ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 82

[EPA–HQ–OAR–2021–0836; FRL–6399–01–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: Proposed rule.

SUMMARY: Pursuant to the U.S. Environmental Protection Agency's Significant New Alternatives Policy program, this action proposes to list certain substances as acceptable subject to use conditions in the refrigeration and air conditioning sector for chillers—comfort cooling, residential dehumidifiers, non-residential dehumidifiers, residential and light commercial air conditioning and heat pumps, and a substance as acceptable subject to use conditions and narrowed used limits in very low temperature refrigeration. Through this action, EPA is proposing to incorporate 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. Additionally, this action proposes to list certain substances as acceptable subject to use conditions in the fire suppression sector for certain streaming and total flooding uses. Finally, EPA requests advance comment on potential approaches to SNAP listing decisions for very short-lived substances that have ozone depletion potentials similar to those of ozone-depleting substances scheduled to be phased out.

DATES: Comments must be received on or before September 12, 2022. Any party requesting a public hearing must notify the contact listed below under **FOR FURTHER INFORMATION CONTACT** by 5 p.m. Eastern Daylight Time on August 2, 2022. If a virtual public hearing is held, it will take place on or before August 12, 2022 and further information will be provided on EPA's Stratospheric Ozone website at *https://www.epa.gov/snap.*

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 Programs (Mail Code 6205T), 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 proposes to list new alternatives for the refrigeration and air conditioning (AC) and fire suppression sectors. Specifically, EPA is:

- Listing hydrofluoroolefin (HFO)-1234yf, R–454A, R–454B, and R–454C as acceptable, subject to use conditions, for use in chillers used in comfort cooling, including commercial and industrial process AC;
- Listing hydrofluorocarbon (HFC)–32 and R–452B as acceptable, subject to use conditions, for use in scroll and rotary chillers used in comfort cooling, including commercial and industrial process AC;
- 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 non-residential dehumidifiers;
- Listing HFC–32 as acceptable, subject to use conditions, for use in self-contained room air conditioners (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 ft^3;
- Listing of EXXFIRE® as acceptable, subject to use conditions, in total flooding—for normally unoccupied areas; and
- Listing of Powdered Aerosol H, also known as Pyroquench-α™, as acceptable, subject to use conditions, in total flooding—for normally unoccupied areas.

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

Additionally, EPA requests advance comment on potential approaches to SNAP listing decisions for very short-lived substances (VSLS) that have ozone depletion potentials (ODPs) similar to those of class II ozone-depleting substances (ODS) that are currently being phased out, in particular trifluoroiodomethane (CF_3I) and blends containing CF_3I. EPA is not proposing to include any regulatory requirements with respect to such VSLS in this rulemaking.

EPA is not requesting comment on the republication of the first six entries of the table titled ''Substitutes That Are Acceptable Subject to Use Conditions''. Those entries are being 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.

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)) 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) 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
ACCA—Air Conditioning Contractors of America
ACGIH—American Conference of Governmental Industrial Hygienists
AEL—Acceptable Exposure Limit
AIHA—American Industrial Hygiene Association
AHRI—Air-Conditioning, Heating, and Refrigeration Institute
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
CO_2—Carbon Dioxide
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.
IPCC—Intergovernmental Panel on Climate Change
LFL—Lower Flammability Limit
LOAEL—Lowest Observed Adverse Effect Level
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
ODP—Ozone Depletion Potential
ODS—Ozone Depleting Substances
OMB—United States Office of Management and Budget
OSHA—United States Occupational Safety and Health Administration
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
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
VSLS—Very Short-Lived Substances
VLTR—Very Low Temperature Refrigeration
WEEL—Workplace Environmental Exposure Limit
WMO—World Meteorological Organization

II. What is EPA proposing in this action?

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

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]

Today's proposed rulemaking is proposing to find HFC–32, HFO–1234yf, and the four refrigerant blends acceptable subject to use conditions as substitutes in certain types of chillers. This proposed listing for HFO–1234yf, R–454A, R–454B, and R–454C applies to all compressor types of chillers, *i.e.,* centrifugal and positive displacement (including reciprocating, screw, scroll and rotary) chillers, while the proposed listing for HFC–32 and R–452B applies to only scroll and rotary chillers. The proposed listings are for comfort cooling applications of such chillers under EPA's proposed use conditions, including but not limited to use in commercial AC and industrial process AC.

Several use conditions proposed for chillers are identical to those proposed for other end-uses (residential dehumidifiers, non-residential dehumidifiers, and residential and light commercial AC and HPs) proposed in sections II.B, II.C, 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 below. For chillers, EPA is also proposing an additional use condition related to adherence to the ASHRAE 15–2019 standard. In summary, the common use conditions proposed 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 chillers 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'' (hereafter in this section, ''UL Standard''). If this rule is finalized as proposed, in cases where the final rule would include requirements different than those of the 3rd edition of UL Standard 60335–2–40, EPA is proposing that the appliance would need to meet the requirements of the final rule in place of the requirements in the UL Standard. See section II.E below for further discussion on the requirements of this standard that EPA is proposing to incorporate by reference.

(3) Warning labels—Several warning labels are proposed 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 (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 shall have marked service ports, pipes, hoses and other devices through which the refrigerant is serviced. Markings shall extend at least 1 inch (25 millimeters) from the servicing port and shall be replaced if removed.

For chillers, EPA is also proposing a use condition related to adherence to the ASHRAE 15–2019 standard in addition to those common proposed use conditions. Specifically, we are proposing that these refrigerants may only be used in chillers that meet all

[1] In this proposed 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 proposed rule.

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

requirements listed in the American National Standards Institute (ANSI)/ ASHRAE Standard 15–2019 (hereafter ''ASHRAE Standard''). If this rule is finalized as proposed, in cases where the final rule would include requirements different than those of ASHRAE Standard 15–2019,[3] EPA is proposing that the appliance would need to meet the requirements of the final rule in place of the requirements in the ASHRAE Standard. EPA is also proposing that if this rule is finalized as proposed, in cases where similar requirements of ASHRAE Standard 15 and UL Standard 60335–2–40 differ, the more stringent or conservative condition shall apply unless superseded by the final rule. This additional use condition is discussed further in section II.A.4 below.

The regulatory text of the proposed decisions appears in tables at the end of this document. If finalized as proposed, this text would be codified in appendix X of 40 CFR part 82, subpart G. The proposed regulatory text contains listing decisions for the end-uses discussed above. EPA notes that there may be other legal obligations pertaining to the manufacture, use, handling, and disposal of the proposed refrigerants that are not included in the information listed in the tables (*e.g.,* the CAA section 608(c)(2) prohibition on 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 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 Industrial Process AC

This proposal 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 the UL Standard applies to 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.'' We 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 proposing 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 listings proposed today would apply to all types of chillers in comfort cooling applications.

