ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 82

[EPA–HQ–OAR–2015–0453; FRL–9950–28–OAR]

RIN 2060–AS51

Protection of Stratospheric Ozone: Update to the Refrigerant Management Requirements Under the Clean Air Act

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: The Clean Air Act prohibits the knowing release of ozone-depleting and substitute refrigerants during the course of maintaining, servicing, repairing, or disposing of appliances or industrial process refrigeration. The existing regulations require that persons maintaining, servicing, repairing, or disposing of air-conditioning and refrigeration equipment containing more than 50 pounds of refrigerant observe certain service practices that reduce emissions of ozone-depleting refrigerant. This rule updates those existing requirements as well as extends them, as appropriate, to non-ozone depleting substitute refrigerants, such as hydrofluorocarbons. Updates include strengthened leak repair requirements, recordkeeping requirements for the disposal of appliances containing more than five and less than 50 pounds of refrigerant, revisions to the technician certification program, and revisions for improved readability and compliance. As a result, this action reduces emissions of ozone-depleting substances and gases with high global warming potentials.

DATES: This final rule is effective on January 1, 2017. The incorporation by reference of certain publications listed in the regulations is approved by the Director of the Federal Register as of on January 1, 2017. This rule contains information collection activities that have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act (PRA). Under the PRA, comments on the information collection provisions are best assured of consideration if the Office of Management and Budget (OMB) receives a copy of your comments on or before December 19, 2016.

ADDRESSES: The EPA has established a docket for this action under Docket ID No. EPA–HQ–OAR–2015–0453. All documents in the docket are listed on the *www.regulations.gov* Web site. Although listed in the index, some information is not publicly available, *e.g.,* 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 *www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT: Jeremy Arling, Stratospheric Protection Division, Office of Atmospheric Programs, Mail Code 6205T, 1200 Pennsylvania Avenue NW., Washington, DC 20460; telephone number (202) 343–9055; email address *arling.jeremy@epa.gov*. You may also visit *www.epa.gov/section608* for further information about refrigerant management, other Stratospheric Ozone Protection regulations, the science of ozone layer depletion, and related topics.

SUPPLEMENTARY INFORMATION:

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List of Acronyms

AHRI Air Conditioning, Heating, and Refrigeration Institute
ARI Air Conditioning and Refrigeration Institute (now AHRI)
ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
CAA Clean Air Act
CARB California Air Resources Board
CBI Confidential Business Information
CFC Chlorofluorocarbon
CO_2 Carbon Dioxide
GHG Greenhouse Gas
GWP Global Warming Potential
HCFC Hydrochlorofluorocarbon
HFC Hydrofluorocarbon
HFO Hydrofluoroolefin
IPCC Intergovernmental Panel on Climate Change
IPR Industrial Process Refrigeration
$MMTCO_2eq$ Million Metric Tons Carbon Dioxide Equivalent
MVAC Motor Vehicle Air Conditioner
NAICS North American Industry Classification System
ODP Ozone depletion potential
ODS Ozone-depleting substance
PFC Perfluorocarbon
RCRA Resource Conservation and Recovery Act
RMP Refrigerant Management Program
SCAQMD South Coast Air Quality Management District
SNAP Significant New Alternatives Policy
UL Underwriters Laboratories

I. General Information

A. Does this action apply to me?

Categories and entities potentially regulated by this action include those who own, operate, maintain, service, repair, recycle, or dispose of refrigeration and air-conditioning appliances and refrigerants, as well as entities that manufacture or sell refrigerants, products and services for the refrigeration and air-conditioning industry, including motor vehicle air conditioning. Regulated entities include, but are not limited to, the following:

TABLE 1—POTENTIALLY AFFECTED ENTITIES

Category	North American industry classification system (NAICS) code	Examples of regulated entities
Industrial Process Refrigeration (IPR).	111, 11251, 11511, 21111, 2211, 2212, 2213, 311, 3121, 3221, 3222, 32311, 32411, 3251, 32512, 3252, 3253, 32541, 3256, 3259, 3261, 3262, 3324, 3328, 33324, 33341, 33361, 3341, 3344, 3345, 3346, 3364, 33911, 339999.	Owners or operators of refrigeration equipment used in agriculture and crop production, oil and gas extraction, ice rinks, and the manufacture of frozen food, dairy products, food and beverages, ice, petrochemicals, chemicals, machinery, medical equipment, plastics, paper, and electronics
Commercial Refrigeration	42374, 42393, 42399, 4242, 4244, 42459, 42469, 42481, 42493, 4451, 4452, 45291, 48422, 4885, 4931, 49312, 72231.	Owners or operators of refrigerated warehousing and storage facilities, supermarkets, grocery stores, warehouse clubs, supercenters, convenience stores, and refrigerated transport
Comfort Cooling	45211, 45299, 453998, 512, 522, 524, 531, 5417, 551, 561, 6111, 6112, 6113, 61151, 622, 7121, 71394, 721, 722, 813, 92.	Owners or operators of air-conditioning equipment used in the following: hospitals, office buildings, colleges and universities, metropolitan transit authorities, real estate rental & leased properties, lodging and food services, property management, schools, and public administration or other public institutions
Plumbing, Heating, and Air-Conditioning Contractors.	238220, 811111, 81131, 811412	Plumbing, heating, and air-conditioning contractors, and refrigerant recovery contractors, including automotive repair
Manufacturers and Distributors of Small Cans of Refrigerant.	325120, 441310, 447110	Automotive parts and accessories stores and industrial gas manufacturers
Reclaimers	325120, 423930, 424690, 562920, 562212.	Industrial gas manufacturers, recyclable material merchant wholesalers, materials recovery facilities, solid waste landfills, and other chemical and allied products merchant wholesalers
Disposers and Recyclers of Appliances.	423990, 562212, 562920	Materials recovery facilities, solid waste landfills, and other miscellaneous durable goods merchant wholesalers
Refrigerant Wholesalers	325120, 42, 424690	Industrial gas manufacturers, other chemical and allied products merchant wholesalers, wholesale trade
Certifying Organizations	541380	Environmental test laboratories and services

This table is not intended to be exhaustive, but rather provides a guide for readers regarding the types of entities that could potentially be regulated by this action. Other types of entities not listed in the table could also be affected. To determine whether your facility, company, business organization, or other entity is regulated by this action, you should carefully examine the regulations in subpart F and this rule. 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.

B. What action is the Agency taking?

The regulations in 40 CFR part 82, subpart F (subpart F) that are in effect before this final action takes effect (often referred to in this notice as the ''prior'' or ''previous'' regulations) require that persons servicing, maintaining, repairing, or disposing of air-conditioning and refrigeration equipment observe certain service practices that reduce emissions of ozone-depleting refrigerant. Specifically, these provisions include: Restricting the servicing of appliances and the sale of refrigerant to certified technicians; specifying the proper evacuation levels before opening an appliance; requiring the use of certified refrigerant recovery and/or recycling equipment; requiring the maintenance and repair of appliances that meet size and leak rate thresholds; requiring that refrigerant be removed from appliances prior to disposal; requiring that appliances have a servicing aperture or process stub to facilitate refrigerant recovery; requiring that refrigerant reclaimers be certified in order to reclaim and sell used refrigerant; and establishing standards for technician certification programs, recovery equipment, and quality of reclaimed refrigerant.

This rule updates the prior refrigerant management requirements in subpart F that apply to ozone-depleting refrigerants. It also extends those requirements, as appropriate, to non-ozone depleting substitute refrigerants that are not exempt from the venting prohibition, including but not limited to hydrofluorocarbons (HFCs), in order to interpret, explain, and enforce the venting prohibition.

C. What is the Agency's authority for taking this action?

Section 608 of the CAA provides EPA authority for these revisions to the regulations found at 40 CFR part 82, subpart F. EPA's authority for this rulemaking is supplemented by section 301(a), which provides authority to ''prescribe such regulations as are necessary to carry out [the EPA Administrator's] functions under this Act,'' and section 114, which provides authority for the EPA Administrator to require recordkeeping and reporting in carrying out any provision of the CAA (with certain exceptions that do not apply here). More detail on EPA's authority for this action is provided in subsequent sections.

D. What are the incremental costs and benefits of this action?

The revisions in this rule require certain businesses to take actions that have associated costs, such as conducting leak inspections, repairing leaks, and keeping records. Total annual incremental compliance costs associated with this rule are estimated to be $24.5 million per year in 2014 dollars using a 7 percent discount rate. Costs were modeled for a single typical year in which all the requirements were in effect, based on the appliance distribution modeled for 2015. Total annual operating savings associated with reduced refrigerant use are estimated to be $44 million; thus incremental compliance costs and refrigerant savings combined are estimated to be approximately $19.5 million per year. A detailed description of the comments received on the proposed analysis can be found in Section VI of this preamble as well as the response to comments document found in the docket. A full description of the technical analysis can be found in the document *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program* in the docket.

EPA estimates that this rule will prevent damage to the stratospheric ozone layer by reducing emissions of ozone-depleting refrigerants by approximately 114 metric tons per year, weighted by the ozone-depletion potential (ODP) of the gases emitted. Avoided emissions of ozone-depleting refrigerants and non-ozone depleting substitutes will also reduce climate impacts because most of these refrigerants are potent greenhouse gases. Weighted by their global warming potentials (GWP) [1], EPA estimates that the revisions will prevent annual emissions of greenhouse gases equivalent to 7.3 million metric tons of carbon dioxide ($MMTCO_2eq$). The reductions in emissions of GHGs and ODS have benefits for human health and the environment because of the threats these substances pose to human health and the environment. Such threats are discussed further in Section II.D of this notice.

TABLE 2—ANNUAL GHG AND ODS EMISSIONS AVOIDED

Rule component	GHG emissions avoided ($MTCO_2eq$)			ODS emissions avoided (ODP-weighted MT)
	HFC	ODS	Total	ODS
Leak Repair and Inspection	.....	.....	.....	.....
Comfort Cooling	1,425,000	2,487,000	3,912,000	78
Commercial Refrigeration	1,246,000	1,077,000	2,323,000	30
IPR	275,000	169,000	444,000	5
Reporting & Recordkeeping	.....	.....	.....	.....
Self-sealing Valves on Small Cans	657,000	.....	657,000	.....
Total	3,603,000	3,733,000	7,336,000	114

Totals may not sum due to independent rounding.

Details of the methods used to estimate the benefits are discussed in Section VI of this notice and the *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program* in the docket.

E. Judicial Review

Under CAA section 307(b)(1), judicial review of this final action is available only by filing a petition for review in the U.S. Court of Appeals for the District of Columbia Circuit by January 17, 2017. This final action is a nationally applicable regulation and has nationwide scope and effect because it makes revisions to the EPA's regulations for the National Recycling and Emission Reduction Program found at 40 CFR part 82, subpart F, which are nationally applicable regulations that have nationwide scope and effect. Under CAA section 307(d)(7)(B), only an objection to this final action that was raised with reasonable specificity during the period for public comment can be raised during judicial review. This section also provides a mechanism for EPA to convene a proceeding for reconsideration, ''[i]f the person raising an objection can demonstrate to [EPA] that it was impracticable to raise such objection within [the period for public comment] or if the grounds for such objection arose after the period for public comment (but within the time specified for judicial review) and if such objection is of central relevance to the outcome of this rule.'' Any person seeking to make such a demonstration to us should submit a Petition for Reconsideration to the Office of the Administrator, Environmental Protection Agency, Room 3000, William Jefferson Clinton Building, 1200 Pennsylvania Ave. NW., Washington, DC 20460, with a copy to the person listed in the preceding **FOR FURTHER INFORMATION CONTACT** section, and the Associate General Counsel for the Air and Radiation Law Office, Office of General Counsel (Mail Code 2344–A), Environmental Protection Agency, 1200 Pennsylvania Ave. NW., Washington, DC 20460.

II. Background

A. What are ozone-depleting substances?

The stratospheric ozone layer protects life on Earth from the sun's harmful ultraviolet (UV) radiation. ODS are generally man-made chemicals that, when transported by winds into the stratosphere, release chlorine or bromine and damage that protective ozone layer. ODS are used as refrigerants, solvents, foam blowing

[1] Unless otherwise stated, GWPs stated in this document are 100-year integrated GWPs, relative to a GWP of 1 for carbon dioxide, as reported in IPCC, 2007. *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. This document is accessible at *www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html*. For blends of multiple compounds, we are weighting the GWP of each component by mass percentage in the blend.

agents, aerosol propellants, fire suppression agents, and in other smaller applications. The Clean Air Act divides ODS into two categories: Class I and class II substances. The production of new class I ODS, which includes chlorofluorocarbons (CFCs), methyl chloroform, carbon tetrachloride, halons, and other compounds has been banned for over a decade. The production of new class II substances, which are all hydrochlorofluorocarbons (HCFCs), will be phased down 99.5 percent by 2020.

The initial concern about the ozone layer in the 1970s led to a ban on the use of CFCs as aerosol propellants in several countries, including the United States. In 1985, the Vienna Convention on the Protection of the Ozone Layer was adopted to formalize international cooperation on this issue. Additional efforts resulted in the adoption of the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987. Today, all Parties to the Montreal Protocol have agreed to phase out the production and consumption of ODS controlled by the Protocol.

B. What is the National Recycling and Emission Reduction Program?

Section 608 of the CAA bears the title ''National Recycling and Emissions Reduction Program.'' Under the structure of section 608, this program has three main components. First, section 608(a) requires EPA to establish standards and requirements regarding use and disposal of class I and II substances, including a comprehensive refrigerant management program to limit emissions of ozone-depleting refrigerants. This program is to include regulations that reduce the use and emissions of class I and II substances to the lowest achievable level and that maximize the recapture and recycling of such substances. The second component, section 608(b), requires that the regulations issued pursuant to subsection (a) contain requirements for the safe disposal of class I and class II substances. The third component, section 608(c), prohibits the knowing venting, release, or disposal of ozone-depleting refrigerants and their substitutes during the maintenance, service, repair, or disposal of air-conditioning and refrigeration appliances or IPR. This prohibition is also referred to as the ''venting prohibition'' in this action. Section 608 is described in greater detail in Section III.

EPA first issued regulations under section 608 of the CAA on May 14, 1993 (58 FR 28660, ''1993 Rule''), to establish the national refrigerant management program for ozone-depleting refrigerants recovered during the maintenance, service, repair, and disposal of air-conditioning and refrigeration appliances. These regulations were intended to substantially reduce the use and emissions of ozone-depleting refrigerants.

The regulations first established in the 1993 Rule require that persons servicing air-conditioning and refrigeration equipment containing an ozone-depleting refrigerant observe certain practices that reduce emissions. They also established requirements for refrigerant recovery equipment, reclaimer certification, and technician certification, and restricted the sale of refrigerant so that only certified technicians could purchase it. In addition, they required the removal of ODS from appliances prior to disposal, and that all air-conditioning and refrigeration equipment using an ODS be provided with a servicing aperture or process stub to facilitate refrigerant recovery.

The 1993 Rule also established a requirement to repair leaking appliances containing 50 or more pounds of ODS refrigerant. The rule set an annual leak rate of 35 percent for commercial refrigeration appliances and IPR and 15 percent for comfort cooling appliances. If the applicable leak rate was exceeded, the appliance must be repaired within 30 days.

EPA revised these regulations through subsequent rulemakings published on August 19, 1994 (59 FR 42950), November 9, 1994 (59 FR 55912), August 8, 1995 (60 FR 40420), July 24, 2003 (68 FR 43786), March 12, 2004 (69 FR 11946), January 11, 2005 (70 FR 1972), May 23, 2014 (79 FR 29682), and April 10, 2015 (80 FR 19453). EPA also issued proposed rules to revise the regulations in subpart F on June 11, 1998 (63 FR 32044), elements of which were not finalized, and on December 15, 2010 (75 FR 78558), which was also not finalized. EPA is withdrawing and therefore not finalizing the 2010 proposed rule. Instead, EPA re-proposed elements of both the 1998 and the 2010 proposed rules in the notice of proposed rulemaking (80 FR 19453) for this rule.

The August 19, 1994, rule amended specific definitions, required practices, and reporting and recordkeeping requirements, as well as adopted industry standards for reclaimed ODS refrigerants.

The November 9, 1994, rule clarified the conditions under which technician certification programs were grandfathered, allowing technicians who had participated in voluntary technician training and certification programs prior to the publication of the 1993 Rule to receive formal certification. The rule also clarified the scope of the technician certification requirement and provided a limited exemption from certification requirements for apprentices.

The August 8, 1995, rule responded to a settlement agreement between EPA and the Chemical Manufacturers Association to give additional flexibility to repair or retrofit IPR appliances containing ODS. EPA allowed owners or operators additional time beyond 30 days to complete repairs and more than one year to retrofit appliances where certain conditions applied (*i.e.,* federally owned equipment located in areas subject to radiological contamination, unavailability of necessary parts for IPR, or instances where adherence to local, state, or federal laws hinder immediate repairs for IPR). EPA also clarified that purged refrigerants that have been captured and destroyed can be excluded from the leak rate calculations.

The July 24, 2003, rule finalized portions of a proposed rulemaking (61 FR 7858; February 29, 1996) that amended the recordkeeping aspects of the section 608 technician certification program, refined aspects of the refrigerant sales restriction, adopted updated versions of ARI Standards 700 [2] and 740 [3], amended several definitions, and set forth procedures for the revocation and/or suspension of approval to certify technicians and refrigerant recovery and/or recycling equipment and revocation and/or suspension procedures for certification as a refrigerant reclaimer.

The March 12, 2004, rule exempted from the venting prohibition under section 608(c)(2) specific non-ozone depleting substances that the Agency found did not pose a threat to the environment (69 FR 11946). Notably, EPA did not exempt HFC or perfluorocarbon (PFC) refrigerants from the venting prohibition. The rule clarified that regulations affecting the handling and sales of ozone-depleting refrigerants apply to blends that contain an ODS.

The January 11, 2005, rule clarified that the leak repair requirements also apply to blends that contain an ODS (70

[2] The Air Conditioning and Refrigeration Institute Standard 700, *Specification for Fluorocarbons and Other Refrigerants,* contains standards for the reclamation of used refrigerants.

[3] The Air Conditioning and Refrigeration Institute Standard 740, *Performance Rating of Refrigerant Recovery Equipment and Recovery/Recycling Equipment,* contains standards for the equipment used to recover refrigerant from air-conditioning and refrigeration appliances.

FR 1927). The rule amended the required practices and associated reporting/recordkeeping requirements and clarified certain leak repair requirements.

On December 15, 2010 (75 FR 78558, ''proposed 2010 Leak Repair Rule''), EPA proposed to create a streamlined set of leak repair requirements that are applicable to all types of appliances containing 50 or more pounds of ozone-depleting refrigerant. The rule also proposed to reduce the leak repair rates. EPA did not finalize that rule and EPA has withdrawn that proposal through this rulemaking, although, as noted above, EPA also re-proposed elements of that proposal in the notice of proposed rulemaking for this rule.

Finally, on May 23, 2014 (79 FR 29682), and April 10, 2015 (80 FR 19453), EPA expanded the list of substitute refrigerants that EPA has exempted from the CAA venting prohibition to include certain hydrocarbons in specific end-uses.

C. What developments have occurred since EPA first established the National Recycling and Emission Reduction Program?

1. Phaseout of CFCs and HCFCs

In 1993, when EPA established the refrigerant management requirements of subpart F, CFCs and HCFCs were the most commonly used refrigerants, depending on the specific application. Just six months prior, in November 1992, the Parties to the Montreal Protocol accelerated the phaseout schedule for CFCs through the Copenhagen Amendment, so that there would be a complete phaseout by 1996. The Copenhagen Amendment also established a phaseout schedule for HCFCs. The schedule for HCFCs was later amended and now calls for a 35 percent reduction in production and consumption from each Article 2 Party's (developed country's) cap by 2004, followed by a 75 percent reduction by 2010, a 90 percent reduction by 2015, a 99.5 percent reduction by 2020, and a total phaseout by 2030. From 2020 to 2030, production and consumption at only 0.5 percent of baseline is allowed solely for servicing existing air-conditioning and refrigeration equipment.

The United States chose to implement the Montreal Protocol phaseout schedule on a chemical-by-chemical basis. In 1993, as authorized by section 606 of the CAA, EPA established a phaseout schedule that eliminated HCFC–141b first and would greatly restrict HCFC–142b and HCFC–22 next, due to their high ozone depletion potentials (ODPs), followed by restrictions on all other HCFCs, and ultimately a complete phaseout (58 FR 15014, March 18, 1993, and 58 FR 65018, December 10, 1993). EPA continues to issue allowances for the production and consumption of HCFCs that have not yet been phased out. The allowance levels reflect not only phaseout schedules but also use restrictions under section 605(a) of the CAA. The phaseout schedule and allowance levels can be found at 40 CFR part 82, subpart A.

EPA established the refrigerant management program shortly before the CFC phaseout. Similarly, today's rule to update those regulations closely precedes the phaseout of HCFCs. In 2020, production and consumption of HCFCs will be limited to 0.5% of baseline, and may not include HCFC–22, the most commonly used HCFC refrigerant. The reasons for encouraging a viable CFC recycling program support the same approach for HCFCs. The 1993 Rule discussed a 1990 advance notice of proposed rulemaking regarding a national CFC recycling program. As the 1993 Rule discussed, that 1990 notice emphasized that recycling is important because it would allow the continued use of equipment requiring CFCs for service past the year in which CFC production is phased out, thereby eliminating or deferring the cost of early retirement or retrofit of such equipment. Because of the continued use of these substances in existing equipment, recycling can serve as a useful bridge to alternative products while minimizing disruption of the current capital stock of equipment. (58 FR 28661).

More than twenty years later, with the experience gained through the phaseout of CFCs, reducing emissions of HCFCs and maximizing their recovery and reclamation remains just as important for ensuring the continued viability of the current stock of equipment. The transition out of CFC and now HCFC refrigerants is one reason that it is important to update the refrigerant management regulations in subpart F.

2. Development of Non-ODS Alternatives

The universe of available refrigerants has expanded dramatically since EPA first established the refrigerant management regulations in subpart F. Under the Significant New Alternatives Policy (SNAP) program (CAA section 612), EPA identifies substitutes that pose lower overall risks to human health and the environment and must prohibit the use of substitutes for which there are other available or potentially available alternatives posing lower overall risk to human health and the environment for the same use. Thus, EPA's SNAP program does not provide a static list of alternatives. Instead, the SNAP list evolves as EPA makes decisions informed by our overall understanding of the environmental and human health impacts as well as our current knowledge about available substitutes. Under SNAP, EPA has reviewed over 400 substitutes in the refrigeration and air-conditioning; fire suppression; foam blowing; solvent cleaning; aerosols; adhesives, coatings, and inks; sterilants; and tobacco expansion sectors. To date, SNAP has issued 31 notices and 20 rulemakings listing alternatives as acceptable, acceptable subject to use conditions, acceptable subject to narrowed use limits, or unacceptable for those various end-uses.

For example, on April 10, 2015, the SNAP Program listed as acceptable, subject to use conditions, three hydrocarbons, one hydrocarbon blend, and HFC–32 as substitute refrigerants in a number of refrigeration and air-conditioning end-uses (80 FR 19454). The SNAP program has also recently listed a number of additional refrigerant options, including blends of hydrofluoroolefins (HFOs) and HFCs that have lower global warming potentials (GWPs) (October 21, 2014, 79 FR 62863; July 20, 2015, 80 FR 42870). EPA anticipates that industry will continue to develop safer alternatives and that EPA will continue to review information concerning additional refrigerant options and determine the appropriate action needed to safeguard human health and the environment.

Due to the change in the suite of acceptable refrigerants available for some end-uses, EPA anticipates that the relative amounts of different refrigerants in stocks in the United States will change, and thus that the universe of refrigerants subject to the refrigerant management program will continue to evolve. The diversity of refrigerants and the potential for cross-contamination are two reasons why it is important to clarify how all refrigerants, including non-exempt substitute refrigerants, should be handled under the refrigerant management regulations in subpart F.

3. Increased Attention to HFCs as Climate Pollutants

Domestic and international efforts to protect the ozone layer have also helped to protect the global climate, because in addition to damaging ozone in the stratosphere, CFCs and HCFCs are also potent GHGs. HFCs, which are the predominant class of compounds being used as replacements for ODS, also can

have high GWPs. As their use has increased, concern has grown over the environmental damage caused by heat trapped in the atmosphere by HFCs.

On December 7, 2009, (74 FR 66496) the Administrator issued an Endangerment Finding regarding GHGs under section 202(a) of the CAA. As part of this finding, EPA concluded that the current and projected concentrations of six key well-mixed GHGs in the atmosphere—carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), HFCs, PFCs, and sulfur hexafluoride (SF_6)—endanger both the health and welfare of current and future generations. While this finding was made specifically for the purposes of section 202(a) of the CAA, EPA is cognizant of the global climate risks generally discussed in the finding in its work to reduce emissions of HFCs and other GHGs.

i. Climate Action Plan

In June 2013, the President announced the Climate Action Plan.[4] Among the many actions called for, the Climate Action Plan outlined a set of measures to address HFCs. The Climate Action Plan states: ''to reduce emissions of HFCs, the United States can and will lead both through international diplomacy as well as domestic actions.'' Part of this international diplomacy is the proposed Amendment to the Montreal Protocol discussed below. The Climate Action Plan also directed EPA to use its authority through the SNAP program ''to encourage private sector investment in low-emissions technology by identifying and approving climate-friendly chemicals while prohibiting certain uses of the most harmful chemical alternatives.'' In July 2015, EPA finalized a rule that revised the listing status for certain substitutes previously listed as acceptable under the SNAP program (80 FR 42870). That rule revised the status of certain HFCs and HCFCs for various end-uses in the aerosols, refrigeration and air-conditioning, and foam blowing sectors. EPA made these revisions based on information showing that other substitutes are available for the same uses that pose lower risk overall to human health and the environment. A copy of the Climate Action Plan is available in the docket to this rule.

The President's Climate Action Plan also calls on the federal government to reduce emissions of HFCs by purchasing alternatives whenever feasible and transitioning to equipment that uses safer and more sustainable alternatives to HFCs. To implement the Climate Action Plan, the Department of Defense, General Services Administration, and National Aeronautics and Space Administration recently amended the Federal Acquisition Regulation to encourage the purchase of alternatives to high GWP HFCs (81 FR 30429; May 16, 2016). This rule is designed to promote the use of safer chemical alternatives to HFCs by service and vendor contractors. To help agencies monitor progress, the amendment requires contractors to keep records of and report on the amounts of HFCs added or removed during the routine maintenance, repair, or disposal of appliances with a full charge of 50 or more pounds of HFC or HFC blend refrigerant.

Minimizing the emissions and maximizing the recovery and reuse of ODS and HFC refrigerants are consistent with the Climate Action Plan. EPA estimates that the revisions finalized in this action will prevent annual emissions of refrigerant equivalent to 7.3 $MMTCO_2eq$. Of this amount, 3.6 $MMTCO_2eq$ are due to HFCs and 3.7 $MMTCO_2eq$ are due to ODS. Because of the significant environmental benefit to be gained by addressing HFC refrigerants, it is important to update the refrigerant management regulations in subpart F.

ii. Trends in HFC Use and Future Projections

Although HFCs represent a small fraction of current GHG emissions by weight, their warming impact per kilogram is very strong. The most commonly used HFC, HFC–134a, has a GWP of 1,430, which means it traps 1,430 times as much heat per kilogram as carbon dioxide does over 100 years. The majority of global, and U.S., HFC use is in the refrigeration and air conditioning sector. HFC emissions are projected to increase substantially and at an increasing rate over the next several decades if their production is left uncontrolled. In the United States, emissions of HFCs are increasing more quickly than those of any other group of GHGs, and globally they are increasing 10 to 15 percent annually. At that rate, emissions are projected to double by 2020 and triple by 2030.

HFCs are also rapidly accumulating in the atmosphere. The atmospheric concentration of HFC–134a has increased by about 10 percent per year from 2006 to 2012, and the concentrations of HFC–143a and HFC–125, which are components of commonly used refrigerant blends, have risen over 13 and 16 percent per year from 2007 to 2011, respectively. Without action, annual global emissions of HFCs are projected to rise to about 6,400 to 9,900 $MMTCO_2eq$ in 2050, which is comparable to the drop in annual GHG emissions of ODS of 8,000 $MMTCO_2eq$ between 1988 and 2010 (UNEP, 2011).

As these HFCs accumulate in the atmosphere, they change the balance between energy entering the Earth's climate from the sun and energy escaping the Earth into space. The change in the net rate at which energy enters the atmosphere is called radiative forcing. By 2050, the buildup of HFCs in the atmosphere is projected to increase radiative forcing to 0.22–0.25 W m^2. To appreciate the significance of the projected HFC radiative forcing within the context of all GHGs, the forcing from HFCs would be 6–9% of that from CO_2 in the IPCC's representative concentration pathways (RCP6 and RCP8.5) in 2050 (Velders *et al.*, 2015).

iii. Montreal Protocol Amendment Proposal

For the past six years, the United States, Canada, and Mexico have proposed an amendment to the Montreal Protocol to phase down the production and consumption of HFCs. The United States seeks adoption of an amendment that is acceptable to all Parties. Global benefits of the amendment proposal would yield significant reductions of over 90 gigatons of carbon dioxide equivalent (CO_2eq) through 2050. A number of other Parties to the Montreal Protocol have also proposed amendments to phase down global production and consumption of HFCs. These proposals were introduced by a group of Island States; the European Union; and India. On November 6, 2015, the Parties to the Montreal Protocol adopted the ''Dubai Pathway'' on HFCs, which provides that the Parties would work together, within the Montreal Protocol, to adopt an HFC amendment in 2016.

4. Petition From the Alliance for Responsible Atmospheric Policy

On January 31, 2014, the Alliance for Responsible Atmospheric Policy (the Alliance) petitioned the Agency to initiate a rulemaking to apply the section 608 refrigerant management regulations to HFCs and other substitute refrigerants. In that petition, the Alliance requested that EPA extend the section 608 regulations relating to refrigerant sales and distribution restrictions, and the evacuation, certification, reclamation and recovery, leak repair, reporting and recordkeeping

[4] The President's Climate Action Plan, 2013, *https://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf.*

requirements to HFCs. The petition argues that applying the section 608 requirements to HFCs ''would increase the environmental benefits already realized from the section 608 regulations, through reduced HFC emissions, and would complement the United States' goal of a global phase down in HFC production and consumption.'' The petition cites sections 608(c)(2) and 301(a) of the CAA as authority for these revisions. A copy of the petition is included in the docket for this rulemaking. While EPA is not taking today's action solely as a result of the Alliance petition, this rulemaking constitutes the Agency's response to the petition.

D. What are the goals of this rule?

The Agency has two goals for this rulemaking. The first is to promote the proper handling and use of ozone-depleting and substitute refrigerants. Doing so will protect the stratospheric ozone layer by reducing emissions of ODS refrigerants and protect the climate system by reducing emissions of refrigerant gases with high GWPs. High-GWP refrigerants include both ODS refrigerants and most substitute refrigerants, including HFCs, that EPA has not exempted from the venting prohibition under CAA section 608. The second goal of this rulemaking is to harmonize the requirements across all major refrigerant types and update the regulations in plain language to reduce uncertainty and complexity for the regulated community, as well as increase clarity, encourage compliance, and facilitate enforcement.

1. Promoting the Proper Handling of Refrigerants

Today's rule will reduce the use and emission of refrigerants, maximize the recapture and recycling of such substances, and further interpret, explain, and enforce the prohibition on knowingly venting or releasing refrigerants during the maintenance, service, repair, or disposal of appliances.

EPA estimates that this rule will result in annual reductions in emissions of approximately 114 ODP-weighted metric tons. A separate support document *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program* contains a full discussion of the benefits of this rule and is available in the docket.

Stratospheric ozone depletion decreases the atmosphere's ability to shield life on the Earth's surface from the sun's UV radiation. The links between stratospheric ozone depletion and public health concerns are well established. Emissions of ODS lead to chemical reactions that reduce the amount of ozone in the stratosphere. Less ozone in the stratosphere means that more UVA and UVB radiation reaches the earth's surface and is incident on exposed organisms, including humans. Adverse health effects associated with exposure to UV radiation include skin cancer, cataracts, and immune suppression. The *Scientific Assessment of Ozone Depletion*,[5] prepared by the Scientific Assessment Panel to the Montreal Protocol, and *Environmental Effects of Ozone Depletion and its Interactions with Climate Change*,[6] prepared by the Environmental Effects Assessment Panel to the Montreal Protocol provide comprehensive information regarding the links between emissions of ODS, ozone layer depletion, UV radiation, and human health effects. Both documents are available in the docket for this rule.

The most common forms of skin cancer are strongly associated with UV radiation, and UV exposure is the most preventable cause of skin cancer (U.S. Department of Health and Human Services. The Surgeon General's Call to Action to Prevent Skin Cancer. Washington, DC: U.S. Department of Health and Human Services, Office of the Surgeon General; 2014). Skin cancer is the most common form of cancer in the United States, with more than 3.5 million new cases diagnosed annually (American Cancer Society, Cancer Facts and Figures, 2015). Rates for new cases of melanoma, the most serious form of skin cancer, have been rising on average 1.4 percent each year over the last 10 years (National Cancer Institute, SEER Stat Fact Sheets: Melanoma of the Skin, available at *http://seer.cancer.gov/statfacts/html/melan.html*, accessed May 5, 2015). In 2015, it is estimated that 70,000 Americans will have been diagnosed with melanoma and almost 10,000 will have died as a result of the disease (American Cancer Society, Cancers Facts and Figures, 2015).

Non-melanoma skin cancers are less deadly than melanomas, but if left untreated they can spread, causing disfigurement and more serious health problems. There are two primary types of non-melanoma skin cancers. Basal cell carcinomas are the most common type of skin cancer tumors. Basal cell carcinoma grows slowly, and rarely spreads to other parts of the body. It can, however, penetrate to the bone and cause considerable damage. Squamous cell carcinomas are tumors that may appear as nodules or as red, scaly patches. This cancer can develop into large masses and can spread to other parts of the body.

Other UV-related skin disorders include actinic keratoses and premature aging of the skin. Actinic keratoses are skin growths that occur on body areas exposed to the sun. The face, hands, forearms, and neck are especially susceptible to this type of lesion. Although premalignant, actinic keratoses are a risk factor for squamous cell carcinoma. Chronic exposure to the sun also causes premature aging, which over time can make the skin become thick, wrinkled, and leathery.

Research has shown that UV radiation increases the likelihood of certain cataracts. (Taylor, H.R., *et al.*, 1988. *Effect of ultraviolet radiation on cataract formation*, New England Journal of Medicine, 319, 1429–33; West, S. *et al.*, 2005. *Model of Risk of Cortical Cataract in the US Population with Exposure to Increased Ultraviolet Radiation due to Stratospheric Ozone Depletion*, American Journal of Epidemiology, 162, 1080–1088.) Cataracts are a form of eye damage in which a loss of transparency in the lens of the eye clouds vision. If left untreated, cataracts can lead to blindness. Although curable with modern eye surgery, cataracts diminish the eyesight of millions of Americans. Other kinds of eye damage caused by UV radiation include pterygium (*i.e.*, tissue growth that can block vision), skin cancer around the eyes, and degeneration of the macula which contains the part of the retina where visual perception is most acute.

Another benefit of reducing refrigerant emissions is protection of the climate system. Many refrigerants, including ODS and substitutes for ODS, are potent GHGs, having GWPs thousands of times higher than that of carbon dioxide (CO_2), which has a GWP of one. For example, HCFC–22 has a GWP of 1,810. R–404A, a commonly used HFC refrigerant blend, has a GWP of 3,922. Other common HFC refrigerants, with their GWPs, include R–134a (1,430), R–410A (2,088), R–407A (2,107), and R–507A (3,985). EPA estimates that today's rule will reduce GWP-weighted emissions by approximately 7.3 $MMTCO_2eq$ per year.

[5] World Meteorological Organization (WMO), Scientific Assessment of Ozone Depletion: 2014, World Meteorological Organization, Global Ozone Research and Monitoring Project—Report No. 55, 416 pp., Geneva, Switzerland, 2014.

