not obstructed.'' b. ''WARNING: Do not use mechanical devices or other means to accelerate the defrosting process, other than those recommended by the manufacturer.'' c. ''WARNING: Do not damage the refrigerant circuit.'' Equipment must have distinguishing red (Pantone® Matching System (PMS) #185 or RAL 3020) color-coded hoses and piping to indicate use of a flammable refrigerant. The laboratory equipment shall have marked service ports, pipes, hoses and other devices through which the refrigerant is serviced. Markings shall extend at least 1 inch (25 mm) from the servicing port and shall be replaced if removed. Equipment must use no more than 150 g of R–1150 in each refrigerant circuit using this refrigerant.	Applicable OSHA requirements at 29 CFR part 1910 must be followed, including those at 29 CFR 1910.94 (ventilation) and 1910.106 (flammable and combustible liquids), 1910.110 (storage and handling of liquefied petroleum gases), and 1910.1000 (toxic and hazardous substances). Proper ventilation should be maintained at all times during the manufacture and storage of equipment containing flammable refrigerants through adherence to good manufacturing practices as per 29 CFR 1910.106. If refrigerant levels in the air surrounding the equipment rise above one-fourth of the lower flammability limit, the space should be evacuated, and reentry should occur only after the space has been properly ventilated. Technicians and equipment manufacturers should wear appropriate personal protective equipment, including chemical goggles and protective gloves, when handling flammable refrigerants. Special care should be taken to avoid contact with the skin which, like many refrigerants, can cause freeze burns on the skin. A class B dry powder type fire extinguisher should be kept nearby. Technicians should only use spark-proof tools when working on air conditioning equipment with flammable refrigerants. Any recovery equipment used should be designed for flammable refrigerants. Only technicians specifically trained in handling flammable refrigerants should service refrigeration equipment containing this refrigerant. Technicians should gain an understanding of minimizing the risk of fire and the steps to use flammable refrigerants safely. Room occupants should evacuate the space immediately following the accidental release of this refrigerant. Personnel commissioning, maintaining, repairing, decommissioning and disposing of appliances with this refrigerant should obtain training and follow practices consistent with Annex HH of UL 60335–2–40.[3 5] CAA section 608(c)(2) prohibits knowingly venting or otherwise knowingly releasing or disposing of substitute refrigerants in the course of maintaining, servicing, repairing or disposing of an appliance or industrial process refrigeration. Department of Transportation requirements for transport of flammable gases must be followed. Flammable refrigerants being recovered or otherwise disposed of from residential and light commercial air conditioning appliances are likely to be hazardous waste under the Resource Conservation and Recovery Act (RCRA) (see 40 CFR parts 260 through 270).

[1] The Director of the Federal Register approves this incorporation by reference (5 U.S.C. 552(a) and 1 CFR part 51). You may inspect a copy at the U.S. EPA or at the National Archives and Records Administration (NARA). Contact the U.S. EPA at: EPA Docket Center, WJC West Building, Room 3334, 1301 Constitution Avenue NW, Washington, DC 20004, *www.epa.gov/dockets,* (202) 202–1744. For information on the availability of this material at NARA, visit *www.archives.gov/federal-register/cfr/ibr-locations.html* or email *fr.inspection@nara.gov.*

[2] You may obtain this material from: American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), 180 Technology Parkway NW, Peachtree Corners, Georgia 30092; phone: 404–636–8400; website: *www.ashrae.org.*

[3] You may obtain this material from: Underwriters Laboratories Inc. (UL) COMM 2000; 151 Eastern Avenue, Bensenville, IL 60106; phone: 415–352–2168; email: *orders@comm-2000.com;* website: *https://ulstandards.ul.com/* or *www.comm-2000.com.*

[4] ANSI/ASHRAE Standard 15–2019. Safety Standard for Refrigeration Systems, Copyright 2019, including the following addenda to ANSI/ASHRAE Standard 15–2019, Safety Standard for Refrigeration Systems:
Addendum a, ANSI—approved February 6, 2020.
Addendum b, ANSI—approved February 6, 2020.
Addendum c, ANSI—approved September 1, 2020.
Addendum d, ANSI—approved April 29, 2022.
Addendum e, ANSI—approved January 27, 2022.
Addendum f, ANSI—approved September 30, 2020.
Addendum i, ANSI—approved July 31, 2020.
Addendum j, ANSI—approved October 30, 2020.
Addendum k, ANSI—approved October 30, 2020.
Addendum m, ANSI—approved June 30, 2022.
Addendum n, ANSI—approved May 31, 2022.