2. What are the American Society of Heating, Refrigerating and Air-Conditioning Engineers (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).[4] 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

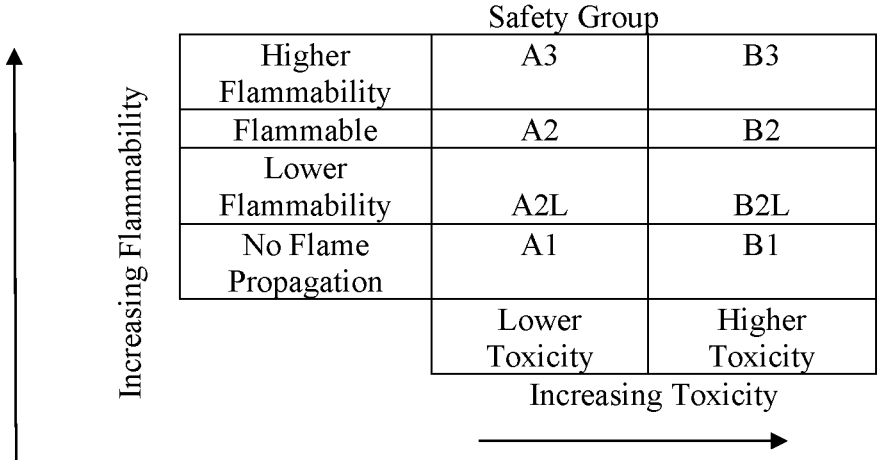
[3] ASHRAE, 2019b. American National Standards Institute (ANSI)/American Society for Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 15. Safety Standard for Refrigeration Systems. 2019.

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

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.

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 the proposed rulemaking 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 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 proposed rule.[5] [6] [7] [8] [9] [10]

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

HFO–1234yf has a 100-year integrated global warming potential (GWP) of less than one to four. [11] [12] [13] 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 one to four, respectively.[14] 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

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

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

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

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

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

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

[11] World Meteorological Organization (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, World Meteorological Organization, Geneva, Switzerland, *http://ozone.unep.org/science/assessment/sap.* (WMO, 2018).

[12] 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.cogci.dk/network/OJN_174_CF3CF=CH2.pdf.*

[13] 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.

[14] 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.

blends, HFC–125, are excluded from EPA's regulatory definition of volatile organic compounds (VOC) (see 40 CFR 51.100(s)) addressing the development of State Implementation Plans (SIPs) to attain and maintain the National Ambient Air Quality Standards (NAAQS). That definition provides that ''any compound of carbon'' which ''participates in atmospheric photochemical reactions'' is considered a VOC unless expressly excluded in that provision based on a determination of ''negligible photochemical reactivity.'' Knowingly venting or otherwise knowingly releasing or disposing of these refrigerants in the course of maintaining, servicing, repairing or disposing of an appliance or industrial process refrigeration is prohibited as provided in section 608(c)(2) of the CAA and EPA's regulations at 40 CFR 82.154(a)(1).

Flammability information: HFO–1234yf, HFC–32 and the four refrigerant blends have lower flammability. All have an ASHRAE flammability classification of 2L.

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 AELs, 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 use conditions proposed (including adherence to ASHRAE Standard 15), and other safety precautions common to the refrigeration and AC industry.

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).[15] 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).[16] 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. For scroll and rotary chillers, 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 R–410A, with a GWP of approximately 2,090, which is the refrigerant that has typically been employed in such systems. EPA listed R–410A as unacceptable for chillers as of January 1, 2024. Our initial evaluation is that the characteristics of these two alternatives meet the technical needs of scroll and rotary chillers while lower-GWP alternatives do not. For instance, under the Air-Conditioning, Heating, and Refrigeration Institute's (AHRI) Low-GWP Alternative Refrigerants Evaluation Program, manufacturers specifically chose HFC–32 amongst others to test in scroll chillers [17] but not in screw chillers.[18] EPA understands that the decision to investigate this refrigerant in scroll chillers was made because it has the higher volumetric capacity that is needed for this type of compressor. This thermodynamic property 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. In contrast, for other types of compressors, such as centrifugal, reciprocating, and screw, the higher volumetric capacity is not required; lower-GWP refrigerants, such as HCFO–1233zd(E), R–450A, and R–513A, with GWPs ranging from less than one to 630, are available and meet technical needs for those compressor types.

HFC–32's and the four refrigerant blends' GWPs, ranging from about 150 to 700, are higher than those of some of the acceptable substitutes for new industrial process AC, 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 industrial process AC, such as HFC–134a, R–410A, and R–507A with GWPs of 1,430, 2,090 and 3,990 respectively. HFO–1234yf's GWP of one to four is comparable to or lower than that of other acceptable substitutes for new industrial process AC, 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 industrial process AC are comparable to or lower than toxicity risks of other available substitutes in the same end-uses. Toxicity risks of the

[15] 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.

[16] 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.''

[17] For example, test report #46 (*https://ahrinet.org/App_Content/ahri/files/RESEARCH/AREP_Final_Reports/AHRI%20Low-GWP%20AREP-Rpt-046.pdf*).

[18] For example, test report #7 (*https://ahrinet.org/App_Content/ahri/files/RESEARCH/AREP_Final_Reports/AHRI%20Low-GWP%20AREP-Rpt-024.pdf*) and test report #25 (*https://ahrinet.org/App_Content/ahri/files/RESEARCH/AREP_Final_Reports/AHRI%20Low-GWP%20AREP-Rpt-025.pdf*).

proposed refrigerants can be minimized by use consistent with ASHRAE 15—which would be required by our proposed use conditions—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 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 flammability risk than other available substitutes in the same end-uses, this risk can be minimized by use consistent with ASHRAE 15—which would be required by our proposed use conditions—and other industry standards such as UL 60335–2–40—which is also required by our proposed use conditions—as well as recommendations in the manufacturers' SDS and other safety precautions common in the refrigeration and AC industry. EPA is proposing 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 proposing 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 might apply, such as for instance ANSI/ASHRAE 15–2019. Hence, EPA is including adherence to both standards as use conditions for chillers, broadening the coverage under this proposed rule.

EPA is proposing that ANSI/ASHRAE Standard 15–2019, with all addenda published to date of this proposal, including addenda a, b, c, d, e, f, i, j, k, n, o, q, and r apply specifically to chillers. Where the requirements specified in this proposed rule (if finalized) and ASHRAE Standard 15 are different, the requirements of this proposed rule (if finalized) would apply. In cases where similar requirements of ASHRAE Standard 15 and UL Standard 60335–2–40 differ, EPA proposes that the more stringent or conservative condition would apply.

A summary of certain aspects of ASHRAE Standard 15 is provided here for information only. This is not meant to be a full explanation of the Standard or how it is applied. ASHRAE Standard 15 specifies requirements for refrigeration systems,[19] 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.

EPA recognizes that ASHRAE Standard 15 is undergoing revisions and is typically updated and republished every three years. While this proposed rule incorporates all addenda published by the date of this proposal, the 2022 version of the standard may incorporate additional changes. ASHRAE standards are open for public comment and participation following ANSI requirements.

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

EPA is providing additional information related to these proposed 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 proposed 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.

6. On which topics is EPA specifically requesting comment?

EPA is requesting comment on all aspects of the proposed listing decision above for use of HFC–32 and R–452B in scroll and rotary chillers. EPA is also requesting comment on the proposal to list HFO–1234yf, R–454A, R–454B, and R–454C acceptable in all chillers. We request comment on our initial evaluation and our proposal to find HFC–32 and R–452B acceptable, subject to use conditions, for use only in scroll and rotary chillers. EPA also seeks specific comments on the use conditions including the proposed requirements to comply with both the third edition of UL Standard 60335–2–40 and ASHRAE 15–2019 including published addenda. With respect to these standards, EPA is requesting comment on the risk mitigation offered by compliance with the current version of the standards proposed as use conditions, the nature of updates proposed for these standards, and the expected timeline for those updates. EPA is requesting comment on the applicability of UL Standard 60335–2–40, 3rd Edition to chillers, including which chillers and under which applications the standard applies, as well as on the applicability of ASHRAE Standard 15–2019 with the addenda published to date.