[6] United Nations Environment Programme, Environmental Effects Assessment Panel, Environmental effects of ozone depletion and its interactions with climate change: progress report, 2011, Photochem. Photobiol. Sci., 2012, 11, DOI: 10.1039/c1pp90033a.

To briefly summarize, GHGs cause climate change by trapping heat on Earth. The Earth is constantly receiving energy from the sun in the form of radiation, while at the same time, energy is radiating away into space, mostly as infrared radiation. By absorbing and scattering radiation that otherwise would escape into space, GHGs throw off the balance between incoming and escaping radiation, resulting in more energy in the Earth's climate system.

As described in the EPA's 2009 Endangerment Finding (74 FR 66496) and subsequent reports by the IPCC, the United States Global Change Research Program, and the National Research Council, climate change impacts threaten the health of Americans in multiple ways and touch on nearly every aspect of public welfare. For more information on GHGs and climate change in the United States, visit *www.epa.gov/climatechange*.

2. Improving Rule Effectiveness

The second goal of today's rule is to improve the clarity and effectiveness of the subpart F regulations. Achieving the health and environmental benefits of these rules depends on widespread compliance, and understanding of the regulations by the regulated community enhances compliance.

EPA has begun an initiative to improve the effectiveness of its rules called Next Generation Compliance. The vision for this initiative is to make it easier for the regulated community to understand and comply with environmental laws and inform the public about their performance. Most importantly, this initiative will help ensure that all Americans are protected from significant risks to human health and the environment and have access to information that allows them to more fully engage in environmental protection efforts.

The Agency has identified several interconnected components in the Office of Enforcement and Compliance Assurance's 2014–2017 strategic plan for its Next Generation Compliance initiative that can improve the effectiveness of rules:

- Effective Regulations: Design regulations that are clear, as easy to implement as possible, and that contain self-reinforcing drivers. For example, where possible, design regulations such that regulated facilities can take steps to monitor their own performance to prevent violations, or be certified by an independent 3rd party.
- *Advanced Monitoring:* Use advanced monitoring technology for the government, industry, and the public to more easily find information on pollutant discharges/emissions, environmental conditions, and noncompliance.
- *Electronic Reporting:* Implement electronic systems to make reporting easier, more efficient, and less costly. For the user, these systems offer speed, convenience, expanded information choices, and filing capabilities. For government, they offer the ability to increase transparency, improve our ability to spot pollution and compliance issues, and respond quickly to emerging problems.
- *Transparency:* Make the information we have today more accessible, and make new information obtained from advanced monitoring and electronic reporting publicly available.
- *Innovative Enforcement:* Use Next Generation Compliance principles and tools in enforcement planning and cases.

Effective Regulations. The Agency and industry have more than 20 years of experience implementing and operating under the refrigerant management regulations in subpart F. Through that experience, it has become clear that there are elements of the program that could be made more effective. This rule revises the structure of these regulations to clearly lay out the process for repairing refrigerant leaks and adds steps to ensure that the repairs were successful. This rule also for the first time addresses chronically leaking systems in a manner that minimizes the burden on compliant systems. EPA has reorganized the subpart so affected entities can more easily find the provisions that apply to them, including recordkeeping and reporting. This rule removes outdated requirements and, where appropriate, removes unnecessary distinctions between refrigerants, appliance types, and recovery equipment types. Clearer regulations will also be supported by comprehensive compliance assistance materials for each industry segment affected by this final regulation. EPA hopes to make it easier for the regulated community to understand their obligations when handling refrigerants, thereby improving compliance and reducing damage to the environment.

Advanced Monitoring. EPA is encouraging owners/operators of appliances containing 50 or more pounds of refrigerant to install automatic leak detection equipment. Such systems provide continuous information about whether a system is leaking, allowing leaks to be caught sooner. This can reduce both refrigerant costs and labor costs of manually inspecting refrigeration systems.

Electronic Reporting. EPA has established the email address *608reports@epa.gov* and this rule requires that all reports that do not contain confidential business information be submitted to EPA at that address. EPA is also revising the regulations to explicitly state that owners and operators of appliances subject to the leak repair provisions may use electronic systems to track when and how much refrigerant is added to equipment and to keep other required records.

Transparency. EPA is requiring members of the regulated community to post additional information online that is of use to this sector. For example, equipment testing organizations must post lists of certified recovery and/or recycling equipment on their Web sites rather than submit paper reports to EPA. Certifying organizations must also publish lists of technicians that they certify online to assist technicians who have lost their certification cards. EPA also posts to its Web site data on the amount of ODS refrigerant reclaimed each year. Under this final rule EPA will begin collecting and making available reclamation data for non-exempt substitute refrigerants which should provide EPA and the general public a greater understanding of the extent of HFC recovery and reclamation.

Innovative Enforcement. EPA has incorporated innovative enforcement principles into subpart F since its inception, and this rule updates and strengthens those principles. For example, the refrigerant sales restriction is an effective way to ensure that anyone maintaining, servicing, or repairing an appliance is a certified technician. EPA has also required certification of refrigerant recovery equipment by independent third parties (*i.e.*, UL and Air Conditioning, Heating, and Refrigeration Institute (AHRI)) to ensure that recovery equipment meets the applicable standards. This ensures that technicians who use these devices to recover refrigerant are also using equipment that, when following the manufacturer's instructions, will meet the minimum refrigerant evacuation requirements. EPA also relies on third parties to administer the technician certification exam.

E. What are the major revisions being finalized in this rule?

EPA is finalizing most of the proposed revisions to the regulations for the National Recycling and Emission Reduction Program. Some of these revisions strengthen the existing program, in particular by requiring owners and operators to repair systems

that leak at lower rates than what is currently required and to verify that those repairs were successful. Others extend, as appropriate, the regulations to HFCs and other non-exempt substitute refrigerants. Still other revisions improve the effectiveness of the regulations. After considering comments, EPA has decided not to finalize certain aspects of the proposal. This section briefly discusses the major proposed revisions and the final actions that EPA is taking. Detailed discussions of all of the revisions to the regulations finalized in this action, changes from the proposal, and responses to significant comments are in Section IV of this notice. EPA also summarizes and responds to all significant comments on the proposed action in the comment response document in the docket.

1. Extend the Regulations To Cover Substitute Refrigerants

EPA is finalizing the proposed extension of the requirements of the National Recycling and Emission Reduction Program to substitute refrigerants that have not been exempted from the venting prohibition (also referred to in this action as ''non-exempt substitutes'').

2. Strengthen Leak Repair Requirements

Prior to this rule, the leak rates for ODS equipment were 35 percent for IPR and commercial refrigeration appliances, and 15 percent for comfort cooling and other appliances. EPA proposed leak rates of 20 percent for IPR and commercial refrigeration and 10 percent for comfort cooling and other appliances. Based in part on comments received on the proposal, EPA is finalizing leak rates for ODS equipment as follows: 30 percent for IPR, 20 percent for commercial refrigeration appliances, and 10 percent for comfort cooling and other appliances. EPA is also extending the new leak rates to equipment using HFCs and other substitute refrigerants that are not exempt from the venting prohibition.

After considering public comments, EPA is modifying the proposed leak inspection requirements in this final rule. EPA proposed to require quarterly or annual leak inspections for all appliances with a full charge of 50 pounds or greater, with the more frequent inspections applying to larger systems. In the revisions finalized in this rule, EPA is requiring quarterly or annual leak inspections only for appliances that have exceeded the applicable leak rate. Similar to the proposal, owners or operators can forgo leak inspections if they install, continuously operate, and maintain automatic leak detection systems.

Based on comments, EPA has given particular attention to situations where the proposed regulations would have required the retrofit or retirement of an appliance. EPA has modified the final rule in numerous places to support the proper repair of leaking systems. Most notably, EPA is modifying the proposed chronic leaker provision. EPA proposed that appliances containing 50 or more pounds of ODS or substitute refrigerant that leak more than 75 percent of the appliance's full charge in each of two consecutive 12-month periods would have to be retired or mothballed. EPA is finalizing a requirement that owners or operators of appliances that leak 125 percent of their full charge in a calendar year must submit a report to EPA detailing their repair efforts. The report must be submitted no later than March 1 following the calendar year of the ≥125 percent leak.

3. Extend the Sales Restriction to Substitute Refrigerants, With an Exception for Small Cans of MVAC Refrigerant

EPA is finalizing the proposed restriction that non-exempt substitute refrigerants may only be sold to technicians certified under sections 608 or 609 of the CAA. In the case of MVAC refrigerant, EPA is exempting the sale of small cans of non-ODS substitutes to allow the do-it-yourself (DIY) community to continue servicing their personal vehicles. EPA is requiring that small cans of non-exempt substitute refrigerant be outfitted with self-sealing valves by January 1, 2018. Based on comments, EPA is not finalizing the proposal to prohibit the sale of small cans that do not contain self-sealing valves that were manufactured or imported prior to that requirement taking effect.

4. Establish Recordkeeping for Appliances Containing More Than 5 and Less Than 50 Pounds of ODS and Non-Exempt Substitute Refrigerant

EPA is finalizing revisions to the regulations that require that technicians, or the company employing technicians, keep records when disposing of appliances containing more than five and less than 50 pounds of refrigerant. These records include the company name, location of the appliance, date of recovery, and type of refrigerant recovered for each appliance. EPA is also finalizing, with some modification, the revision to the regulations requiring that technicians keep records of the amounts of ODS and non-exempt substitute refrigerant transferred for reclamation by refrigerant type.

EPA is reducing the burden in this final rule by only requiring maintaining records typically generated in the field during the normal disposal of appliances. Therefore, EPA is not finalizing the proposed requirement to keep records indicating the amount of refrigerant recovered from each appliance. Instead, EPA is finalizing a requirement to record the total amount of refrigerant, by type, recovered from all appliances they disposed of over a calendar month. This tally can be performed less frequently and at a central location.

5. Update the Technician Certification Program

EPA is finalizing the requirement that technicians be certified to handle HFCs and other non-exempt substitutes, as proposed. EPA is also finalizing the proposed requirement for certifying organizations to publish lists or create online databases of technicians that they certify.

6. Improving Readability and Restructuring the Requirements

EPA is finalizing the extensive revisions to the regulations in subpart F to more clearly state the requirements of the National Recycling and Emission Reduction Program and to remove potentially ambiguous language, with minor changes from the proposal. EPA is modifying some of the proposed revisions to address additional suggestions raised by commenters. EPA's intent with these edits is to improve readability, not to change the substantive content or requirements of the regulations. For edits to the regulations that are intended to be substantive, EPA is discussing those revisions in this notice. EPA is adding to the docket a red-line version of the final regulatory text from subpart F that shows the final revisions to the prior regulations to assist the regulated community in identifying the differences.

F. Enforcement of Subpart F Regulations

Subpart F regulations must be enforced to realize their full environmental and human health benefit. This section briefly presents examples of recent actions that EPA has taken to enforce the venting prohibition, leak repair, and safe disposal provisions of subpart F. Several provisions that EPA is finalizing in this rule are based on lessons learned in taking these enforcement actions. These revisions are intended to encourage compliance and facilitate potential future enforcement of

the requirements actions of these and other sections of the subpart F regulations. EPA's Web site contains more information on these enforcement actions.[7]

Some commenters stated that EPA should seek better ways to enforce the pre-existing regulations for Class I and II ODS. One commenter encouraged EPA to continue to identify cost-effective means of ensuring that the entire regulated community supports and follows lawful policies and regulations. Another commenter wrote that venting of HFCs above *de minimis* levels must be severely penalized for the rule to be as effective as possible. That commenter encouraged EPA to reiterate that EPA welcomes information and reporting on an anonymous basis regarding parties known to be venting ODS, HFCs, and any non-exempt substitute.

EPA responds that the Agency has enforced and continues to enforce these regulations in actions that range from civil fines to criminal prosecutions. EPA encourages anyone who suspects or witnesses unlawful releases of refrigerants or other violations of CAA regulations to report an environmental violation to EPA (*www.epa.gov/enforcement/report-environmental-violations*). In 2014 and 2015, EPA brought or assisted in three cases against individuals for violating the venting prohibition when cutting into the refrigerant lines to steal metal from HCFC–22 containing air conditioners. Under the plea agreement in a case from 2014, the individual cutting the refrigerant line must serve 31 months in federal prison and then remain under court supervision for an additional 12 months during which time he must perform 200 hours of community service.

EPA entered into consent decrees with the supermarket chains Safeway in 2013, Costco in 2015, and Trader Joe's in 2016 for violations of the leak repair provisions of subpart F for their commercial refrigeration units. In 2015, EPA obtained corrective action with the United States Navy to resolve allegations of failing to perform leak rate calculations when servicing comfort cooling equipment, and with DuPont for improper maintenance and repair of two large IPR units. In 2012, EPA executed consent decrees with Icicle Seafoods, American Seafoods Co. LLC, and Pacific Longline Co. LLC for failure to repair refrigerant leaks at chilling units aboard its fishing vessels and failure to verify the adequacy of repairs before resuming operations, among other violations. In March of 2016, Ocean Gold Seafoods, Inc. and Ocean Cold, LLC entered into a consent decree with EPA that resolved alleged violations for failing to promptly repair refrigerant leaks and failing to keep adequate records of the servicing of their IPR equipment necessary to prevent leaks.

EPA has executed consent decrees to resolve alleged violations of the safe disposal regulations in subpart F. These include decrees in 2016 with Parkway Iron and Metal, and in 2015 with Metal Dynamics and Basic Recycling, as well as at least forty-five non-judicial settlements against scrap recyclers in 2014 and 2015.

EPA also continues to take steps to maintain the integrity of the certification programs under subpart F. EPA recently revoked over a dozen technician certification programs that had failed to submit the required biannual activity report (81 FR 28864). EPA is also ensuring that certified refrigerant reclaimers continue to operate in accordance with § 82.164 and maintain records and submit reports in accordance with § 82.166. EPA recently published a notice announcing the previous revocation of the certification of eight refrigerant reclaimers and giving a ninth reclaimer notice of impending revocation (80 FR 75455).

G. Incorporation by Reference

This action involves technical standards. In some instances, EPA is deciding to use a modified version of an industry standard for purposes of this rule; in others, EPA is deciding to use an industry standard by incorporating it by reference exactly as written. This section summarizes the technical standards that EPA is incorporating by reference and describes how interested parties can access those standards. Sections IV.C (small cans of MVAC refrigerant), Section IV.G (recovery and/or recycling equipment), and IV.K (reclamation requirements) contain further discussion of these technical standards including comments received on EPA's proposal to incorporate certain standards by reference.

EPA is incorporating by reference UL 1963, *Requirements for Refrigerant Recovery/Recycling Equipment*, Fourth Edition, June 1, 2011 in appendix B4. This establishes standards for refrigerant recovery and refrigerant recovery/recycling equipment to ensure the equipment can be used safely with flammable refrigerants. The standard is available at *www.comm-2000.com* or by writing to Comm 2000, 151 Eastern Avenue, Bensenville, IL 60106. The cost is $798 for an electronic copy and $998 for hardcopy. UL also offers a subscription service to the Standards Certification Customer Library (SCCL) 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. Therefore, EPA concludes that the UL standard being incorporated by reference is reasonably available.

EPA is not incorporating by reference AHRI Standard 700–2016, *Specifications for Refrigerants.* Rather EPA is basing the content found in appendix A on this standard. This standard establishes purity specifications for refrigerants, and specifies the associated methods of testing for acceptability of refrigerants. The standard is available at *www.ahrinet.org* or by mail at Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201. EPA is incorporating by reference publically available versions of the standards referenced in AHRI Standard 700–2016. Specifically, these standards are:

—*2008 Appendix C for Analytical Procedures for AHRI Standard 700–2014—Normative.* This document establishes definitive test procedures for determining the quality of new, reclaimed and/or repackaged refrigerants in support of the standards established in AHRI–700. An electronic copy of the appendix is available at *www.ahrinet.org*. It is also available by mail at Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—*2012 Appendix D for Gas Chromatograms for AHRI Standard 700–2014—Informative* Air-Conditioning, Heating, and Refrigeration Institute. This appendix provides figures for the gas chromatograms used with Appendix C to AHRI Standard 700–2015: Normative. An electronic copy of the appendix is available at *www.ahrinet.org*. It is also available by mail at Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—Federal Specification for ''Fluorocarbon Refrigerants,'' BB–F–1421 B, dated March 5, 1982. This section of this standard establishes a method to determine the boiling point and boiling point range of a refrigerant. The standard is available in the docket for this rulemaking. Therefore, EPA concludes that the standard being

[7] *https://www.epa.gov/ozone-layer-protection/enforcement-actions-under-title-vi-clean-air-act.*

incorporated by reference is reasonably available.

—GPA STD–2177, *Analysis of Natural Gas Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography*, 2013, Gas Processors Association. This standard establishes methods for analyzing demethanized liquid hydrocarbon streams containing nitrogen/air and carbon dioxide, and purity products such as ethane/propane mix that fall within compositional ranges indicated in the standard. The standard is available at *www.techstreet.com* or by writing to Techstreet, 6300 Interfirst Drive, Ann Arbor, MI 48108. The cost of this standard is $55 for an electronic copy or $65 for a printed edition. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—ASTM Standard D1296–01–2012, *Standard Test Method for Odor of Volatile Solvents and Diluents*, July 1, 2012, ASTM International. This test method covers a comparative procedure for observing the characteristic and residual odors of volatile organic solvents and diluents to determine their odor acceptability in a solvent system. The standard is available at *www.astm.org* or by writing to ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428–2959. The cost of this standard is $39. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

EPA is not incorporating by reference AHRI Standard 740–2016, *Performance Rating of Refrigerant Recovery Equipment and Recovery/Recycling Equipment.* Rather EPA is basing the content found in appendices B3 and B4 on this standard. This standard establishes methods of testing for rating and evaluating the performance of refrigerant recovery equipment and recovery/recycling equipment. The standard is available at *www.ahrinet.org* or by mail at Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2111 Wilson Blvd., Suite 500, Arlington, VA 22201. EPA is incorporating by reference the standards referenced in AHRI Standard 740–2016. Specifically, these standards are:

—ANSI/ASHRAE Standard 63.2–1996 (RA 2010) Method of Testing Liquid-Line Filter Drier Filtration Capability, 2010, American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. The purpose of this standard is to prescribe a laboratory test method for evaluating the filtration capability of filters and filter driers used in liquid lines of refrigeration systems. The standard is available at *www.ashrae.org* or by mail at AHSRAE, 1791 Tullie Circle NE., Atlanta, GA 30329. The cost is $39 for an electronic copy or printed edition. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—UL Standard 1963–2011, *Refrigerant Recovery/Recycling Equipment*, Fourth Edition, 2011, American National Standards Institute/Underwriters Laboratories, Inc. This standard establishes safety requirements for and methods to evaluate refrigerant recovery and refrigerant recovery/recycling equipment. The standard is available at *www.comm-2000.com* or by writing to Comm 2000, 151 Eastern Avenue, Bensenville, IL 60106. The cost is $798 for an electronic copy and $998 for hardcopy. UL also offers a subscription service to the Standards Certification Customer Library (SCCL) 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. Therefore, EPA concludes that the UL standard being incorporated by reference is reasonably available.

—AHRI Standard 110–2016, *Air-Conditioning, Heating and Refrigerating Equipment Nameplate Voltages*, 2016, Air-Conditioning, Heating, and Refrigeration Institute. This standard establishes voltage rating requirements, equipment performance requirements, and conformance conditions for air-conditioning, heating, and refrigerating equipment. A free electronic copy of this standard is available at *www.ahrinet.org.* It is also available by mail at Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—International Standard IEC 60038, *IEC Standard Voltages,* Edition 7.0, 2009–06, International Electrotechnical Commission. This standard specifies standard voltage values which are intended to serve as preferential values for the nominal voltage of electrical supply systems, and as reference values for equipment and system design. The standard is available at *www.techstreet.com* or by writing to Techstreet, 6300 Interfirst Drive, Ann Arbor, MI 48108. The cost of this standard is $50. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

EPA is not incorporating by reference California Air Resources Board, *Test Procedure for Leaks from Small Containers of Automotive Refrigerant*, TP–503, as amended January 5, 2010. Rather EPA is basing the content found in appendix E on this standard. This standard establishes methods for assessing the leak rate from small containers of refrigerant. A copy of this standard is available in the docket and *www.arb.ca.gov/regact/2009/hfc09/hfc09.htm.*

III. EPA's Authority Under the Clean Air Act

A. Summary of EPA's Authority for the Revisions to Subpart F

The authority for this action is provided primarily by section 608 of the CAA. Section 608 is divided into three subsections, which together comprise the ''National Recycling and Emission Reduction Program.'' Among other things, section 608 of the CAA requires EPA to establish a comprehensive program to limit emissions of ozone-depleting refrigerants. It also prohibits the knowing release or disposal of ozone-depleting refrigerants and their substitutes in the course of maintaining, servicing, repairing, or disposing of air-conditioning and refrigeration equipment in a manner which permits such a substance to enter the environment. The three subsections of section 608 are described in more detail in the following paragraphs.

Section 608(a) requires EPA to establish standards and requirements regarding use and disposal of class I and II substances. With regard to refrigerants, EPA is to promulgate regulations establishing standards and requirements for the use and disposal of class I and class II substances during the maintenance, service, repair, or disposal of air-conditioning and refrigeration appliances or IPR. Regulations under section 608(a) are to include requirements to reduce the use and emission of ODS to the lowest achievable level, and to maximize the recapture and recycling of such substances. Section 608(a) further provides that ''such regulations may include requirements to use alternative substances (including substances which are not class I or class II substances) or to minimize use of class I or class II substances, or to promote the use of safe alternatives pursuant to section [612] or any combination of the foregoing.''

Section 608(b) requires that the regulations issued pursuant to section 608(a) contain requirements for the safe disposal of class I and class II substances, including requirements that such substances shall be removed from such appliances, machines, or other goods prior to the disposal of such items or their delivery for recycling.

Section 608(c) establishes a self-effectuating prohibition, commonly called the ''venting prohibition,'' that generally speaking, makes it unlawful to knowingly release ODS and substitute refrigerants in a way that allows the refrigerant to enter the environment

while maintaining, servicing, repairing, or disposing of air-conditioning or refrigeration equipment. More specifically, section 608(c)(1), effective July 1, 1992, makes it unlawful for any person in the course of maintaining, servicing, repairing, or disposing of an appliance or IPR to knowingly vent, release, or dispose of any ODS used as a refrigerant in such equipment in a manner that permits that substance to enter the environment. The statute exempts from this prohibition ''[d]e minimis releases associated with good faith attempts to recapture and recycle or safely dispose'' of such a substance. Section 608(c)(2) extends the provisions of (c)(1), including the prohibition on venting, to substitutes for class I or class II refrigerants, effective November 15, 1995, unless the Administrator determines that such venting, release, or disposal ''does not pose a threat to the environment.'' EPA has determined through prior rulemakings that specific substances do not pose a threat to the environment when vented, released, or disposed of and has exempted those specific substitutes from the venting prohibition. The full list of substitutes that EPA has exempted from this prohibition is at 40 CFR 82.154(a). For some substitutes that have been exempted from the venting prohibition under section 608(c)(2) and § 82.154(a) the exemption only applies when the substitute is used in specified applications, but for others, the exemption is for the substitute refrigerant as used in all applications.[8]

The statutory standards under section 608(a) against which the regulations concerning the use and disposal of ozone-depleting substances are to be measured are whether they ''reduce the use and emission of such substances to the lowest achievable level'' and ''maximize the recapture and recycling of such substances.'' These standards are often complementary in the context of maintenance, service, repair, and disposal of air conditioning and refrigerant equipment. For example, in the context of recycling, maximizing recycling will also help reduce the use and emission of these substances to the lowest achievable level. These statutory standards also bear a relationship to the *de minimis* releases addressed in section 608(c). More specifically, emissions that occur while complying with EPA's recovery and recycling regulations are considered *de minimis,* because those regulations set forth practices and requirements which result in the lowest achievable level of emissions. EPA has established this interpretation in its regulations under section 608 for ODS refrigerants.

On May 14, 1993, EPA published the original regulations implementing subsections (a), (b), and (c)(1) for ODS refrigerants (58 FR 28660). These regulations include evacuation requirements for appliances being serviced or disposed of, standards and testing requirements for recovery and/or recycling equipment, certification requirements for technicians, purity standards and testing requirements for used refrigerant sold to a new owner, certification requirements for refrigerant reclaimers, leak repair requirements, and requirements for the safe disposal of appliances that enter the waste stream with the charge intact. This rule also stated that the Agency interprets ''*de minimis*'' to mean releases that occur while the recycling and recovery requirements of regulations under sections 608 and 609 are followed. However, those requirements only applied to ODS refrigerants, and these regulations did not explain how the venting prohibition or the *de minimis* exemption applied for substitute refrigerants. Among other things, this rulemaking addresses that gap in the regulations.

1. Applying Regulations Under Section 608 to Substitute Refrigerants

In this rule, EPA is extending, as appropriate, provisions of the refrigerant recovery and/or recycling regulations, which previously had only applied to ODS refrigerants, to non-exempt substitute refrigerants. To summarize briefly, EPA's authority for this action rests largely on section 608(c), which EPA interprets to provide it authority to promulgate regulations that interpret, explain, and enforce the venting prohibition and the *de minimis* exemption, as they apply to both ODS refrigerants and non-exempt substitute refrigerants. Accordingly, this rule establishes a comprehensive and consistent framework that applies to both ODS and non-exempt substitute refrigerants. This, in turn, provides clarity to the regulated community concerning the measures that should be taken to comply with the venting prohibition for non-exempt substitutes and reduces confusion and enhances compliance for both ODS and non-exempt substitutes.[9] EPA's authority to issue regulations for section 608(c) is supplemented by section 301(a), which provides authority for EPA to ''prescribe such regulations as are necessary to carry out [the EPA Administrator's] functions under this Act.'' In addition, EPA's authority to extend the recordkeeping and reporting requirements to non-exempt substitutes is supplemented by section 114, which provides authority to the EPA Administrator to require recordkeeping and reporting in carrying out provisions of the CAA. Finally, the extension of requirements under section 608 to non-exempt substitutes in this rule is also supported by section 608(a) because having a consistent regulatory framework for non-exempt substitutes and ODS is expected to reduce emissions of ODS refrigerants, as well as non-exempt substitutes.

Section 608 of the CAA is ambiguous with regard to EPA's authority to establish refrigerant management regulations for substitute refrigerants. As Congress has not precisely spoken to this issue, EPA has the discretion to adopt a permissible interpretation of the CAA. *Chevron, U.S.A., Inc.* v. *Natural Res. Def. Council, Inc.*, 467 U.S. 837, 843–44 (1984). Primarily under the authority of section 608(a), EPA has established standards for the proper handling of ODS refrigerants during the maintenance, service, repair, or disposal of an appliance to maximize the recovery and/or recycling of such substances and reduce the use and emission of such substances. Section 608(a) expressly requires EPA to promulgate regulations that apply to class I and class II substances, but is silent on whether its requirements apply to substitute substances. On the other hand, section 608(c)(2) contains provisions for substitute refrigerants which parallel those for ODS refrigerants in section 608(c)(1). For instance, as for ODS refrigerants under section 608(c)(1), section 608(c)(2) prohibits knowingly venting, releasing, or disposing of any substitute refrigerant in the course of maintaining, servicing, repairing, or disposing of an appliance

[8] EPA is using the term ''non-exempt substitute'' in this notice to refer to substitute refrigerants that have not been exempted from the venting prohibition under CAA section 608(c)(2) and 40 CFR 82.154(a) in the relevant end-use. Similarly, the term ''exempt substitute'' refers to a substitute refrigerant that has been exempted from the venting prohibition under section 608(c)(2) and § 82.154(a) in the relevant end-use.

[9] EPA used an analogous analysis in promulgating the regulations for section 608 originally. In that rulemaking, EPA explained that extending regulatory requirements to class II substances (rather than only regulating class I substances) would facilitate compliance with the venting prohibition, in part by providing clear guidance to technicians recovering class II substances on what releases do and do not constitute violations of the prohibition. 58 FR 28667. EPA also explained that it was desirable to provide a ''clear, consistent framework for fully implementing the prohibition on venting for all refrigerants'' to ''minimize confusion and maximize compliance with the prohibition.'' 58 FR 28666.

in a manner which permits the substance to enter the environment.[10] This creates a tension or ambiguity because the regulated community is subject to an explicit and self-effectuating prohibition on venting, releasing, or disposing of non-exempt substitute refrigerants while maintaining, servicing, repairing, or disposing of equipment but at the same time is not explicitly required by section 608(a) to recover substitute refrigerant prior to servicing or disposing of equipment or to engage in any of the practices or behaviors that EPA has established to minimize the emission and release of ODS refrigerants during such maintenance, service, repair, or disposal.

Moreover, some amount of refrigerant, whether ODS or substitute, is inevitably released during the maintenance, servicing, repair, and disposal of air-conditioning or refrigeration appliances or equipment. Without a clear regulatory framework for determining what requirements apply during the maintenance, servicing, repair, and disposal of such equipment containing a non-exempt substitute refrigerant, the regulated community and the public would not have the same measure of certainty as to whether such releases violate the venting prohibition or fall within the *de minimis* exemption to that prohibition, and what steps must be taken to comply with CAA obligations for such substitute refrigerants in undertaking such actions. Accordingly, this rulemaking finalizes regulations to interpret and explain how the venting prohibition and the *de minimis* exemption apply to non-exempt substitute refrigerants. In doing so, EPA is clarifying that the regulated community that uses non-exempt substitute refrigerants may rely on the *de minimis* exemption to the venting prohibition if they follow the amended requirements in subpart F.

Consistent with the language of sections 608(c)(1) and (2), this rule aims to avoid knowing releases of non-exempt substitute refrigerants into the environment in the course of maintaining, servicing, repairing, or disposing of an appliance or IPR, unless those releases meet the criteria for the *de minimis* exemption. Section 608(c)(1) provides an exemption from the venting prohibition for ''[d]e minimis releases associated with good faith attempts to recapture and recycle or safely dispose of any such [class I or class II] substance.'' In this context, EPA interprets this provision to exempt releases that occur while the recycling and recovery requirements of regulations under sections 608 and 609 are followed and has promulgated regulations consistent with that interpretation.

In particular, EPA has incorporated both the venting prohibition and the *de minimis* exemption into the regulations at § 82.154(a). Further, the last sentence in the existing regulations at § 82.154(a)(2) provides that ''refrigerant releases shall be considered de minimis only if they occur when'' enumerated regulatory practices in subpart F or, alternatively, subpart B are followed. These subpart F requirements are the ones established in the 1993 rule mentioned above, and as periodically amended. The term *refrigerant*, however, was defined in § 82.152 for purposes of subpart F to mean ''any substance consisting in part or whole of a class I or class II ozone-depleting substance that is used for heat transfer purposes and provides a cooling effect.'' This definition did not include substitute substances. In addition, EPA had not yet applied the recycling and recovery requirements to non-ODS substitutes, and therefore these provisions which make clear how to qualify for the *de minimis* exemption for ODS refrigerants did not apply to substitute refrigerants.

EPA interprets section 608(c) such that the statutory *de minimis* exemption contained in section 608(c)(1) also applies to substitute refrigerants. Section 608(c)(2) states that, effective November 15, 1995, ''paragraph 1 shall also apply'' to the venting, release, or disposal of any substitute substance for class I or class II substances. As section 608(c)(2) incorporates ''paragraph 1'' it is reasonable to interpret it to also contain this *de minimis* exemption, which is included in paragraph 1 of section 608(c). However, the Act's exemption applies only to those *de minimis* releases ''associated with good faith attempts to recapture and recycle or safely dispose of refrigerants'' and the Act does not explicitly address what would be considered such ''good faith attempts to recapture and recycle or safely dispose'' of either ODS or substitute refrigerants. In fact, Title VI does not contain any further explanation or definition of those terms. Moreover, the statutory provisions that require EPA to promulgate regulations addressing recapturing and recycling requirements and safe disposal requirements in section 608(a) and 608(b) expressly mention that they apply to ODS refrigerants but are silent as to application to substitute refrigerants. This silence and the corresponding tension between these provisions creates an ambiguity in section 608 and EPA may fill that gap with a permissible interpretation. *Chevron, U.S.A., Inc.* v. *Natural Res. Def. Council, Inc.*, 467 U.S. 837, 843–44 (1984).

Consistent with the interpretation of section 608(c)(2) as incorporating the *de minimis* exemption, prior to this rulemaking EPA's regulations at § 82.154(a)(2) stated that ''[d]e minimis releases associated with good faith attempts to recycle or recover . . . non-exempt substitutes are not subject to this prohibition,'' thus applying the statutory *de minimis* exemption from the venting prohibition to good faith efforts to recycle or recover non-exempt substitute refrigerants. However, in contrast to the regulations for ODS refrigerants, the regulations did not provide any specific provisions to explain what constitutes such a ''good faith attempt'' with respect to substitute refrigerants. Thus, the prior regulations were unclear as to what requirements or practices regulated parties must follow to qualify for the *de minimis* exemption, and thereby comply with the venting prohibition, for non-exempt substitute refrigerants.

EPA has discussed this issue in previous notices. On June 11, 1998, EPA proposed to apply the *de minimis* exemption in section 608(c)(1) to substitute refrigerants and to issue regulations under section 608(c)(2) that interpret, clarify, and enforce the venting prohibition for substitutes (63 FR 32044). EPA stated in that proposed rule, ''[w]hile section 608(c) is self-effectuating, EPA regulations are necessary to define '*(d)e minimis* releases associated with good faith attempts to recapture and recycle or safely dispose' of such substances and to effectively implement and enforce the venting prohibition.'' 63 FR 32046.

In the final rule issued March 12, 2004 (69 FR 11946), EPA extended the regulations interpreting and enforcing the 608(c)(1) *de minimis* exemption to blends containing an ODS component but not to refrigerants containing only substitutes. As stated in that rule at 69 FR 11949:

> [V]enting of all substitute refrigerants, including HFC and PFC refrigerants (and

[10] As noted previously, this venting prohibition does not apply to substitutes for which the Administrator has made a determination that such venting, release, or disposal ''does not pose a threat to the environment'' under CAA 608(c)(2). As indicated elsewhere in this notice, EPA is not extending the requirements of the refrigerant management program to substitutes that have been exempted from the venting prohibition in this action. Where a substitute has been exempted only in specific uses, the requirements in this rule apply to uses in which the substitute has not been exempted.

blends thereof) is prohibited under section 608(c), with the exception of *de minimis* releases associated with good faith attempts to recapture and recycle. The *de minimis* releases exception, however, is not self-effectuating, nor is it self-explanatory.

EPA believes that regulatory clarification is necessary to define such '*[d]e minimis* releases' and 'good faith attempts to recapture and recycle or safely dispose of any such substance' and safely dispose of appliances to effectively implement and enforce the venting prohibition. Section 608(c)(1) in conjunction with 608(c)(2) of the Act allow for an exemption for *de minimis* releases associated with good faith attempts to recapture and recycle or safely dispose of substitutes for class I and class II ODSs used as refrigerants. A regulation reflecting the statutory requirement for recovery of substitute refrigerants is an essential part of a regulatory framework within which *de minimis* releases and good faith attempts to recapture and recycle or safely dispose of substitute refrigerants can be defined.

This interpretation that the statutory *de minimis* exemption applies to substitutes but is not self-explanatory is consistent with the interpretation of section 608(c)(1) and (2) that EPA articulates in this section. However, in the March 2004 Rule EPA did not finalize its proposal to extend all of the subpart F regulations to substitute refrigerants. See 69 FR 11953.