Addendum o, ANSI—approved April 29, 2022.
Addendum q, ANSI—approved May 31, 2022.
Addendum r, ANSI—approved May 31, 2022.
[5] UL 60335–2–40, Standard for Safety: Household And Similar Electrical Appliances—Safety—Part 2–40: Particular Requirements for Electrical Heat Pumps, Air-Conditioners and Dehumidifiers, 3rd edition, Dated November 1, 2019.
[6] UL 61010–2–011, Standard for Safety: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use—Part 011: Particular Requirements for Refrigerating Equipment, 2nd edition, Dated May 13, 2021.

FIRE SUPPRESSION AND EXPLOSION PROTECTION AGENTS—ACCEPTABLE SUBJECT TO USE CONDITIONS

End-use	Substitute	Decision	Use conditions	Further information
1. Total Flooding	2–BTP	Acceptable Subject to Use Conditions.	Acceptable only for use in normally unoccupied spaces under 500 ft^3.	This fire suppressant has a relatively low GWP of 0.23–0.26 and a short atmospheric lifetime of approximately seven days. This agent is subject to a TSCA section 5(a)(2) SNUR. For establishments manufacturing, installing and maintaining equipment using this agent, EPA recommends the following: • This agent should be used in accordance with the safety guidelines in the latest edition of NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems; [1] • In the case that 2–BTP is inhaled, person(s) should be immediately removed and exposed to fresh air; if breathing is difficult, person(s) should seek medical attention; • Eye wash and quick drench facilities should be available. In case of ocular exposure, person(s) should immediately flush the eyes, including under the eyelids, with fresh water and move to a non-contaminated area; • Exposed persons should remove all contaminated clothing and footwear to avoid irritation; and medical attention should be sought if irritation develops or persists; • Although unlikely, in case of ingestion of 2–BTP, the person(s) should consult a physician immediately; • Manufacturing space should be equipped with specialized engineering controls and well ventilated with a local exhaust system and low-lying source ventilation to effectively mitigate potential occupational exposure; regular testing and monitoring of the workplace atmosphere should be conducted; • Employees responsible for chemical processing should wear the appropriate PPE, such as protective gloves, tightly sealed goggles, protective work clothing, and suitable respiratory protection in case of accidental release or insufficient ventilation; • All spills should be cleaned up immediately in accordance with good industrial hygiene practices; and • Training for safe handling procedures should be provided to all employees that would be likely to handle containers of the agent or extinguishing units filled with the agent. • Safety features that are typical of total flooding systems such as predischarge alarms, time delays, and system abort switches should be provided, as directed by applicable OSHA regulations and NFPA standards.[1] Use of this agent should also conform to relevant OSHA requirements, including 29 CFR 1910.160 and 1910.162. See notes 1 through 5 to this table.
2. Streaming	2–BTP	Acceptable, Subject to Use Conditions.	Acceptable only for use in non-residential applications, except for commercial home office and personal watercraft.	This fire suppressant has a relatively low GWP of 0.23–0.26 and a short atmospheric lifetime of approximately seven days. This agent is subject to a TSCA section 5(a)(2) SNUR. For establishments manufacturing, installing and maintaining equipment using this agent, EPA recommends the following: • This agent should be used in accordance with the safety guidelines in the latest edition of NFPA 10, Standard for Portable Fire Extinguishers; [1] • In the case that 2–BTP is inhaled, person(s) should be immediately removed and exposed to fresh air; if breathing is difficult, person(s) should seek medical attention; • Eye wash and quick drench facilities should be available. In case of ocular exposure, person(s) should immediately flush the eyes, including under the eyelids, with fresh water and move to a non-contaminated area; • Exposed persons should remove all contaminated clothing and footwear to avoid irritation; and medical attention should be sought if irritation develops or persists; • Although unlikely, in case of ingestion of 2–BTP, the person(s) should consult a physician immediately;