EPA recognizes that these standards are undergoing revision. Both UL and ASHRAE standards are open for public comment and participation following ANSI requirements. UL opened for comment a proposed 4th edition of this standard as an update to the 3rd Edition to which comments were due March 1, 2022. If the final 4th edition is published before EPA takes final action on today's proposed listings that would incorporate the 3rd edition by reference, EPA may incorporate the 4th Edition by reference into those listings in lieu of the 3rd Edition. Similarly, ASHRAE has opened for comment a 2022 version of ANSI/ASHRAE 15. If the final 2022 edition of ASHRAE 15 is published before EPA takes final action on today's proposed listings that would incorporate the 2019 edition by reference, EPA may incorporate the 2022 edition by reference into those listings in lieu of the 2019 edition. If either revised standard becomes final before EPA takes final action on these

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

listings, EPA anticipates reopening or extending the public comment period to provide an opportunity for public comment on incorporating the final 4th edition of UL 60335–2–40 or the final 2022 edition of ASHRAE 15 by reference into those listings.

B. Residential Dehumidifiers—Proposed 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 End-Use

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).

Several use conditions proposed for residential dehumidifiers are common to those proposed for other end-uses in section II.A, above, and II.C and II.D, below. Because of this similarity, EPA discusses the use conditions that would apply to all four end-uses in section II.E. For residential dehumidifiers, those are the only use conditions EPA is proposing. In summary the use conditions proposed 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 residential dehumidifiers that meet all requirements listed in the 3rd edition, dated November 1, 2019, of Underwriters Laboratories (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). If this rule is finalized as proposed, in cases where the final rule would include requirements different from those of the 3rd edition of UL Standard 60335–2–40, EPA is proposing that the appliance would need to meet the requirements of the final rule in place of the requirements in the UL Standard. See section II.E below for further discussion on the requirements of this standard that EPA is proposing to incorporate by reference.

(3) Warning labels—Several warning labels are proposed 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.

The regulatory text of the proposed decisions appears in tables at the end of this document. If finalized as proposed, this text would be codified in appendix X of 40 CFR part 82, subpart G. The proposed regulatory text contains listing decisions for the end-use discussed above. EPA notes that there may be other legal obligations pertaining to the manufacture, use, handling, and disposal of the proposed refrigerants that are not included in the information listed in the tables (*e.g.,* the CAA section 608(c)(2) prohibition on 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, 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.[20] 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).

Today's proposal, if finalized, would find 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 air conditioning 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 HP.

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.

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

[20] 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.

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 proposed rule.[21] [22] [23] [24] [25] [26]

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).[27] 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.

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

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

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

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

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

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

[27] 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.''

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 proposed 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, required by our proposed use conditions, as well as recommendations in the manufacturers' SDS and other safety precautions common in the refrigeration and AC industry. EPA is proposing 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 proposing these specific use conditions?

EPA is proposing to list HFO–1234yf, HFC–32 and the four refrigerant blends as acceptable, subject to use conditions, for use in residential dehumidifiers for new equipment. The use conditions identified in the listing above are explained below in section II.E.1 in greater detail.

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

EPA is providing additional information related to these proposed 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 proposed 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.

6. On which topics is EPA specifically requesting comment?

EPA is requesting comment on all aspects of the proposed listing decision in section II.B above, proposing to find HFO–1234yf, HFC–32, and the four refrigerant blends acceptable, subject to use conditions, in new residential dehumidifiers. EPA seeks comment on the risk mitigation offered by the use conditions proposed, including requiring compliance with the third edition of UL Standard 60335–2–40, except to the extent the proposed rule conflicts with the UL Standard, in which case we propose that the conditions specified in the proposed rule would apply if finalized. We also request comment on whether EPA should consider other use conditions to further mitigate potential risk from refrigerants. EPA requests comment on whether residential dehumidifiers have been designed for the refrigerants proposed and any information on the safety of such equipment in other countries, and if and how such experience would translate to safe use in the United States. EPA also requests comment on our description of different types of dehumidifiers and how EPA classifies different types in different end-uses.

C. Non-Residential Dehumidifiers—Proposed Listing of HFC–32 as Acceptable, Subject to Use Conditions, for Use in New Non-Residential Dehumidifiers End-Use

EPA is proposing to list HFC–32 as acceptable, subject to use conditions for use in new non-residential dehumidifiers. 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).

The use conditions proposed for non-residential dehumidifiers are the same as those proposed for residential dehumidifiers. The use conditions are common to those proposed for other end-uses in section II.A and II.B, above, and II.D, below. Because of this similarity, EPA discusses the use

conditions that would apply to all four end-uses in section II.DE. In summary, the use conditions proposed 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 non-residential dehumidifiers that meet all requirements for dehumidifiers listed in the 3rd edition, dated November 1, 2019, of Underwriters Laboratories (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). If this rule is finalized as proposed, in cases where the final rule would include requirements different from those of the 3rd edition of UL Standard 60335–2–40, EPA is proposing that the appliance would need to meet the requirements of the final rule in place of the requirements in the UL Standard. See section II.E below for further discussion on the requirements of this standard that EPA is proposing to incorporate by reference.

(3) Warning labels—Several warning labels are proposed 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 non-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.

The regulatory text of the proposed decisions appears in tables at the end of this document. If finalized as proposed, this text would be codified in appendix X of 40 CFR part 82, subpart G. The proposed regulatory text contains listing decisions for the end-use discussed above. EPA notes that there may be other legal obligations pertaining to the manufacture, use, handling, and disposal of the proposed refrigerants that are not included in the information listed in the tables (*e.g.,* the CAA section 608(c)(2) prohibition on 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, or Department of Transportation requirements for transport of flammable gases). Flammable refrigerants being recovered or otherwise disposed of from non-residential dehumidifiers are likely to be hazardous waste under RCRA (see 40 CFR parts 260–270).

1. Background on Non-Residential Dehumidifiers

Today's proposal would create a new SNAP end-use for non-residential dehumidifiers. As described in section II.B.1 above, while AC systems often combine cooling and dehumidification, the non-residential dehumidifier end-use serves only the latter purpose. This equipment is self-contained and circulates air from a room, passes it through a cooling coil, and collects condensed water for disposal. Non-residential dehumidifiers are similar in function to residential dehumidifiers described in section II.B.1 above, but are used in spaces not covered by residential use (see definition provided in section II.B.1 above). These types of non-residential spaces include commercial, industrial, or agricultural spaces (*e.g.,* grow-rooms for plants) to provide finely controlled environments with temperature and humidity monitored carefully to ensure optimal conditions (*e.g.,* plant growth). Examples of non-residential settings where self-contained dehumidifiers are used include food production and preparation where excessive humidity could damage the product or to manage humidity in greenhouses to protect crops. This type of equipment falls 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.''

2. What are the ASHRAE classifications for refrigerant flammability?

HFC–32 is a lower flammability refrigerant with an ASHRAE safety classification of A2L. 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.

The redacted submission 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 this substitute. This assessment is available in the docket for this proposed rule.[28]

Because EPA is proposing new non-residential self-contained dehumidifiers as a new end-use, there are no other listed substitutes to compare to HFC–32.

4. Why is EPA proposing these specific use conditions?

The use conditions identified in the listing above are explained below in section II.E.1 in greater detail.

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

EPA is providing additional information related to these proposed 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 proposed 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.