Following the March 12, 2004, rulemaking, the Administrator promulgated a direct final rule to amend the regulatory definitions of *refrigerant* and *technician,* as well as the venting prohibition, to correct and clarify the intent of those regulations (70 FR 19273, April 13, 2005). As part of that rule, EPA edited the regulatory venting prohibition to reflect the statutory *de minimis* exemption in section 608(c)(2). As explained at 70 FR 19275:

> In accordance with section 608(c)(2) of Title VI of the Clean Air Act (as amended in 1990), *de minimis* releases associated with good faith attempts to recapture and recycle or safely dispose of such substitutes shall not be subject to the prohibition. EPA has not promulgated regulations mandating certification of refrigerant recycling/recovery equipment intended for use with substitutes; therefore, EPA is not including a regulatory provision for the mandatory use of certified recovery/recycling equipment as an option for determining *de minimis* releases of substitutes. However, the lack of a regulatory provision should not be interpreted as an exemption to the venting prohibition for non-exempted substitutes. The regulatory prohibition at § 82.154(a) reflects the statutory reference to *de minimis* releases of substitutes as they pertain to good faith attempts to recapture and recycle or safely dispose of such substitutes.
>
> In order to emphasize that the knowing venting of HFC and PFC substitutes remains illegal during the maintenance, service, repair, and disposal of appliances and to make certain that the *de minimis* exemption for refrigerants remains in the regulatory prohibition, § 82.154(a) is amended to reflect the venting prohibition of section 608(c)(2) of the Act.

In that action, EPA added the phrase ''[d]e minimis releases associated with good faith attempts to recycle or recover refrigerants *or non-exempt substitutes* are not subject to this prohibition'' to § 82.154(a)(2) (emphasis added). However, because EPA has not extended the regulatory recycling and recovery requirements to substitute refrigerants, the regulations have not provided clarity or certainty how this exception applies to non-exempt substitute refrigerants that do not contain an ODS. Moreover, as for ODS, some amount of substitute refrigerant is released during the maintenance, servicing, repair, or disposal of appliances, even if precautions to avoid such releases are taken. For ODS refrigerants, the rules have provided certainty to the regulated community that if specific identified practices are followed, regulated entities would not be held liable for releases of small amounts of refrigerant incidental to these actions. These regulations have supported the recovery or recycling of ODS refrigerants and reduced the emissions of such substances. In other words, for ODS, EPA has reasonably interpreted the *de minimis* exemption to apply only to the small amount of emissions that cannot be prevented by following the regulatory requirements. This interpretation of the *de minimis* exemption is equally reasonable for non-exempt substitute refrigerants. Accordingly, to provide the same clarity and certainty to the regulated community for substitute refrigerants, it is important to clarify how this exemption applies to non-exempt substitute refrigerants that do not contain an ODS. To do so, EPA is finalizing its proposal to extend the amended regulations concerning emissions reduction and recapture and recycling of CFC and HCFC refrigerants, found at 40 CFR part 82, subpart F, to all substitute refrigerants that have not been exempted from the venting prohibition under § 82.154(a)(1).

These regulations establish standards and requirements related to the maintenance, servicing, repair, or disposal of appliances and IPR that use ODS or non-exempt substitutes as refrigerants. They are designed to minimize or avoid knowing releases or disposal, in the course of those activities, of ODS and non-exempt substitute refrigerants in a manner which allows that substance to enter the environment. For example, the regulations establish requirements to minimize emissions during appliance maintenance, servicing, or repair (*e.g.*, by requiring that technicians recover refrigerant from an appliance before servicing and by setting standards for the repair of appliances that have leaked above the applicable threshold), as well as disposal (*e.g.*, by requiring the use of certified recovery equipment to remove refrigerant from the appliance before the final disposal). Accordingly, the regulations finalized in this action fall within the scope of EPA's authority to interpret and explain the venting prohibition, and to give regulated entities greater certainty about what is required to comply.

EPA is also adopting a broader interpretation of the venting prohibition under CAA sections 608(c)(1) and (2) in this action. As discussed in more detail in the proposal for this action (80 FR 69486), in the 1993 Rule EPA stated that the venting prohibition did not ''prohibit 'topping off' systems, which leads to emissions during the use of equipment'' but explained that the ''provision on knowing releases does however, include the situation in which a technician is practically certain that his or her conduct will cause a release of refrigerant during the maintenance, service, repair, or disposal of equipment'' or fails to appropriately investigate facts that demand investigation (58 FR 28672). The proposal also explained that EPA had subsequently moved toward a broader interpretation of the venting prohibition in the proposed 2010 Leak Repair Rule (80 FR 69486, quoting 75 FR 78570). EPA concludes that its statements in the 1993 Rule presented an overly narrow interpretation of the statutory venting prohibition. Consistent with the direction articulated in the proposed 2010 Leak Repair Rule, EPA is adopting a broader interpretation. When refrigerant must be added to an existing appliance, other than when originally charging the system or for a seasonal variance, the owner or operator necessarily knows that the system has leaks. At that point the owner or operator is required to calculate the leak rate. If the leaks exceed the applicable leak rate for that particular type of appliance, the owner or operator will know that absent repairs, subsequent additions of refrigerant will be released in a manner that will permit the refrigerant to enter the environment. Therefore, EPA interprets section 608(c) such that if a person adds refrigerant to an appliance that he or she knows is leaking, he or she also violates the venting prohibition unless he or she has complied with the applicable practices

referenced in § 82.154(a)(2), as revised, including the leak repair requirements, as applicable.

This action extending the regulations under subpart F to non-exempt substitutes is additionally supported by the authority in section 608(a) because regulations that minimize the release and maximize the recapture and recovery of non-exempt substitutes will also reduce the release and increase the recovery of ozone-depleting substances. Improper handling of substitute refrigerants is likely to contaminate appliances and recovery cylinders with mixtures of ODS and non-ODS substitutes, which can lead to illegal venting because such mixtures are difficult or expensive to reclaim or appropriately dispose of. Under the prior definition of *refrigerant*, any substance that consists in whole or in part of a class I or class II ODS and is used for heat transfer and provides a cooling effect, is a refrigerant and is subject to the requirements for ODS. However, when a regulated entity believes it is using a substitute refrigerant, and that substitute becomes contaminated with ODS, the contamination may not be apparent to the user, and thus, the user may not be aware that the requirements for refrigerants apply to that substance. This confusion can also lead to illegal venting of ODS. In short, the authority to promulgate regulations regarding the use of class I and II substances encompasses the authority to establish regulations regarding the proper handling of substitutes where this is needed to reduce emissions and maximize recapture and recycling of class I and II substances. Applying consistent requirements to all non-exempt refrigerants will reduce complexity and increase clarity for the regulated community and promote compliance with those requirements for ODS refrigerants, as well as their substitutes.

2. Recordkeeping Provisions

In this action, EPA is also establishing new recordkeeping requirements, as well as extending existing recordkeeping requirements to non-exempt substitutes. EPA's authority to establish and extend these requirements is supported by CAA sections 608(a), 608(c), and 114, consistent with the description of these authorities offered above. These new recordkeeping requirements are an important part of EPA's efforts to address illegal venting of refrigerants, improve accounting of refrigerants in affected appliances, and facilitate enforcement of requirements under section 608. For example, EPA is establishing a new recordkeeping requirement for the disposal of appliances containing more than five and less than 50 pounds of refrigerant. Section 608(a) gives EPA explicit authority to implement requirements that reduce ODS refrigerant emissions to the lowest achievable level. This recordkeeping requirement, along with other recordkeeping requirements in this rule, further the recovery, reclamation, and/or destruction of ODS refrigerants and discourages the illegal venting of such refrigerants from affected appliances. Because it minimizes the emission of ODS refrigerant, EPA has authority for this requirement as it relates to ODS appliances under 608(a). Additionally, providing a consistent standard for ODS and non-exempt substitute refrigerants will facilitate the recovery, reclamation, and/or destruction of both ODS and non-ODS refrigerants and, accordingly, will reduce the emission of such refrigerants. EPA will continue to evaluate how best to use the information to promote the recovery of refrigerants and compliance with these provisions.

EPA also has authority under section 114 of the CAA to require that technicians document that appliances containing an ODS refrigerant or a non-exempt substitute refrigerant have been properly evacuated prior to disposal. Section 114 of the CAA provides the primary authority to establish these recordkeeping and reporting requirements because it provides EPA authority to require recordkeeping and reporting in carrying out provisions of the CAA, including the venting prohibition under CAA sections 608(c) and the requirements under 608(a). Because these records will help EPA determine whether requirements under sections 608(c) and 608(a) are being complied with, this requirement falls within the scope of section 114.

3. Amendments Related to Practices and Requirements for ODS

In addition to extending the existing regulations in subpart F to non-exempt substitute refrigerants, EPA is also revising and augmenting the existing requirements that apply to ozone-depleting substances, including: Lowered leak rates, periodic leak inspections for equipment that has leaked above the leak threshold, leak repair verification tests, and recordkeeping requirements for the disposal of appliances containing more than five and less than 50 pounds of refrigerant. EPA is also finalizing its proposal to update and revise subpart F to improve clarity and enforceability. EPA's authority for these amendments is based primarily on section 608(a), which requires EPA to promulgate regulations regarding the use and disposal of class I and II substances to ''reduce the use and emission of such substances to the lowest achievable level'' and ''maximize the recapture and recycling of such substances.'' In addition, because EPA is further elaborating the requirements and practices that regulated parties must follow to qualify for the *de minimis* exemption from the venting prohibition for ODS, EPA is drawing on its authority under section 608(c)(1). EPA's authority for these actions is also supplemented by section 301(a) and 114, in the same way as described earlier in this notice.

4. Provisions Related to MVAC and MVAC-Like Appliances

While section 608 covers all appliances,[11] section 609 of the CAA directs EPA to establish requirements to prevent the release of refrigerants during the servicing of MVACs specifically. MVACs are defined under EPA's section 608 implementing regulations at 40 CFR part 82, subpart F as ''any appliance that is a motor vehicle air conditioner as defined in 40 CFR part 82, subpart B.'' 40 CFR 82.152. Under section 609, in 40 CFR part 82, subpart B, MVACs are defined as ''mechanical vapor compression refrigeration equipment used to cool the driver's or passenger's compartment of any motor vehicle. . . .'' 40 CFR 82.32(d).

A motor vehicle is defined under subpart B as ''any vehicle which is self-propelled and designed for transporting persons or property on a street or highway, including but not limited to passenger cars, light duty vehicles, and heavy duty vehicles. This definition does not include a vehicle where final assembly of the vehicle has not been completed by the original equipment manufacturer.'' 40 CFR 82.32(c).

Under section 609, no person repairing or servicing motor vehicles for consideration may perform any service on an MVAC that involves the refrigerant without properly using approved refrigerant recovery or recovery and recycling equipment and no such person may perform such service unless such person has been properly trained and certified. Refrigerant handling equipment must be certified by EPA or an independent organization approved by EPA. Section 609 also prohibits the sale or distribution of any class I or class II MVAC refrigerant in a container of less

[11] For EPA's discussion on the definition of *appliance*, see Section IV.A.

than 20 pounds to any person who is not certified under section 609.

Regulations issued under section 609 are in 40 CFR part 82, subpart B, and include information on prohibitions and required practices (§ 82.34), approved refrigerant handling equipment (§ 82.36), approved independent standards testing organizations (§ 82.38), requirements for technician certification and training programs (§ 82.40), and certification, recordkeeping, and public notification requirements (§ 82.42). Appendices A–F of subpart B provide standards for minimum operating requirements for MVAC servicing equipment.

Because MVACs are defined in subpart F as an ''appliance'' (§ 82.152), the section 608 regulations found in subpart F are generally applicable to MVAC systems. However, because servicing and technician training and certification are regulated under section 609, EPA's section 608 regulations in subpart F defer to those requirements in subpart B. Procedures involving MVACs that are not regulated under section 609, such as the disposal of MVACs and the purchase of refrigerant for use in MVACs besides ODS refrigerant in containers less than 20 pounds, are covered by section 608. The prohibition in section 608 against venting ODS and substitute refrigerants is also applicable to refrigerants used in MVAC systems.

EPA also regulates MVAC-like appliances under subpart B. MVAC-like appliances are used to cool the driver's or passenger's compartment of off-road vehicles, including agricultural and construction vehicles.[12] While these types of systems are outside of the scope of the definition of *motor vehicle* established in subpart B, there are similarities between MVAC-like appliances and MVAC systems. In the 1993 Rule, under the authority of section 608, EPA adopted requirements for the certification and use of recycling equipment for MVAC-like appliances in subpart B. MVAC-like appliances may only be serviced by a certified technician and this requirement is not limited to those servicing for consideration, but MVAC-like technicians have the option to be certified under section 608 or 609.

Through this rulemaking EPA is finalizing its proposal to apply the provisions of section 608 to non-exempt ODS substitutes, including those used in MVAC and MVAC-like appliances. EPA is not extending the regulations under section 609 as part of this rulemaking because the 609 regulations have been applicable to all substitute substances since 1995.[13]

5. Consideration of Economic Factors

Section 608 of the CAA does not explicitly address whether costs or benefits should be considered in developing regulations under that section. The statutory standards under section 608(a) against which the regulations concerning the use and disposal of ozone-depleting substances are to be measured are whether they ''reduce the use and emission of such substances to the lowest achievable level'' and ''maximize the recapture and recycling of such substances.'' The phrase ''lowest achievable level'' as used in section 608(a)(3) is not clear on its face as to whether economic factors should be considered in determining what is the ''lowest achievable level.'' Title VI does not further explain or define the term nor does it expressly state whether economic factors may or must be considered. Thus, EPA has discretion to adopt a reasonable interpretation. EPA has previously interpreted this phrase to allow the consideration of economic factors. *See* 58 FR 28659, 28667 (May 14, 1993). EPA did not propose to revise that interpretation and has considered economic as well as technological factors in the development of this rule.

The phrase ''de minimis releases associated with good faith attempts to recapture and recycle or safely dispose of any such substance'' as used in section 608(c)(1) and as applied to substitutes through section 608(c)(2) is similarly not clear on its face as to whether economic factors may be considered in determining what is *de minimis.* Title VI does not further address this issue. Thus, EPA has discretion to adopt a reasonable interpretation. EPA interprets this phrase to allow the consideration of economic factors. The Senate Manager's Statement for the Clean Air Act Amendments of 1990 indicates that ''the exception is included to account for the fact that in the course of properly using recapture and recycling equipment, it may not be possible to prevent some small amount of leakage'' (Cong. Rec. S 16948 (Oct. 27, 1990), *reprinted in* 1 A Legislative History of the Clean Air Act Amendments of 1990, at 929 (1993)). EPA does not read this statement as expressing an intent that the Agency consider only technological factors in setting standards for recapture and recycling equipment and the proper use of such equipment. Rather, EPA understands it as meaning that once those standards are set, only the small amount of emissions that cannot be prevented by following such standards should be exempted.

Because the statutory language does not dictate a particular means of taking economic factors into account, if at all, EPA has discretion to adopt a reasonable method for doing so. In developing this rule, EPA has not applied a strict cost-benefit test, but rather has focused primarily on the state of air conditioning and refrigeration best practices and recovery technology, while also giving consideration to costs and benefits. The fact that industry has identified and uses these best practices indicates they are affordable.

EPA considered cost for many specific aspects of this rule. For instance, as discussed in the leak repair section (Section IV.F of this notice), EPA considered what is achievable from a technical perspective, while also considering the costs of those practices and technologies and the benefits from their use, when determining whether to establish new requirements and extending existing requirements to non-exempt substitute refrigerants. See the technical support document *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program* in the docket for sensitivity analyses conducted on various options. Generally, the leak repair requirements finalized in this action take into account that the variability of those conditions in the field is significant in each air-conditioning and refrigeration sector. For example, some appliances generally have more leaks than others. An industrial process refrigeration appliance can have thousands of pounds of refrigerant running through miles of piping, resulting in numerous opportunities for leaks to occur, whereas a household refrigerator typically has about one pound of refrigerant in a hermetically sealed refrigerant loop that rarely leaks. The

[12] We are amending the subpart F definition of ''MVAC-like appliance'' to replace the term ''off-road motor vehicle'' with the term ''off-road vehicles or equipment.'' This revision is not intended to effect a substantive change in the equipment covered by this definition but rather simply is intended to clarify the definition.

[13] The Agency has indicated plans to issue a separate proposed rule to consider adopting standards from the Society of Automotive Engineers (SAE) for servicing equipment in 40 CFR subpart B. These standards are: SAE J2843 R–1234yf Recovery/Recycling/Recharging Equipment for Flammable Refrigerants for Mobile Air-Conditioning Systems, SAE J2851 Recovery Equipment for Contaminated Refrigerant from Mobile Automotive Air Conditioning Systems, and SAE J3030 Automotive Refrigerant Recovery/Recycling Equipment Intended for Use with Multiple Refrigerants. In a future rulemaking, EPA intends to propose to incorporate by reference these standards developed by SAE International's Interior Climate Control Committee.

requirements in this rule reflect that difference.

As another example, EPA considered the costs of extending the refrigerant sales restriction to small cans of non-exempt substitutes used for MVAC servicing. EPA decided a more cost effective method of reducing emissions is requiring that manufacturers install self-sealing valves on small cans rather than limiting the sale of small cans to certified technicians only. As a final example of how EPA considered costs in this rulemaking, EPA relied heavily on the existing program and requirements already in place for ODS refrigerants rather than developing a new and separate set of requirements for non-exempt substitutes. This will allow the regulated community to in many instances use or adapt existing compliance procedures for non-exempt substitutes rather than having to develop wholly new approaches to managing compliance. This approach should help regulated entities to better predict and manage compliance costs.

B. Comments and Responses Related to EPA's Authority

This section summarizes many comments related to EPA's authority under the Clean Air Act to issue this rule and EPA's responses. Other comments related to EPA's authority for this action are addressed in the response to comments document found in the docket for this action.

1. Comment: EPA Does Not Have Authority To Regulate Substitutes That Have Limited or No Impact on Stratospheric Ozone Under Section 608

Some comments asserted that EPA does not have the authority to extend the existing refrigerant management provisions in subpart F to non-ozone depleting refrigerants. Some commenters stated that under a plain language reading of section 608(a) it is clear that regulations to reduce use and emissions apply only to class I and class II substances and not substitutes. These comments said the language of section 608 as a whole authorizes a wide range of prescriptive regulations to reduce the use and emissions of class I and class II refrigerants but mentions substitutes only twice: That their use be promoted and the general requirement that their knowing venting is prohibited.

On the contrary, other comments agreed that EPA had authority to extend these regulations to substitutes. One such comment stated: ''We believe that both the language of section 608 and the Agency's discretionary authority allow the extension of section 608's requirements to substitutes for ODS in the regulations.'' [14] These commenters noted that extending these regulations to substitutes allows for a coherent and robust regime to address venting across the full suite of appliances and applications, and that applying the regulatory regime to substitute refrigerants would more fully allow for and incentivize the recovery and reclamation of both ODS and substitutes. These comments concluded that because ODS and substitutes can be used interchangeably, the regulation of substitutes reinforces the regulation of ODS and more reliably reduces ODS emissions. Another commenter who generally believes the Agency does not have authority to apply the leak repair provisions to appliances using substitute refrigerants does concede that there may be provisions of subpart F which are directly related to emissions occurring in the course of maintenance, service, repair or disposal activities and might be reasonably extended to substitute refrigerants.

EPA disagrees that its regulatory authority under CAA section 608 extends only to class I and class II (ODS) substances and not to substitutes. EPA also disagrees with comments contending that, as a factual matter, extension of the refrigerant management regulations to substitutes would not reduce emissions of ODS and maximize the recapturing and recycling of ODS. Section 608 expressly addresses substitute refrigerants in the venting prohibition in section 608(c)(2). As explained previously in this notice, EPA's authority for extending the refrigerant management regulations to substitute refrigerants is based primarily on section 608(c)(2) (via interpretation, explanation, and enforcement of the venting prohibition for substitutes) and secondarily on section 608(a) (via the corresponding reductions in ODS emissions and increases in ODS recapture and recycling that are expected to result from requiring consistent practices for ODS and substitute refrigerants), with additional support from CAA sections 301 and 114.

More specifically with respect to section 608(a), that section states that the regulations under that section shall include requirements that reduce the use and emission of ODS to the lowest achievable level and that maximize their recapture and recycling. EPA's interpretation that section 608(a) supports the extension of the refrigerant management regulations to substitutes is based on reducing emissions of ODS and maximizing recapturing and recycling of ODS. This is because requiring practices that are consistent for both ODS and for substitutes reduces the likelihood that a person maintaining, servicing, repairing, or disposing of an appliance that uses ODS as a refrigerant mistakenly believes that it contains a substitute refrigerant and fails to apply the proper procedures for ODS, leading to increased ODS emissions or failure to recover or reclaim ODS. It is also because in the course of servicing, repairing, or maintaining appliances there is a potential for mixing ODS and substitute refrigerants, which may lead to venting or release of the mixture due to the difficulty of reclamation. EPA has explained that the venting prohibition applies to all refrigerants consisting in whole or in part of an ODS, such as a blend with an HFC component. (See 69 FR 11949). Accordingly, the commenters' statements that section 608(a) only applies to class I and class II substances fail to recognize that regulation of substitutes can help effectuate the statutory purposes mentioned in section 608(a). EPA is relying in part on section 608(a) for the extension of regulatory requirements to substitutes because it interprets this provision to support regulation of substitutes when such regulations can help achieve the purposes listed in section 608(a). The extension of regulatory requirements to substitutes in this action is supported by section 608(a) because that extension of requirements to substitutes is expected to reduce ODS emissions and further maximize the recovery and reclamation of ODS. After consideration of all the comments, EPA concludes that it has authority to extend the refrigerant management regulations to substitutes, and that section 608(a) is a relevant source of authority because applying a consistent and coherent regulatory regime to both ODS and substitute refrigerants improves the application of the requirements to ODS, promoting the recovery and reclamation of ODS and reducing ODS emissions. Such ODS-focused goals are well within EPA's authority under CAA section 608(a).[15]

Commenters also disagreed with EPA's statement that there is ambiguity in the CAA regarding the Agency's authority to create a comprehensive regulatory program akin to that

[14] Comment submitted by Natural Resources Defense Council and Institute for Governance and Sustainable Development, David Doniger, et. al., pg. 3. EPA–HQ–OAR–2015–0453–0121.

[15] Although these comments do not relate to EPA's authority to regulate ODS, we do note for completeness' sake that CAA section 608(a) also provides authority for the portions of this rulemaking that revise the refrigerant management requirements as those apply directly to ODS.

applicable to class I and class II ODS. These commenters expressed that Congress explicitly addressed substitutes in section 608(c)(2) and did not in section 608(a) and that Congress was fully aware and capable of granting EPA authority to regulate substitutes under section 608(a) and it chose not to do so. They further commented that Congress knew which provisions of Title VI it wished to extend to substitutes and which it did not, and pointed to sections 609, 612, and 615 as allowing EPA to regulate substitutes. These comments concluded that Congress demonstrated that it knew how to include substitutes in refrigerant management regulations if it wanted to.

EPA recognizes that Congress expressly mentioned substitutes in certain sections of Title VI of the CAA, such as section 608(c)(2). In EPA's interpretation of section 608, the fact that Congress expressly applied the venting prohibition to substitutes in section 608(c)(2) supports this action because this action clarifies how EPA interprets that venting prohibition and explains what actions must be taken during the maintenance, servicing, repair, or disposal of appliances and IPR to avoid violating the venting prohibition. The inclusion of substitutes in section 608(c)(2) also indicates that Congress contemplated that regulation of substitutes would play a role in implementing section 608. The ambiguity in section 608 is that Congress created an explicit prohibition on venting substitute refrigerants in the course of maintaining, servicing, repairing, or disposing of appliances or IPR, and also provided an exception to that prohibition for ''de minimis releases associated with good faith attempts to recapture and recycle or safely dispose'' of such substances. CAA section 608(c)(1); see also CAA section 608(c)(2) (applying paragraph (c)(1) to the venting, release, or disposal of substitute refrigerants). Congress, however, did not define what releases would be considered ''*de minimis*'' nor which activities would be considered ''good faith attempts to recapture and recycle or safely dispose'' of such substances. Where Congress has not directly spoken to an issue or has left ambiguity in the statute, that silence or ambiguity creates an assumption that ''Congress implicitly delegated to the agency the power to make policy choices that represent a reasonable accommodation of conflicting policies that are committed to the agency's care by the statute.'' *National Ass'n of Mfrs.* v. *United States DOI,* 134 F.3d 1095, 1106 (D.C. Cir. 1998). As the U.S. Supreme Court has explained, the ''power of an administrative agency to administer a congressionally created . . . program necessarily requires the formulation of policy and the making of rules to fill any gap left, implicitly or explicitly, by Congress.'' *Chevron,* 467 U.S. at 843–44. The Court later explained, ''[w]e accord deference to agencies under *Chevron,* . . . because of a presumption that Congress, when it left ambiguity in a statute meant for implementation by an agency, understood that the ambiguity would be resolved, first and foremost, by the agency, and desired the agency (rather than the courts) to possess whatever degree of discretion the ambiguity allows.'' *Smiley* v. *Citibank (s.D.), N.A,* 517 U.S. 735, 740–741 (1996). Accordingly, Congress's silence with regard to the venting prohibition and the exception for certain releases leaves a gap for the Agency to fill, as it is doing in this rulemaking.

In addition to the statutory interpretation and the principle of *Chevron* deference discussed above, the legislative history further supports the notion that Congress anticipated and intended for the Agency to establish regulations that would further interpret, explain, and enforce the exception to the venting prohibition. A Senate Report accompanying a version of the Senate bill for the Clean Air Act Amendments of 1990, which enacted Title VI, addressed the venting prohibition and described that it would include ''[e]xceptions . . . for de minimis releases associated with good faith attempts to recapture, recycle and safely dispose of'' the substances used as refrigerants in household appliances, commercial refrigeration and air conditioning units. *Report of the Committee on Environment and Public Works United States Senate, Report Accompanying S. 1630 (S. Rept. 101–228)* (December 20, 1989) at 396 (*reprinted in* 4 A Legislative History of the Clean Air Act Amendments of 1990, at 8736 (1993)). This report further stated that the standards and requirements that EPA was required to promulgate ''should include provisions to foster implementation of this prohibition, including guidance on what constitutes 'de minimis' and 'good faith'.'' *Id.* Thus, EPA reasonably interprets the ambiguity in section 608(c) to mean that in creating the exception to the venting prohibition, Congress intended for the Agency to provide additional specificity regarding how a regulated entity would qualify for this exception. This rulemaking provides such additional specificity and further articulates the policy of how this exception is interpreted, explained, and enforced.

While EPA acknowledges that section 608(a) does not explicitly mention substitutes, we disagree with the conclusion that the comment draws from that. The fact that Congress required EPA to address ODS in a certain manner under section 608(a) is not the same as prohibiting EPA from addressing other refrigerants in the same manner. EPA has explained in the preceding response to comments how it interprets section 608(a) to support this rulemaking.

Some commenters contend that Congress specifically listed class I and class II substances for coverage under the regulations and under the principle of *expressio unius est exclusio alterius,* regulations cannot be applied to refrigerants that are neither class I or class II substances. This rule of statutory interpretation, which has limited force in an administrative law setting, means that the inclusion of one thing implies the exclusion of another thing. However, the fact that Congress mandated certain measures for ODS but was silent regarding appropriate measures for substitutes does not mean that Congress prohibited EPA from adopting similar measures for substitutes. *See Cheney R.R. Co.* v. *ICC,* 902 F.2d 66, 69 (D.C. Cir. 1990) (''The contrast between Congress's mandate in one context with its silence in another suggests not a prohibition but simply a decision *not to mandate* any solution in the second context, *i.e.,* to leave the question to agency discretion.'')

Commenters stated that section 608(c) is self-implementing and no promulgation of regulations by EPA is required or contemplated to implement such prohibition. In contrast, 608(a) and (b) require EPA to promulgate regulations to establish ''standards and requirements.'' These standards and requirements are different in kind and broader than the 608(c) statutory prohibition. EPA cannot merge the distinct requirements of 608(a) and (b) with the statutory prohibition of 608(c). Another commenter stated that in trying to apply section 608(b) to any substitute substance, EPA is inferring authority that is not there.

EPA agrees that the prohibition under 608(c) as it applies to the knowing venting or releasing of ODS and substitutes is itself self-implementing. However, that fact does not preclude EPA from establishing regulations to include the prohibition in the overall context of the regulatory scheme and to promulgate rules to further interpret, explain, and enforce it, including by

providing certainty to enhance compliance. Indeed, EPA's prior regulations at 40 CFR 82.154 included the venting prohibition. More specifically, these regulations provided that ''no person maintaining, servicing, repairing, or disposing of appliances may knowingly vent or otherwise release into the environment any refrigerant or substitute from such appliances'' and then provided for exceptions from this prohibition for specified substitutes in specified end-uses. These exceptions implemented the discretion Congress left EPA under 608(c)(2) to exempt certain releases from the venting prohibition, if the Administrator has determined that ''venting, releasing, or disposing of such substance does not pose a threat to the environment.'' CAA section 608(c)(2). Contrary to the comment, the inclusion of this discretion in section 608(c)(2) indicates that Congress intended for the EPA to have authority to implement aspects of the prohibition and in fact left gaps in this section that it expected EPA would fill as appropriate.

Similarly, as discussed in the preceding response, the legislative history indicates that in establishing the venting prohibition, Congress expected EPA to promulgate regulatory ''provisions to foster implementation of this prohibition, including guidance on what constitutes 'de minimis' and 'good faith'.'' *Report of the Committee on Environment and Public Works United States Senate, Report Accompanying S. 1630 (S. Rept. 101–228)* (December 20, 1989) at 396 (*reprinted in* 4 A Legislative History of the Clean Air Act Amendments of 1990, at 8736 (1993)). Consistent with that Congressional intent, the prior regulations at 40 CFR 82.154 included provisions clarifying that ''[ODS] releases shall be considered de minimis only if they occur when'' certain regulatory requirements are observed. 40 CFR 82.154(a)(2). However, those regulations did not provide the same clarity regarding releases of non-exempt substitute refrigerants or what practices would be considered to fall within the ambit of ''good faith attempts to recycle or recover'' non-exempt substitute refrigerants. 40 CFR 82.154(a)(2). Because Congress provided this exception to the venting prohibition for substitutes under section 608(c)(2) but did not specify what practices or actions should be taken to qualify for this exception, it is reasonable to interpret this provision as indicating that Congress contemplated that EPA would resolve this ambiguity.

While Congress did not establish specific rulemaking authority under section 608(c)(2), Congress did provide a general grant of authority in CAA section 301(a)(1) to ''prescribe such regulations as are necessary to carry out [the Administrator's] functions under'' the CAA. This rulemaking authority supplements EPA's authority under section 608 by authorizing EPA to promulgate regulations necessary to carry out its functions under section 608, including regulations necessary to interpret the venting prohibition and exceptions to it.

EPA disagrees with the commenter that it is impermissibly merging the distinct requirements of CAA sections 608(a) and (b) with section 608(c). While EPA's regulations under section 608(b) are simply one part of the regulations required under section 608(a), EPA is not relying on section 608(b) to justify its extension of the section 608 regulations to substitutes in this rulemaking. The role of EPA's section 608(a) authority in this rulemaking has been discussed above, in a prior response to comment. Moreover, as noted above, the fact that Congress required EPA to address ODS refrigerants in specific way under section 608(a), or section 608(b) for that matter, is not the same as precluding EPA from addressing other refrigerants in a similar fashion. Likewise, where EPA has authority to establish regulations for non-exempt substitute refrigerants, the fact that it has exercised its authority to establish similar regulations for other refrigerants does not prevent it from exercising its authority to regulate non-exempt substitute refrigerants in a similar manner.

One commenter stated that using section 608(c) to establish the same requirements as authorized under section 608(a) renders section 608(a) null and stated that statutory language should not be read in a manner that renders other provisions of the statute inconsistent, meaningless or superfluous.

EPA disagrees with this comment. Unlike section 608(c), section 608(a) is not limited to refrigerants. EPA has applied its authority under section 608(a) to establish or consider regulations for ODS in non-refrigerant applications. As an example, in 1998, EPA issued a rule on halon management under the authority of section 608(a)(2) (63 FR 11084, March 5, 1998). In that action, EPA noted that section 608(a)(2) ''directs EPA to establish standards and requirements regarding the use and disposal of class I and II substances other than refrigerants.'' 63 FR 11085. Similarly, EPA considered whether to establish a requirement to use gas impermeable tarps to reduce emissions of methyl bromide under section 608(a)(2), ultimately determining not to do so for technological and economic reasons. 63 FR 6008 (February 5, 1998). In that action, EPA noted: ''[s]ection 608(a)(1) of the Act provides for a national recycling and emission reduction program with respect to the use and disposal of Class I substances used as refrigerants. Section 608(a)(2) provides for such a program with respect to Class I and Class II substances not covered by section 608(a)(1).'' 63 FR 6008. Accordingly, this interpretation of section 608(c)(2) to allow EPA to establish requirements for non-exempt substitute refrigerants similar to those established under section 608(a) for ODS refrigerants does not render section 608(a) null or superfluous. Although EPA interprets its substantive authority under both sections 608(a) and 608(c) to support application of the refrigerant management requirements to both ODS and non-exempt substitute refrigerants, that is different from asserting that its section 608(c) authority would extend to any requirement that could be imposed under section 608(a). EPA was required to establish certain regulations for ODS refrigerants under section 608(a) and then decided to use those provisions to interpret and explain the venting prohibition for ODS under section 608(c). The fact that EPA is now electing to use the same requirements under section 608(c) for substitutes does not render 608(a) a nullity. EPA could have established different requirements to interpret and explain the venting prohibition, but for the reasons discussed above, decided to make the requirements consistent for both ODS and substitutes.

2. Comment: Congress Did Not Regulate Substitutes Because It Wanted To Create Incentives To Use Substitute Refrigerants

One commenter asserted that applying detailed refrigerant management requirements to substitutes discourages the development of substitutes as it eliminates the incentive to operate with fewer regulatory requirements. Another commenter stated that the current regulations provide an opt-out incentive to owners that voluntarily retrofit to a non-ozone depleting substitute and suggested that EPA should seek to revise the proposed rule so that it continues to provide similar incentives.

EPA disagrees that applying the refrigerant management requirements to non-exempt substitute refrigerants will discourage the development of substitutes. At this point in time, there are other incentives to either retrofit or

replace existing equipment that relies on ODS. Most ODS have been completely phased out and the HCFC phaseout is well underway. Allowances for domestic consumption of the most common HCFC refrigerant, HCFC–22, are set at 5.6 percent of baseline for 2016 and will decline to zero in 2020 (40 CFR 82.16, 82.15(e)). In addition, use restrictions issued pursuant to section 605(a) prohibit use of newly produced HCFC–22 in equipment manufactured on or after January 1, 2010 (40 CFR 82.15(g)(2)). The section 605(a) use restrictions further prohibit use of newly produced HCFC–123 in equipment manufactured on or after January 1, 2020 (40 CFR 82.15(g)(4)). While used HCFCs are not subject to these restrictions, the HCFC phaseout and the restrictions on use of newly produced HCFCs provide clear market signals regarding future availability of HCFC refrigerants.

In addition, while some provisions of the statute indicate Congressional intent to encourage companies to use safer alternatives, other provisions indicate that Congress was also concerned about the potential impacts of unregulated releases of these substitute refrigerants. Section 608(c)(2) is in the latter category, as it extends the venting prohibition to substitute refrigerants, unless EPA determines that such releases do not pose a threat to the environment. Accordingly, the application of these regulatory requirements to non-exempt substitute refrigerants provides clarity and certainty to owners, operators, and people servicing, maintaining, repairing, or disposing of air conditioning and refrigeration equipment of how they can avoid violating the venting prohibition. Such clarity and certainty is consistent with EPA's efforts through other regulatory programs to facilitate and encourage the use of substitute refrigerants.

Other commenters stated that Congress did not extend the refrigerant management requirements to substitutes, likely because it wanted to create incentives for companies to switch to safer alternatives.

EPA responds that Congress did extend the venting prohibition to substitute refrigerants and left to EPA's discretion how to interpret and enforce that prohibition. While Congress did not require EPA to interpret and enforce the venting prohibition by regulating substitute refrigerants in the same manner as ODS, neither did it prevent EPA from doing so.