FIRE SUPPRESSION AND EXPLOSION PROTECTION AGENTS—ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
				• Manufacturing space should be equipped with specialized engineering controls and well ventilated with a local exhaust system and low-lying source ventilation to effectively mitigate potential occupational exposure; regular testing and monitoring of the workplace atmosphere should be conducted; • Employees responsible for chemical processing should wear the appropriate PPE, such as protective gloves, tightly sealed goggles, protective work clothing, and suitable respiratory protection in case of accidental release or insufficient ventilation; • All spills should be cleaned up immediately in accordance with good industrial hygiene practices; and • Training for safe handling procedures should be provided to all employees that would be likely to handle containers of the agent or extinguishing units filled with the agent. See notes 1 through 5 to this table.
3. Total Flooding	EXXFIRE®	Acceptable Subject to Use Conditions.	Acceptable only for use in normally unoccupied spaces.	Use of this agent should be in accordance with the safety guidelines in the latest edition of the NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems.[1] For establishments manufacturing, installing and maintaining equipment using this agent, EPA recommends the following: • In the case that EXXFIRE® is inhaled, person(s) should be immediately removed and exposed to fresh air. • Eye wash and quick drench facilities should be available. In case of ocular exposure, person(s) should immediately flush the eyes with water for a minimum of 15 minutes. • In the case of dermal exposure, the SDS recommends that person(s) should remove large grain particles, rinse with water for a minimum of 15 minutes, and remove all contaminated clothing. • Manufacturing space should be equipped with engineering controls, specifically an adequate exhaust ventilation system, to effectively mitigate potential occupational exposure. • Employees responsible for chemical processing should wear the appropriate personnel protective equipment (PPE), such as protective gloves, tightly sealed goggles, protective work clothing, and suitable respiratory protection in case of accidental release or insufficient ventilation. • All spills should be cleaned up immediately in accordance with good industrial hygiene practices. • Training for safe handling procedures should be provided to all employees that would be likely to handle containers of the agent or extinguishing units filled with the agent. • Safety features that are typical of total flooding systems such as predischarge alarms, time delays, and system abort switches should be provided, as directed by applicable OSHA regulations and NFPA standards.[1] See notes 1 through 5 to this table.
4. Total Flooding	Powdered Aerosol H.	Acceptable Subject to Use Conditions.	Acceptable only for use in normally unoccupied spaces.	Use of this agent should be in accordance with the safety guidelines in the latest edition of NFPA 2010, Standard for Fixed Aerosol Fire Extinguishing Systems.[1] For establishments manufacturing, installing, and maintaining equipment using this agent, EPA recommends the following: • Workers should use appropriate safety and protective equipment (*e.g.,* protective gloves, tightly sealed goggles, protective work clothing, and particulate-removing respirators using NIOSH type N95 or better filters) consistent with OSHA guidelines. • A local exhaust system should be installed and operated to provide adequate ventilation to reduce airborne exposure to Powdered Aerosol H constituents. • An eye wash fountain and quick drench facility should be close to the production area. • Training for safe handling procedures should be provided to all employees that would be likely to handle the containers of the agent or extinguishing units filled with the agent. • Workers responsible for cleanup should allow particulates to settle before reentering area and wear appropriate personal protective equipment. • All spills should be cleaned up immediately in accordance with good industrial hygiene practices. See notes 1 through 5 to this table.

[1] National Fire Protection Association (NFPA) standards are available from *www.nfpa.org.*

Note 1: EPA recommends that users consult Section VIII of the OSHA Technical Manual for information on selecting the appropriate types of personal protective equipment for all listed fire suppression agents. EPA has no intention of duplicating or displacing OSHA coverage related to the use of personal protective equipment (*e.g.,* respiratory protection), fire protection, hazard communication, worker training or any other occupational safety and health standard with respect to halon substitutes.

Note 2: Use of all listed fire suppression agents should conform to relevant OSHA requirements, including 29 CFR 1910.160 and 1910.162.

Note 3: Per OSHA requirements, protective gear (SCBA) should be available in the event personnel should reenter the area.

Note 4: Discharge testing should be strictly limited to that which is essential to meet safety or performance requirements.

Note 5: The agent should be recovered from the fire protection system in conjunction with testing or servicing and recycled for later use or destroyed.

[FR Doc. 2023–08663 Filed 4–27–23; 8:45 am]

BILLING CODE 6560–50–P