6. On which topics is EPA specifically requesting comment?

EPA is requesting comment on all aspects of the proposed listing decision in section II.C above, proposing to find HFC–32 acceptable, subject to use conditions, in non-residential dehumidifiers. EPA seeks comment on the risk mitigation offered by the use conditions proposed, including requiring compliance with the third edition of UL Standard 60335–2–40, except to the extent the proposed rule conflicts with the UL Standard, in which case we propose that the conditions specified in the proposed rule would apply if finalized. We also request comment on whether other use conditions would offer needed risk mitigation for the flammable refrigerants proposed. EPA requests comment on whether non-residential dehumidifiers have been designed for the refrigerant proposed, HFC–32, any information on the safety of such equipment in other countries, and if and how such experience would translate to safe use in the United States. EPA also requests

[28] ICF, 2022m. Risk Screen on Substitutes in Non-residential Dehumidifiers (New Equipment); Substitute: HFC–32.

comment on our description of different types of dehumidifiers and how EPA classifies different types in different end-uses.

D. Residential and Light Commercial AC and Heat Pumps (HPs)—Proposed Revision of Use Conditions Provided in the Previous Listing of HFC–32 as Acceptable, Subject to Use Conditions, 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). Today we are proposing to update those use conditions to be consistent with use conditions applied to other refrigerants with lower flammability as finalized in SNAP Rule 23 (86 FR 24444; May 6, 2021). The proposed use conditions would be required on all such equipment manufactured on or after the effective date of the final rule and would not apply to or affect equipment manufactured before the effective date of the final action and manufactured in compliance with the SNAP requirements applicable at the time of manufacture.

1. Background on Self-Contained Room ACs and HPs

EPA provided an overview of the residential and light commercial AC and HPs end-use, and the self-contained equipment category within that end-use, in SNAP Rule 19 (80 FR 19461; April 10, 2015) and the Notice of Proposed Rulemaking for SNAP Rule 23 (85 FR 35881–35882; June 12, 2020). We believe the descriptions there adequately describe the end-use category as it exists today.

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.

A redacted submission and supporting documentation for HFC–32 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 this substitute, available in the docket for this proposed rule.[29]

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 currently apply 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 packaged terminal air conditioner (PTAC) units, packaged terminal heat pumps (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 an ignition source (*e.g.,* static electricity, a spark resulting from a closing door, or a cigarette), an explosion or a fire could occur if the concentration of HFC–32 were to exceed the LFL of 144,000 ppm by volume.

To address flammability, EPA listed HFC–32 as acceptable, subject to use conditions, in new self-contained room AC units. The current use conditions address safe use of this flammable refrigerant and include 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 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 proposing?

EPA is proposing to update the use conditions that apply to HFC–32 in new self-contained room ACs and HPs for

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

equipment manufactured after the effective date of a final rule based on this proposal. Several of the updated use conditions proposed for self-contained room ACs and HPs are common to those proposed for other end-uses in sections II.A, II.B, and II.C above. Because of this similarity, EPA discusses the use conditions that would apply to all four end-uses in section II.E. For HFC–32 in self-contained room ACs and HPs, these are the only use conditions EPA is proposing. In summary, with the updates proposed, the use conditions proposed 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 in the 3rd edition, dated November 1, 2019, of Underwriters Laboratories (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). If this rule is finalized as proposed, in cases where the final rule would include requirements different than those of the 3rd edition of UL Standard 60335–2–40, EPA is proposing that the appliance would need to meet the requirements of the final rule in place of the requirements in the UL Standard. See section II.E below for further discussion on the requirements of this standard that EPA is proposing to incorporate by reference. This change in the use condition updates the standard to which the equipment must comply from Supplement SA to the 8th edition, dated August 2, 2012, of UL Standard 484, ''Room Air Conditioners'' to the 3rd edition of UL 60335–2–40.

(3) Warning labels—Several warning labels are proposed 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. 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 and are based on the updated UL Standard, 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 1 inch (25mm) 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 regulatory text of the proposed decisions appears in tables at the end of this document. If finalized as proposed, this text would be codified by amending appendix R. The amendment would be to indicate that the use conditions finalized apply to HFC–32 self-contained room AC units manufactured on or after the effective date of such a final rule (which we anticipate would be 30 days after publication in the **Federal Register**). Equipment manufactured before the effective date of the final rule would not be affected by this action and would hence be subject to the use conditions included in appendix R at the time they were manufactured. The proposed revisions to the current regulatory text update the use conditions as they apply to the previous listing decision for HFC–32 in self-contained room ACs and HPs. EPA notes that there may be other legal obligations pertaining to the manufacture, use, handling, and disposal of the proposed refrigerants that are not included in the information listed in the tables (*e.g.,* the CAA section 608(c)(2) prohibition on 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, 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 proposed use conditions differ from the existing ones and why is EPA proposing to change the use conditions?

The updated use conditions EPA is proposing are similar to the ones that exist today in appendix R of 40 CFR part 82, subpart G for HFC–32 in this end-use category. The proposed requirements that HFC–32 must be used in new equipment only and must include red markings at service ports are repeated in this proposed listing. Existing room ACs using HFC–32 manufactured before the effective date of a final rule to this proposal would not be affected by these updated use conditions.

Warning labels are required under EPA's current regulations, and EPA is proposing to continue to require them, although with some specific language changes. The warning labels EPA is proposing are identical 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). EPA finds that using a common set of labels, similar to those from UL Standard 60335–2–40, 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 labels EPA is proposing use the opening word ''WARNING'' in lieu of ''DANGER'' or ''CAUTION'' and change ''Risk of Fire or Explosion'' to just ''Risk of Fire.'' EPA is proposing that the labels must be provided in letters no less than 6.4 millimeter (¼ inch) high and must be permanent, which is identical to the current requirement for HFC–32 in self-contained room ACs and HPs.

EPA is proposing to update the standard incorporated by reference in the use conditions, replacing the requirement to follow certain sections of the 2012 version of UL 484 with the proposed requirement to adhere to the 3rd edition of UL Standard 60335–2–40. UL Standard 60335–2–40 was 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 replaces the previously published version of several standards, including UL Standard 484, which had already been revised into a ninth edition by that time. 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 60335–2–40'' (86 FR 24463; May 6, 2021). Today, we are proposing 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.

Updating the UL Standard incorporated as a use condition will provide more consistency amongst 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 self-contained room ACs and HPs in SNAP Rule 23. This change will allow the industry to focus on the existing 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. Rather than requiring examination of both items and determining which charge size was lower, the proposed updated use conditions would rely on a single document, the 3rd edition of UL Standard 60335–2–40.

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

If finalized as proposed, the use conditions in this action would apply to new self-contained room ACs and HPs using HFC–32 manufactured on or after the effective date of the final rule (which we anticipate would be 30 days after publication in the **Federal Register**). The final rule would 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 as stipulated in SNAP Rule 19 and appendix R of 40 CFR part 82, subpart G at that time. EPA views equipment to be manufactured at the date upon which 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. For self-contained room ACs and HPs, this occurs at the factory. If this rule is finalized as proposed, products manufactured between May 11, 2015, and the effective date of the final rule would be required to meet the use conditions in SNAP Rule 19 (which took effect May 11, 2015) and as listed in appendix R of 40 CFR part 82, subpart G. Such products would be permitted to be warehoused and sold through normal channels, even if they are sold or installed after the effective date of the final rule based on this proposed rule. Self-contained room ACs and HPs using HFC–32 manufactured on or after the effective date of the final rule based on this proposed rule would be required to meet the use conditions so finalized and listed in the revisions to appendix R.