Commenters also stated that 608(a)(3) encourages EPA to use the regulations under that provision to promote the use of safe alternatives. EPA responds that while section 608(a)(3) provides that the regulations that are required under section 608(a) ''may include requirements . . . to promote the use of safe alternatives pursuant to section [612],'' whether to include such provisions is discretionary, not mandatory. While Congress left such regulations to EPA's discretion, Congress directly applied the venting prohibition to substitute refrigerants under section 608. Moreover, the legislative history for section 608 recognizes the distinctions between sections 612 and 608, stating: ''The fact that a particular substance has been identified by the Administrator as a 'safe substitute' for purposes of section 612, does not affect the requirement for a separate determination under [section 608]. The purposes of section 612 and of this section are different and substances approved under section 612 will not automatically qualify for exclusion from the prohibition on venting that is included in this section.'' Statement of Senate Managers, S. 1630, The Clean Air Act Amendments of 1990, *reprinted in* 1 A Legislative History of the Clean Air Act Amendments of 1990, at 928 (1993). Accordingly, EPA does not interpret the discretion provided by section 608(a)(3) to diminish its ability to interpret, explain, and enforce section 608(c) as it is doing in this rule.

3. Comment: Section 608 Does Not Authorize EPA To Regulate the Normal Operation of Refrigerant Equipment

Commenters stated that EPA's authority under section 608 is limited to regulating actions taken during servicing, repair, or disposal of refrigeration equipment, or class I and II refrigerants evacuated during such servicing and repair. These comments further stated that EPA's authority extends only to technicians and that nothing in section 608 would enable EPA to impose liability on the equipment owner or operator.

With regard to the actions that are within the scope of section 608(c), as explained earlier in this notice, EPA interprets section 608(c) to convey authority to interpret, explain, and enforce the venting prohibition for both ODS and substitute refrigerants, and that prohibition applies to the maintenance, service, repair, or disposal of appliances and IPR. As explained elsewhere in this rulemaking, this action applies regulations to non-exempt substitute refrigerants that are related to the maintenance, service, repair, or disposal of such appliances or to providing persons engaged in such activities with additional clarity and certainty on how to ensure that their actions comport with the venting prohibition and the *de minimis* exemption to it. For example, the technician certification provisions relate to who can maintain, service, or repair an appliance and the evacuation and recovery equipment provisions relate to how to maintain, service, repair or dispose of an appliance. Furthermore, the comment omits the concept of maintenance, which is included in section 608(c). EPA notes that the definition of the term ''maintain'' includes ''to keep in an existing state; preserve or retain'' and to ''keep in a condition of good repair or efficiency.'' The American Heritage College Dictionary, 4th ed. (Houghton Mifflin, 2002), at 834; see also *http://www.merriam-webster.com/dictionary/maintain* (including in the definition of maintain ''to keep in an existing state (as of repair, efficiency, or validity): Preserve from failure or decline <maintain machinery>'') (last accessed May 31, 2016). Thus, ''maintenance'' and ''maintaining'' include a broad range of activities involved in preserving equipment in normal working order.

EPA noted in a prior response that section 608(c) is limited to refrigerants while section 608(a) is not. However, the comment is incorrect that section 608(c) is limited to the activities of a technician. Section 608(c)(2) refers to ''any person,'' and ''person'' is defined broadly in CAA section 302, as well as in subpart F to 40 CFR part 82. More specifically, section 302(e) defines ''person'' to ''include[ ] an individual, corporation, partnership, association, State, municipality, political subdivision of a State, and any agency, department, or instrumentality of the United States and any officer, agent or employee thereof.'' Thus, the definition clearly is not limited to technicians. Furthermore, the current statement of purpose and scope in subpart F, § 82.150, lists appliance owners and operators as one of the persons to which the subpart applies.

When EPA initially promulgated the subpart F regulations, it explained that these rules applied to owners. For example, in the preamble to the 1993 Rule, EPA explained that it had made ''additions to the scope section to clarify that the rule covers refrigerant reclaimers, *appliance owners,* and manufacturers of appliances and recycling and recovery equipment in addition to persons servicing, repairing, maintaining, and disposing of appliances.'' 58 FR 28707 (emphasis added); *see also* 58 FR 28681

(explaining that the rule required the owner of the equipment to either authorize the repair of substantial leaks or develop the equipment retirement/retrofit plan within 30 days of discovering leak above the standard and that the owner has the legal obligation to ensure that repairs are made to equipment where the leak rate exceeds the standard).

Some comments on the proposed rule stated that section 608(c) cannot be used to require that an equipment owner undertake repairs. EPA disagrees with this comment. As explained above, owners are within the scope of ''person'' as defined in CAA section 302(e) and subpart F. An owner's failure to undertake repairs of leaky appliances or IPR could lead directly to a violation of the venting prohibition. As one example, if in the course of a normal maintenance check, a technician discovers that the appliance is releasing refrigerant above the threshold leak rate but the owner does not authorize the repairs as required by the rules, and instead decides to add refrigerant and continue operating the equipment, the owner would be participating in a knowing release.

Many commenters also disagreed with EPA's interpretation of the venting prohibition, as articulated in the proposed rule that ''when a person adds refrigerant to an appliance that he or she knows is leaking, without repairing the appliance consistent with the leak repair requirements, he or she also violates the venting prohibition.'' One commenter stated that this could prohibit technicians from filling any leaking appliance. Another commenter noted that that it appears to cover failed repairs and verification tests during the repair period allowed by § 82.156(i)(9) and § 82.157(e). Commenters requested that EPA clarify that leaks that occur within an applicable repair window or retrofit/retirement schedule, even though the facility may be aware of the leak, do not violate the venting prohibition, where the leak repair procedures prescribed in subpart F are followed. To clarify EPA's statement in the proposed rule and to respond to these comments, EPA's position is that while the addition of refrigerant to an appliance known to be leaking above the threshold rate is a knowing release, that release does not violate the venting prohibition so long as the applicable practices referenced in § 82.154(a)(2), as revised, are complied with, including the leak repair requirements, as applicable.

4. Addressing Concerns About Global Warming Is Not Lawful Under Title VI of the CAA

Multiple commenters stated that EPA cannot use Title VI to control substances based on their GWPs. These commenters referred to section 602(e), which states that EPA's required publication of the GWP of a class I or class II substance ''shall not be construed to be the basis of any additional regulation under this chapter.'' EPA responds that section 602(e) relates to the GWPs of ODS, and says nothing regarding the GWPs of substitutes. In any event, EPA is not relying on section 602 as authority for the action being taken in this rulemaking. Rather, EPA is relying on section 608 for the substantive requirements contained in this rule. Section 608(c) prohibits the knowing venting or release of a substitute refrigerant unless the Administrator determines that such venting, release, or disposal does not pose a threat to the environment. While it is true that EPA anticipates a significant GHG emissions reduction as a result of this rule, EPA is extending the subpart F regulations to all substitute refrigerants that are not exempt from the venting prohibition irrespective of their GWPs. The GWPs of the non-exempt substitutes addressed in this rulemaking range from 4 to over 14,000.

One commenter stated that the legislative history demonstrates that Congress considered and rejected regulating GHGs under Title VI of the CAA. Congress does not intend *sub silento* to enact statutory language that it has earlier discarded. The commenter also noted that Congress rejected the Senate version known as ''The Stratospheric Ozone and Climate Protection Act.'' That version of the act sought to reduce methane emissions in the U.S. and other countries. The removal of those provisions signifies, in the commenter's opinion, that Congress did not intend for Title VI to address substances that were not ozone depleting, even if they have high GWPs.

EPA responds that while Congress chose not to include certain potential measures regarding regulation of GHGs unrelated to ODS, Congress nonetheless included multiple provisions regarding ODS substitutes. The legislative history of section 608(c) indicates that Congress specifically recognized that substitutes could pose a threat to the environment because they could include greenhouse gases. In discussing the venting prohibition, as it applies to substitute refrigerants, the statement of the Senate Managers included the following:

> Effective 5 years after enactment, the prohibition on venting or release shall also apply to all substances that are used as refrigerants as substitutes for class I or class II refrigerants. By its terms, this provision applies to substances that are not listed as class I or class II substances. This is an important provision because many of the substitutes being developed do not have ozone depleting properties but they are 'greenhouse gases' and have radiative properties that are expected to exacerbate the problem of global climate change. The prohibition shall apply to all such substitute substances except where the Administrator determines that the venting, release or disposal of a particular substitute substance does not pose a threat to the environment.
>
> The Administrator shall consider long term threats, such as global warming, as well as acute threats. The fact that a particular substance has been identified by the Administrator as a 'safe substitute' for purposes of section 612 does not affect the requirement for a separate determination under this section. The purposes of section 612 and of this section are different and substances approved under section 612 will not automatically qualify for exclusion from the prohibition on venting that is included in this section.[16]

It is therefore clear that Congress understood that substitute refrigerants could be greenhouse gases, specifically sought to apply the venting prohibition to such gases, and specifically contemplated that climate risks would be considered in carrying out the venting prohibition. The removal of a provision related to methane within Title VI does not indicate that Congress did not intend to address greenhouse gases in the venting prohibition.

One commenter stated that EPA has not undertaken an endangerment finding to support regulation of HFCs from IPR as a greenhouse gas which can be regulated under the CAA. EPA responds that under section 608(c), the venting prohibition applies to substitutes unless EPA exempts them. EPA is not required to take any affirmative action, let alone an endangerment finding, for the venting prohibition to apply.

One commenter stated that the purpose of Title VI is to implement the Montreal Protocol, whose sole goal is to protect the stratospheric ozone layer from ODS. EPA responds that while certain sections of Title VI do in fact implement the Montreal Protocol, several sections of Title VI call on EPA to take measures that are not required by the Montreal Protocol but are complementary to the ODS phaseout. These sections include, in addition to

[16] Statement of Senate Managers, S. 1630, The Clean Air Act Amendments of 1990, *reprinted in* 1 A Legislative History of the Clean Air Act Amendments of 1990, at 929 (1993).

section 608, sections 609 (servicing of motor vehicle air conditioners), 610 (nonessential products), 611 (labeling), and 612 (safe alternatives policy). Section 608 clearly provides EPA authority to regulate the venting, release, and disposal of substitute refrigerants.

5. EPA's Proposal Would Increase Risks to Human Health and Violate Section 612

One commenter stated that the proposed rule would drive owners and operators of IPR from HFCs to exempt substitutes in order to remove themselves from the regulatory requirements of subpart F. The commenter stated that some of these exempt substitutes are not safer for human health. HFCs are non-ozone depleting, non-flammable, and non-toxic whereas ammonia, chlorine, and hydrocarbons are either toxic or flammable. By encouraging the use of these non-exempt but riskier substitutes, the commenter states that EPA is violating section 612(a) of the CAA.

EPA responds that the commenter is quoting the policy statement that appears in section 612(a). The Agency is not acting under section 612. Rather, EPA is acting under section 608. This action under section 608 is consistent with decisions made under section 612 and does not alter those decisions. Specifically, it does not preclude use of any substitute listed as acceptable or acceptable subject to use restrictions under section 612(c) for the specified end-use. Under section 612(c), EPA compares substitutes not only to ODS but also to other available substitutes. When reviewing substitute refrigerants, EPA considers a variety of risks, including toxicity and flammability. In some instances, EPA lists substitutes as acceptable subject to use conditions that mitigate such risk. EPA does not dictate that a particular user choose a specific substitute from among those listed as acceptable for that end-use. Whether an owner or operator of an IPR facility chooses to transition to an exempt substitute is a decision that must be made weighing the advantages and disadvantages of the specific refrigerant.

6. Section 301 and 114 Do Not Grant EPA Authority To Regulate Substitutes

Two commenters stated that section 301 grants EPA general rulemaking authority but does not authorize the Agency to act where a specific statutory provision already has addressed an issue. They further stated that section 608(a) does address the issue of whether the refrigerant management regulations apply to substitutes and therefore EPA cannot use section 301 to create that authority.

As discussed above, nothing in Title VI says what refrigerant management requirements should apply to substitutes: Therefore, this is not a situation where a specific statutory provision has already addressed the issue. EPA is issuing regulations to interpret, explain, and enforce the venting prohibition in section 608(c)(2) with regard to non-exempt substitutes. EPA is not deriving substantive authority from section 301. Rather, EPA is relying on section 608 for its substantive authority and is looking to section 301 as supplemental authority to issue regulations to carry out its functions under section 608. Similarly, EPA is looking to section 114 not for the substantive refrigerant management requirements being finalized today but rather as authority to require recordkeeping and reporting in carrying out the venting prohibition for non-exempt substitutes.

IV. The Revisions Finalized in This Rule

A. Revisions to the Definitions in § 82.152

EPA proposed to update and clarify many of the definitions in subpart F. EPA also proposed to add new definitions and remove definitions that solely restated the required practice. In general, these revisions are to improve readability, increase consistency with how the term is used in the regulatory text, and specifically incorporate substitute refrigerants as appropriate.

EPA received comment on the proposed revisions to definitions of *refrigerant* and *appliance,* as well as terms specifically applicable to the leak repair portion of the regulations. EPA also received requests to define additional terms. Those comments, and changes from the proposed definitions that are being made in this final rule, are discussed later in this section with those terms. EPA is finalizing as proposed the other revisions to definitions in this section that were addressed in the notice of proposed rulemaking and where we did not receive comments. Other revisions elicited only supporting comments, which are briefly noted in the descriptions of the revisions.

Appliance

EPA proposed to define *appliance* as any device which contains and uses a class I or class II substance or substitute as a refrigerant and which is used for household or commercial purposes, including any air conditioner, motor vehicle air conditioner, refrigerator, chiller, or freezer. EPA is finalizing three revisions to the definition of *appliance.* First, EPA is extending the subpart F regulatory definition to apply to substitute refrigerants. Second, EPA is adding ''motor vehicle air conditioner'' to the list of example appliances. Third, EPA is adding a sentence stating that each independent circuit on a system with multiple circuits is considered a separate appliance.

The prior definitions in subpart F are written to separate ozone-depleting substances from non-ozone depleting substitutes. EPA's prior regulations defined an *appliance* as a device which contains and uses a *refrigerant.* As relevant here, section 601 of the CAA defines an *appliance* as a ''device which contains and uses a class I or class II substance as a refrigerant.'' Class I and class II substances are defined as substances listed under sections 602(a) or (b), respectively. Section 601 of the CAA does not define *refrigerant* but EPA's regulations at § 82.152 as they existed before this rulemaking defined *refrigerant* as solely class I or class II ozone-depleting substances, or mixtures containing a class I or class II ODS.

Defining these terms in this manner was appropriate before section 608(c)(2) took effect on November 15, 1995. Under section 608(c)(2), the venting prohibition applies to substitutes for ODS refrigerants and, accordingly, it states that ''[f]or purposes of this paragraph'' *appliance* includes any ''device which contains and uses as a refrigerant a substitute substance and which is used for household or commercial purposes.'' However, EPA had not updated the definition of *appliance* in subpart F to reflect section 608(c)(2). Because EPA regulations, as they existed before this rulemaking, had defined an *appliance* as a device that contains and uses a refrigerant, and *refrigerant* in a way that does not include substitutes, substitutes were excluded from the regulatory definition of *appliance.*

In this action, EPA is revising the definition of *appliance* so that it encompasses the definition of the term in both sections 601 and 608 of the CAA. EPA is defining *appliance* as any device which contains and uses a class I or class II substance or substitute as a refrigerant and which is used for household or commercial purposes. This revision makes the regulatory definition consistent with both sections 601 and 608 of the CAA, improves internal consistency of the regulations, and increases clarity for the regulated community.

One commenter stated that EPA should not add ''substitutes'' to the definition of *appliance* because CAA section 601(1) already defines appliance and ''substitutes'' is not included. EPA responds that while the definition of *appliance* in section 601(1) does not contain ''substitutes,'' section 608(c)(2) does extend the term *appliance* to systems containing substitutes for purposes of that paragraph. It is reasonable to update the regulatory definition so that there is a consistent definition of *appliance* throughout subpart F. Further, because the regulations in subpart F address the venting prohibition under section 608(c)(2) for substitute refrigerants and requirements to interpret, explain, and enforce the *de minimis* exemption to that prohibition, it is reasonable to include ''substitutes'' in the regulatory definition of appliance. In addition, this rulemaking only changes the definition of appliance as it appears in subpart F, but the definition of the term in other regulations under Title VI, such as in 40 CFR 82.3, remains unchanged.

EPA also proposed and is finalizing the addition of ''motor vehicle air conditioner'' to the list of example appliances. Two commenters objected to this proposal, stating that neither definition of *appliance* in section 601 or 608 of the CAA specifically includes motor vehicle air conditioners. One commenter states that Congress specifically considered but ultimately decided against explicitly including ''motor vehicles'' within the definition of *appliance* in section 601 of the CAA.

A plain reading of the Clean Air Act would include motor vehicle air conditioning under *appliance.* Section 601 of the CAA defines an appliance as ''*any* device . . . which is used for household or commercial purposes including *any* air conditioner . . .'' (emphasis added). In the 1993 Rule establishing regulations under section 608 for the first time, the Agency stated the following:

> The Act defines 'appliance' as 'any device which contains and uses a class I or class II substance as a refrigerant and which is used for household or commercial purposes, including any air conditioner, refrigerator, chiller, or freezer.' EPA interprets this definition to include all air-conditioning and refrigeration equipment except that designed and used exclusively for military applications. Thus, the term includes all the sectors of air-conditioning and refrigeration equipment described under Section III.A above, including household refrigerators and freezers (which may be used outside the home), other refrigerated appliances, residential and light commercial air-conditioning, transport refrigeration, retail food refrigeration, cold storage warehouses, commercial comfort air-conditioning, *motor vehicle air conditioners,* comfort cooling in vehicles not covered under section 609, and industrial process refrigeration.'' (58 FR 28669; May 14, 1993, emphasis added)

In that same final rule, EPA established the definition of MVAC in subpart F as ''*any appliance* that is a motor vehicle air conditioner as defined in 40 CFR part 82, subpart B'' (emphasis added), and that definition has not since been changed. The commenters themselves state that procedures that are not regulated under section 609, such as the disposal of MVACs and the purchase of refrigerant in some sized containers, are covered by section 608. Furthermore, they agree that the prohibition against venting ODS and substitute refrigerants in section 608 is also already applicable to refrigerants used in MVAC and MVAC-like appliances. This necessarily implies that *appliance* as used in section 608 includes ''motor vehicle air conditioners.'' The inclusion of ''motor vehicle air conditioners'' as an example within *appliance* is a clarification, and it reflects the way the term appliance has been used throughout the history of the program. Specific provisions in subpart F that relate to activities that are regulated for MVACs under section 609 refer, as appropriate, to the subpart B regulations issued under section 609 of the CAA.

Comments from the auto industry also expressed concern that adding motor vehicle air conditioners to the list of examples in the definition of *appliance* would affect EPA's exemption from servicing requirements for MVACs in vehicles that have not yet left the manufacturing facility. In the 1992 rule establishing regulations under section 609, EPA stated that:

> a motor vehicle air conditioner is not subject to these regulations prior to the completion of final assembly of the vehicle by the original equipment manufacturer. While repair or service work on air conditioners in unfinished vehicles may well fit the definition of 'service for consideration,' the equipment and technician certification requirements of these rules do not apply as the motor vehicle air conditioner is not subject to these rules prior to the completion of the final assembly process by the vehicle's manufacturer. (57 FR 31246; July 14, 1992)

The addition of motor vehicle air conditioners as an example within the definition of *appliance* does not affect current practices and EPA regulations as they affect vehicle manufacturing. That was not the intent of the proposed change and is not a result of this final action. As previously discussed, the definition of *motor vehicle air conditioner* in subpart F is ''any appliance that is a motor vehicle air conditioner as defined in 40 CFR part 82, subpart B'' and the definitions within subpart B, under section 609, exclude vehicles that have not completed manufacturing by the original equipment manufacturer. EPA provided the following explanation for the exclusion of vehicles that have not yet been fully manufactured from the servicing requirements under section 609 in the 1992 final rule:

> EPA believes the repair of newly manufactured units is not likely to be a common occurrence and when it does occur, the manufacturing facilities clearly use equipment to recover and recycle the refrigerant so that it may be reintroduced once the motor vehicle air conditioner is repaired. The equipment is significantly different from the kind of equipment covered by EPA's definition of approved equipment, yet serves the purpose of such equipment equally well. In addition, the technicians performing this operation are typically manufacturing employees, not service technicians. For all these reasons, the Agency believes it is not necessary at this time to extend the requirements of this servicing regulation into the assembly operation. . . EPA wants to be clear that this exclusion is limited to final assembly activities conducted by the vehicle's original manufacturer, and does not include service or repair activities conducted, for example, by a dealer. (57 FR 31245, July 14, 1992)

One commenter further stated that it is not necessary to impose new technician training and certification requirements, or other regulatory requirements, for the automobile company and component supplier employees and contractors engaged in these activities. EPA agrees and reiterates that because the venting prohibition already applied to ODS and substitutes, this final action will not have any new effect on the automotive manufacturing process or individuals employed in the automotive and/or MVAC manufacturing process prior to the vehicle leaving the manufacturing plant. EPA's regulations under both sections 608 and 609 are intended, and will continue, to apply only to MVACs that are fully manufactured.

A few commenters requested that EPA clarify that for systems containing multiple circuits, each independent circuit is considered a separate appliance for the purposes of subpart F. This is the position that EPA has taken in the *Compliance Guidance for Industrial Process Refrigeration Leak Repair Regulations under Section 608 of the Clean Air Act* from October 1995 and the commenters believe that making such a statement in the regulations will be clearer to the regulated community.

EPA agrees and is adding a sentence clarifying this point to the definition.

Many commenters from the supermarket industry believe that the Agency's interpretation of the term *appliance* is too broad. In these commenters' view, appliances are display cases or unit coolers and not the broader system of piping, compressors, and condensing units to which those are attached. One commenter suggested that EPA create a definition for the term *system* to indicate a combination of various pieces of equipment and appliances that are professionally and specifically designed and erected for a particular application. Another commenter suggested that EPA define the refrigerant circuit as separate from the appliance. These commenters are especially concerned about a definition of *appliance* that includes all coolers, display cases, components, and piping in light of EPA's proposal to require that an appliance be retired if it exceeds the proposed two-year leak limit.

EPA responds that the Agency interprets an *appliance* as a fully assembled device that can function for its intended purpose. Components, on the other hand, are all the parts of the appliance that make up the refrigerant circuit, as described later in this section. As EPA described in the final rule allocating HCFCs for 2010–2014, ''appliances are separate from components, which are the individual parts of an appliance, such as a condensing unit or line set, that by themselves cannot function to provide a cooling effect'' (74 FR 66439; December 15, 2009). EPA recognizes that some would prefer that some components be considered appliances. For example, some members in the industry consider a condensing unit in a residential split system to be an appliance. However, EPA does not believe it is practical or clear for some components to also be considered appliances in the regulatory definitions. The concepts of *full charge* or *leak rate* do not make sense in the context of only a component. Finally, EPA notes that much of these commenters' concerns about the scope of the term *appliance* was in response to EPA's proposal that chronically leaking appliances be retired. As discussed in Section IV.F.12, EPA is not finalizing the proposed requirement for automatic retirement of chronically leaking appliances.

Apprentice

As proposed, EPA is amending the definition of *apprentice* to replace the ''Bureau of Apprenticeship and Training'' with the ''Office of Apprenticeship'' to match the current name of the office and to make minor edits to improve clarity and readability.

Batch

EPA proposed a requirement that each batch of reclaimed refrigerant be tested. EPA did not propose to define ''batch'' but is doing so in this final rule based on requests by commenters to clarify the term. EPA agrees with the comment that adding a definition of *batch* will clarify this requirement, and is defining the term based on language provided by multiple commenters. Therefore, EPA is defining *batch* to mean a single bulk cylinder of refrigerant after all reclamation has been completed prior to packaging or shipping to the market.

Certified Refrigerant Recovery or Recycling Equipment

As proposed, EPA is removing the defined term *certified refrigerant recovery or recycling equipment* which was merely a reference to the sections of the Code of Federal Regulations that discuss the certification program. This term was also used inconsistently throughout subpart F as ''recovery and recycling equipment,'' ''recovery or recycling equipment,'' ''recycling and recovery equipment,'' and ''recycling or recovery equipment.'' The regulations at § 82.36 make a distinction, in the context of MVAC servicing, between equipment that only recovers refrigerant and equipment that both recovers and recycles refrigerant. The regulations in subpart F generally do not make a distinction. The standards in appendices B1 and B2 refer to recovery and/or recycling equipment while the standard in appendix C for small appliances refers to recovery equipment only. For consistency, in the revised provisions, EPA is using ''recovery and/or recycling equipment'' throughout, except for when referring only to small appliances.

Class I and Class II

EPA is finalizing as proposed regulatory definitions for *class I* and *class II* ozone-depleting substances to assist the reader. These terms are currently defined in section 601 of the CAA and in 40 CFR part 82, subpart A. EPA is finalizing the addition of a definition of class I as an ozone-depleting substance that is listed in 40 CFR part 82, subpart A, appendix A. Similarly, EPA is finalizing the addition of a definition of class II as an ozone-depleting substance that is listed in 40 CFR part 82, subpart A, appendix B. EPA also notes that the regulatory text uses class I substance, class I ODS, and class I refrigerant interchangeably (and similarly uses class II substance, class II ODS, and class II refrigerant interchangeably) and all are intended to have the same meaning for the purpose of subpart F.

Comfort Cooling

EPA is finalizing the addition of a definition for *comfort cooling.* The leak repair provisions divide refrigeration and air-conditioning equipment into four categories: Comfort cooling, commercial refrigeration, industrial process refrigeration, and other. EPA's prior regulations defined commercial refrigeration and industrial process refrigeration but not comfort cooling.

For purposes of the leak repair requirements, EPA proposed to define *comfort cooling* as the air-conditioning appliances used to provide cooling in order to control heat and/or humidity in facilities including but not limited to office buildings and light commercial buildings. EPA further proposed to include language explaining that comfort cooling appliances include building chillers and roof-top self-contained units, and may be used for the comfort of occupants or for climate control to protect equipment within a facility, such as but not limited to computer rooms. EPA sought comments on the applicability of the proposed definition of *comfort cooling* to air-conditioning equipment that is typically used to provide cooling and or humidity control in such environments.

Commenters suggested that EPA remove the reference to equipment and computer rooms as this is beyond the scope of comfort cooling. One commenter suggested that comfort cooling only include computer rooms set to above 68 degrees F to align the definition with CARB–32. That commenter also suggested that appliances used to cool computer rooms would fall under the category of ''other appliances.'' Another commenter believes that such appliances are currently considered as IPR. EPA responds that the intent was to apply the term *comfort cooling* only to spaces occupied by humans. EPA has made edits to better reflect this understanding in the final definition and is therefore not including in the final definition the last sentence from the proposed definition (which read ''[t]hey may be used for the comfort of occupants or for climate control to protect equipment within a facility, including but not limited to computer rooms.'').

EPA notes here that *comfort cooling,* with respect to the leak repair provisions in this subpart, does not include MVACs or MVAC-like appliances.

Commercial Refrigeration

As proposed, EPA is finalizing the amendment to the definition of *commercial refrigeration* that removed the sentence stating that this equipment typically contains a charge size over 75 pounds. While accurate, this sentence has caused confusion as to whether or not the leak repair requirements are applicable to such appliances with a full charge between 50 pounds, as stated in the leak repair required practices, and 75 pounds. The leak repair requirements do apply because the threshold is a refrigerant charge of 50 pounds or greater. EPA is removing this sentence to avoid this confusion. EPA received comments in support of this revision.

Critical Component/Component

As proposed, EPA is removing the defined term *critical component* and adding the term *component.* The term *critical component* was only used in the context of an extension for the repair of IPR when critical components could not be delivered within the necessary time. EPA is amending the definition so that it is not limited to IPR, but also includes comfort cooling and commercial refrigeration appliances. As discussed in Section IV.F of this notice, EPA is applying the extensions for leak repairs to all types of appliances. The unavailability of a component is not unique to IPR and EPA is granting all appliances the same flexibility to request additional time. This revision to the regulatory definitions supports that flexibility.

EPA proposed to define *component* as ''a part of the refrigerant loop within an appliance including, but not limited to, compressors, condensers, evaporators, receivers, and all of its connections and subassemblies.'' *Component* is intended to be broader than *critical component.* EPA considers components to include all the parts of the appliance that make up the refrigerant circuit such as the compressor, heat exchangers (condenser and evaporator), and valves (*e.g.,* heat recovery, expansion, charging). Other components may include receivers, manifolds, filter driers, and refrigerant piping. EPA is finalizing this definition substantially as proposed, although it is replacing the word ''loop'' with ''circuit,'' as *refrigerant circuit* is a defined term in the regulations.

Custom-Built

As proposed, EPA is amending the definition of *custom-built* to remove a citation to a section of the regulation that has moved.

Disposal

EPA proposed to amend the definition of *disposal* to clarify that the disposal process includes the destruction of an appliance that releases or would release refrigerant to the environment. This proposed revision is intended to cover activities such as vandalism or the cutting of refrigerant lines, whether to steal metal or to vent the refrigerant or both. EPA also proposed to clarify that the disassembly of an appliance for recycling, as well as reuse, is part of the disposal process.

One commenter stated that the regulatory definition of *disposal* is inconsistent with EPA's Sustainable Materials Management policy and with the RCRA definition of *disposal* at 40 CFR 260.10, which leads to regulatory confusion. The commenter seeks to clarify that the recycling of appliances or components is separate from disposal. The commenter believes there should be four definitions regarding recycling and disposal: (1) Recycle refrigerant; (2) dispose of refrigerant; (3) recycle an appliance; and (4) dispose of an appliance. The commenter finds that the proposed revision to the definition confuses the distinction between recycling and disposal. The commenter also finds that the word ''destruction'' is too broad if EPA is trying to address vandalism, line-cutting, or theft and is concerned that the term equates recycling with such unlawful activities.

EPA responds that the Agency addresses the recycling and disposal (or reclamation) of refrigerant elsewhere in subpart F. The safe disposal provisions at § 82.155 relate to the disposal of appliances. The Clean Air Act in 608(a) refers to the ''service, repair, and *disposal of appliances*'' and 608(c) refers to the ''maintaining, servicing, repairing, or *disposing of an appliance*'' (emphases added). The manner in which the appliance is disposed of, whether by recycling, landfilling, reuse of component parts, or another method is not addressed by the CAA. For the purposes of section 608, what is relevant is that an action is taken on an appliance at the end of its useful life that releases or would release refrigerant if the proper precautions are not taken. EPA agrees it is appropriate to specify what is included in *disposal* for clarity but does not agree that the term must have the same meaning in section 608 of the CAA as under RCRA or the Sustainable Materials Management policy. The commenter does not make clear how the Agency's Sustainable Materials Management policy is in conflict with the requirement in subpart F to recover, or verify the prior recovery, of refrigerant in discarded appliances. EPA is finalizing its proposal to include recycling for scrap as one of the methods by which an appliance may be disposed.

Furthermore, EPA's intent is to address the various actions taken upon an existing and operational system that will effectively end its useful life and potentially release refrigerant. Both recycling and vandalizing a fully charged appliance would have that effect, though EPA recognizes the distinctions between those two actions. This revision is also consistent with a recent court decision-which found that cutting a functioning condenser unit and releasing refrigerant into the environment constituted disposal of an appliance within the meaning of CAA section 608 and its implementing regulations, even if the underlying intent was to steal and sell the metal piping. *United States* v. *Harrold,* No. 2:15–mj–605 (S.D. Ohio, Oct. 28, 2015) (order concluding that the complaint sufficiently charged a violation of the Act and that sufficient evidence was presented to establish probable cause that defendant violated the Act).[17] *See also United States* v. *Morrissette,* 579 F. App'x 916, 919 (11th Cir. 2014) (stating that defendant who stole metal coils from commercial air conditioning units had violated the CAA regardless of the underlying intent to steal copper). EPA is finalizing the definition of *disposal* substantially as proposed. In response to the comment, EPA is replacing the word ''destruction'' with ''vandalism'' to more specifically refer to actions such as line cutting and metal theft. The vandalism would have to be of such a nature that it would release the refrigerant. EPA is also separating ''[t]he recycling of any appliance for scrap'' from ''[t]he disassembly of any appliance for reuse of its component parts.'' Both are considered disposal.

Follow-Up Verification Test

EPA is amending the definition of *follow-up verification test* to remove duplicative text that was also covered in § 82.156(i). The revised definition describes what the test is and how it is conducted, not the regulatory requirements of the test. The revised regulatory requirements are found in § 82.157(e). EPA is not specifying one test that would satisfy what constitutes a follow-up verification test, but is providing an illustrative list of tests that would qualify. EPA does not intend for this list to be all-inclusive, but rather to

[17] A copy of this opinion and other documents related to this case are available in the docket for this rulemaking.

provide examples of known methodologies of performing leak repair verification tests.

One commenter suggested that EPA modify the name of this test to *follow-up leak repair verification test.* The commenter has found that over 40 percent of technicians who do not work on IPR, where these tests were previously required, were confused about the distinction between the initial and follow-up verification tests. The technicians indicated to the commenter that such a name change would make it clearer that the tests are about the effectiveness of the repair. EPA disagrees that changing the name of the test will improve technician's abilities to conduct these tests or reduce refrigerant emissions. It is understandable that technicians that do not work on IPR equipment and are not trained in the procedures of subpart F that had previously only applied to IPR would not be aware of the requirements. EPA is concerned that changing the name of the test would confuse those who already know of the requirement. EPA is therefore finalizing the definition of *follow-up verification test* as proposed.

Full Charge and Seasonal Variance

EPA is amending the definition of *full charge* to account for seasonal variances and to make minor edits for readability. Owners or operators of commercial refrigeration appliances and IPR have previously expressed concerns that the full charge may not be accurately determined due to seasonal variances that may alter the amount of refrigerant in an appliance. Seasonal variances in ambient temperature and pressure have the effect of forcing refrigerant to different appliance components (for example, from an appliance's receiver to the condenser).

EPA is allowing owners or operators to account for seasonal variances by measuring the actual amount of refrigerant added to or evacuated from the appliance. EPA is defining *full charge* as the amount of refrigerant required for normal operating characteristics and conditions of the appliance as determined by using one or a combination of the following four methods:

(1) Use of the equipment manufacturer's determination of the full charge;

(2) Use of appropriate calculations based on component sizes, density of refrigerant, volume of piping, and other relevant considerations;

(3) Use of actual measurements of the amount of refrigerant added to or evacuated from the appliance, including for seasonal variances; and/or

(4) Use of an established range based on the best available data regarding the normal operating characteristics and conditions for the appliance, where the midpoint of the range will serve as the full charge.

To further explain the definition of *full charge,* EPA is creating a defined term for *seasonal variance.* This term means the removal of refrigerant from an appliance due to a change in ambient conditions caused by a change in season, followed by the subsequent addition of an amount that is less than or equal to the amount of refrigerant removed in the prior change in season, where both the removal and addition of refrigerant occurs within one consecutive 12-month period. A complete discussion of allowing for seasonal variances when calculating appliance leak rates is found in Section IV.F of this preamble.

EPA received several comments on the proposed definition of *seasonal variance.* Two commenters recommended that EPA use the removal of refrigerant as the first step and the addition of refrigerant as the second step. While EPA proposed the opposite framing, you can measure the amount removed to be able to determine the amount that can be added in the next season without triggering a leak rate calculation. EPA has adjusted the definition and the narrative in the preamble accordingly.

Four commenters suggested that the amount added and removed does not always have to be equal, as was proposed. EPA agrees that as long as the amount added is less than or equal to the amount removed in the prior season, the addition will be considered a seasonal variance.

One commenter requested that EPA clarify whether the added refrigerant amount is to be included in the full charge amount. The commenter is concerned that not reflecting the seasonal variance could affect what is considered normal operating characteristics and conditions, which would in turn affect when verification tests can be conducted. Another commenter proposed that the maximum charge be used at all times when calculating the leak rate, regardless of what is actually in the appliance at the time of repair.

Given the concerns raised by the commenter about including seasonal variances in the appliance's full charge to prevent problems with compliance with normal operating characteristics and conditions, the full charge must be adjusted to account for the amount of refrigerant removed or added for a seasonal variance if the full charge was calculated using any method other than method four, since that method inherently includes a range. To be clear, verification tests should be conducted regardless of whether the appliance contains extra refrigerant to account for a seasonal variance. This could result in two ''full charges,'' one for each season. EPA does not agree that it would be appropriate to use the maximum charge or the higher of the two full charge calculations because some seasonal variances are large enough that adjusting the full charge would make significant difference in the leaks that would exceed the applicable leak rate. Since this is an added flexibility, requiring slightly more recordkeeping is warranted.

One commenter indicated that refrigerant charge should never be added or removed throughout the year. While this may be true for some types of equipment, there are legitimate situations where such additions or removals are appropriate, typically in larger commercial refrigeration and industrial process refrigeration appliances. For example, one commenter cited the instance of a seafood packer who may need to add refrigerant during crab season when the refrigeration or freezing load spikes.

Finally, the Agency is allowing an owner or operator to choose a combination of methods to determine full charge. There are instances where multiple methods may be necessary to accurately determine the full charge. Further EPA is providing flexibility by not requiring that owners or operators commit to the same method for the life of the appliance. EPA is requiring in this final rule that owners or operators maintain a written record of the full charge, the method(s) used to determine the full charge, and any changes to that amount.

High-Pressure Appliance

EPA is amending the definition of *high-pressure appliance* as proposed to update the list of example refrigerants with the most commonly used refrigerants today. Because revisions to *appliance* and *refrigerant* carry over into this term as well, under the revisions finalized in this rule, high-pressure appliances include those that use ODS and non-ODS substitute refrigerants.

Industrial Process Refrigeration

EPA is amending the definition of *industrial process refrigeration* as proposed to make minor clarifications for readability and to remove a citation

to a section of the regulation that has moved.

Industrial Process Shutdown

EPA is amending the definition of *industrial process shutdown* as proposed to remove a citation to a section of the regulation that has moved.

Initial Verification Test

EPA is amending the definition of *initial verification test* to remove duplicative text that is also covered in the required practices section of the regulation. The revised definition describes in general terms what the test is, not what the requirements of the test are. The purpose of this test is to verify that a leak has been repaired prior to adding refrigerant back into the system. The requirements for an initial leak repair verification test are described in Section IV.F.8 of this notice and in § 82.157(e)(1) of the revised regulation.

Leak Inspection

EPA is creating a new defined term *leak inspection.* EPA proposed to define *leak inspection* as the examination of appliances using a calibrated leak detection device, a bubble test, or visual inspection for oil residue in order to determine the presence and location of refrigerant leaks.

Some commenters recommended additional leak detection methods including: Standing pressure/vacuum decay tests, ultrasonic tests, periodic evacuations, gas-imaging cameras, sight glass checks, viewing receiver levels, pressure checks, charging charts, and the sub-cooling method (for expansion systems).

In general, leak detection methods fall into two categories: Ones that indicate that an appliance is leaking; and ones that can identify the location of a leak. EPA stated in the proposal that the proposed definition covers the techniques currently used to detect the location of leaks, not activities that would assist only in determining whether a system is leaking generally without providing information that would allow detection of the location of the leak. One commenter stated that limiting leak inspections in such a manner increases the costs of conducting leak inspections.

EPA responds that the purpose of a leak inspection is to determine the location of a leak, not to determine whether an appliance is leaking. As discussed in Section IV.F.4 of this notice, EPA is modifying the leak inspection requirement so that it is only required on appliances that have exceeded the applicable leak rate. To repair a leak, the technician must be able to locate it. Therefore, inspection methods that only indicate that the appliance is releasing refrigerant do not provide the necessary information for a technician to repair leaks. Further leak inspections on the repaired system may benefit from using a combination of methods to determine whether the system continues to leak refrigerant, and if so, where.

Commenters also recommended that EPA remove some of the proposed inspection methods. Multiple commenters recommended that EPA not include a visual inspection for oil residue, as that is not a reliable indicator of a refrigerant leak. Similarly, some commenters noted that the bubble test should be used in conjunction with another leak detection method due to its low sensitivity or potential unreliability when performed outdoors. EPA agrees that a visual inspection for oil residue is not dispositive and has removed that method from the list of leak inspection methods included in the definition as finalized. EPA is including bubble tests in that list because it may be appropriate in some circumstances. EPA is also strengthening the leak inspection by requiring under § 82.157(g)(2) that it be performed by a certified technician, while providing discretion for the technician to determine which methods are appropriate.

Some commenters also recommended that EPA remove the word ''calibrated'' because some electronic leak detectors are self-calibrating while others do not require calibration. Instead, these commenters suggested that EPA require that the devices be operated and maintained according to manufacturer guidelines. Another commenter recommended that EPA maintain the requirement that leak detection devices be calibrated. Given the variability of equipment, EPA agrees with the comments suggesting that it is preferable to follow the manufacturer guidelines. Thus, in this final definition EPA is replacing ''calibrated leak detection device'' with ''leak detection device operated and maintained according to manufacturer guidelines'' based on public comment.

In this final rule, EPA is providing a non-exhaustive list of methods for leak inspections, and clarifying that techniques that only determine whether the appliance is leaking must be used in combination with another method that can identify the location of the leak. In general, commenters encouraged EPA to allow for or require multiple methods due to the limitations of individual techniques in different circumstances. This approach is consistent with those comments.

Leak Rate

EPA proposed, and is now finalizing, one substantive change to the definition of *leak rate* to change the calculation performed under what is called Method 2 under the prior rules. The first step of that method has been to take the sum of the quantity of refrigerant added to the appliance over the previous 365-day period (or over the period that has passed since leaks in the appliance were last repaired, if that period is less than one year). Instead of the cut-off being since the last repair (if less than 365 days), EPA is amending Step 1 to cover the period of time since the last successful follow-up verification test showing that all identified leaks were successfully repaired (if less than 365 days have passed since the last refrigerant addition). The goal of this change is to improve the clarity of the requirements. Under the prior definition, it was unclear if the repair had to be successful in order to be considered in the leak rate calculation. These revisions clarify that all identified leaks must be verified as having been successfully repaired.

EPA is also renaming the two methods from Method 1 and Method 2 to ''Annualizing Method'' and ''Rolling Average Method'' to improve readability. EPA is also finalizing the proposed change to clarify that while the same leak rate calculation must be used for all appliances at the same facility, this only refers to the appliances subject to the leak repair provisions (*i.e.,* appliances normally containing 50 or more pounds of refrigerant).

EPA received three comments on this proposed definition. One commenter recommended that EPA remove the Rolling Average Method for simplicity and change the Annualizing Method such that the calculation is based on the time since the last successful follow-up verification test instead of the last refrigerant addition. The commenter further recommended changes to the Rolling Average Method, if EPA keeps it in the regulation, to better express the amount of refrigerant that would be lost if that leak continued for a full year.

EPA responds that while reducing the number of leak rate calculation methods could simplify the regulations, numerous appliance owners and operators have used the Rolling Average method for years and they continue to seek flexibility. EPA does not see an environmental benefit in reducing this flexibility. On the suggestions to change the Annualizing and Rolling Average Methods, EPA is not adopting the suggestions. Broadly speaking, EPA

interprets the comment to indicate that the Rolling Average Method should be more like the Annualizing Method and vice versa such that they are effectively identical. This seems unnecessary and confusing, and limits flexibility. Both methods have strengths that would be undercut by the suggested changes.

The strength of the Annualizing Method is that it is future-oriented. It allows an owner or operator to ''close out'' each leak event so long as the requirements are followed and does not lump past leak events with the current leak event. It considers the amount of time since the last refrigerant addition and then scales that up to provide a leak rate that projects the amount lost over a whole year if not fixed. As a result, this formula will yield a higher leak rate for smaller leaks if the amount of time since the last repair was shorter. This can have significant environmental benefits by requiring more thorough leak inspections and verified repairs sooner. The commenter's suggested change would make this method too similar to the Rolling Average Method for minimal, if any, benefit and could potentially increase the amount of time included in each leak rate calculation. Stretching out the period of time covered could result in lower leak rates depending on the situation.

The Rolling Average Method also has its strengths. It accounts for all refrigerant additions over the past 365 days or since the last successful follow-up verification test showing that all identified leaks were successfully repaired (if less than 365 days). If an owner or operator verifies all identified leaks are repaired, this method would also allow an owner or operator to ''close out'' a leak event. If there is no follow-up verification test showing that all identified leaks were successfully repaired within the last year, the leak rate would be based completely on actual leaks in the past year. This retrospective approach measures actual performance and if leaks are identified and fixed quickly, an appliance may never reach the applicable leak rate.

Two other commenters questioned the rationale for the change given the need to update tracking software and provide staff training. EPA explained its rationale in the proposed rule and earlier in this notice. Specifically, the change is needed to provide clarity that repairs must be successful and verified in order to be considered in the calculation and to improve effectiveness of the rule.

In this action, EPA is requiring that owners or operators use a prospective approach (the Annualizing Method), that focuses on the current leak event rather than the size of past leaks, or a retrospective approach (the Rolling Average Method), where past performance is key. If an owner or operator repairs all identified leaks and verifies that the repairs have been successful, then the Agency considers that a sufficient clearing event in that the leak rate has been brought as close to zero as possible. We recognize that these changes may require modification to software and technician training with the new requirements. For that reason, EPA intends to develop several compliance assistance tools that will help technicians and owners/operators to better understand the requirements. EPA has also delayed the compliance date for the appliance maintenance and leak repair requirements to January 1, 2019, to allow time for the industry to prepare for these changes.

Low-Pressure Appliance

EPA is amending the definition of *low-pressure appliance* to update the list of example refrigerants with the most commonly used refrigerants today. Because revisions to *appliance* and *refrigerant* carry over into this term as well, under the revisions finalized in this action, low-pressure appliances include those that use ODS and non-ODS substitute refrigerants. EPA is finalizing this definition as proposed.

Medium-Pressure Appliance

EPA is amending the definition of *medium-pressure appliance* to update the list of example refrigerants with the most commonly used refrigerants today. Because revisions to *appliance* and *refrigerant* carry over into this term as well, under the revisions finalized in this action, medium-pressure appliances include those that use ODS and non-ODS substitute refrigerants. EPA is finalizing this definition as proposed.

Mothball

EPA proposed to revise the defined term *system mothballing* to *mothball* to reflect how it is used in the regulations, and EPA is finalizing this definition as proposed. Mothballing an appliance suspends the time needed to complete repairs, retrofit or retirement plans, or the actual retrofit or retirement of appliances that have triggered the leak repair requirements. The previous definition referred to refrigeration appliances, but the suspension is allowed for comfort cooling appliances as well as commercial refrigeration and IPR systems. EPA is therefore removing the reference to ''refrigeration'' appliances in the definition. The previous definition also required that the appliance be shut down for ''an extended period of time.'' EPA is removing this phrase because the Agency is not concerned about length of time that the system is shut down but rather that the system has been removed from service temporarily, as opposed to permanently, and that the refrigerant has been evacuated. The revised definition also notes that refrigerant can be evacuated from an isolated component of the appliance if only an isolated section or component is affected and makes minor edits to improve clarity and readability. EPA is also clarifying in § 82.157(d)(3) and § 82.157(i) that the suspension of time ends when refrigerant is added back into the appliance.

One commenter recommended that EPA allow the system to be filled with nitrogen or another inert gas to protect the system while repair is in process. EPA responds that the regulations in subpart F do not prohibit or address this action, as long as the holding charge is an inert gas and not a refrigerant as defined in this subpart. However, EPA is not making revisions to address this point specifically, as the regulations in subpart F are concerned with refrigerants and the nitrogen or other inert gas in this example is not being used as a refrigerant.

Normal Operating Characteristics and Conditions

As proposed, EPA is changing the defined term *normal operating characteristics or conditions* by replacing ''or'' with ''and'' for consistency through the regulations and to accurately describe the intended state of the appliance to which this term refers. EPA is also removing a reference to a section of the regulation that has moved and adding a reference to the appliance's full charge. Operating at full charge is a necessary element of an appliance's normal characteristics and it should be reflected in the definition. Finally, the revised definition clarifies that this term applies to all appliances, not just refrigeration appliances.

Normally Containing a Quantity of Refrigerant

As proposed, EPA is removing the defined term *normally containing a quantity of refrigerant.* Because EPA is replacing this term with the phrase ''with a full charge of'' in the regulatory text where the term occurred, this definition is no longer needed.

One-Time Expansion Device

EPA is amending the definition of *one-time expansion device* as proposed to clarify that this includes devices that can store multiple charges, which are

released individually to the environment to provide a cooling effect.

Opening an Appliance

EPA proposed to amend the definition of *opening an appliance* to improve readability. EPA is finalizing this amended definition as proposed.

Reclaim

As proposed, EPA is changing the defined term *reclaim refrigerant* to *reclaim* so as to match usage in the regulatory text and to update the Air Conditioning, Refrigeration, and Heating Institute (AHRI) standard referenced in the definition. Because revisions to *refrigerant* carry over into the definition for this term, it is appropriate to use the updated AHRI standard which also includes non-ODS substitute refrigerants.

Recover

As proposed, EPA is changing the defined term *recover refrigerant* to *recover* so as to match usage elsewhere in the regulatory text.

Recycle

In the context of recycling refrigerant, EPA is finalizing revisions to the defined term *recycle refrigerant* to *recycle* so as to match usage elsewhere in the regulatory text. The revised term also clarifies that reuse of recycled refrigerant must occur in equipment of the same owner. This revision facilitates consistency with the prohibition in § 82.154(g) of the existing rules on the sale of used refrigerant unless it has either been reclaimed or is being transferred to an appliance owned by the same parent company or by the same federal agency or department. EPA is finalizing this definition substantially as proposed.

Refrigerant

EPA is amending the definition of *refrigerant,* for the purposes of subpart F, to include both ODS and substitutes that are used for heat transfer purposes and provides a cooling effect. This amended definition is closer to how the term is commonly understood, based on its functional properties. From an engineering standpoint, it is irrelevant whether or not a compound is an ODS to function as a refrigerant. Broadening the term also brings another term in subpart F that contains this term, *refrigerant circuit,* more in line with common usage.

One commenter stated that EPA does not have authority to regulate substitutes to the same extent as class I and class II ODS and thus the Agency is prohibited from redefining *refrigerant* to include substitutes. EPA is revising the definition of *refrigerant* under subpart F for purposes of interpreting, explaining, and enforcing the venting prohibition, which applies to substitute refrigerants as well as to ODS refrigerants. EPA is not revising the definition of *refrigerant* for other subparts under part 82. EPA addresses comments about its authority for this action in Section III of this notice.

Retire

EPA is creating a defined term *retire.* EPA proposed retire to mean, in reference to appliances, the disassembly of the entire appliance including its major components, such that the appliance as a whole cannot be used by any person in the future.

One commenter recommended that retire not include the phrase ''such that the retired appliance as a whole cannot be used by any person in the future.'' The commenter is concerned that this could prevent the reuse of certain equipment parts. Furthermore, the owner/operator has no means to determine the ultimate fate of the retired appliance or components. Another commenter stated that the requirement to render the appliance unfit for use by the current or future owner is unnecessary because retired appliances typically use an older refrigerant and are not economical to purchase. Requiring that the owner do something to render the unit unfit for use would impose an unnecessary burden. EPA responds that the term *retire* concerns the continued use of that appliance as a whole. All of the working components of a retired appliance could be disassembled and resold to be used in multiple other appliances because the original appliance, as a whole, is no longer operating.

Another commenter stated that appliances may be retired without being completely disassembled. This comment stated that often, especially for IPR, appliances can be abandoned in place for a considerable length of time; so long as an appliance is made inoperable and permanently shut down it should be considered retired. This commenter provided recommended language which accurately describes the necessary state of the appliance ''rendered unusable'' and notes that any remaining refrigerant would be recovered from the appliance. EPA is finalizing the definition of *retire* that largely matches the definition suggested by this commenter because it more accurately describes the intent of what the Agency proposed.

As discussed in the proposed rule, retirement differs from *mothballing,* as defined at § 82.152, because a mothballed appliance is simply evacuated and shut down until it is ready to be used once again, whereas retirement involves a permanent shutdown of an appliance. Retirement should also not be confused with a repair. *Repair* is not expressly defined in the subpart F regulations. Repair may include the removal of a faulty component, but such removal does not mean that the appliance as a whole has been removed from service and rendered unfit for further use. Throughout this rule, ''replacement'' or ''replace'' may be used when discussing a situation where an existing appliance is retired and replaced with another appliance. In some instances, however, the owner or operator may choose to only retire and not replace an appliance so the two terms are not always used together.

Retrofit

EPA is creating a defined term *retrofit.* Many appliance owners or operators have incorrectly equated *retrofit* with *repair* and EPA received one comment on the proposed rule requesting additional examples of activities and refrigerant conversions that would qualify as a retrofit.

EPA is finalizing this definition as proposed. EPA uses *retrofit* to refer to a change to the appliance in order to convert it to the use of a different refrigerant. In response to the comment requesting the addition of examples of activities or refrigerant conversions, EPA concludes that it is not necessary to include additional examples of activities in the definition. Further, EPA is not specifying the type of refrigerants that are being converted, though typically retrofits have involved the replacement of an ODS with a non-ozone depleting substitute. Retrofits often require changes to the appliance (for example, change in lubricants, filter driers, gaskets, o-rings, and in some cases, components) in order to acquire system compatibility. Sometimes very few or no changes to the appliance are necessary to convert from one refrigerant to another. That would still be a retrofit because the refrigerant has changed.

Retrofit does not apply to upgrades or repairs to existing equipment where the refrigerant is not changed. EPA generally considers a repair to include an action that addresses the leaking appliance or the affected component(s) of the leaking appliance. Repairs may include replacement of components or component subassemblies but changing the refrigerant would make the action a retrofit.

Self-Sealing Valve

EPA is finalizing its proposal to create a defined term *self-sealing valve.* Under this definition, *self-sealing valve* is a valve affixed to a container of refrigerant that automatically seals when not actively dispensing refrigerant and that meets or exceeds established performance criteria as identified in § 82.154(c)(2). The purpose of a self-sealing valve is to prevent or minimize inadvertent release of refrigerant to the environment during the use and storage of the container of refrigerant. The requirement for self-sealing valves for small cans of MVAC refrigerant is discussed in more detail in Section IV.C.

Small Appliance

EPA is finalizing proposed amendments to the definition of *small appliance* to remove the reference to class I and class II refrigerants. Because revisions to *appliance* and *refrigerant* carry over into this term as well, under the revisions finalized in this rulemaking *small appliances* include those that use ODS and non-ODS substitute refrigerants. EPA is also adding portable air conditioners to the list of example small appliances.

One commenter requested that EPA specifically exclude MVACs and MVAC-like appliances from this definition. The commenter believes that without such an exclusion those types of appliances would be included in the revised definition of *small appliance,* which it characterizes as including any appliance charged with five pounds or less of refrigerant, and be subject to regulations that apply to *small appliances.* EPA responds that MVACs and MVAC-like appliances are not *small appliances* even though the charge sizes may be similar. *Small appliances* must be hermetically sealed, which MVACs and MVAC-like appliances are not.

Another commenter noted that EPA has specifically granted an exemption for the manufacture of small appliances in subpart B and urged EPA to preserve that exclusion in subpart F for MVACs. The commenter points to the definition of *motor vehicle* in subpart B. EPA responds that the definition of *motor vehicle air conditioner* in subpart F is simply a reference to subpart B. Thus, the use of MVAC in subpart F has the meaning granted to it in subpart B and this rule does not remove the exclusion granted for the assembly of MVACs in subpart B. EPA disagrees that it is necessary to clarify this point by amending the definition of *appliance,* which is a broader category, nor is it appropriate to amend the definition of *small appliance* in the manner in which the commenter recommends. See discussion under the definition of *appliance* for additional information.

Substitute

EPA is finalizing proposed amendments to the definition of *substitute* to remove the phrases ''EPA-approved'' and ''in a given refrigeration or air-conditioning end-use.'' These phrases are references to the SNAP program, which identifies acceptable alternatives to ODS for specific end-uses. The Agency has changed the status of certain refrigerants from acceptable to unacceptable for new retail food refrigeration equipment, vending machines, and motor vehicle air conditioning (80 FR 42870; July 20, 2015). EPA has also recently proposed to make additional changes (81 FR 22810; April 18, 2016). EPA does not mean to imply that finding a refrigerant to be unacceptable in a given end-use under SNAP means that it is no longer included within *substitute,* and thus by extension *refrigerant.* Were that the case, those substances would be exempted from the safe handling requirements of subpart F, or even the venting prohibition, despite still being used as refrigerants. EPA intends for those substances to continue to be subject to those requirements where they are being used as refrigerants. Accordingly, EPA is finalizing this revision to prevent that confusion, especially since the Agency allows for the servicing of existing appliances designed to use refrigerants that the Agency recently listed as unacceptable in new (and in some cases) retrofitted appliances.

Under the revised definition, any chemical or product, whether existing or new, that is used by any person as a replacement refrigerant for a class I or II ozone-depleting substance would be considered a substitute, even if it has been recently listed as unacceptable under SNAP in some end-uses or has not been submitted to or reviewed by the SNAP program. One commenter stated that by limiting the definition of *substitut*e to replacements for ODS, EPA could be unintentionally permitting new replacements to HFCs, as opposed to ODS, to be beyond the scope of subpart F. Another commenter suggested that the term be limited to the SNAP-approved list of substitutes but provided no reasons for such a limitation.

EPA responds that in 2004, the Agency affirmed an inclusive view of the scope of substitutes under subpart F. In that rule, it stated:

> Under section 608, EPA considers a SNAP-approved refrigerant a 'substitute' for CFC or HCFC refrigerants under section 608 if any of the following is the case: (1) The substitute refrigerant immediately replaced a CFC or HCFC in a specific instance, (2) the substitute refrigerant replaced another substitute that replaced a CFC or HCFC in a specific instance (*i.e.,* it was a second-or later-generation substitute), or (3) the substitute refrigerant has always been used in a particular instance, but other users in that end-use have used it to replace a CFC or HCFC. (March 12, 2004; 69 FR 11958)

EPA continues to hold this interpretation, except that for the reasons discussed above, EPA no longer maintains the position that substitutes must be approved under SNAP in order to be considered a refrigerant under section 608 when the substance is used as a refrigerant. In addition, the phrase ''any chemical or product, whether existing or new'' makes clear that the term is to be applied broadly, even to compounds that do not yet exist or have not yet been developed.

Other commenters recommended that EPA explicitly state the types of refrigerants that are considered substitutes. The proposal stated that EPA intends to apply the requirements in subpart F to all substances that are functionally refrigerants, including but not limited to HFCs, PFCs, HFOs, hydrofluoroethers, and hydrocarbons, as long as those substances have not been exempted from the venting prohibition. To the extent these comments are suggesting that EPA should provide some examples as a non-exhaustive list in the definition, EPA agrees that this increases clarity and EPA has added a non-exhaustive list of examples of substances that would be included in this definition, as well as clarifying that blends of such substances are also included. This approach also matches other definitions in subpart F that have similar lists of examples. To the extent the commenters are suggesting that EPA establish an exhaustive list of substances that would qualify as substitutes, EPA does not agree such a list is needed or would be feasible to include. Including such a list would also be unadvisable given the continued development of new substitutes. Therefore, the definition provides an illustrative list of substances that are included.

To provide clarity, EPA is adding mention of the venting prohibition in the definition of substitute. While EPA is finalizing its interpretation that carbon dioxide, nitrogen, water, ammonia, chlorine, hydrocarbons, and R–441A are substitutes, the regulations as finalized make clear that when these substitutes are used as refrigerants in

the end-uses specified in § 82.154(a)(1), they are exempt from the requirements of subpart F and can be referred to as ''exempt'' substitutes. Similarly, the term ''non-exempt substitutes'' as used in this subpart refers to all other substitutes and end-uses not specified in § 82.154(a)(1) as exempt from the venting prohibition. This clarification is only for purposes of the subpart F regulations, and should not be construed to affect any other subpart.

One commenter requested that the regulations include the phrase ''non-exempt refrigerants'' more frequently so that the reader does not have to understand that the regulatory definition of refrigerants excludes substitutes that are exempted from the venting prohibition. EPA responds that while exempt substitutes are included in the regulatory definition of refrigerant, the regulatory text has been revised to clarify that the obligations under subpart F do not apply to exempt substitutes. EPA has included in the definition of substitute a description of the terms ''exempt substitutes'' and ''non-exempt substitutes'' with reference to § 82.154(a)(1), which provides that exempt substitutes are exempt from the requirements of this subpart, so that readers of the regulation can follow EPA's intent from the definition. EPA has also added references in the regulation to class I, class II, and non-exempt substitute refrigerants, where applicable, to be clear which refrigerants are subject to the provisions.

Suitable Replacement Refrigerant

EPA is removing the defined term *suitable replacement refrigerant.* As discussed in Section IV.F.10 of this notice, EPA is removing the extension to retrofit or retire an appliance using an ODS refrigerant if a suitable replacement refrigerant with a lower ozone depletion potential is unavailable. It is therefore appropriate to remove the term from the list of definitions.

System Receiver

EPA is finalizing the creation of a defined term *system receiver* to provide clarity to the reader and improve the organization of these regulations, by providing a definition of this term in a location where the reader might expect to find it. Under the added definition, a system receiver is the isolated portion of the appliance, or a specific vessel within the appliance, that is used to hold the refrigerant charge during the servicing or repair of that appliance. This definition was previously included only in a parenthetical in the regulatory text at § 82.156(a), which describes the required practices to properly evacuate refrigerant from an appliance. The definition added in this rule does not introduce any new practices to the evacuation requirements. EPA is also removing the parenthetical in § 82.156(a), as it is no longer needed.

Technician

EPA is amending the definition of *technician* to improve clarity. As revised, the definition highlights that the determining factor for being a technician is performing actions that could reasonably be expected to violate the integrity of the refrigerant circuit. In general, only people who have completed the technician certification process should be performing actions that could violate the integrity of the refrigerant circuit and could therefore release refrigerant into the environment.

The exception to that general statement is that persons maintaining, servicing, or repairing MVACs and persons disposing of small appliances, MVACs, or MVAC-like appliances do not need to be technicians, as defined within subpart F. This exception is explicitly included in the definition finalized in this action. This revision is not intended to affect the scope of the existing requirements but rather to respond to requests from stakeholders prior to the publication of the proposed rule that the Agency clarify which activities must be conducted by technicians and which need not be. EPA received comments stating that the proposed revision would require persons maintaining, servicing, or repairing MVACs to be technicians. EPA did not intend to impose that requirement and has corrected that in the final rule. EPA also edited the regulations in the sales restriction in § 82.154(c) to ensure that *technician* applies only to technicians authorized under section 608 and not persons authorized under section 609.

The prior definition of *technician* also included a non-exclusive list of example activities that are reasonably expected to violate the integrity of the refrigerant circuit as well as examples of activities that do not. EPA proposed to edit these examples to improve clarity and to add the following two examples of activities reasonably expected to violate the integrity of the refrigerant circuit: Adding or removing components and cutting the refrigerant line. EPA is finalizing the definition substantially as proposed, including the two new example activities that are reasonably expected to violate the integrity of the refrigerant circuit, and with the modifications from the proposal described above related to MVACs and persons authorized under section 609.

Very High-Pressure Appliance

EPA is finalizing amendments to the definition of *very high-pressure appliance* to update the list of example refrigerants with the most commonly used refrigerants today. Because revisions to *appliance* and *refrigerant* carry over into this term as well, under the revised definition v*ery high-pressure appliances* include those that use ODS and non-ODS substitute refrigerants.

Voluntary Certification Program

EPA is finalizing the proposed removal of the defined term *voluntary certification program.* This term references a provision in the regulations that grandfathered in technicians who were certified prior to the establishment of the technician certification program in subpart F. As discussed in Section IV.J.4 below, EPA is removing these grandfathering provisions in this action because they are no longer needed and therefore is removing the definition as well.

B. Revisions to the Venting Prohibition in § 82.154(a)

1. Background

As explained in Section III of this notice, under the revisions finalized in this rule, § 82.154(a) prohibits the venting of ODS refrigerants and non-ODS substitute refrigerants to the environment by persons maintaining, servicing, repairing, or disposing of an appliance. This provision provides an exemption to the venting prohibition for certain substitutes in specific end-uses based on a determination that the listed substitutes in the listed end-uses do not pose a threat to the environment when released. As revised, this section also exempts from the venting prohibition *de minimis* releases of ODS refrigerants and non-exempt substitute refrigerants, and defines *de minimis* releases of ODS refrigerants and non-exempt substitute refrigerants to be those releases that occur when the other provisions of subpart F (or subpart B in the case of MVACs) are followed.

2. Applying the *de minimis* Exemption to Substitute Refrigerants

As explained in more detail earlier in this notice, the knowing venting, release, or disposal of substitutes for class I and class II refrigerants in the course of maintaining, servicing, repairing, or disposing of an appliance or IPR is expressly prohibited by section 608(c)(1) and (2) of the CAA, effective November 15, 1995, unless the Administrator determines that such

venting, release, or disposal does not pose a threat to the environment. This prohibition is commonly called the venting prohibition. Section 608(c)(1) establishes the venting prohibition for class I and class II substances, and also establishes an exemption from the prohibition for *de minimis* releases associated with good faith attempts to recapture and recycle or safely dispose of ''any such substance.'' The statutory language of section 608(c)(2) extends paragraph 608(c)(1) to substitutes for class I and class II substances used as refrigerants in appliances and IPR. This extension includes both the prohibition on venting and the exemption for *de minimis* releases associated with good faith attempts to recapture and recycle or safely dispose of such substances.

Prior to this rulemaking, for class I and II substances EPA had interpreted as *de minimis* those releases that occur despite compliance with EPA's required practices under the previous regulations for recycling and recovery, use of certified recovery and/or recycling equipment, and technician certification programs. EPA interpreted compliance with those regulations to represent ''good faith attempts to recapture and recycle or safely dispose'' of refrigerant. Accordingly, the prior regulations at § 82.154(a)(2) provided that releases of ODS refrigerants are considered *de minimis* only if they occur when the other provisions of subpart F (or subpart B in the case of MVACs) are followed. Although the prior regulations at § 82.154(a) exempted *de minimis* releases of non-exempt substitutes from the venting prohibition, those regulations did not provide any express guidance for such substitutes as to what practices are considered ''good faith attempts to recapture and recycle or safely dispose'' of the substitute such that incidental releases would qualify for the *de minimis* exemption.

EPA interprets the phrase ''good faith attempts to recapture and recycle or safely dispose'' similarly when it applies to substitute refrigerants under section 608(c)(2) as when it applies to ODS refrigerants under section 608(c)(1). Thus, compliance with the provisions regarding the evacuation of equipment, use of certified equipment, and technician certification in any instance where a person is opening (or otherwise violating the refrigerant circuit) or disposing of an appliance would represent ''good faith attempts to recapture and recycle or safely dispose'' of non-exempt substitute refrigerants. EPA considers these provisions to appropriately represent good faith attempts to recapture and recycle or safely dispose of such substitute refrigerants. For example, the proper use of certified recovery equipment and the evacuation of refrigerant to prescribed standards would be considered a good faith attempt to recapture and recycle or safely dispose of non-exempt substitute refrigerants when maintaining, servicing, repairing, or disposing of an appliance.

Under this approach, releases are only considered *de minimis* if they occur when these procedures, or those under subpart B, are followed. Conversely, emissions that take place during maintenance, servicing, repair, or disposal when these provisions are not followed are not *de minimis* emissions and are subject to the venting prohibition. While these principles were clearly expressed in the prior regulations for ODS, the prior regulations did not clearly establish what practices the regulated community would need to follow in order to qualify for the *de minimis* exemption and to comply with the venting prohibition while maintaining, servicing, repairing, or disposing of equipment containing non-exempt substitute refrigerants. With the revisions finalized in this rule, EPA is clarifying how the venting prohibition and *de minimis* exemption apply to non-exempt substitute refrigerants, to increase certainty for and facilitate compliance by the regulated community, as well as further explaining its interpretation of these statutory provisions.

It is impossible to open an appliance (or otherwise violate the refrigerant circuit) or dispose of an appliance without emitting some of the refrigerant in the circuit. Even after the appliance has been evacuated, some refrigerant remains, which is released to the environment when the appliance is opened or disposed of. Other activities that fall short of opening or disposing of the appliance but that involve violation of the refrigerant circuit also release refrigerant, albeit in very small quantities, because connectors (*e.g.,* between hoses or gauges and the appliance) never join together without intervening space. Even in the best case in which a good seal is made between a hose and an appliance before the valve between them is opened, some refrigerant will remain in the space between the valve and the outer seal after the valve is closed. This refrigerant will be released when the outer seal is broken. Thus, whenever a person opens an appliance (or otherwise violates the refrigerant circuit) in the course of maintaining, servicing, repairing, or disposing that appliance, he or she could violate the venting prohibition unless the exception for *de minimis* releases applies. Because EPA is finalizing revisions that define the exception for substitute refrigerants such that it only applies when the person complies with the existing refrigerant management provisions, compliance with those provisions will ensure that any releases incidental to these practices will be considered *de minimis* and thus will not violate the venting prohibition under section 608(c)(2).

One commenter stated that it fails to see why it would be unclear to the regulated community that the same *de minimis* exemption applicable to class I and II substances applies equally to substitutes. Section 608(c)(1) provides a specific *de minimis* exemption. Paragraph 1 contains the *de minimis* language, so that language clearly applies to the intentional venting/release of substitutes under paragraph 2. In other words, the *de minimis* language in section 608(c)(1) is expressly applicable to section 608(c)(2), and there is no ambiguity that EPA needs to clarify.

EPA agrees with the comment that the statute applies the *de minimis* exemption to substitute refrigerants. This statutory interpretation supports the revisions finalized in this rule. The statutory ambiguity arises because neither section 608(c)(1) or (2) specifically define what releases would qualify for the *de minimis* exemption or what would be considered ''good faith attempts to recapture and recycle or safely dispose'' of such a substance. The Agency previously established regulations clarifying what releases would be considered exempt from the venting prohibition under the *de minimis* exemption for ODS refrigerants. For class I and II substances EPA has interpreted those releases that occur despite compliance with EPA's required practices for recycling and recovery under the previous § 82.156, use of recovery and/or recycling equipment certified under § 82.158, and technician certification programs under § 82.161 as falling within the *de minimis* exemption. Because the *de minimis* language in section 608(c)(1) is directly applicable to section 608(c)(2), it is reasonable for EPA to choose to use the same regulations to clarify which releases of non-exempt substitute refrigerants qualify for the *de minimis* exception. These regulations accordingly fill a gap in the statute and the prior regulations relating to the definition of the *de minimis* exemption and the phrase ''good faith attempts to recapture and recycle or safely dispose'' for non-exempt substitute refrigerants.

Another commenter stated that EPA must distinguish between provisions interpreting and enforcing the venting prohibition and other provisions implementing the statutory requirements to ''minimize the use and emission'' and ''maximize the recapture and recycling'' of class I and class II substances. In the commenter's view, the leak repair program is clearly related to the latter requirements. In addition, to the extent that a regulatory violation such as recordkeeping does not cause a release, EPA cannot use that as a violation of the venting prohibition. The comment concludes that all *de minimis* releases associated with good faith attempts to recover or recycle refrigerants are exempt regardless of regulatory compliance.

EPA disagrees that there is a subset of the provisions finalized in this action that does not interpret, explain, or enforce the venting prohibition and is only aimed at minimizing the use and emission or maximizing the recapture and recycling of refrigerants. Under the prior regulations with regard to ODS, the regulatory text has long used the required practices under subpart F, including the leak repair provisions under the prior § 82.156(i), to clarify which emissions will qualify for the *de minimis* exemption and thus not run afoul of the venting prohibition. The stakeholder community has appeared to accept this structure, and the interpretation of the venting prohibition it embodies, as it related to ODS. As described above in more detail, EPA is extending this regulatory structure which has long interpreted and enforced the venting prohibition for ODS to do the same for the venting prohibition as it applies to non-exempt substitute refrigerants. The fact that these requirements may also be related to minimizing the use and emission or maximizing the recapture and recycling of ODS refrigerants does not preclude EPA from using those requirements to clarify how the venting prohibition applies to non-exempt substitute refrigerants. Nor does it prevent EPA from choosing to interpret, explain, and enforce the *de minimis* exemption for ODS and non-exempt substitutes through consistent requirements. EPA is extending this regulatory structure to non-exempt substitutes to clarify its interpretation of the ambiguous statutory phrase ''*de minimis* releases associated with good faith attempts to recover or recycle refrigerants'' and to enhance certainty that emissions that occur while complying with the regulations are covered by this exemption. After the revisions finalized in this rule, releases of non-exempt substitutes will be considered *de minimis* only if they occur when the specified requirements are satisfied.