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

EPA is providing additional information related to these proposed 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 proposed listings. EPA notes that the additional information is similar to, but not identical with, the addition information in the listing for HFC–32 in self-contained room ACs and HPs in SNAP Rule 19. EPA is proposing additional information consistent with that included in the other proposed 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.

9. On which topics is EPA specifically requesting comment?

EPA is requesting comment on all aspects of the proposed updates to the use conditions as discussed in section II.D above. EPA requests comments on the proposed change in use conditions and if and how such change would affect the safety of self-contained room ACs and HPs using HFC–32.

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

1. What use conditions is EPA proposing and why?

As described above, EPA is proposing to list:

- HFO–1234yf, 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 industrial process AC
- HFC–32 and R–452B as acceptable, subject to use conditions, for use in scroll and rotary chillers for new equipment in comfort cooling applications, including commercial AC and industrial process AC
- 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
- HFC–32 as acceptable, subject to use conditions, for use in non-residential dehumidifiers for new equipment

In addition, EPA is proposing to update the use conditions that apply to the previous 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, II.B, and II.C, 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 proposes (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 proposing 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. EPA is unaware of information on how to address hazards if these flammable refrigerants were to be used in equipment that was designed for non-flammable refrigerants. Given the flammable nature of these refrigerants, the fact that EPA is unaware of information to assess the risk if such retrofits were allowed, and because the refrigerants were not submitted to the SNAP program for retrofits, EPA has not reviewed them for retrofit applications for this proposal and is only proposing that they may be used in new equipment which can be properly designed for their use. This proposed 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 proposing 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 (hereafter ''UL'') 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 proposing 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 and 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 proposal 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 would 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 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. 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. 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 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 this standard is undergoing revision. UL opened for comment a proposed 4th edition of this standard as an update to the 3rd Edition to which comments were due March 1, 2022. UL standards are open for public comment and participation following ANSI requirements.

Warning Labels

As a use condition or revision to existing use conditions, EPA is proposing to require labeling of chillers, residential dehumidifiers, non-residential dehumidifiers, and HFC–32 self-contained room ACs and HPs (''equipment'') containing the proposed flammable refrigerants. EPA is proposing 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:

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 non-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. 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, non-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, including chillers, 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.'' EPA expects that residential dehumidifiers, non-residential dehumidifiers, and self-contained ACs and HPs would not be ducted, but that chillers used for comfort cooling could be.

The text of the warning labels, above, is exactly the same as that required in UL 60335–2–40, with the exception of the label identified in v., which is similar to that in the UL Standard. The major difference between this proposed requirement 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 proposing in this action. EPA believes that it would be difficult to see warning labels with the minimum lettering height requirement for A2L refrigerants of 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 proposing that the minimum height for lettering must be ¼ inch as opposed to ⅛ inch, which will make it easier for technicians, consumers, retail storeowners, first responders, and those disposing the appliance to view the warning labels.

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 proposing 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 in SNAP listings, 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 aspect of the proposal 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 proposing 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 believes having two such warning methods is 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 proposed listings?

For chillers, residential, dehumidifiers, non-residential dehumidifiers, and self-contained room ACs and HPs, EPA is including recommendations, 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.

3. On which topics is EPA specifically requesting comment?

EPA is requesting comment on all aspects of the proposed use conditions described above and the appropriateness for applying these use conditions to the listings for chillers, residential dehumidifiers, and non-residential dehumidifiers, and the revisions to the listing for self-contained room ACs and HPs described in sections II.A, II.B, II.C, and II.D, respectively.

EPA is requesting comment on the applicability of UL Standard 60335–2–40, 3rd Edition, to chillers, including for which chillers and under which applications the standard applies. We likewise are requesting comment on the applicability of the UL Standard to residential dehumidifiers, non-residential dehumidifiers, and self-contained room ACs and HPs.

With regard to UL Standard 60335–2–40, EPA is requesting comment on the status of the standard, the modifications that are being or have been incorporated in it, how those modifications would change the risk associated with the use of these flammable refrigerants in these end-uses, and the appropriateness of adopting as a use condition the current (3rd) edition of this standard.

EPA recognizes that this standard is undergoing revision. UL opened for comment a proposed 4th edition of this standard as an update to the 3rd Edition to which comments were due March 1, 2022. UL standards are open for public comment and participation following ANSI requirements. If the final 4th edition is published before EPA takes final action on today's proposed listings that would incorporate the 3rd edition by reference, EPA may incorporate the 4th Edition by reference into those listings in lieu of the 3rd Edition. In that situation, EPA anticipates reopening or extending the public comment period to provide an opportunity for public comment on incorporating the final 4th edition by reference into those listings.

EPA is also requesting comment on requiring labeling, the height of the lettering, and the likelihood of labels remaining on a product throughout the lifecycle of the product, including its disposal.

F. Very Low Temperature Refrigeration (VLTR)—Proposed Listing of R–1150 as Acceptable, Subject to Use Conditions and Narrowed Use Limits, for Use in VLTR End-Use

1. Background on VLTR

The very low temperature refrigeration 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 notice of proposed 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 proposed 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 proposed rule and a warmer stage, usually classified as industrial process refrigeration, not addressed in this proposed 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.

Each of these types of laboratory equipment, including other VLTR equipment not mentioned that fit within the narrowed use limits proposed in section II.F.6, would be subject to the listing decision under this rule for R–1150 if this decision were to become final as proposed.

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

EPA is proposing to list R–1150 as acceptable, subject to use conditions and narrowed use limits, for use in VLTR equipment, including freeze-dryers, cold traps, and laboratory freezers. This proposed listing would apply to 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 proposed use conditions and narrowed use limits.

3. What is R–1150 and how does it compare with 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 (HC). 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 *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.'' [30]

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

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

and other HC refrigerants on local air quality. R–1150 is considered a VOC and not excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)) addressing the development of SIPs to attain and maintain the NAAQS. As described below, EPA estimates that potential emissions of HCs do not have a significant impact on local air quality. This includes R–1150 in VLTR, when used in the refrigeration and AC sector as substitute refrigerants in end-uses consistent with their listings under the SNAP program.[31]

In response to the increased market share of HCs, particularly in VLTR applications, EPA conducted additional analysis of various scenarios to consider the potential impacts on local air quality if HC refrigerants were used in further applications.[32] In particular, use of R–1150 in very low temperature freezers, including VLTR equipment with an industrial process refrigeration (IPR) stage using propylene, and R–1150 in retail food refrigeration systems[33] were investigated for ground-level ozone effects. The analysis first considers highly conservative modeling scenarios where a specific HC 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,[34] 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 HCs 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) HCs, 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 HCs used in Scenario 2. Scenarios 3a and 3b differentiate based on whether propylene and R–1150 would be subject to the prohibition under CAA sections 608(c)(1) and (2) against knowingly venting or otherwise knowingly releasing or disposing of any refrigerant substitute for class I or class II substances by any person maintaining, servicing, repairing, or disposing of appliances or IPR. For further information on the specific assumptions, see the docket for this rulemaking.[35]

In highly conservative Scenario 1b, examining widespread R–1150 adoption across the 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, in the more realistic scenarios 3a and 3b, 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 HCs for current refrigerants because an actual transition would likely introduce less than one kg of HC for each kg replaced. As a result of this analysis, EPA believes that the use of R–1150 consistent with the use conditions and narrowed use limits proposed would 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 are the effects of other acceptable substitutes in 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.[4] 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).[4 30]

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.[3 30]

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.[36] EPA proposes to address 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

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

[32] Ibid.