In addition, EPA does not agree with the comment's implication that the leak repair program relates only to minimizing the use and emission or maximizing the recapture and recycling of refrigerants. For example, leak repair is a type of servicing and releases of non-exempt substitutes that occur in the course of repairing leaks as required by the leak repair program could violate the venting prohibition. As such, it is reasonable to clarify in the regulations that releases of non-exempt substitutes that are incidental to repairing leaks as required by the regulations will not be considered to violate the venting prohibition. In establishing the recordkeeping requirements in this rule, EPA is not suggesting that every failure to comply with a recordkeeping requirement would necessarily result in a violation of the venting prohibition. But in any event a failure to comply with a recordkeeping requirement would certainly be a violation of section 114.

Another commenter stated that there is no basis in the text of the CAA to assert that the venting prohibition is self-effectuating but that the *de minimis* exemption is not. It may be reasonable to interpret *de minimis* to mean in compliance with a comprehensive regulatory program when such a program is already authorized, but EPA cannot create a comprehensive regulatory program from that term. The commenter believes that it would be reasonable to interpret *de minimis* as those releases that occur when following best practices that occur while maintaining, servicing, repairing, or disposing of an appliance.

While the prohibition on venting under section 608(c) is self-effectuating, meaning the prohibition itself is legally binding even without implementing regulations, the statutory terms contain ambiguity. For example, the terms ''*de minimis* releases'' and ''good faith attempts to recapture and recycle or safely dispose'' are not specifically defined in section 608(c)(1) or (c)(2). Accordingly, it is appropriate for EPA to clarify in its regulations how it interprets and will apply those terms. As described in greater detail above, EPA is finalizing revisions to the section 608 regulations to further interpret and explain the venting prohibition and increase its enforceability by giving greater clarity and certainty as to which releases it views as being covered by the *de minimis* exemption. Addressing the application of the venting prohibition and the *de minimis* exemption through rulemaking provides advance notice to regulated entities; this is in contrast to case-by-case application, which would be the approach in the absence of rulemaking.

Further, even if we agreed with the comment that the term *de minimis* does not support development of a comprehensive regulatory program, EPA is not creating such a program through this rule. Rather, it is extending a regulatory program that already exists and serves to interpret and enforce the venting prohibition and *de minimis* exemption for ODS and using those same requirements for the same purpose for non-exempt substitute refrigerants. Although EPA could have chosen a different method to interpret and enforce the venting prohibition for non-exempt substitute refrigerants, for reasons described elsewhere in this rule, EPA is electing to regulate ODS refrigerants and non-exempt substitute refrigerants consistently.

3. Exempting Certain Substitutes From the Venting Prohibition

EPA proposed to explicitly state in the regulatory text that the substitutes exempted from the venting prohibition in § 82.154(a)(1) are also exempt from the other provisions of subpart F. EPA also proposed to reorganize the list of exempt substitutes by refrigerant type for readability. EPA did not propose to revise the listed end-uses or propose to add or remove any substitutes from the list.

Multiple commenters supported EPA's proposal to extend the existing regulations to HFCs and other non-exempt substitutes for the clarity it would provide to manufacturers and technicians. Other commenters recommended that EPA treat all refrigerants (including exempt substitutes like hydrocarbons, ammonia, and carbon dioxide) equally in all aspects of the subpart F regulations, including recovery and reclamation, technician certification, leak detection, and recordkeeping. Consistent application of the regulations to all refrigerants, the commenters say, would reinforce essential refrigerant management practices for all systems, reduce leaks, improve safety, and improve the operating efficiency of equipment. The commenters say that all refrigerants, other than water and some HFOs, have either flammability properties, higher GWP properties, or properties hazardous to human health (toxicity, risk of asphyxiation, frostbite, etc). Another commenter was opposed to exempting refrigerants that may be vented from the broader subpart F

requirements (with the possible exception of systems using water, nitrogen, or carbon dioxide) as it viewed such an exemption as a dramatic expansion of the exemption to the venting prohibition. The commenter states that establishing a separate class of equipment that does not require proper refrigerant management practices will only increase confusion in the field and exacerbate the problem of illegal venting.

EPA agrees with the comments that the extension of the subpart F regulations increases clarity. EPA disagrees that its clarification that exempt substitutes are not subject to the subpart F requirements is an expansion of the exemption since the service practices and requirements in subpart F had previously only applied to ODS refrigerant. There are a couple of reasons for EPA's present view that it is appropriate not to extend the provisions of subpart F to refrigerants that have been exempted from the venting prohibition. First, EPA has previously determined that the release of these substances do not pose a threat to the environment or are already controlled by other authorities. (See 69 FR 11949, 80 FR 19454, and 81 FR 22810). Given those decisions, it would generally not make sense to require all procedures for recovery or safe disposal, or to apply all other provisions of subpart F to those exempt refrigerants. This is consistent with the intent of section 608(c)(2), which states that substitutes may be exempted from the venting prohibition if the Administrator determines that not just the venting but also the ''releasing, or disposing'' of such substance does not pose a threat to the environment.

Second, the refrigerant management practices in subpart F may be inappropriate for some of the exempted refrigerants. For example, the venting of exempt hydrocarbon refrigerants in certain end-uses may be the safest option for technicians at this time, considering that such refrigerants are flammable but most existing recovery equipment were not designed and constructed, *e.g.* with spark-proof components, for use on flammable refrigerants. As long as the Administrator has determined that such venting of those substances in those end-uses does not pose a threat to the environment, such venting is legal and may be safer than following the subpart F requirements in some circumstances.

4. Releases From Containers

EPA is moving the previous regulatory provision in § 82.154(a)(2) that states that the venting prohibition applies to the release of refrigerant (both ODS and non-exempt substitute refrigerants) after its recovery from an appliance. EPA is moving this provision to a separate paragraph (§ 82.154(a)(3)) rather than its previous location in the description of a *de minimis* release. Standing alone should make the provision clearer that it is a violation of the venting prohibition to vent or otherwise release refrigerant after that refrigerant is recovered from an appliance, whether from cylinders, recovery equipment, or any other storage container or device. The venting prohibition cannot be circumvented by using a recovery device and subsequently releasing the refrigerant. This is especially important because refrigerant recovered from appliances may be contaminated or be a mixture of multiple refrigerants. Such refrigerant may be difficult to reclaim or may require a fee for proper disposal or destruction. In light of those difficulties, it is important to emphasize that venting this refrigerant, even though it is in a cylinder and not an appliance, is illegal. EPA did not receive any comments on this provision and is finalizing it as proposed.

C. Revisions to the Refrigerant and Appliance Sales Restrictions in § 82.154

1. Background

Under the prior regulations at § 82.154(m), the sale or distribution of a refrigerant containing a class I or class II substance, such as R–12 or refrigerant blends that include HCFCs, is restricted to technicians certified under sections 608 or 609 of the CAA. The sale or distribution of any class I or class II substance suitable for use in an MVAC that is in a container of less than 20 pounds may only be sold to technicians certified under section 609.

The prior regulations at § 82.154(g) also restricted the sale of used ODS refrigerant sold for reuse unless certain conditions are met, the most important of which is that the refrigerant has been reclaimed. Sections 82.154(j) and (k) prohibited the sale of appliances containing an ODS refrigerant unless the appliance has a servicing aperture or process stub to facilitate the removal of refrigerant at servicing and disposal. Section 82.154(p) prohibited the manufacture or import of one-time expansion devices that contain any refrigerant (ODS or non-ODS), other than exempted refrigerants.

2. Extension to Substitute Refrigerants

Through today's rule, EPA is extending the sales restriction to HFCs and other non-exempt substitute refrigerants. This sales restriction applies to non-exempt substitute refrigerants sold in all sizes of containers for use in all types of appliances, including MVACs. EPA is creating an exception for small cans (two pounds or less) of refrigerant intended to service MVACs, so long as the cans are equipped with a self-sealing valve. EPA is also restricting the sale of used non-exempt substitute refrigerants.

Since 1993, EPA has restricted the sale of ODS refrigerant to certified technicians as a means of ensuring that only qualified individuals—those who have sufficient knowledge of the safe handling regulations—actually handle refrigerant. EPA considers the restriction on the sale of ODS refrigerant to be important for ensuring compliance with and aiding enforcement of the regulations issued under sections 608 and 609 of the CAA. This requirement also relates to EPA's Next Generation Compliance strategy since compliance with this requirement is largely carried out by distributors who sell refrigerant to technicians. In this rulemaking, EPA is choosing to apply the same requirements for sales of ODS and non-exempt substitutes. Limiting the sale of non-exempt substitute refrigerants to technicians who have demonstrated knowledge of safe handling practices helps minimize the release of refrigerants during the maintenance, servicing, and repair of appliances containing such substitute refrigerants. A sales restriction for non-exempt substitute refrigerants also provides important support to the extension of the technician certification requirements to individuals working with non-exempt substitute refrigerants.

Generally, commenters are supportive of EPA's proposal and agree with EPA's rationale. Commenters who are generally opposed to extending EPA's regulations under section 608 to substitutes did not specifically raise the issue of whether EPA had authority to extend the sales restriction to HFCs and other non-exempt substitute refrigerants. EPA addresses the general comments about its authority for extending the refrigerant management regulations, as appropriate, to non-exempt substitute refrigerants in Section III of this notice. Some commenters stated that the sales restriction should be extended to hydrocarbons. These commenters noted that the flammability of these refrigerants poses far greater risks than that of R–22 when handling it and servicing equipment. Because the sales restriction is an element of the broader technician certification provisions of subpart F, EPA responds to comments concerning the sale and

handling of flammable refrigerants in Section IV.I of this notice.

3. Sales of Small Cans

a. What is EPA finalizing concerning small cans of MVAC refrigerant?

Historically, individuals have been able to purchase small cans of non-ODS refrigerant to service their own vehicles. This do-it-yourself (DIY) servicing is unique in the air-conditioning and refrigeration sector to the MVAC end-use. As mentioned previously in this notice, EPA is finalizing the extension of the sales restriction to non-exempt substitutes. EPA is also finalizing an exemption from the sales restriction for small cans of MVAC refrigerant that are manufactured with a self-sealing valve to minimize the release of refrigerant during servicing because the Agency has concluded that restricting the sale of small cans of refrigerant for use in servicing MVAC would be unnecessarily burdensome. If EPA extended the sales restriction to substitute refrigerants without exempting small cans, the sale of both small containers of refrigerant, which are used for DIY servicing of MVAC systems, and typical size (*e.g.,* 25- or 30-pound) cylinders of refrigerant used by technicians to service MVAC and other appliances would be limited to certified technicians.

In the United States, HFC–134a has been used in all newly manufactured vehicles with air-conditioning systems since 1994 and almost all small cans of refrigerant sold for MVAC DIY use are cans of HFC–134a.[18] More recently, the SNAP program listed HFO–1234yf, HFC–152a, and carbon dioxide (CO_2 or R–744), three climate-friendly alternatives for MVAC, as acceptable subject to use conditions for use in new light-duty vehicles. Manufacturers are currently producing or are actively developing light-duty models using these three refrigerants. As finalized in this rule, the exception for small cans would apply to HFC–134a, HFO–1234yf, HFC–152a, as well as any additional MVAC refrigerants listed as acceptable subject to use conditions under SNAP that are not exempt from the venting prohibition. Because CO_2 is exempt from the venting prohibition, it is not subject to the sales restrictions and certification is not required for its purchase in any size container. EPA has not received a submission of a unique fitting for use on a small can of HFO–1234yf; therefore, at this time this refrigerant cannot be sold in small cans to individuals, regardless of the exemption finalized in this rule.

Based on the NPD Automotive Aftermarket Industry Monitor, 2008, approximately 14 million small cans are sold each year. If EPA were to extend the sales restriction to small cans without the exemption for small cans with self-sealing valves, individuals who normally service their own MVAC would be required to either seek certification under section 609 or take their car to a technician to be serviced. EPA estimates that the cost associated with those two actions could be as much as $1.5 billion per year. For more details, see *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program* in the docket.

EPA's proposal to exempt small cans of refrigerant for use in MVAC systems that are equipped with a self-sealing valve was informed by input from the Auto Care Association and the Automotive Refrigeration Products Institute, two associations that represent the vast majority of manufacturers of small cans in the United States. EPA also reached out to CARB and other industry representatives as discussed in the NPRM. Based on California's experience, EPA proposed the exemption for small cans equipped with self-sealing valves as an effective way to reduce emissions of HFCs used to service MVACs without limiting sales to certified technicians. These valves reduce the release of refrigerant during servicing and reduce releases from the can after the servicing is complete.

Manufacturers already produce small cans with self-sealing valves to meet California's requirements. According to industry representatives and CARB, self-sealing valves are estimated to cost $0.25 per can. In light of that information, EPA does not find it to be unduly burdensome to add self-sealing valves to all small cans produced for sale in the United States, especially as compared to an extension of the sales restriction that would prohibit the sale of small cans to non-certified persons. Because they are incorporated into the product, consistent with EPA's Next Generation Compliance principles, the individual servicing her or his personal MVAC would reduce emissions without any additional effort or training, as compared to using small cans of refrigerant on the market today that do not employ a self-sealing valve. Thus, EPA has determined that self-sealing valves are an effective mechanism for controlling the release of non-exempt substitute refrigerants to the atmosphere, making it unnecessary to impose burdensome training and/or certification requirements more broadly at this time.

As described in *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program,* EPA estimates that a nationwide requirement to use self-sealing valves on all small cans will reduce emissions by more than 0.657 $MMTCO_2eq.$ per year. EPA also anticipates there could be additional emissions reductions to the extent the self-sealing valves allow individuals to store and re-use the same can of refrigerant, reducing the need to buy additional small cans. Currently, a small can is typically used in one vehicle and then discarded with some refrigerant still remaining in the can –from which it will ultimately be released to the environment. EPA estimates that the annual cost for this requirement would be approximately $3 million with the cost decreasing over time as manufacturers increase production and achieve greater economies of scale.

EPA is finalizing a new appendix E establishing a standard for self-sealing valves that is based largely on CARB's *Test Procedure for Leaks from Small Containers of Automotive Refrigerant,* TP–503, as amended January 5, 2010. To be consistent with the CARB standard and existing small cans that are already on the market, the leakage rate may not exceed 3.00 grams per year when the self-sealing valve is closed. This leakage rate applies to full containers as well as containers that have been used and are partially full.

b. How is EPA responding to comments about this topic?

EPA received comments from several manufacturers, distributors, and retailers of automotive refrigerant, and associations representing them, in support of requiring that the small cans be outfitted with self-sealing valves and not restricting the sale of small cans to certified technicians. EPA also received comments from multiple industry associations and CARB supporting these provisions.

Two environmental organizations were opposed to the proposed exemption for small cans equipped with self-sealing valves. The commenters recommend that only certified technicians be allowed to purchase MVAC refrigerant, regardless of the container size. The commenters believe that the DIY community is a large source of emissions of automotive refrigerant. Specifically, they claimed that emissions occur because DIYers are untrained in the use of the product, they

[18] ODS refrigerant for MVAC servicing that is sold in cylinders less than 20 pounds is currently restricted to technicians certified under section 609 of the CAA.

vent remaining refrigerant from the MVAC prior to recharging it because they do not own recovery and recycling equipment, and they are merely filling, rather than repairing, a leaking system. One of the commenters estimated the annual emissions of automotive refrigerant at 18 $MMTCO_2eq$.

EPA responds that DIY servicing is unique to the MVAC end-use, as discussed previously in this notice. EPA did not propose to restrict the sale of small cans of MVAC refrigerant to certified technicians, explaining its concerns that such a requirement could be unnecessarily burdensome (80 FR 69479; Nov. 9, 2015). If EPA were to prohibit DIY servicing, individuals who normally service their own MVAC would be required to either seek certification under section 609 or take their car to a technician to be serviced. EPA estimates that the cost associated with those two actions could be as much as $1.5 billion per year. In the short term, EPA has concluded that requiring small cans of refrigerant to have self-sealing valves is an effective mechanism for controlling the release of refrigerant to the atmosphere by DIYers from the can of refrigerant. In the longer term, the transition to new MVAC refrigerants will reduce emissions of high GWP refrigerants from DIY servicing at little to no cost for DIYers.

EPA has estimated that the requirement for self-sealing valves on small cans of refrigerant will reduce refrigerant emissions by 0.657 $MMTCO_2eq$. per year compared to the current status. Self-sealing valves prevent emissions of the gas remaining in the can after the system is fully filled. Currently, if a system takes 1.5 cans to fill, the DIYer will have no choice but to allow the extra 0.5 can to be released to the environment after detaching it. Furthermore, because self-sealing valves allow individuals to store and re-use the same can of refrigerant, there may be less need to buy additional small cans. CARB has claimed benefits of 0.25–0.47 MMTCO2eq for their small can program in 2020. However, because their program includes more than just self-sealing valves (*e.g.,* refundable deposits), the benefits are not directly comparable. CARB has noted a reduction in sales of small cans of 1.1 million to 1.9 million cans, which they attribute to the effectiveness in the valves and the displacement of new purchases by later use of the remaining heel.

EPA received one comment from a chemical manufacturer stating that they would support the continued sale of small cans without self-sealing valves but limit those sales to certified technicians under section 609. EPA does not see the benefit of restricting the sale of small cans to people certified under section 609 since small cans of refrigerant that do not have self-sealing valves are inherently emissive. Being certified under section 609 would not prevent the emission of the refrigerant from the heel of the can.

Commenters who oppose the sale of small cans generally do support the requirement to use self-sealing valves if there is not a total ban on sales. One commenter also strongly recommended that EPA allow the sale of small cans of HFO–1234yf and HFC–152a so that DIY consumers will not be enticed to recharge their HFO–1234yf system with HFC–134a for the lack of any alternative. EPA responds that the regulations at § 82.154(c)(1)(x) as revised in this action include any non-exempt substitute refrigerant that is intended for use in an MVAC. Therefore, small cans of HFO–1234yf and HFC–152a would be exempt from the sales restriction but also have the same requirements for unique fittings and self-sealing valves under section 608. As discussed previously in this notice, HFO–1234yf cannot currently be sold in small cans because a submission has not yet been made to SNAP for a unique fitting for small cans of HFO–1234yf. This action under section 608 does not prohibit the sale of any MVAC refrigerant alternative in a small can; however, refrigerants must be listed as acceptable or acceptable subject to use conditions for MVAC and unique fittings for small cans must be established under section 612 of the CAA prior to use[19].

Small cans of refrigerant sold for MVAC servicing are different from containers of refrigerant sold for stationary refrigeration and air-conditioning in that the small cans for MVAC are required to have unique fittings. The SNAP program requires as a use condition for MVAC refrigerants that the container and the MVAC system use unique fittings to prevent cross-contamination. If used properly, the unique fittings will not allow for the introduction of HFC–134a refrigerant into a system using any other refrigerant, including CFC–12, HFO–1234yf, or another approved substitute refrigerant. Using an adapter or deliberately modifying a fitting to use a different refrigerant is a violation of the SNAP use conditions. Unique fittings will also reduce the likelihood that a small can will be used to service appliances other than MVACs that use non-exempt substitute refrigerants, which would be in contravention of the sales restriction.

Refrigerant sold for MVAC servicing is also different than other refrigerant because of the limited types of equipment that could be serviced with a small can. First, many household appliances that use refrigerants are hermetically sealed, like a refrigerator. Someone who wanted to open that appliance would need greater skill and specialized equipment to service the appliance since there would not be a servicing port to access. This makes it less likely that homeowners would attempt to use a small can to service other small household appliances. Larger appliances that use HFC–134a that are not hermetically sealed, like a reach-in cooler, would need more than one small can to fully charge the appliance. Because of the cost and the added effort to use multiple small cans to charge a larger appliance, it is not practical for someone to use a small can. This would likely lead the person to purchase a larger container of refrigerant, which would require that the person be a certified technician.

Commenters, including CARB, supported the use of CARB's standards. One commenter representing the manufacturers of small cans noted that this standard was developed in a cooperative effort between CARB and the refrigerant industry and that the procedures described in the standard have been used since 2010 to certify small cans sold in the California market. The commenter also stated that adopting the California standard would also allow for a quicker transition to cans with self-sealing valves, while development and adoption of a new standard would require a longer transition time and therefore, EPA should provide a later compliance date.

EPA agrees with the commenters and has determined that the establishment of the standard in appendix E, which is based on CARB's *Test Procedure for Leaks from Small Containers of Automotive Refrigerant,* TP–503, is appropriate. This provides for one uniform standard across the nation, thus simplifying compliance and avoiding potential burdens associated with complying with two different standards, one in California and another in the rest of the country. No commenter identified any other standard for self-sealing valves. EPA is finalizing the provisions in the newly created appendix E without any changes from the proposal.

EPA requested comment on whether the final rule should exempt the sale of

[19] ''Use'' is defined at 40 CFR 82.172 to include ''use in a manufacturing process or product, in consumption by the end-user, or in intermediate uses, such as formulation or packaging for other subsequent uses.''

HFC–134a only or of all MVAC substitute refrigerants in small cans. One commenter responded that the exemption should apply to all refrigerants for use in MVAC and MVAC-like appliances because the rationale applies equally to other MVAC refrigerants. The minimal leakage and venting from small cans of other refrigerants is relatively the same as from small cans of HFC–l34a, and the commenters know of no technical reason why a self-sealing valve could not be created for those cans also. EPA appreciates the commenters' support for the proposal to apply the exemption to all MVAC substitute refrigerants. EPA is finalizing the exemption as proposed. It will apply to all MVAC substitute refrigerants, except those exempt from the venting prohibition. EPA also notes that refrigerants for use in MVAC-like appliances are not exempt from the sales prohibition, consistent with EPA's approach to MVAC-like appliances historically. Under section 609, technician certification is required only when a person is servicing an MVAC system for consideration whereas MVAC-like appliances must always be serviced by a certified technician.

4. Servicing Apertures and Process Stubs

EPA is finalizing revisions that require that new appliances containing a non-exempt substitute refrigerant (including a used non-exempt substitute refrigerant) have a servicing aperture or process stub to facilitate the recovery of refrigerant at servicing and disposal. Including these design features on appliances containing such substitutes facilitates compliance with the section 608(c) prohibition against the venting, release, or disposal of substitute refrigerants into the environment. These access points allow for the proper evacuation or recovery of substitute refrigerant, preventing releases to the atmosphere in the course of maintaining, servicing, repairing, or disposing of the appliance. Without these access points, it would be harder for persons maintaining, servicing, repairing, or disposing of such appliances to properly evacuate the refrigerant in accordance with § 82.156(b). For example, these access points provide the person disposing of an appliance the opportunity to properly remove the refrigerant prior to crushing or shredding and thus avoid a knowing release. EPA did not receive comments on this provision. The manufacture or import of one-time expansion devices that contain any refrigerant (ODS or non-ODS), other than exempted refrigerants, was prohibited under the prior regulations. One-time expansion devices, by design, release their refrigerant charge to the environment in order to provide a cooling effect. Examples include self-chilled beverage containers that must be disposed of or recycled after each use, as well as reusable containers. EPA is finalizing minor edits to this prohibition that reference the list of exempt refrigerants as proposed. EPA did not receive any comments on this provision.

D. Revisions to the Safe Disposal Provisions in § 82.155

1. Background

In the 1993 Rule, EPA established specific requirements for the safe disposal of small appliances, MVACs, and MVAC-like appliances containing ODS refrigerant since they typically enter the waste stream with the refrigerant charge intact. Under the prior rules at § 82.156(f), persons who took the final step in the disposal process of such appliances had to either recover any remaining refrigerant in the appliance or verify that the refrigerant has previously been recovered from the appliance or shipment of appliances. If they verified that the refrigerant has been recovered previously, they had to retain a signed statement attesting to this or a contract from the supplier of the appliances for three years. While recovery equipment used to remove the refrigerant had to be certified under § 82.158, persons recovering the refrigerant at disposal did not need to be certified technicians.

2. Extension to Substitute Refrigerants

EPA is extending the preexisting safe disposal provisions previously found at § 82.156(f) for small appliances, MVACs, and MVAC-like appliances containing ODS refrigerants to the same types of appliances that contain non-exempt substitute refrigerants. Generally, commenters support EPA's proposal and agree with EPA's rationale. Commenters who stated that EPA does not have authority to extend section 608 regulations to substitutes were silent on the specific issue of the safe disposal provisions. A fuller and more general discussion of the authority for this action is found in Section III of this notice.

Safely disposing of both ODS and substitute refrigerant in small appliances, MVACs, and MVAC-like appliances is important for the environment and public health. According to EPA's Vintaging Model,[20] EPA projects that the GWP-weighted amount of refrigerant contained within MVACs and small appliances in use in 2015 was more than 260 $MMTCO_2eq$ and 175 $MMTCO_2eq$, respectively. This constitutes 12 and 8 percent, respectively, of the total GWP-weighted amount of refrigerant contained within all appliances in the United States in 2015. On an ODP-weighted basis, EPA estimates that more than 1,400 ODP-weighted metric tons of refrigerant were contained within small appliances in 2015, representing 5 percent of the refrigerant contained within all appliances in the United States. While EPA projects that these amounts will decrease over time as zero-ODP and low-GWP substitute refrigerants penetrate the market, the need for robust safe disposal requirements remains because these appliances are used for a long time. One commenter agreed, noting that forty percent of the refrigerators sent to their recovery facility were manufactured prior to 1993 and contain CFCs.

One commenter approves of the clear signal that the rule sends for appliances containing exempt refrigerants. However, this commenter asks how a recipient of a component of such an appliance for disposal would be aware that the subpart F requirements do not apply to that component. EPA responds that the only likely exempt refrigerant in that scenario is a small appliance containing a flammable refrigerant. As required under the SNAP use conditions, the component would have markings such as red tubing or a warning label that would distinguish that component from other components. The labels must be placed on the outside of the appliance, on the inside of the appliance near the compressor, on or near any evaporators that can be contacted by the consumer, near the machine compartment, and near any and all exposed refrigerant tubing.

3. Clarifications to the Existing Program

The safe disposal regulations require actions of three separate groups of people: The final processor, the supplier of appliances for disposal, and the person who recovers the refrigerant. The final processor is the person who takes the final step in the disposal process,

[20] EPA's Vintaging Model estimates the annual chemical emissions from industry sectors that have historically used ODS, including air-conditioning and refrigeration. The model uses information on the market size and growth for each of the end-uses, as well as a history and projections of the market transition from ODS to alternatives. The model tracks emissions of annual ''vintages'' of new equipment that enter into operation by incorporating information on estimates of the quantity of equipment or products sold, serviced, and retired or converted each year, and the quantity of the compound required to manufacture, charge, and/or maintain the equipment.

typically a scrap recycler or landfill operator. Final processors may receive appliances with a charge or without a charge. The supplier is the person dropping off the appliance (or shipment of appliances) for disposal. The person who recovers the refrigerant may be the final processor, the supplier, or a separate third entity. EPA is finalizing as proposed regulatory text to help clarify the different actors.

Refrigerant may be recovered at any stage in the disposal process, even prior to the supplier taking possession. As EPA stated in the 1993 Rule, ''the supplier to the final processor does not have to remove the refrigerant but then must assure, through an accompanying certification, that refrigerant has been removed earlier in the disposal chain. Any copies of the certificate of removal provided to the supplier could be passed on to the final processor.'' (58 FR 28704–28705). EPA's intent has been to provide the flexibility needed to permit the recovery of refrigerant by the entity in the disposal chain that can accomplish that task most efficiently while at the same time establishing a mechanism to help ensure that the refrigerant has not simply been illegally vented. This flexibility is important for the disposal sector, which is highly diverse and decentralized. This signed certification serves both goals.

EPA is revising the regulations to clarify what must be in the contract stating that refrigerant will be removed prior to delivery. EPA is replacing the word ''remove'' which appears repeatedly in these provisions with ''properly recover.'' These revisions clarify the provisions' intent that the refrigerant is recovered to the required evacuation levels using the appropriate equipment. EPA is also stating explicitly that the contract should provide that the supplier of the appliances is responsible for recovering any remaining refrigerant or verifying that the refrigerant has already been evacuated. As discussed in the 1993 Rule, the supplier to the final processor does not have to remove the refrigerant but must assure, through accompanying certifications, that the refrigerant has been removed earlier in the disposal chain.

EPA notes here that a contract is appropriate for businesses to streamline transactions in cases where they maintain long-standing business relationships. A contract would be entered into prior to the transaction, such as during the set-up of a customer account, not simultaneously with the transaction. A signed statement is more appropriate for one-off transactions between the supplier and the final processor.

EPA is also clarifying the format that the records required under this section may take. In general, where the regulations in subpart F require an individual to maintain records, the Agency intends for them to do so either in an electronic or paper format, preferably in an electronic system. EPA is clarifying this point explicitly in the recordkeeping provision at § 82.155(c).

One commenter stated that the new § 82.155 will remain unclear if EPA does not review the relevant applicability determinations for potential inclusion in the regulatory text. EPA responds that applicability determinations are only applicable to the person requesting the determination from EPA. However, in response to the comment, EPA has reviewed and is incorporating information from specific applicability determinations into the regulatory text where the Agency finds it will increase clarity to the industry as a whole.

Two applicability determinations address the situation where refrigerant has leaked out of an appliance prior to arriving at the final disposer. Applicability determination number 608–8 addresses whether a verification statement is needed where all of the refrigerant has already leaked out due to a break in the refrigerant circuit. Applicability determination number 608–9 addresses whether the term *leaked out* includes instances in which the line has been cut prior to the delivery of the appliance. EPA's determination in 1993 was that if all the refrigerant has leaked out, the signed statement need not contain the name and address of the person who performed the recovery as no such person exists. The signed statement must, however, clearly state that all the refrigerant in the appliance had already leaked out. EPA also determined that ''leaked out'' means those situations in which the refrigerant has escaped because of system failures, accidents, or other unavoidable occurrences not caused by a person's deliberate acts or negligence, such as deliberately cutting refrigerant lines. Scrap processors may accept appliances whose lines have been cut as long as they obtain a signed statement from the supplier. This includes appliances that have been vandalized. EPA is incorporating information from these determinations into the regulatory text at § 82.155(b)(2)(iii).

Two applicability determinations address whether the verification statements are needed for appliances that arrive at the final processor in various conditions. Applicability determination number 608–8 pertains to the situation where the entire refrigeration circuit has been removed from the appliance prior to delivery. Applicability determination number C040001 pertains to (1) receipt of an appliance in which some components of the refrigerant circuit have been removed; (2) receipt of portions of the refrigerant circuit (*e.g.,* compressor); (3) receipt of an appliance in which the entire refrigerant circuit has been removed; and (4) receipt of an appliance which has previously been through a process in which refrigerant would have been released or recovered.

EPA's determinations in 1993 and 1996 were that the first two situations would be subject to the safe disposal regulations and the third and fourth situations would not be. Any equipment that contained refrigerant is subject to the safe disposal requirements. This includes a complete appliance with an intact refrigerant circuit, an appliance with a broken refrigerant circuit such as one with a component removed, or a single component that would contain refrigerant in an appliance. In all such instances the intent of the safe disposal program—to verify that the refrigerant was recovered properly—still applies.

Consistent with these determinations, EPA interprets its regulations such that items that have had the entire refrigerant circuit removed, such as the outer housing of an air conditioner or the structural shell of a refrigerator, are not subject to the safe disposal regulations, as these items do not meet the definition of appliance. Similarly, shredded material, baled scrap, or crushed cars are not subject to the safe disposal regulations. The person responsible for compliance with the safe disposal regulations is the entity upstream that conducted the final processing where the appliance was shredded, crushed, flattened, baled, or otherwise demolished and where the refrigerant would have been previously recovered in accordance with the regulations.

4. Hazardous Wastes

One commenter requested that EPA exclude hydrocarbon refrigerants that are vented from the definition of hazardous waste. The commenter reacted to a discussion in the proposed rule that household appliances containing a hydrocarbon refrigerant would be exempt as a household hazardous waste under the federal hazardous waste regulations at 40 CFR 261.4(b)(1) (although States may have more stringent regulations) and therefore, could generally be vented upon disposal under both RCRA and CAA regulations. The commenter notes

that a household-type appliance may also originate from institutional and commercial settings and therefore would not qualify for the household waste exclusion under RCRA.

EPA responds that these refrigerants may be subject to regulation as hazardous waste, with the exception of refrigerants that are directly reused. The Agency did not propose to amend the regulations issued under RCRA in the proposal to this final action and has not undertaken the analysis to do so at this time. This comment is also outside the scope of this rulemaking, which relates to regulations under section 608 of the CAA, not to regulations under RCRA.

5. Restructuring and Edits for Readability

EPA is creating a single section, § 82.155, for all safe disposal provisions, including the recordkeeping and reporting requirements. One commenter supported moving the refrigerant recovery requirements for small appliances, MVACs, and MVAC-like appliances into a single section. The commenter suggested the section be titled ''Safe Disposal of Refrigerant'' rather than ''Safe Disposal of Appliances'' as they stated that the CAA does not contain the concept of safe disposal of appliances. While it is true that section 608(c) is concerned with the entry of refrigerants into the environment, it addresses such releases in the context of ''disposing of an appliance.'' EPA disagrees that it is necessary to change the name of the section. However, EPA has reorganized the section to put up front the general requirement that refrigerant be evacuated from appliances before describing the requirements of the final processor.

E. Revisions to the Evacuation Requirements in § 82.156

1. Background

Under EPA's existing regulations at § 82.156(a), ODS refrigerant must be transferred to a system receiver or to a certified recovery and/or recycling machine before appliances are opened for maintenance, service, or repair. The same requirement applies to appliances that are to be disposed of, except for small appliances, MVACs, and MVAC-like appliances which were subject to separate requirements under § 82.156(g) and (h). To ensure that the maximum amount of refrigerant is captured rather than released, EPA requires that air-conditioning and refrigeration appliances be evacuated to specified levels of vacuum.

2. Extension to Substitute Refrigerants

EPA is finalizing revisions in this action that extend the existing requirements at § 82.156 to appliances containing non-exempt substitute refrigerants. Therefore, before appliances containing non-exempt substitute refrigerants are opened for maintenance, service, or repair, the refrigerant in either the entire appliance or the affected part (when it can be isolated) must be transferred to a system receiver or to a certified recovery and/or recycling machine. The same requirements apply to appliances that are to be disposed of, except for small appliances, MVACs, and MVAC-like appliances, which have separate requirements.

Generally, commenters were supportive of EPA's proposal and agreed with EPA's rationale. Commenters who stated that EPA does not have authority to extend section 608 regulations to substitutes were silent on the specific issue of evacuation requirements. EPA addresses general comments about its authority for this action in Section III of this notice.

i. Evacuation Levels for Appliances Other Than Small Appliances, MVACs, and MVAC-Like Appliances

EPA is finalizing revisions to § 82.156(a) such that appliances other than small appliances, MVACs, and MVAC-like appliances containing non-exempt substitute refrigerants must be evacuated to the levels established for CFCs and HCFCs with similar saturation pressures. These levels are based on the saturation pressures of the refrigerant, which is a characteristic independent of whether or not the refrigerant is an ozone-depleting substance. As is the case for CFCs and HCFCs, the appropriate evacuation levels for HFCs and other substitutes depends upon the size of the appliance and the date of manufacture of the recovery and/or recycling equipment. EPA did not receive comment expressing any technical concerns with extending the evacuation requirements to substitute refrigerants. Some commenters stated that they currently treat ODS and HFC appliances in the same manner, including the level of evacuation.

ii. Evacuation Levels for Small Appliances

EPA is finalizing revisions to § 82.156(b) to establish the same evacuation requirements for servicing small appliances charged with non-exempt substitute refrigerants as had previously existed only for small appliances charged with ODS refrigerants. Technicians opening small appliances for service, maintenance, or repair are required to use equipment certified either under appendix B, based on AHRI 740, or under appendix C, Method for Testing Recovery Devices for Use with Small Appliances, to recover the refrigerant.