[33] 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.

[34] 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.

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

[36] 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)) addressing the development of SIPs to attain and maintain the NAAQS.

II.F.6 below for a discussion of the proposed 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 proposed 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 proposed 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 standards, 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 R–1150 because of their higher boiling points. Thus, EPA is proposing to list this substitute as acceptable subject to use conditions and narrowed use limits in VLTR.

4. What use conditions is EPA proposing?

EPA proposes the following use conditions to address flammability risks of R–1150:

(1) 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'' (hereafter in this section, ''UL Standard''). If this rule is finalized as proposed, in cases where the final rule would include requirements different than those of the UL Standard, EPA is proposing that the equipment would need to meet the requirements of the 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.''

- 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 millimeter) 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.

The regulatory text of the proposed decisions appears in tables at the end of this document. If finalized as proposed, this text would be codified in appendix X of 40 CFR part 82, subpart G. The proposed regulatory text contains listing decisions for the end-use discussed above. 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 (*e.g.,* the CAA section 608(c)(2) prohibition on 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, 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 the RCRA (see 40 CFR parts 260–270).

5. Why is EPA proposing these specific use conditions?

EPA is proposing to list 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 proposes include conditions requiring use of R–1150 in new equipment, which can be specifically designed for the refrigerant; use consistent with the UL Standard, 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 listings with specific use conditions are intended to allow for the use of this 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 proposing that R–1150 may be used only in new equipment [37] 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. EPA is unaware of

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

information on how to address hazards if this flammable refrigerant were to be used in equipment that was designed for non-flammable refrigerants. Given the flammable nature of the refrigerant, the fact that EPA is unaware of information to assess the risk if such retrofits were allowed, and because the refrigerant was not submitted to the SNAP program for retrofits, EPA has not reviewed it for retrofit applications for this proposal and is only proposing that it may be used in new equipment which can be properly designed for their use. Therefore, EPA is proposing that R–1150 may only be used in new equipment that can be properly designed for its use.

Standards

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

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 proposing 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 the UL Standard as they affect R–1150 and the end-use addressed in this section of our proposal follows. This summary is offered for information only and does not provide a complete review of the requirements in this standard. The UL Standard 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 the UL Standard 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 the UL Standard are limits on the amount of refrigerant allowed in each appliance. The limitations on refrigerant charge size for VLTR would be consistent with the UL Standard to reduce the risk to workers and consumers. EPA is proposing to require 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 proposing 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, the UL Standard 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 proposing?

EPA is proposing 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 would 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)).

7. Why is EPA proposing 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).[38] 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 proposes 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

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

air quality concerns discussed in section II.F.3 that could occur with broad use, given the larger picture of VOC and generation of ground-level ozone in areas like Los Angeles. If R–1150 were used broadly 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.

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

EPA is providing additional information related to these proposed 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 above for further discussion on what additional information EPA is including in these proposed 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.

9. On which topics is EPA specifically requesting comment?

EPA takes comment on this listing, including the proposed use conditions and narrowed use limits. In particular, EPA takes comment on the specific temperature range to which R–1150 should be limited. For example, R–1150 could instead be listed as acceptable for equipment designed to attain temperatures of −89 °C (−128.2 °F), lower than the boiling point of ethane, since ethane could attain temperatures down to −89 °C and would present lower risk of potential local air quality impacts because of lower reactivity in the lower atmosphere than R–1150. EPA also takes comment on whether R–1150 should be listed as unacceptable, given the potential local air quality impacts.

G. Streaming and Total Flooding Fire Suppression—Proposed 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 ft³

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).[39] 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 proposed listing decisions for 2–BTP?

EPA is proposing to list 2–BTP as acceptable, subject to use conditions, for use in normally unoccupied spaces under 500 ft³ in total flooding fire suppression systems. In addition, EPA proposes to list 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. 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 production operations and the filling of 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 proposed rule.[40] [41]

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 and a GWP of 0.23–0.26. The ODPs of other total flooding agents range from 0 to 0.048 and GWPs of other total flooding alternatives range from 0 to 3,500. 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 nonflammable.

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 m³ (500 ft³) during manufacture, installation, and servicing, 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

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

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

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

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.[42] 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 proposed 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, required 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 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.

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 proposed use in spaces under 500 ft^3 would require 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. 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 proposed 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.

Comparison to other fire suppressants: 2–BTP has an ODP of 0.0028, comparable to or lower than other listed 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 3,500. 2–BTP is considered a VOC and is not excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)) 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 proposing to find 2–BTP 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 nonflammable.

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

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

the risks associated with potential exposures to 2–BTP during 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 when the engineering controls and PPE requirements as referenced in the SDS for this proposed substitute are followed. The potential health risks from exposure to the proposed substitute for personnel during manufacturing is described above under total flooding applications.

EPA also assessed potential end-use exposure scenario 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).[43] 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 must follow required minimum room volumes established by UL 2129, Halocarbon Clean Agent Fire Extinguishers,[44] 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.

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 3,220. 2–BTP is considered a VOC and is not excluded from EPA's regulatory definition of VOC (see 40 CFR 51.100(s)) 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 proposing to find 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 proposing?

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

5. Why is EPA proposing these specific use conditions?

EPA is proposing to list 2–BTP as acceptable, subject to use conditions, for use in normally unoccupied spaces under 500 ft^3 in total flooding fire suppression systems. These 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 proposing to list 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 watercrafts. 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 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 proposing to list 2–BTP for use in non-residential applications other than commercial home office and personal watercraft.

6. On which topics is EPA specifically requesting comment?

EPA is requesting comment on all aspects of the proposed listing decision, including the proposed use conditions.

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

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

EPA is proposing to list EXXFIRE® as acceptable, subject to use conditions, for use in total flooding fire suppression systems in normally unoccupied spaces. 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.

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

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

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 proposed rule.[45]

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)), 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 nonflammable, 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 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 proposed 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.

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 HFCs, with GWPs up to 3,500. 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)), 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 proposing to list 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 proposing and why?

Consistent with the request by the submitter, 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.[46]

4. On which topics is EPA specifically requesting comment?

EPA is requesting comment on all aspects of the proposed listing decision, including the proposed use conditions.

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

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

EPA is proposing to list 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. Prior to activation, the Powdered Aerosol H formulation is

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

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

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 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 proposed rule.[47]

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 120 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)), addressing the development of SIPs to attain and maintain the NAAQS.

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

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 with regard to 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 should 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 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.

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 one to 120 for certain post-activation products) is comparable to or lower than that of other acceptable substitutes, such as HFC–227ea and other HFCs, with GWPs up to 3,500. 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 proposing to list 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 proposing and why?

Consistent with the submitter's request, EPA proposes 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.[48]

4. On which topics is EPA specifically requesting comment?

EPA is requesting comment on all aspects of the proposed listing decision, including the proposed use conditions.

III. Request for Advance Comment on Potential Approaches to SNAP Listing Decisions for Certain Very Short-Lived Substances

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) which includes (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. The ability of a chemical to destroy ozone is represented quantitatively by its ODP, which is the ratio of the amount of ozone that would be destroyed by the emission of a given mass of that chemical to the amount of

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

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

ozone destroyed by emission of the same mass of CFC–11. In order for a chemical to deplete stratospheric ozone, it must be transported from the troposphere, where almost all emissions occur, to the stratosphere, where release of its halogen atoms can trigger catalytic ozone destruction.

Most class I and class II ODS are fairly stable in the troposphere and persist long enough to become well-mixed in the troposphere and then be transported into the stratosphere. Because of their longer tropospheric lifetimes and tropospheric mixing, the ability of these chemicals to deplete stratospheric ozone depends little on where on the surface of the Earth or during which season the chemicals are released, and so the ability of a particular chemical to destroy ozone can reasonably be represented by a single ODP value that is constant over space and time. However, some alternatives that contain chlorine, bromine, and/or iodine are more reactive and have shorter atmospheric lifetimes. Halogenated substances with atmospheric lifetimes shorter than about six months are called very short-lived substances (VSLS). Given the shorter atmospheric lifetimes of VSLS, the location of emissions can significantly impact the amount of ozone depletion that results. Emissions at locations where atmospheric conditions quickly move VSLS to the stratosphere will result in more ozone depletion. Conversely, emissions from locations where atmospheric conditions result in VSLS moving more slowly to the stratosphere result in less ozone depletion. If there are different ODPs calculated for different regions, the reported consensus value in WMO (2018) is the upper limit of those values. While not the only source of information used by the Agency, EPA regards the quadrennial report of the Montreal Protocol's Scientific Assessment Panel as the premier source for information concerning stratospheric ozone science. Appendix A of the Scientific Assessment of Ozone Depletion: 2018 (WMO, 2018) contains a compilation of metrics, including ODPs, for ODS, ODS alternatives, and related species, based on best available data. The international scientific community considers these ODPs to be consensus ODPs.

Given the United States is a party to the Montreal Protocol with 196 other countries, we recognize the importance of a globally consistent approach to considering ODPs. A globally consistent approach to assessing risk of alternatives is also important because SNAP listing decisions are often used by other countries as a signal that the alternative is safe. Thus, considerations under the SNAP program about the ozone depletion risk of a particular chemical have been based on an ODP that is the consensus of the scientific community.

Under the SNAP program EPA has found alternatives with ODPs to be unacceptable. However, having a non-zero ODP does not necessarily make a substance unacceptable in all contexts. We have previously listed alternatives with an ODP, including listing class II substances as alternatives to class I substances—noting that many of those class II substances have subsequently been listed as unacceptable and were also listed as chemicals to be phased out under the Montreal Protocol and the Clean Air Act. We have also listed alternatives with an ODP as acceptable, subject to use restrictions. In a few cases, particularly where the ODP is several orders of magnitude below that of the class II substances, we have listed the alternative as acceptable without any use restrictions. In other words, a substitute with a measurable ODP could be determined to reduce overall risks to human health and the environment, compared with other currently or potentially available alternatives. For example, the SNAP program listed a number of class II ODS as acceptable as substitutes to class I ODS and changed the status to unacceptable when alternatives with lower ODPs became available.

The SNAP program has made some acceptability determinations regarding VSLS in the past. Two examples are given below:

- In 1995, EPA listed the VSLS trifluoroiodomethane (CF_3I) as acceptable with use restrictions for specialized total flooding fire suppression applications, noting that its ODP was then estimated to be 0.008–0.01, lower than some class II ODS listed as acceptable fire suppressants in the same end-use at that time.[49] Given the limited applications where this chemical was found to be acceptable, it has not been widely used. More recent studies have found CF_3I emissions in different regions have an ODP ranging from 0.0034 (Europe) to 0.094 (S. Asia).[50] [51] These studies were considered by WMO in their 2018 report, which lists an ODP of <0.09 for CF_3I.
- In 2012, SNAP listed HCFO–1233zd(E), a VSLS with a WMO-listed ODP of <0.0004 (WMO, 2018), as acceptable for use as a blowing agent in polyurethane foams (77 FR 47768; August 10, 2012). This VSLS has an ODP orders of magnitude below the class II substances it can replace and has become more widely used in part because of its very low ODP and GWP.

EPA's SNAP program has received a submission to find the blend R–466A acceptable in certain end uses in the refrigeration and AC sector. This blend contains CF_3I, which is listed by the World Meteorological Organization (WMO, 2018) as having an ODP of < 0.09. This is significantly higher than the ODPs of some HCFCs subject to phaseout, *e.g.,* HCFC–22 has an ODP of 0.055 and HCFC–123 has an ODP of 0.02.[52] While EPA has at times listed substitutes that have non-zero ODPs, including VSLS, as acceptable under the SNAP program, EPA has also at times listed substitutes with ODPs as unacceptable. While EPA is not proposing any action on the substitute R–466A in this proposal, we note that broad use of R–466A, containing CF_3I, for air conditioning end-uses could lead to large amounts of emissions on an ODP-weighted basis. If R–466A were to penetrate the AC market to the extent that it substituted for 10 percent of the R–410A estimated to be used annually in the United States in 2022, this would mean consumption of over 200 ODP-weighted tons using the consensus ODP values of 0.09 for CF_3I and 0.036 for R–466A. For comparison, the U.S. cap on HCFC consumption is currently 75 ODP-weighted tons annually. While HCFO–1233zd(E) is also a VSLS with potential for widespread use, the WMO-listed ODP of <0.0004 for HCFO–1233zd(E) is two orders of magnitude less than that of CF_3I and EPA's Vintaging Model estimates annual U.S. consumption at less than 5 ODP-weighted tons.

The Agency is seeking advance comment on how EPA should address VSLS within the SNAP program to inform potential future listing decisions. EPA is specifically requesting comment on the following questions:

- Should EPA consider finding a VSLS with a WMO-listed ODP that is similar to the ODP of substances that have been phased out under the CAA Title VI to be unacceptable under SNAP?

[49] 60 FR 31092, June 13, 1995.

[50] Brioude et al. (2010). Variations in ozone depletion potentials of very short-lived substances with season and emission region, *Geophys. Res. Lett., 37,* L19804, doi:10.1029/2010GL044856, 2010.

[51] Youn et al. (2010). Potential impact of iodinated replacement compounds CF_3I and CH_3I on atmospheric ozone: A three-dimensional modeling study, *Atmos. Chem. Phys., 10,* 10,129–10,144,doi:10.5194/acp-10-10129-2010, 2010.

[52] N.B. There are limitations on the use of HCFC–123 as detailed in section II.A.3 above.

- Should EPA take a more conservative approach when determining whether VSLS with ODPs similar to class II substances are acceptable alternatives under SNAP given these substances are not listed as class II substances under the CAA and therefore are not scheduled to be phased out?
- How should the Agency consider submissions of VSLS with ODPs similar to class II ODS, or blends containing such VSLS, as alternatives in light of the reality that SNAP listings are used by other countries to determine whether an alternative may be acceptable?

IV. 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)

This action does not impose any new information collection burden under the 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 an information collection burden under the PRA.

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 proposes to add 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, R–454C is not manufactured yet in the U.S. for the chillers, residential dehumidifiers, and non-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 proposed to be 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 are consistent with the most recent, updated standard; these would allow for greater consistency in business practices for different types of equipment using the same refrigerant. Equipment for HFC–32 already manufactured prior to the effective date of a final rule would not be required to be changed. Self-contained room ACs and HPs using HFC–32 have been subject to similar use conditions, and thus the updated requirements would result in no adverse impact compared with the absence of this rule. Thus, if the rule were finalized as proposed, it would not impose new costs on small entities. We have therefore concluded that this action will have no net regulatory burden for all 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 fora.