Technicians using equipment certified under appendix B have to pull a four-inch vacuum. Technicians using equipment certified under appendix C have to capture 90 percent of the refrigerant in the appliance if the compressor is operational, and 80 percent of the refrigerant if the compressor is not operational. Because the percentage of refrigerant recovered is very difficult to measure on any given job, technicians would have to adhere to the servicing procedure certified for that recovery system under appendix C to ensure that they achieve the required recovery efficiencies.

One commenter specifically expressed support for extending the evacuation requirements to small appliances charged with non-exempt substitutes but not to small appliances containing exempt refrigerants. The commenter notes that the technician would be required to use appropriately certified equipment to recover the refrigerant. EPA did not propose to require the recovery of exempt refrigerants and agrees that it would not be appropriate to finalize such a requirement in this rule, as the venting prohibition does not apply to these substances.

EPA is also revising § 82.156(b) to establish the same evacuation requirements for disposing of small appliances that are charged with non-exempt substitute refrigerants as currently exist for small appliances charged with ODS refrigerants. Small appliances must have 80 or 90 percent of the refrigerant in them recovered (depending on whether or not the compressor was operational) or be evacuated to four inches of mercury vacuum.

EPA is also finalizing revisions to the regulations to simplify the evacuation requirements for small appliances so that they are the same for both servicing and disposal. This new provision applies to both ODS and non-exempt substitute refrigerants. Prior to this rulemaking, a technician servicing a small appliance containing an ODS needed to only recover 80 percent of the refrigerant when using recovery equipment manufactured before November 15, 1993. At the same time, there was no established level of evacuation in the disposal requirements when using pre-1993 recovery

equipment. EPA is allowing that 80 percent level of evacuation for disposal to simplify and unify the requirements. This revision will have minimal effect as few people continue to use recovery equipment manufactured prior to that date.

One commenter stated that there should not continue to be separate evacuation levels for recovery equipment manufactured before 1993. This commenter saw such equipment being used only rarely and only to avoid the deeper evacuation requirements. This commenter also stated that pulling a 4-inch vacuum on a small appliance is not equal to 80 percent refrigerant recovery. EPA responds that the proposal explicitly stated that EPA was not proposing to amend the required levels of evacuation in Table 1, change the circumstances that would allow for alternate evacuation levels, or to revise those alternate levels. EPA understands the concerns raised by the commenter, but removing the older evacuation levels at this time is beyond the scope of this rulemaking.

iii. Evacuation Levels for MVACs and MVAC-Like Appliances

Technicians repairing or servicing MVACs for consideration and MVAC-like appliances containing an ODS or a non-exempt substitute refrigerant are subject to the requirement to ''properly use'' (as defined at § 82.32(e)) servicing equipment approved pursuant to § 82.36(a). All persons recovering refrigerant from MVACs and MVAC-like appliances for purposes of disposal of these appliances must reduce the system pressure to or below 102 mm of mercury vacuum or use refrigerant recycling equipment dedicated for use with MVAC and MVAC-like appliances approved pursuant to § 82.36(a). The proposed rule incorrectly extended the MVAC servicing requirement to all persons, not just those servicing MVACs for consideration. EPA has revised the final rule to properly distinguish between the two.

EPA received a comment that section 608 of the CAA does not apply to MVACs. As discussed above in Section III of this notice, section 608(c) provides EPA authority to regulate the disposal of MVACs, which are a type of appliance. With respect to disposal of MVACs, this final rule, like the prior regulations, only specifies evacuation levels for such appliances when they are disposed.

3. Records for Disposal of Appliances With a Charge of More Than 5 and Less Than 50 Pounds

EPA is adding new recordkeeping requirements at § 82.156(a)(3) for the disposal of appliances with a full charge of more than five and less than 50 pounds of either ODS or non-exempt substitute refrigerant. Most appliances this size are disassembled in the field and as such must have the refrigerant recovered in the field. EPA is requiring records that document the name of the company that employs the technician, the location of the appliance being disposed of, the date of recovery, and the type of refrigerant removed from each appliance prior to disposal. The technician who evacuated the refrigerant, or the company employing that technician, must also maintain records indicating the quantity and type of refrigerant transferred for reclamation, the company that they transferred the gas to, and the date of the transfer. The technician, or the company employing the technician, would be required to maintain these records for three years. By company employing the technician, EPA means the person paying the technician's salary or wage, not the appliance owner or operator who has hired the technician for that specific service. The finalized regulations have one change compared to the proposal: EPA is not requiring records indicating the amount and type of refrigerant recovered from each separate appliance but rather the total amount and types recovered from all appliances disposed of in each calendar month. As described in more detail below, this modification from the proposed revision was made after consideration of public comments.

Comments in support of this proposed recordkeeping requirement agreed with EPA's goal of improving the enforceability of the venting prohibition. One commenter stated that EPA's rationale to improve compliance with the venting prohibition and facilitate enforcement against those who do vent is insufficient and not adequately supported in the record. Another commenter believes that venting is not as prevalent as EPA thinks it is and that to the extent that it does occur, it is done by individuals who are not certified technicians.

EPA responds that the Agency has heard from people throughout the HVAC/R industry that venting regularly happens in appliances with more than 5 and less than 50 pounds of refrigerant. One commenter to this rule who regularly addresses contractor and service technician groups hears from them that the venting prohibition is widely disregarded. At a recent meeting EPA attended with air-conditioning and refrigeration contractors, an industry speaker asked attendees what percentage of technicians recover refrigerant. The estimates individuals offered were generally between 10 to 30 percent, with the caveat that recovery is much more common in the refrigeration industry than the air-conditioning industry. EPA also receives numerous tips each year of someone cutting refrigerant lines to quickly and illegally dispose of appliances of this size. This feedback indicates a likelihood that venting regularly occurs.

At times, including in public fora such as the public meeting in November 2014, stakeholders have requested that EPA increase enforcement of the venting prohibition. At that meeting, some stakeholders indicated that technicians will knowingly and illegally vent refrigerant if they think EPA will not bring an enforcement action. Multiple commenters urged the Agency to do a better job of enforcing the venting prohibition. This request came from a broad cross section of the air conditioning and refrigeration community including refrigerant reclaimers, recycling and recovery equipment certifiers, and appliance manufacturers and distributors. Some of these comments stated that good actors who comply with the law are placed at a competitive disadvantage by entities who can operate more cheaply by skipping the required recovery practices and choose instead to illegally vent refrigerant.

The Agency has recently brought successful cases against individuals who have illegally vented refrigerant. However, the availability of the records required under this provision would enhance the Agency's ability to enforce the venting prohibition because these records could be used to demonstrate whether or not refrigerant has been recovered and sent for reclamation. If refrigerant cannot be accounted for, a company or technician may not be able to show that they complied with the venting prohibition.

Some commenters who objected to this proposal stated that EPA did not provide sufficient justification and that EPA underestimated the burden to technicians. EPA responds that it is reasonable to require technicians and the companies employing technicians to maintain records of the amount of refrigerant that they recover and send for reclamation to enhance compliance with and enforceability of the venting prohibition. There is a significant environmental benefit to ensuring that ODS and HFC refrigerant are recovered from existing appliances of this size at the time of disposal. Using EPA's Vintaging Model, EPA estimated the number of appliances in this size category that are disposed of annually,

the full charge of those appliances, and the type of refrigerant they contain. EPA estimates that 7.3 million appliances of this size, with a total charge of 27,300 MT of refrigerant, are disposed of annually. This is equal to 960 ODP-weighted metric tons and 49.5 $MMTCO_2eq$. This represents 45 percent of the total amount of ODS and HFC refrigerants contained within all appliances from all size categories that are disposed of annually.

EPA's benefits assessment for the proposed rule did not calculate any additional emissions reductions because the existing regulations already require recovery when appliances are disposed. However, in practical terms, requiring a record from each disposal event may drive more technicians to comply with the venting prohibition because the recordkeeping requirement places extra emphasis on the prohibition and on the risks of violating it. Even slight improvements to compliance could produce substantial environmental benefits.

Another commenter stated that some IPR facilities may have hundreds or even a thousand of these smaller 5–50 pound appliances and that requiring additional tracking or recordkeeping would be unnecessary and overly burdensome. Furthermore, the commenter continued, because industry has the burden of proof that it is in compliance with the venting prohibition, industry has established basic recordkeeping that can meet the intent of this rule without requiring additional or duplicative information. A couple of commenters similarly noted that it is good business practice to recover refrigerant from such units prior to disposal.

EPA responds that the incentive to illegally vent may be less if the owner has hundreds of appliances or uses in-house technicians. In that situation, it may be good business practice to recover refrigerant from a system being disposed of because that refrigerant can be reused in that owner's other appliances. The desire to fit more service calls into a day is also perhaps less when using in-house personnel. However, in cases where a technician is getting paid by the job, there is an economic incentive to minimize the time spent at each job-site which could include venting refrigerant. EPA disagrees that such facilities will require burdensome new tracking and recordkeeping. While a facility may have many appliances, the records that EPA is requiring in this rule are only necessary once—upon disposal—and only a small subset of the total number of appliances is likely to be disposed of in a given year.

EPA has considered ways to minimize the burden to technicians in light of commenters' concerns. EPA is modifying the final rule so as to require records that are generated through normal operations in the field. Therefore, EPA is removing the requirement to determine the amount of refrigerant recovered from each appliance. Entities would not be required to weigh cylinders or otherwise calculate how much refrigerant they recovered at each and every site, which was the most time consuming element of the proposed recordkeeping requirements. Instead, EPA's goals can be achieved by requiring records of the amount recovered in each calendar month. This way, recovery cylinders can be weighed less frequently and at a centralized location or recovery cylinders can simply be tallied if the amount of refrigerant in them is known.

One commenter encouraged EPA to consider exempting residential systems from the recordkeeping requirements due to the nature of their servicing. EPA responds that this recordkeeping requirement does not apply to regular servicing, only disposal, which occurs much less frequently.

A couple of commenters requested clarification of who must maintain records. One commenter did not support this requirement because they believed it would require records be kept by homeowners. Another commenter suggested that third-party collection sites not have recordkeeping requirements so as to not discourage wholesalers and storefronts from serving in the collection chain.

EPA responds that the recordkeeping requirements finalized for this provision apply solely to the company employing the technician (or to the technician, if operating independently) who is disposing of the appliance in both commercial and residential settings. This could be the owner or operator of the appliances or it could be a contractor who is hired to dispose of the appliance. When that company transfers the refrigerant for reclamation they may have to receive records from other entities (such as reclaimers or third-party collection sites) but those receiving refrigerant are not obligated to maintain any records themselves. EPA is not requiring any recordkeeping by the owners of the appliance unless the owner of the appliance and the employer of the technician are the same entity.

One commenter suggested that EPA extend the proposed recordkeeping requirements to those who collect at least 100 pounds of refrigerant per year from small appliances. This commenter also suggested less detailed records be kept in such instance, specifically (1) the quantity of refrigerant recovered monthly, (2) the number of units disposed of, and (3) the name of the certified reclaimer to whom they transferred the recovered refrigerant. EPA disagrees that extending this requirement to small appliances is necessary. Certification and recordkeeping requirements currently exist for the disposal of small appliances. These records are held by the final disposer, who is best suited to maintain them. In addition, EPA does not require that small appliances be evacuated by a certified technician when being disposed of.

Two commenters suggested that EPA extend the recordkeeping requirement to appliances containing more than 50 pounds as well. One of the commenters was concerned that contractors who collect from both smaller 5–50 pound and larger 50-plus pound appliances would have to separate or otherwise distinguish between what was recovered from each when transferring their refrigerant to a reclaimer. EPA finds that it would not be necessary to distinguish between these two size categories. A single record of all refrigerant transferred for reclamation is sufficient because EPA is not requiring an accounting of all recovered refrigerant as it moves through the market.

After consideration of these comments, EPA is requiring records that are regularly generated by technicians or companies recovering refrigerant while disposing of appliances as a practical way to improve the Agency's ability to enforce the venting prohibition without imposing an undue burden on regulated entities that are already complying fully with the venting prohibition. To avoid imposing an undue burden on good actors, especially out in the field where there may already be pressure to cut corners, EPA is not finalizing the proposed requirement that records be kept of how much refrigerant is recovered from each appliance. Weighing or otherwise calculating the amount of refrigerant recovered at each job site could increase burden of these requirements by consuming additional time.

4. Clarifications and Edits for Readability

As proposed, EPA is moving the provisions that were found in § 82.156 ''Required Practices'' in the prior rules into three separate sections: § 82.155 to address the safe disposal of small appliances, MVACs, and MVAC-like

appliances; § 82.157 to address appliance maintenance and leak repair for appliances containing 50 or more pounds of refrigerant; and § 82.156 to address the proper evacuation of refrigerant from appliances. These provisions tend to affect different stakeholders so separating them into different sections will make the required provisions easier to find.

F. Revisions to the Leak Repair Requirements in § 82.157

1. Background

A central component of EPA's longstanding program to properly manage ODS refrigerants is the requirement to repair leaking appliances within 30 days of determining that a certain leak rate has been exceeded. Owners and operators of appliances normally containing 50 or more pounds of ODS refrigerant must repair their appliances if they leak above a certain rate or take other actions to reduce the emissions such as retrofitting, retiring, or mothballing the appliance. Under the prior regulations, the leak rate at or above which action was required was 35 percent for commercial refrigeration appliances and IPR and 15 percent for comfort cooling and other appliances. If the attempt to repair failed to bring the appliance's leak rate below the applicable leak rate within that time frame, the owner or operator must develop a retrofit or retirement plan and implement it within one year of the plan's date. Owners or operators also had the option of developing a retrofit or retirement plan within thirty days of identifying that the leak rate has been exceeded. Owners or operators of IPR or federally owned appliances may have more than 30 days to complete repairs and more than one year to retrofit appliances where certain conditions applied (*e.g.,* equipment located in areas subject to radiological contamination, unavailability of necessary parts, and adherence to local or state laws that may hinder immediate repairs). The full suite of the prior requirements are found at § 82.156(i).

EPA recognizes that refrigeration and air-conditioning equipment often do leak. This is particularly likely for larger and more complicated appliances like those subject to the subpart F leak repair provisions. However, leaks from such appliances can be significantly reduced. Multiple factors support this conclusion. Concrete evidence that leaks can be significantly reduced include experience with the GreenChill program, an EPA partnership designed to encourage supermarkets to reduce emissions of refrigerants and transition to low-GWP and low-charge refrigeration appliances; reports from facilities regulated under California's Refrigerant Management Program; and feedback from stakeholders prior to publishing the proposed rule. The revised leak repair provisions in this action will reduce refrigerant releases of ODS and non-exempt substitute refrigerants by ensuring effective repairs and ongoing monitoring of leaking systems.

2. Restructuring and Edits for Readability

The regulatory text has been modified several times since EPA first established the program in 1993. The regulation now contains numerous cross-references to other provisions in § 82.156(i), making the requirements difficult to follow and in some places potentially leading to differing interpretations. Many important provisions are not readily apparent, such as the primary requirement that repairs must occur within 30 days, which appears explicitly only at the end of the leak repair requirements at § 82.156(i)(9). Therefore, EPA has rewritten the regulation and moved the provisions to a single new section of the Code of Federal Regulations (CFR) to make it easier for stakeholders to locate and understand the requirements.

EPA recognizes that changing the text so significantly may make stakeholders who are familiar with the existing requirements wonder how these revisions affect their current compliance monitoring systems and protocols. EPA emphasizes that the Agency did not intend to alter the substance of the requirements while restructuring except where specified. EPA discusses the intended amendments to the requirements in this section of the notice. In general, commenters were supportive of EPA's efforts to rewrite and simplify the leak repair provisions.

To avoid both ambiguity and cumbersome language throughout, EPA establishes from the outset in § 82.157(a) that the provisions of § 82.157 apply to owners and operators of all appliances containing 50 or more pounds of refrigerant, unless otherwise specified. One commenter stated that EPA should clarify throughout the rule whether the owner/operator or the technician is responsible. EPA responds that the final rule makes clearer that the owner or operator is responsible for conducting the leak inspection or repairing the appliance even when it is the technician who will be performing those actions. When a provision applies to technicians or people servicing equipment, the provision so specifies.

Multiple commenters requested that EPA define owner/operator and one commenter requested that EPA clarify who is responsible if the owner is different from the operator. EPA responds that the Agency is not defining *owner* or *operator* because these terms are widely understood in the public and regulated community. If the owner and the operator are separate entities, both are responsible for complying with the applicable leak repair provisions. EPA notes that the owner of the system chooses the operator of the system, or passes that responsibility to someone else (*e.g.,* a tenant in a building may be provided authority to operate an air conditioning system even though that tenant does not own the building or the air conditioning system). EPA does not want to hinder the ability of the owner and operator of the system to make the decision as to who would be responsible for complying with these requirements, and, therefore, the Agency has maintained the existing language that places responsibility for such compliance with requirements on both parties.

The existing regulations also inconsistently described the leak repair requirements as applying to appliances with ''50 or more pounds'' or ''more than 50 pounds'' of refrigerant. The proposed revisions consistently use ''50 or more pounds of refrigerant.'' EPA received a comment from CARB that the California regulations are based on EPA's ''more than 50 pounds,'' but CARB stated they can address any potential inconsistencies created by this revision. As such, EPA is finalizing consistent use of the phrase ''50 or more pounds of refrigerant'' in the revised regulations.

3. Extension to Substitute Refrigerants

EPA proposed to extend the leak repair provisions previously found at § 82.156(i) to appliances containing non-exempt substitute refrigerants. EPA is finalizing this extension in the revised leak repair regulations (now found at § 82.157). As such, the other provisions related to leak repair and maintenance finalized in this rule (*e.g.,* verification tests, reporting by chronic leakers, etc.) apply to appliances containing ODS and non-exempt substitute refrigerants as well. Consistent with discussions elsewhere in this notice, EPA is not extending these requirements to appliances using substitute refrigerants in a specific end-use for which the substitute refrigerant used has been exempted from the venting prohibition. These exemptions are listed in the regulations at § 82.154(a)(1). For example, these

requirements would not be extended to water in any application, or to ammonia in commercial or industrial process refrigeration or in absorption units.

Extending the leak repair requirements to non-exempt substitute refrigerants will lead to significant environmental benefits because these substances pose a threat to the environment when released. Like ODS, HFCs and PFCs also have the ability to trap heat that would otherwise be radiated from the Earth back to space. This ability gives both HFCs and PFCs relatively high GWPs. The 100-year GWPs of saturated HFCs used as refrigerants range from 124 (for HFC-152a) to 14,800 (for HFC–23), and the GWPs of PFCs used as refrigerants range from 7,390 (for PFC–14) and higher. HFC–134a, the most common individual HFC used in air-conditioning and refrigeration equipment, has a GWP of 1,430. See Section II.C.2 of this notice for further discussion related to the environmental effects of greenhouse gases.

In determining whether to exempt HFC and PFC refrigerants from the venting prohibition in 2004, EPA examined the potential effects of the refrigerant from the moment of release to its breakdown in the environment, considering possible effects on workers, building occupants, and the environment. EPA concluded that the release of HFCs and PFCs poses a threat to the environment due to their high GWPs. For that reason, and because of a lack of regulation governing the release of such refrigerants, EPA did not exempt the release of HFC or PFC refrigerants from the statutory venting prohibition. Therefore, knowingly venting or otherwise releasing into the environment of HFC and PFC refrigerants during the maintenance, service, repair, or disposal of appliances remains illegal. The venting prohibition focuses on knowing venting or release during the maintenance, service, repair, or disposal of appliances and thus does not account for all HFC (and PFC) refrigerant emissions. For instance, in previous rules we have not assumed that emissions of HFCs that occur due to appliance leaks constitute knowing releases. However, as discussed elsewhere in this rulemaking, EPA is broadening its interpretation of what is considered a knowing release under section 608(c) for purposes of appliance leaks. In addition, the requirements to calculate leak rates and monitor leaking systems that EPA is finalizing in this action provide knowledge to appliance owners and operators and thereby broaden the set of refrigerant releases for which they would be liable for a knowing release.

Consideration of Costs

Based on the evidence discussed later, the reported leak rate performance of today's comfort cooling, commercial refrigeration, and IPR appliances with full charges of 50 or more pounds argues for lowering the leak rates. The evidence discussed later demonstrates that the leak rates of 35 percent for IPR and commercial refrigeration and 15 percent for comfort cooling are considerably above the ''lowest achievable level of emissions'' envisioned in CAA section 608(a)(3)(A).

While section 608(a)(3) does not require EPA to perform a cost-benefit analysis to determine what leak rate(s) would constitute the ''lowest achievable level of emissions,'' in general, EPA has balanced the benefits from reducing emissions of refrigerants with the costs of these requirements. EPA has determined that the costs are reasonable given the significant benefits that accrue (both private in the form of cost savings and public in the form of improved health and environmental protection from reduced GHG and ODS emissions). Specifically, EPA reviewed data from the lowest-emitting equipment to gauge technological feasibility and then reviewed other datasets, such as CARB data and consent decree requirements, to determine a reasonable set of requirements. EPA then assessed the costs and benefits associated with extending the existing requirements to appliances using substitute refrigerants. EPA also assessed the tighter requirements applicable to appliances containing ODS or non-exempt substitute refrigerants such as lower leak rates, the requirement to repair leaks once the applicable leak rate is exceeded, the requirement to conduct verification tests on all types of appliances, and periodic leak inspections for appliances that had exceeded the leak rates.

Based on the comments received, EPA considered ways to reduce the cost of these requirements, as compared to the proposal. These changes are discussed in full later in this section and include: Limiting periodic leak inspections to appliances that have exceeded the applicable leak rate, rather than requiring all appliances to be inspected; finalizing a leak rate for IPR of 30 percent rather than 20 percent; allowing greater flexibility for owners and operators to determine which leaks to repair rather than requiring the repair of all leaks; and modifying the proposed chronic leaker provision so that it results in reporting to EPA rather than automatic retirement of the appliance.

This rule also provides flexibility that will reduce the cost of complying with the existing regulations. For comfort cooling and commercial refrigeration appliances, EPA is allowing an extension to the 30-day repair requirement if the arrival of a part is delayed, recognizing that the short additional time needed for delivery of a part can result in a nearer-term and less costly emission reduction than a retrofit. EPA is also allowing an extension to implement a retrofit or retirement for any appliance that transitions to a non-exempt substitute refrigerant.

4. Leak Inspections

The prior regulations at § 82.156(i) focused on actions an appliance owner or operator must take after discovering an appliance has a leak. EPA proposed to require annual or quarterly leak inspections as a proactive maintenance practice depending on the type and size of the appliance. More specifically, EPA proposed to require that owners or operators of commercial refrigeration appliances or IPR normally containing 500 or more pounds of refrigerant conduct quarterly leak inspections of the appliance, including the appliance's refrigerant circuit. Inspections would be annual for commercial refrigeration appliances and IPR containing 50 pounds or more but less than 500 pounds of refrigerant, as well as comfort cooling appliances and other appliances normally containing 50 or more pounds of refrigerant.

The purpose of the proposed leak inspection requirement was to determine the location of refrigerant leaks. This proposal was designed with Next Generation Compliance objectives in mind (see Section II.D.3). The Agency anticipated that many appliance owners and operators would take action earlier if leaks were identified because it is in their financial interest to do so and would reduce emissions and refrigerant costs. Repairing leaks earlier could also prevent that appliance from being pulled into the proposed regulatory requirements at § 82.157 for exceeding the applicable leak rate. EPA also proposed to allow owners or operators to forgo periodic leak inspections if they installed and operated an automatic leak detection system that continuously monitors the appliance for leaks.

Frequency of Leak Inspections. State regulatory agencies and environmental organizations supported the proposed requirement to conduct periodic leak inspections. Two such commenters suggested that EPA require quarterly leak inspections for systems with 200

pounds or more to harmonize the leak inspection requirements with California's Refrigerant Management Program. However, many other commenters expressed strong opposition to mandatory quarterly or annual leak inspections, asserting that requiring inspections of all appliances imposes unnecessary costs, especially for systems that are not leaking. Those commenters estimated the cost of an inspection for a large supermarket could exceed $5,000. Another commenter stated that companies do not need a regulatory requirement to inspect and maintain their refrigeration equipment and that since EPA did not require repair of leaks identified in a leak inspection for appliances that do not exceed the applicable leak rate, there is not a reasonable relationship between the proposed requirement and the goal of emissions reduction. One commenter stated that leak inspections are unnecessary, at least for chemical manufacturing, because temperatures and pressures must be maintained within tight tolerances for reactions to proceed. Furthermore, any changes in temperature and pressure would trigger an alarm or shutdown the process.

Other commenters expressed qualified support for annual leak inspections, especially if it is phased in, starting with larger systems or if a company can provide evidence that they have not added refrigerant to a system in over a year. Another commenter stated that leak inspections should only be annual, unless the equipment exceeds the applicable leak rate for that system. That commenter believes that the inspections should return to being an annual requirement after the leak rate has been reduced below the threshold for two years. One commenter stated that the greatest value of a leak inspection is on a system with a known leak.

Based on these comments relating to the expense and value of conducting leak inspections on all appliances, EPA is finalizing the leak inspection requirement only for appliances that have been found to be above the applicable leak rate. EPA proposed to only require that the leaks identified from a leak inspection be repaired when the applicable leak rate is exceeded. EPA's proposal observed that the costs of repairing all leaks when the leak rate is below the applicable leak rate may be higher than the benefits, especially when the leak is a series of small pinhole leaks and the leak rate is very low, as may often be the case. As stated in the proposed rule, when the applicable leak rate is exceeded, the benefits of repairing those leaks are significant—both for the environment and for the owner/operator (in decreased refrigerant replacement costs)—and do result in significant savings, which supports repair of leaks. EPA appreciates the concern raised by commenters who question the value of conducting leak inspections on appliances that are known to not be leaking, or leaking at a low rate that would not trigger a requirement for repair under the regulations. Periodic leak inspections are a best practice within the industry to reduce emissions of refrigerants and the Agency continues to recommend periodic leak inspections for all appliances as even well-maintained appliances might leak.[21] EPA did not quantify any benefits for systems that had a leak rate below the applicable leak rate because the Agency did not propose that the leaks that were discovered in those systems needed to be repaired. While requiring proactive leak inspections would generally reduce leaks because companies would find leaks and could repair them before the applicable leak rate was exceeded, EPA is not finalizing the periodic leak inspections for all appliances, as proposed. Many of the specific comments about timing of leak inspections no longer apply because of this change. However, EPA has reconsidered the cost of conducting a leak inspection, as discussed further in Section VI of the preamble.

EPA is finalizing a requirement at § 82.157(d)(1) to conduct a leak inspection after discovering the leak rate had exceeded the applicable leak rate. Thereafter, EPA is requiring episodic leak inspections based on the full charge size and type of appliance on the same schedule as in the proposed § 82.157(b)(1)–(3), but in this final rule EPA added a provision clarifying that this requirement ends if the appliance remains below the applicable leak rate for a specific time. More specifically, following a leak rate exceedance, EPA is requiring quarterly leak inspections for IPR and commercial refrigeration appliances containing 500 or more pounds of refrigerant until there are four quarters in a row where the appliance has not exceeded the applicable leak rate. For IPR and commercial refrigeration appliances containing between 50 and 500 pounds of refrigerant, and for all comfort cooling appliances or other remaining appliances normally containing 50 or more pounds of refrigerant, EPA is requiring annual leak inspections following a leak rate exceedance until the owner or operator can demonstrate that the appliance has not exceeded the applicable leak rate for one year. More frequent monitoring is important for larger commercial refrigeration appliances and IPR because those systems tend to have more leaks than comfort cooling appliances and because the amount of refrigerant that would be lost in a leak is generally greater for those systems.

In our view, and based on our review of comments, limiting inspections to those appliances that are known to have leaked and triggered the repair requirements appropriately tailors the leak inspection requirement to those systems that are most likely to leak and provides important information about whether the leak repairs have held over the longer term. EPA is not finalizing the proposed revision allowing for annual leak inspections when refrigerant has not been added to the appliance for more than a year as EPA is not finalizing the periodic leak inspection requirement for systems that are below the applicable leak threshold. As discussed later, EPA is finalizing the proposed revision allowing the use of automatic leak detection systems in lieu of quarterly or annual leak inspections.

EPA proposed to establish a process that would allow less frequent leak inspections for federally owned appliances that are located in remote locations or are otherwise difficult to access for routine maintenance. One commenter disagreed with the proposal to allow a reduced inspection schedule for federally owned appliances. Other commenters requested that EPA provide a similar exemption to privately owned appliances.

Because EPA is not finalizing periodic leak inspections for appliances below the applicable leak threshold, EPA is also not finalizing the reduced leak inspection schedule for federally owned appliances. EPA is requiring that federally owned equipment that has leaked in excess of the applicable leak rate be subject to the same periodic leak inspection schedule as privately owned equipment. The concerns about burden raised by federal agencies during the development of the proposal are addressed by removing the proposed requirement that leak inspections be conducted on all appliances. The number of appliances leaking above the final leak thresholds is less than 20 percent of the total number of installed appliances with charges of 50 pounds or greater.

Description of leak inspections. Many commenters requested clarification

[21] See GreenChill's *Best Practices Guidelines: Commercial Refrigeration Leak Prevention & Repairs,* May 2011, available in the docket for this rulemaking.

about the types of methods that can be used to conduct a leak inspection. EPA responds to those comments in the section of this notice that addresses comments on the proposed definitions. As described there, the revised definition includes examples of methods that may be appropriate for leak inspections.

EPA proposed that periodic leak inspections would not need to be performed by certified technicians and took comment on that idea. Two commenters agreed that leak inspections should not be required to be conducted by certified technicians. Reasons stated for not requiring the inspection to be done by a certified technician are that they are more expensive than in-house personnel, they may be less familiar with the appliance, and that the person doing the inspection will not necessarily be performing activities that can only be performed by a certified technician such as adding or removing refrigerant or making any repairs to the appliance. Another commenter believes that leak inspections should be performed by someone trained to fix leaks, and thus that the persons performing leak inspections must be a certified technician.

In this final rule, EPA is requiring that the required leak inspections be performed by certified technicians. EPA is making this change from the proposal for several reasons. First, required leak inspections are now limited to appliances that are known to have been leaking. It is now very likely that a technician will have to add refrigerant or make additional repairs after the leak inspection. This is certainly the case for the inspection triggered by discovering that the leak rate exceeds the threshold. Second, because EPA is no longer requiring the repair of all identified leaks, the person inspecting the system must also be qualified to determine which leaks must be repaired to bring the leak rate below the applicable level. Third, while certified technicians may be more expensive to hire, the overall burden of the leak inspection requirement is less since many fewer appliances must be inspected than originally proposed. Under the proposal, all appliances of a certain size would require leak inspections, which EPA estimated to be approximately 1.5 million. Under the finalized provisions, that number drops to approximately 282,000 appliances. EPA has considered the comments about the cost of performing a leak inspection and has updated the technical support document accordingly. Finally, EPA is not specifying a single method but rather allowing the person conducting the inspection to determine the method(s) that are appropriate for that appliance. This technical judgment requires someone trained in the methods of leak detection, which is more likely to be the case for a certified technician.

Many commenters requested clarification on what portions of an appliance are subject to a leak inspection. The proposed regulatory text was silent on this issue but the notice of proposed rulemaking discussed inspecting visible components and the proposed definition of leak inspection included an examination of ''all visible components of an appliance.'' The proposal did not define ''visible'' or address the treatment of components that are only visible if intermediary steps are taken (*e.g.,* clearing ice or elevating monitoring personnel). Commenters noted that refrigerant lines may be insulated and thus the piping is not visible and that lines may run along the ceiling of a store and are not observable or are difficult to access. One commenter proposed a definition that would limit inspections to areas that are visible and accessible without the use of equipment. The commenter states that the vast majority of components in commercial refrigeration, and those most prone to refrigerant leakage, are accessible directly from floor or roof level. One commenter requested that EPA define visible components as those that are readily accessible to be viewed and accessed during normal preventative maintenance activities for the appliance. One commenter suggested that the leak inspection be ''consistent with good industry practice.'' Another commenter expressed concern that requiring the inspection of all visible components may necessitate the appliance be shut down.

Another commenter requested specific exceptions for components that are difficult to monitor, insulated, unsafe to monitor, or otherwise not accessible. Consistent with other leak detection and repair programs for New Source Performance Standards, Subparts VV and VVa, which relates to equipment leaks of VOC in synthetic organic chemicals manufacturing, the commenter suggests that the following sources be exempt from inspection: (1) Components that require monitoring personnel to be elevated more than 2 meters above a support surface; (2) components that are insulated; (3) components that are determined to be un-safe to monitor as determined by site personnel; (4) components that are under ''ice'' that forms on the outside of equipment. A couple of commenters also expressed concern about requiring leak inspections on equipment that cannot be accessed due to radiological concerns.

EPA appreciates the difficulties associated with inspecting the entirety of an appliance, which these comments illustrate. EPA proposed a definition of leak inspection that includes ''all visible components.'' EPA is modifying that proposed definition to remove the reference to ''all visible components.'' Also, in light of the points raised in the comments, EPA is clarifying in the final rule that a leak inspection must be conducted on all visible and accessible components of an appliance, with some exceptions. EPA did not propose any exceptions but did state in the notice of proposed rulemaking that the inspection should occur on all visible and accessible components of an appliance. The exceptions finalized in this rulemaking clarify what is not considered visible or accessible: 1) Where components are insulated, under ice that has formed on the outside of equipment, underground, behind walls, or are otherwise inaccessible; (2) where personnel must be elevated more than 2 meters above a support surface; or (3) where components are unsafe to inspect, as determined by site personnel. This clarification takes into consideration risks to the person conducting the inspection. The Agency does not expect that an appliance be shut down in order to fulfill the obligation of inspecting all visible components.

Automatic Leak Detection. EPA proposed to not require periodic leak inspections if owners or operators install and operate an automatic leak detection system that continuously monitors the appliance for leaks. Although EPA is removing the periodic leak inspection requirements for many appliances, EPA will continue to allow the use of automatic leak detection equipment to continuously monitor whole appliances or portions of appliances in lieu of the required periodic inspections for that appliance or that portion of the appliance. Use of such equipment can minimize releases of refrigerant because it discovers leaks sooner than a quarterly or annual leak inspection can. Using their 2014 Refrigerant Management Program (RMP) data, CARB commented that they found that leaking systems using automatic leak detection had a 25 percent lower annual leak rate than those without. This comment provides further support for including this option to use automatic leak detection equipment to continuously monitor an appliance or portion of an appliance in the final rule.

A few commenters encouraged EPA to require automatic leak detection equipment on appliances with more than 2,000 pounds of refrigerant to harmonize EPA's requirements with California's. EPA responds that while this rule does not impose requirements that are inconsistent with CARB's program, EPA has not included all of CARB's requirements in this rule. EPA is requiring that automatic leak detection systems meet the same level of detection (10 parts per million of vapor) and notification thresholds (100 parts per million of vapor, a loss of 50 pounds of refrigerant, or a loss of 10 percent of the full charge) as CARB requires. EPA knows that such equipment is already available on the market and capable of meeting those standards, which allows companies wishing to install automatic leak detection equipment to do so sooner than if EPA established different standards in this rule. It also means that installed equipment that meets California's requirements will meet EPA's requirements. EPA disagrees, as discussed later, with the comment suggesting it require the use of automatic leak detection equipment.

Some commenters were opposed to requiring automatic leak detection. One such commenter stated that it does not work well outdoors and that it may be hazardous to enclose a system to facilitate leak detection. It can also be expensive and EPA did not estimate the costs of requiring it. One nuclear power producer commented that any modifications to nuclear generating stations must undergo extensive engineering and risk review processes. This argues against requiring the installation of monitoring equipment. Another commenter stated that it has not been able to identify any reliable information confirming that such automatic leak detection devices are available, cost-effective, and capable of satisfying EPA's requirements.