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

This action is not subject to Executive Order 13045 because the rule 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 proposed 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 uses and incorporates by reference portions of the 2019 UL Standard 60335–2–40, which establishes requirements for the evaluation of residential AC equipment and safe use of flammable refrigerants, among other things. Additionally, EPA uses and incorporates by reference portions of the 2021 UL Standard 61010–2–011, which establishes requirements for the evaluation of

laboratory equipment. These standards are discussed in greater detail in sections II.D.1 and II.E.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*; Telephone: 1–888–853–3503 in the U.S. or Canada (other countries dial 1–415–352–2178); internet address: *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 hard copy. 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 standard 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 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 telephone: 1–800–527–4723 in the U.S. or Canada; internet address: *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 hard copy. 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 proposed to be incorporated by reference is reasonably available.

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

A regulatory action may involve potential environmental justice concerns if it could: (1) Create new disproportionate impacts on people of color, communities of low-income, and/or indigenous peoples; (2) exacerbate existing disproportionate impacts on people of color, communities of low-income, and/or indigenous peoples; or (3) present opportunities to address existing disproportionate impacts on people of color, communities of low-income, and/or indigenous peoples through the action under development.

EPA believes that this action does not create disproportionately high and adverse human health or environmental effects on people of color, communities of low-income and/or indigenous peoples, as specified in Executive Order 12898 (59 FR 7629, February 16, 1994) and may help reduce any existing disproportionate impacts. The proposed 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 would 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 proposed rule is also anticipated to reduce the use and eventual emissions of potent GHGs in this end-use, 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. 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. Based on these considerations, EPA expects that the effects on people of color, communities of low-income and/or indigenous peoples would not be disproportionately high and adverse.

V. References

Unless specified otherwise, all documents are available electronically through the Federal Docket Management System at *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.

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

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. Risk Screen on Substitutes in Non-residential Dehumidifiers (New Equipment); Substitute: HFC–32.
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™.
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UL 2129, 2017. UL Standard 2129—Halocarbon Clean Agent Fire Extinguishers. Edition 3.
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, World Meteorological Organization, Geneva, Switzerland, *http://ozone.unep.org/science/assessment/sap.*
Youn et al. (2010). Youn, D., K.O. Patten, D.J. Wuebbles, H. Lee, and C.-W. So, Potential impact of iodinated replacement compounds CF_3I and CH_3I on atmospheric ozone: A three-dimensional modeling study, *Atmos. Chem. Phys., 10,* 10,129–10,144, doi:10.5194/acp-10–10129–2010, 2010.

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 proposes to amend 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 for appendix R to subpart G of part 82;

■ b. Revising the table titled ''Substitutes That Are Acceptable Subject to Use Conditions''; and

■ c. Removing the two undesignated paragraphs immediately preceding table A.

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 [Date of Publication of the Final Rule in the Federal Register] Final Rule, Effective [Date 30 Days After Date of Publication of the Final Rule in the Federal Register]

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. 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.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
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.[1323] In cases where listing 3 or 4 of this table includes requirements more stringent than those of UL 471, the appliance must meet the requirements of listing 3 or 4 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.	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. 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.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
4. Very low temperature refrigeration. Non-mechanical heat transfer (New equipment only).	Ethane (R–170)	Ethane (R–170)	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 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.	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.

5. 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.[125] In cases where listing 5 or 6 of this table includes requirements more stringent than those of UL 541, the appliance must meet the requirements of listing 5 or 6 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.	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.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
6. Vending Machines (New equipment only).	Isobutane (R–600a) Propane (R–290) R–441A.	Acceptable subject to use conditions.	As provided in clauses SA6.1.2 to SA6.1.5 of UL 541,[125] 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 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.	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.

7. 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.[124] In cases where listing 7 or 8 includes requirements more stringent than those of UL 484, the appliance must meet the requirements of listing 7 or 8 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.	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.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
8. 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.	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.	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.

9. Residential and light-commercial air conditioning and heat pumps—self-contained room air conditioners only.(New equipment only) manufactured on or after May 10, 2015 and up to but not including [Date 30 days after date of publication of the final rule in the **Federal Register**].	HFC–32	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.[124] In cases where listing 9 or 10 of this table includes requirements more stringent than those of UL 484, the appliance must meet the requirements of listing 9 or 10 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.	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.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
10. Residential and light-commercial air conditioning and heat pumps—self-contained room air conditioners only. (New equipment only) manufactured on or after May 10, 2015 and up to but not including [Date 30 days after date of publication of the final rule in the **Federal Register**].	HFC–32	Acceptable subject to use conditions.	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.	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.
11. Residential and light-commercial air conditioning and heat pumps—self-contained room air conditioners only. (New equipment only) manufactured on or after [Date 30 days after of publication of the final rule in the **Federal Register**].	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 the UL 60335–2–40.[127] In cases where this listing 11 includes requirements more stringent than those of UL 60335–2–40, the appliance must meet the requirements of this listing 11 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.

SUBSTITUTES THAT ARE ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
			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 11or 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 (25mm) 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.[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, email *fr.inspection@nara.gov,* or visit *www.archives.gov/federal-register/cfr/ibr-locations.html.*

[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 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.

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■ 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 [Date of Publication of the Final Rule in the Federal Register] Final Rule—Effective [Date 30 Days After Date of Publication of the Final Rule in the Federal Register]

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 would 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." (§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.	HFO–1234yf, 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.[135] 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.[124] 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.	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.

REFRIGERANTS—SUBSTITUTES ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
			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 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.''LI O=≥xl≥ O=≥oi3≥≤(g) For fixed equipment that is ducted, including chillers, 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 (25mm) in both directions from such locations and shall be replaced if removed.	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, 3rd edition.[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).

2. Positive Displacement chillers for comfort cooling using a rotary or scroll compressor and Industrial Process Air Conditioning using a chiller with a rotary or scroll compressor.	HFC–32, R–452B.	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 2 3] 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. These refrigerants may be used in chillers if and only if such chiller meets all requirements listed in ASHRAE 15–2019.[1] In cases where this listing 2 includes requirements different than those of ASHRAE 15–2019, the appliance must meet the requirements of this listing 2 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. 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.	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 60355–2–40.[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
			(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) 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) For fixed equipment that is ducted, including chillers, 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 (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 (25mm) in both directions from such locations and shall be replaced if removed.	

3. 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 3 includes requirements more stringent than those of UL 60335–2–40, the appliance must meet the requirements of this listing 3 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 3or 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 (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 (25mm) 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
4. Non-residential Dehumidifiers.	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 dehumidifier equipment that meets all requirements in UL 60335–2–40.[1 3 5] In cases where this listing 4 includes requirements more stringent than those of UL 60335–2–40, the appliance must meet the requirements of this listing 4 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:	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 6035–2–40.[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).

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 4 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 (25mm) in both directions from such locations and shall be replaced if removed.

REFRIGERANTS—SUBSTITUTES ACCEPTABLE SUBJECT TO USE CONDITIONS—Continued

End-use	Substitute	Decision	Use conditions	Further information
5. 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.[136] In cases where this listing 5 includes requirements more stringent than those of UL 61010–2–011, the appliance must meet the requirements of this listing 5 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 (25mm) 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.[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).

[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, email *fr.inspection@nara.gov,* or visit *www.archives.gov/federal-register/cfr/ibr-locations.html.*

[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, including all addenda published as of July 28, 2022.

[5] UL 60335–2–40, Standard for 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, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use—Part 011: Particular Requirements for Refrigerating Equipment, 2nd edition, dated May 13th, 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.

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

End-use	Substitute	Decision	Use conditions	Further information
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; • 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: The 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. The 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.

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