EPA responds that the Agency is not requiring the use of automatic leak detection equipment in this final rule. Rather, this is an option that an owner or operator can choose to pursue in lieu of conducting periodic leak inspections. EPA agrees that automatic leak detection equipment may not be appropriate for all systems, and the Agency is not suggesting that components be enclosed in order to allow for automatic leak detection equipment where it would be hazardous to do so. The decision to install such equipment is up to the owner/operator. With regard to availability, EPA responds that California's existing requirements for use of such systems have been in place since 2011 and include the same standards as those EPA is finalizing in this rule, so equipment meeting these requirements is already available and in use. EPA encourages anyone interested in using automatic leak detection to consult entities in California regarding the availability and performance of such equipment. Another commenter notes that electronic leak detection equipment is currently installed in thousands of supermarkets, further supporting the idea that such equipment is available and in use.

Many commenters supported automatic leak detection equipment in lieu of periodic leak inspections but were concerned that the systems they currently have installed do not meet the requirements of the proposed rule because the entire refrigeration system is not within the building envelope. EPA proposed that automatic leak detection equipment systems that directly detect the presence of a refrigerant in air could only be used where the entire appliance or the compressor, evaporator, condenser, or other component with a high potential to leak is located inside an enclosed building or structure. Multiple commenters requested that EPA still allow the option of using automatic leak detection for those components that are not outdoors. The outside components would then be the only portion of the system that would be subject to periodic inspections. EPA agrees that automatic leak detection equipment should be allowed for enclosed components even if only portions of an appliance are enclosed and the proposed rule was intended to cover that situation. EPA has revised the final rule to more clearly allow for this and to clarify that in such situations, the automatic leak detection equipment would only be used to monitor components located in an enclosed building or structure but the other components would continue to be subject to any applicable leak inspection requirements.

One commenter encouraged EPA to require that the leak detection system be certified. There are third party systems on the market that claim to check charges, but the commenter believes some may be inaccurate. The commenter recommends referencing ASHRAE 207P, which will allow for verification of the charge checking systems. EPA responds that the referenced ASHRAE standard is still under development and we are unaware of any certification programs that exist or that are planned to reference that standard once finalized. Requiring certifications for leak detection systems is therefore not appropriate at this time. EPA is finalizing the proposal to require that the owner or operator calibrate the automatic leak detection system annually and keep records documenting the calibration.

5. Lowering Leak Rates

The leak rate is the rate at which an appliance is losing refrigerant, measured between refrigerant charges. If the leak rate for an appliance is above a specified threshold, the regulatory revisions finalized in this rule require certain actions, such as leak repair, from the owner/operator.

EPA is lowering the leak rates for IPR, commercial refrigeration, and comfort cooling and other appliances containing ODS refrigerants and is establishing those same leak rates for appliances using non-exempt substitute refrigerants. EPA is lowering the leak rates to 30 percent (from 35 percent) for IPR, 20 percent (from 35 percent) for commercial refrigeration appliances and 10 percent (from 15 percent) for comfort cooling and all other appliances with a full charge of 50 pounds or more of ODS or non-exempt substitute refrigerant. For the reasons discussed below, EPA is finalizing a higher leak rate for IPR than proposed while finalizing the same rates as proposed for commercial refrigeration and comfort cooling. In making this decision, EPA has assessed the compliance costs, cost savings, and environmental benefits and has found that the aggregated costs are reasonable, and that lowering leak rates will result in fewer emissions of both ODS and non-exempt substitute refrigerants.

EPA reviewed data submitted under California's RMP, the South Coast Air Quality Management District (SCAQMD), GreenChill partners, consent decrees for both commercial refrigeration and IPR for companies found to be in violation of subpart F regulations, EPA's Vintaging Model, conversations with potentially affected stakeholders, and comments on this and past proposed rules. See the technical support document *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program* for a complete discussion. EPA presents here background on two data sources (CARB and SCAQMD) that EPA relied on for multiple types of appliances and then discusses appliance-specific data separately.

California's RMP requires that owners or operators of any appliance with more than 50 pounds of ODS or HFC refrigerant repair leaks, conduct leak inspections or install automatic leak detection equipment, and report their

refrigerant usage and repairs.[22] In addition, any facility with a refrigeration appliance containing more than 50 pounds of refrigerant must report all service records annually to California. CARB has categorized facilities based on the facility's largest appliance. Facilities that have at least one appliance with a full charge of 2,000 pounds or more (classified as ''large'' facilities under the RMP) began reporting in 2012 (for 2011 service records). These large facilities must submit service records for any appliance that has a full charge greater than 50 pounds. ''Medium'' facilities have at least one appliance with a full charge of 200 or more pounds but less than 2,000 pounds and they started reporting in 2014. ''Small'' facilities have at least one appliance between 50 and 200 pounds and will have begun reporting in 2016. California's reporting program provides insight into the use and emissions of ODS and substitute refrigerants from refrigeration appliances in the state, across a broad range of sectors that use refrigeration appliances. For the proposed rule, EPA reviewed the 2013 data, the most recent dataset available at that time, which contained information from 11,166 appliances at large and medium facilities. EPA has subsequently reviewed the 2014 data, containing data on 12,605 appliances, and found it to be substantially similar. A series of charts showing the aggregated California data has been included in the technical support document. EPA has analyzed these data in developing the revised leak rates for IPR, commercial refrigeration, and comfort cooling appliances.

California's South Coast Air Quality Management District is an air pollution control agency that services the areas of Orange County and the urban portions of Los Angeles, Riverside, and San Bernardino counties, which contained approximately half of the population of California at that time. SCAQMD had issued Rule 1415 to reduce emissions of ozone-depleting refrigerants from stationary refrigeration and air-conditioning systems. The rule required any person within SCAQMD's jurisdiction who owns or operates a refrigeration system to minimize refrigerant leakage. A refrigeration system is defined for the purposes of that rule as ''any non-vehicular equipment used for cooling or freezing, which holds more than 50 pounds of any combination of class I and/or class II refrigerant, including, but not limited to, refrigerators, freezers, or air-conditioning equipment or systems.''

Under Rule 1415, SCAQMD collected the following information every two years from owners or operators of such refrigeration systems: Number of refrigeration systems in operation; type of refrigerant in each refrigeration system; amount of refrigerant in each refrigeration system; date of the last annual audit or maintenance performed for each refrigeration system; and the amount of additional refrigerant charged every year. For the purposes of Rule 1415, additional refrigerant charge is defined as the quantity of refrigerant charged to a refrigeration system in order to bring the system to a full capacity charge and replace refrigerant that has leaked. This reporting requirement has now been replaced by the statewide RMP reporting.

EPA analyzed the SCAQMD data on ODS-containing appliances for the proposed 2010 Leak Repair Rule. The analysis prepared for that rule can also be found in the docket for today's rulemaking. The dataset contains information on over 4,750 appliances from 2004 and 2005 with ODS refrigerant charges greater than 50 pounds. The data included refrigeration and air-conditioning appliances that meet EPA's definitions of IPR (*e.g.,* food processing industry, pharmaceutical manufacturing), commercial refrigeration (*e.g.,* refrigerated warehouses, supermarkets, retail box stores), and comfort cooling (*e.g.,* office buildings, universities, hospitals) from businesses of all sizes. EPA has considered the previous analysis of those data in developing the revised leak rates for IPR, commercial refrigeration, and comfort cooling appliances in this final rule.

i. Industrial Process Refrigeration

In the proposed rule, EPA discussed reducing the leak rate for IPR and commercial refrigeration from 35 percent to 20 percent. EPA specifically sought comments on whether a 20 percent leak rate was appropriate, or whether a leak rate higher than 35 percent or as low as 10 or 15 percent would be appropriate. After considering the comments received and upon further analysis of the CARB data, EPA is finalizing a leak rate of 30 percent.

Some commenters supported the lower leak rates noting that real-world experience shows that the lower leak thresholds are technically and practically achievable. Some industry members encouraged EPA to explore the feasibility of further lowering rates for IPR in the future, consistent with improved and available industry best practices. Other commenters stated that data from GreenChill and consent decrees are not representative of IPR facilities. One commenter also stated that CARB data do not support that a 20 percent threshold is achievable because one third of the reporting facilities are not achieving such performance. As a result, the commenter stated that EPA has not shown that lowering the leak rate for IPR from 35 to 20 percent is necessary nor economically or practically feasible.

Some commenters suggested EPA distinguish between old and new equipment. One commenter noted that existing IPR equipment can meet the 35 percent leak rate but not all could achieve the 20 percent leak rate. Thus, the proposed leak rate would strand significant investment in custom-designed refrigeration process equipment. Another commenter stated that older IPR facilities were designed when refrigerant tightness was not a critical design element. Facilities have been upgraded and maintained to achieve 35 percent leak rates but further upgrades and repairs to bring them to a lower rate would be costly if not impossible. The commenter also stated that it would not be cost effective since many are near the end of their useful lives. A few commenters suggested that EPA follow the 1998 proposal and allow for the 35 percent rate if the appliance meets all of the following criteria: (1) The refrigeration system is custom-built; (2) the refrigeration system has an open-drive compressor; (3) the refrigeration system was built in 1992 or before; and (4) the system is direct-expansion (contains a single, primary refrigerant loop). Another commenter recommended keeping the leak rate at 35 percent for systems using substitute refrigerants, stating that companies that retrofitted from ODS to HFC refrigerants should be recognized for that prior environmental advancement.

In response to the comment that some of the data are not representative of IPR facilities, EPA responds that the Technical Support Document for the proposal did distinguish between IPR and commercial refrigeration. EPA did not use GreenChill's commercial refrigeration data or consent decrees for commercial refrigeration as a basis for the proposal on IPR. In the final Technical Support Document, as well as the discussion that immediately follows, EPA has further separated out the analysis for IPR.

[22] Among other requirements, the RMP establishes leak repair requirements for appliances with more than 50 pounds of refrigerant. More detail on the RMP is provided in the technical support document in the docket titled *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program* and online at *www.arb.ca.gov/stoprefrigerantleaks.*

After considering these comments and further reviewing the CARB data, EPA is finalizing a leak rate of 30 percent for IPR, rather than 20 percent as proposed. The potential benefits of lowering the leak rate to 20 percent are small in relation to the potential costs incurred by those small number of facilities that could be affected.

EPA's model, informed by the 2013 CARB data, indicates that 92 percent of IPR appliances have leak rates below 30 percent. Almost 10 percent of ODS-containing appliances would trigger the leak repair requirements if the leak rate were lowered from 35 to 20 percent, as proposed. However, if the leak rate is lowered from 35 to 30 percent only 0.6 percent more ODS-containing IPR appliances would trigger the leak repair requirements.

Viewed another way, using the California data as a proxy for the entire United States' IPR systems, the proposed 20 percent leak rate could affect up to 9 percent of all IPR appliances (though only a small subset of IPR systems above 20 percent using ODS refrigerant would be newly affected because they were already subject to the 35 percent leak rate). Appliances that leaked more than 20 percent are responsible for 86 percent of emissions in the CARB data. Changing the leak rate threshold to 30 percent, as EPA is finalizing in this rule, would affect 7 percent of all IPR appliances and an even smaller subset of ODS-containing equipment (only 0.6 percent). In the CARB records, appliances leaking more than 30 percent are responsible for 75 percent of emissions.

EPA's review of the 2004 and 2005 data submitted to the SCAQMD from 349 IPR facilities also indicate that 81 percent of ODS-containing IPR appliances had leak rates below 30 percent. Slightly less than 5 percent of ODS-containing appliances would trigger the leak repair requirements if the leak rate was lowered from 35 to 20 percent, as proposed. In this final rule, only 1.5 percent of ODS-containing appliances would trigger the leak repair requirements if the leak rate was lowered from 35 to 30 percent. However, by extending the leak repair requirements to IPR appliances containing non-exempt substitute refrigerants, a 30 percent leak rate would also trigger all IPR facilities using non-exempt substitute refrigerants above that threshold, not just the incremental difference of facilities operating between 30 and 35 percent.

EPA calculates leak inspection and repair costs of a 20 percent leak rate for IPR to be $7.0 million, with annual emissions reductions equal to 0.63 $MMTCO_2eq$ and 8.0 ODP tons. EPA calculates the leak inspection and repair compliance costs of a 30 percent leak rate for IPR to be $5.5 million, with annual emissions reductions equal to 0.44 $MMTCO_2eq$ and 5.4 ODP tons. Finally, EPA analyzed retaining the current 35 percent leak rate for IPR, as applied to IPR using substitute refrigerants. In that scenario, the leak inspection and repair costs would be $5.1 million, with annual emissions reductions equal to 0.26 $MMTCO_2eq$ and 0 ODP tons. Lowering the leak rate from 35 to 30 percent provides significantly more environmental benefits, including reductions in emissions of ozone-depleting substances, for the costs. Lowering the leak rate further provides diminishing returns.

EPA recognizes that some IPR transitioned to HFCs from ODS refrigerants. This may have been an environmental decision for some, but other commenters stated that this was done to avoid being covered by the subpart F regulations. For whatever reasons, these facilities transitioned to a substitute refrigerant and therefore were no longer required to maintain a leak rate below 35 percent. EPA's analysis described above indicate that that a majority of the new IPR equipment affected by the rule will be those using substitute refrigerants. At a 30 percent leak rate, EPA estimates that there will be 492 newly affected systems containing ODS refrigerant but 5,938 systems containing HFC refrigerants.

While the number of affected IPR facilities may be small (EPA estimates there are 1.5 million appliances with a charge size of at least 50 pounds of an ODS or non-exempt substitute refrigerant), the challenges faced by IPR facilities to upgrade or improve their system are more substantial that those faced by other appliance types. In general, leak rates are highest for IPR systems for a number of factors. First, such appliances are generally custom-built and assembled at the site where they are used rather than in a factory where standard manufacturing practices can be put in place to reduce leaks. Appliances used in IPR are custom-designed for a wide spectrum of processes and facilities, including applications such as flash freezers aboard commercial fishing vessels to cooling processes used in the manufacture of pharmaceuticals. This results in the sector having an extraordinarily broad range of equipment configurations and designs. Custom designed equipment may also present more challenges to original equipment manufacturers who wish to systematically implement leak reduction technologies. Second, these appliances generally use a long, single refrigerant loop for cooling that is not enclosed within a piece of equipment. This tends to raise average leak rates, particularly when the refrigerant loop flows through inaccessible spaces, such as underneath floors, or when used in challenging climates and operating conditions. Third, these appliances are often integrated into production plants or other applications and typically operate continuously. This need for continuous operation can make repairing certain leaks more difficult and costly, possibly requiring manufacturing processes to be shut down and long lead times. Multiple commenters agreed with and provided comments supporting EPA's assessment that IPR facilities can be leakier and more challenging to repair than commercial refrigeration and comfort cooling appliances.

In response to comments requesting different leak rates for old and new appliances, EPA is not distinguishing between old and new appliances in the regulations for the following reasons. First, CARB data indicate that older IPR equipment is not necessarily leakier than newer IPR equipment. While newer systems can generally be designed with leak tightness in mind, EPA has also found that the quality of the construction and the operation and maintenance of the appliance plays a larger role in whether the appliance leaks than the age of the equipment *per se*. Leakage can be reduced even on older equipment by taking appropriate measures. Second, in EPA's experience with the HCFC phaseout, it has been challenging in some circumstances for owners and operators to determine whether an appliance is existing or new.

For clarity and to facilitate compliance, and consistent with the proposal, EPA is not finalizing a distinction between old and new IPR appliances in the leak thresholds finalized in this rulemaking. In response to the commenters encouraging EPA to explore the feasibility of further lowering IPR rates in the future, EPA will take this under advisement for future analyses and such a future analysis may include the age of the facility and refrigeration technology used. Further gradation of the IPR category is not necessary at this time.

ii. Commercial Refrigeration Appliances

EPA proposed to lower the leak rate for commercial refrigeration appliances from 35 percent to 20 percent. Based on the data analysis discussed in this

section and comments, EPA is finalizing that rate as proposed.

First, EPA reviewed data from GreenChill, an EPA partnership with food retailers to reduce refrigerant emissions and decrease their impact on the ozone layer and climate change. Established in 2007, this partnership has 27 member companies comprising almost 30 percent of all supermarkets in the United States. GreenChill works to help food retailers voluntarily (1) transition to environmentally friendlier refrigerants; (2) lower refrigerant charge sizes; (3) eliminate leaks; and (4) adopt green refrigeration technologies and best environmental practices. One of the GreenChill partnership's programs that helps food retailers reduce their refrigerant emissions is the Food Retailer Corporate Emissions Reduction Program. Under this program, partners report their corporate-wide average leak rate for all refrigerants. A corporate-wide average leak rate is the sum of all refrigerant additions in a given time period for all of the commercial refrigeration appliances owned by a corporate entity, divided by the full charge for all of the commercial refrigeration appliances owned by that same corporate entity during that time period.

Between 2007 and 2014, the corporate-wide average leak rate for all reporting GreenChill partners remained within a relatively narrow range of between 12.6 percent and 13.8 percent. Remarkably, when new partners joined, the reported corporate-wide average leak rate across all partners remained level. Several supermarket chains in the GreenChill program, including some having hundreds of stores, have consistently reported a corporate-wide leak rate below 10 percent. These data support the conclusion that leak rates in commercial refrigeration appliances can be considerably lower than 35 percent and that a 20 percent leak rate is reasonable.

Some commenters found GreenChill data unpersuasive because they are self-reported and unverified and because they represent the average performance of multiple appliances rather than the performance of individual systems. Another commenter stated that GreenChill data are not representative of the supermarket industry as a whole and do not consider the capabilities of independent operators or small businesses.

EPA disagrees with the comments regarding the use of GreenChill data. It is appropriate to use the GreenChill data to inform EPA's consideration of achievable leak rates for commercial refrigeration. The average performance of multiple appliances is relevant to understanding how well individual appliances, on average, perform. This dataset represents almost a third of the supermarket industry, including a few smaller independent operators, over multiple years and locations across the United States. Even if the data were biased towards larger chains and organizations that have proactively sought to reduce their emissions below the prior regulatory rate of 35 percent, these data give an indication of what is achievable when companies seek to reduce leak rates. Further, these data demonstrate that leak rates well below 20 percent are not just achievable but may be consistently maintained. A leak rate is not inherent to a particular piece of equipment but rather includes factors such as how that appliance is operated and maintained.

One commenter representing the supermarket industry supported lowering the leak rate threshold but stated that 20 percent may be burdensome for small businesses and independent retailers. Other commenters in the supermarket industry supported the proposed 20 percent leak rate and one stated that they currently meet that rate for both ODS and HFC equipment. CARB submitted comments suggesting that EPA lower the leak rate to 10 percent for commercial refrigeration, or totally eliminate the threshold. Based on their 2014 RMP data, lowering the threshold to 10 percent would raise the number of affected systems in California from 5,500 to 6,342 (out of more than approximately 20,000 systems) while reducing greenhouse gas emissions by 0.11 $MMTCO_2e$. Another commenter urged EPA to establish a leak rate of 10 percent for new commercial refrigeration to incentivize improved design, installation, and maintenance. The commenter refers to the GreenChill program at least 125 stores currently certified as Silver or above, and with Platinum certified stores achieving leak rates below 5 percent and to a supermarket chain in the UK that has a corporate-wide leak rate of 7.1 percent in 2013.

EPA responds that the average leak rate across all GreenChill commercial refrigeration appliances does not rise appreciably when new companies joined the partnership, which indicates that companies operating outside of the GreenChill partnership are operating with leak rates well below 35 percent.[23] EPA's standard presumption, based on CARB data, is that the average leak rate for all commercial refrigeration is 25 percent. That some commenters say they operate their commercial refrigeration with leak rates below 20 percent for both ODS and HFC equipment is further support that private incentives drive lower leak rates and that a 20 percent rate is clearly achievable.

Based on data in the record, EPA does not agree that a 10 percent leak rate would be appropriate for commercial refrigeration. GreenChill partners have lower leak rates than the industry average, yet the average rate among all commercial refrigeration appliances in GreenChill is around 13 percent. There are only nine supermarkets that have achieved the Platinum level certification. EPA therefore does not believe that 10 percent is currently regularly achievable industry-wide. EPA also appreciates the concept raised by the commenter that establishing lower leak rates for future appliances could be a way to encourage innovation. EPA did request comment on whether there are other regulatory incentives that could provide a basis to go with a leak rate lower than 20 percent and establishing a target rate to achieve in the future is an intriguing concept. EPA will take this comment under advisement. However, in today's final rule EPA is basing the revised leak rates on what appliances are currently able to regularly achieve.

The data submitted to the SCAQMD from 1,722 commercial refrigeration appliances indicate that 77 percent of ODS-containing comfort cooling appliances had leak rates below 20 percent. Only 8 percent of ODS-containing appliances would trigger the leak repair requirements if the leak rate was lowered from 35 to 20 percent. In 2010, when EPA analyzed the data, EPA found that the SCAQMD leak repair data for commercial refrigeration appliances was consistent with EPA's analysis of the commercial refrigeration sector.

EPA has also reviewed how companies agreed to manage refrigerants through recent consent decrees with the Agency. In consent decrees with Safeway and Costco, the two companies agreed to bring their corporate-wide leak rates from about 25 percent to 18 and 19 percent, respectively. In a recent consent decree with Trader Joe's, the company agreed to achieve and maintain an annual corporate-wide average leak rate of 12.1 percent through 2019. One commenter was unpersuaded by the use of consent decrees because they are aspirational and do not reflect actual operation. EPA agrees that the corporate-wide leak rates to be obtained under these consent decrees are not data

[23] See the document *GreenChill Partnership's 2014 Data: Benchmarks, Results, and Trends* in the docket.

of actual operations, per se, but they are more than merely aspirational. Consent decrees are legally binding and the companies would not have committed to them if they thought they were unachievable. These consent decrees provide additional support for the proposition that a 20 percent leak rate for commercial refrigeration is reasonably achievable. These consent decrees are available in the docket.

iii. Comfort Cooling and Other Appliances

EPA proposed to lower the leak rate for comfort cooling appliances and all other refrigeration appliances normally containing 50 pounds or more of refrigerant that do not fit into the commercial refrigeration or IPR categories from 15 percent to 10 percent. Based on the data analysis discussed in this section and comments, EPA is finalizing that rate as proposed.

Some commenters recommended keeping the leak rate at 15 percent because some older systems may not be able to achieve a lower leak rate. These commenters stated that large chillers from the 1990s have a leak rate of 8 to 10 percent due to the seal lubrication design and that as chillers age, the leak rate increases. They asserted EPA should therefore consider the equipment's date of manufacture, the compressor configuration, and whether the equipment is custom built. Another commenter recommended a 5 percent leak rate for comfort cooling and cited multiple data sources. This commenter pointed to sources of data showing a 0.5 percent leak rate for HCFC–123 chillers, as well as a 2009 CARB analysis showing a leak rate of 1 percent and the 2005 IPCC/TEAP Special Report which shows average annual leak rates for best practice in large commercial air-conditioning to be 0.5 percent. Another commenter indicated support for the 10 percent leak rate and noted that the threshold could be lowered further without creating undue burden, but did not provide any technical data concerning average leak rates.

EPA responds that the Agency does consider factors such as the date of manufacture and the compressor configuration for establishing a leak rate applicable to all comfort cooling appliances. Since as far back as 1998, EPA found that comfort cooling appliances leaked less than five percent per year, with many new comfort cooling appliances leaking around two or even one percent per year. The highest leak rates reported from new equipment back in 1998 was high pressure chillers with open-drive compressors with leak rates ranging from four to seven percent. (63 FR 32066). This assessment continues to be valid based on industry feedback on EPA's Vintaging Model. On the other side of the spectrum, the ultralow leak rates (*e.g.,* 1 percent or lower) cited by the other commenter are generally best-practice leak rates or average leaks rates across new or low-pressure chillers and do not necessarily represent the full range of chillers, by type and age, that are subject to these regulations. The HCFC–123 chillers cited by the commenter operate at a lower pressure than the other systems and thus might not be representative of achievable leak rates for HFC and other HCFC equipment which operate under higher pressures.

A few commenters stated that EPA lacks definitive data on typical and economically achievable leak rates for comfort cooling appliances. These commenters asserted that the CARB and GreenChill data presented in the proposed rule are primarily related to commercial refrigeration and IPR, and that SCAQMD's data is not nationally representative because those appliances have been subject to leak regulations since 1991.

EPA responds that the Agency has analyzed average leak rates specifically of comfort cooling appliances as reported to SCAQMD and CARB, and as estimated in the Vintaging Model. As reflected in this analysis, these three sources indicate that most comfort cooling appliances can regularly achieve an annual leak rate of 10 percent. This memo also cites other industry estimates of leak rates in comfort cooling appliances. The majority of these estimates range between 2 and 5 percent with three of the fourteen estimates estimating leak rates above 10 percent.

The data submitted to the SCAQMD from 2,700 comfort cooling appliances indicate that 87 percent of ODS-containing comfort cooling appliances had leak rates below 10 percent. Only 1.5 percent of ODS-containing appliances would trigger the leak repair requirements if the leak rate was lowered from 15 to 10 percent.

EPA agrees that appliances in California or in the SCAQMD may have lower leak rates than appliances nationally, given the refrigerant management regulations that have existed in the state for many years. EPA therefore compared California data with the national assumptions in the Vintaging Model and found that the two correlate closely. The Vintaging Model is updated frequently with data supplied by refrigerant industry stakeholders. Therefore, any difference is not likely to be significant. This comparison is found in the final technical support document in the docket.

Commenters also stated that previous actions are leading the recovery of the ozone layer. These commenters stated that reducing the leak rate as proposed will not contribute to the recovery of the ozone layer and thus EPA cannot justify the burden on owners and operators of such equipment. EPA anticipates that this action will contribute to the recovery of the ozone layer and has calculated a reduction in ODP-weighted emissions of 114 ODP tons. However, section 608 does not require EPA to quantify the impact of this action on the ozone layer. To the contrary, section 608(a) directs EPA to establish regulations that reduce the use and emissions of ODS to the lowest achievable level, without requiring separate evaluation of how each such reduction would affect the recovery of the stratospheric ozone layer. Individual actions such as reducing emissions from comfort cooling appliances fit into the broader approach to ozone layer protection reflected in Title VI of the Clean Air Act. As such, any action that reduces the use and emissions of ODS can help the recovery of the ozone layer.

EPA also received two comments regarding what is included under the term *other appliances.* One commenter recommended that the Agency create a defined term that includes refrigerated air dryers, non-food cold storage, wind tunnels, electrical equipment room cooling, non-occupied digital control rooms, computer server rooms with set point below 68 °F, environmental chambers, growth chambers, turbine inlet air cooling, test cells and chambers, and aquariums. That commenter stated that thousands of regulated entities have identified systems that potentially fall into that category. Another commenter noted that humidity control in paint booths and air compressors could be *other appliances* but are currently treated as IPR. This commenter encouraged EPA to remove the other category and instead treat appliances that do not fall under comfort cooling or commercial refrigeration as IPR.

At this time, EPA is not finalizing a definition of ''other appliance.'' The owners or operators of some of the appliances included in a definition may currently treat such appliances as IPR or commercial refrigeration. While not all ''other appliances'' fall under IPR, for those that do, moving them into an ''other appliances'' category would reduce their leak rate from 35 to 10 percent without prior notice. More

fundamentally, EPA's current view is that it is appropriate for other appliances to be regulated according to their function, such that those that fit within the definition of IPR would be regulated as IPR and those that fit within the definition of commercial refrigeration would be regulated accordingly. That view is reflected in the regulatory text finalized in this rule, which provides that the 10 percent leak rate applies to ''other appliances'' with a full charge of 50 or more pounds of refrigerant that are not covered by subparagraphs addressing IPR or commercial refrigeration equipment.

6. Leak Rate Calculation and Seasonal Variances

The first step in reducing refrigerant leaks is knowing whether the appliance is leaking refrigerant and, if so, to what extent. The prior regulations at § 82.156(i) did not explicitly require technicians or owners and operators to calculate the leak rate each time refrigerant is added to an appliance. Recognizing that knowing the leak rate is necessary for compliance with the leak repair provisions of subpart F, EPA's *Compliance Guidance for Industrial Process Refrigeration Leak Repair Regulations under Section 608 of the Clean Air Act* from October 1995 states that ''*[e]ach* time you add refrigerant to a system normally containing 50 pounds or more of refrigerant, you should promptly calculate the leak rate.'' (emphasis in original). Generally, the only time one can calculate the leak rate is when refrigerant is added to the appliance.

To reinforce this practice, EPA is clarifying in the revisions to the regulatory text finalized in this rule that owners or operators of appliances with 50 or more pounds of refrigerant must calculate the leak rate every time refrigerant is added to those appliances. EPA is also clarifying that the leak rate would not need to be calculated when refrigerant is added immediately following a retrofit or the installation of a new appliance or for a seasonal variance.

Two commenters suggested that the leak rate calculation should not be required on non-leaking appliances where all identified leaks are repaired within 30 days of discovery. While EPA commends appliance owners and operators who regularly repair all identified leaks within 30 days, calculating the leak rate each time refrigerant is added is still necessary. Comments indicate that in some instances, appliance owners and operators are unable to find significant leaks that may be driving the high leak rate. Given this feedback, EPA concludes that calculating the leak rate is needed to alert the appliance owner or operator to the fact that, in the case of a continually high leak rate, the typical repair and inspection attempts are not sufficiently addressing the problem with the appliance. Moreover, because the revisions to the leak repair rules as finalized in this action require owners or operators to repair leaks to lower the leak rate below the applicable threshold, calculating the leak rate on an ongoing basis provides important information to help evaluate whether this requirement has been satisfied. Not calculating the leak rate each time refrigerant is added could also lead to confusion for technicians that service more than one customer if each has different equipment subject to different regulatory compliance requirements.

EPA is also clarifying in this final rule how to handle seasonal variances. In regions of the country that experience large temperature swings during the year, refrigerant in some appliances can migrate from the condenser to the receiver. This migration results in a need to add refrigerant to an appliance to ''flood the condenser'' in the season of lower temperature ambient conditions (fall or winter). In this case, the added refrigerant would have to be removed when the weather returns to design ambient conditions to prevent high head pressures. This technique is often referred to as a winter-summer charge procedure or a seasonal adjustment. Seasonal adjustments are not necessary for appliances with properly sized system receivers because they can hold the appliances' full charge, including the additional charge needed to flood the condenser.

Under this final rule, owners or operators can exclude from the leak rate calculation the amount added that is less than or equal to the amount removed during the prior season. In a properly charged, non-leaking system, adding refrigerant during months with lower ambient conditions (fall or winter) would require an equivalent amount of refrigerant to be removed in the months with higher ambient conditions (spring or summer). If more refrigerant is added in the fall/winter than was removed in the prior spring/summer, the difference between the two would be considered a leak and not a seasonal variance. Without requiring that the amount added be equal to or less than the amount removed to qualify for the exemption, there is no way to distinguish legitimate seasonal variances from refrigerant leaks. For example, an appliance owner removes 150 pounds of refrigerant during the spring. Later that year, he adds 180 pounds to that same system to address a seasonal variance. The owner would be able to consider 150 of the 180 pounds as a seasonal variance and the remaining 30 pounds as a leak.

EPA expects only one removal and one addition of refrigerant to account for seasonal variance. If the amount added is equal to or less than the amount removed in the previous season, but an additional amount is added in close proximity (typically within a few days to a few weeks) to the addition being counted as a seasonal variance, and the two additions together are less than or equal to the amount removed in the previous season, the second addition would be considered part of the same refrigerant addition unless the owner or operator could document a leak.

As discussed previously in this notice, EPA is defining a seasonal variance as the removal of refrigerant from an appliance due to a change in ambient conditions caused by a change in season, followed by the subsequent addition of an amount that is less than or equal to the amount of refrigerant removed in the prior change in season, where both the removal and addition of refrigerant occurs within one consecutive 12-month period.

EPA is finalizing in the revised regulations at § 82.157(b) that the leak rate does not need to be calculated when adding refrigerant that qualifies as a seasonal variance. Both the addition and prior removal of refrigerant due to seasonal variances must be documented. Such additions and removals would already be accounted for in service records provided by the technician to the owner/operator. The recordkeeping requirements for this flexibility in calculating the leak rate are located in § 82.157(l)(2), and those for maintaining records associated with the seasonal variance if it is excluded from the leak rate calculation are at § 82.157(l)(10).

Commenters were generally supportive of this new flexibility, but had some concerns, many of which are discussed in the definitions section of this notice. Several commenters requested clarification on whether the owner or operator would be responsible for this requirement. Owners or operators must keep records of refrigerant added and removed from an appliance. If they wish to claim a seasonal variance, they must note in their records the amount of refrigerant that was removed at the end of the last season for a seasonal variance. This is likely to be one of the only reasons to remove refrigerant without immediately adding additional refrigerant or without

mothballing, retiring or retrofitting an appliance.

7. Appliance Repair

The prior regulations at § 82.156(i) generally require owners or operators to repair leaks within 30 days of the leak rate being exceeded (*i.e.,* the date of the refrigerant addition) to bring the leak rate to below the applicable leak rate. In the proposed rule, EPA discussed that owners or operators may not know that they have performed sufficient repairs to bring the system below the leak rate, or they may have completed the repairs but may find themselves out of compliance if a separate leak occurs. To reduce emissions of refrigerants to the lowest achievable level, and remove ambiguity concerning compliance, EPA proposed to require a leak inspection of the appliance and then repair all identified leaks. Recognizing that a small amount of refrigerant can be released from an appliance even if the refrigerant circuit is unbroken, EPA sought comments on not requiring the repair of certain minor leaks. Specifically, EPA asked whether it should exempt situations where sound professional judgment indicates an individual identified leak is not the result of a faulty component or connection and that refrigerant releases would not be reduced from repair or adjustment.

Many commenters requested that EPA differentiate between major fixable leaks and minor unfixable leaks. They stated that it is impossible to repair ''all leaks'' as many systems have minuscule leaks that are not fixable. A couple of commenters suggested that EPA not require the repair of leaks that meet the ASHRAE 147 standard, which are those that are less than 0.1oz/year/joint. Another commenter recommends a threshold of 10,000 ppm if using leak detection equipment, or detection visible to the naked eye if using qualitative tests like a soap bubble test. Other commenters supported EPA's proposed exception that allows a technician to use best professional judgment to decide that a leak is not caused by a faulty component or connection and that the leak would not be reduced from repair or adjustment.

Some commenters were concerned about the diminishing returns of repairing all identified leaks. In some cases, small leaks may actually require extensive repair activities and even component replacement. Repairing all identified leaks will extend repair times, which for IPR systems may increase the costs of the repair or, in the case of nuclear generating facilities, increase the risk of conducting those repairs. For those reasons, these commenters said owners and operators should be provided flexibility to select which leaks to repair or make a good-faith effort to repair leaks.

In this final rule, after consideration of the comments, EPA is not finalizing the proposed change to require repair of all identified leaks. In the proposal, EPA acknowledged that a small amount of refrigerant can migrate from an appliance even if the refrigerant circuit is unbroken, and requested comment on whether there should be a limited exception from the requirement. Instead, the regulations finalized today contain the same requirement as in the original rule by requiring that leaks be repaired such that the leak rate will be below the applicable leak rate. Accordingly, EPA is not at this time setting a final standard for what is, or is not, an actionable leak beyond the applicable leak rate. In not finalizing this proposed change, EPA considers that an owner or operator may have good reason to choose not to repair a small leak. EPA also considers the original intent of the leak repair provisions, as explained in the 1993 Rule. At that time the Agency considered requiring the repair of all leaks ''which has the benefit of simplicity and clarity'' but explained that without ''any type of lower bound, however, this standard could result in huge amounts of money being spent to repair even pinhole leaks in equipment that may soon be obsolete . . . The intent of the leak repair requirement in this rule is to assure that substantial leaks are repaired.'' (58 FR 28680). Not finalizing this proposed requirement reduces the number of leaks that are to be repaired and accordingly will reduce the burden of the final rule compared with the proposed rule for two reasons. First, the repair effort itself may take less time. Second, fewer verification tests on the repairs, and recordkeeping associated with such tests, will be needed.

The final regulations include other provisions to help ensure that leaks are repaired consistent with the Rule's provisions, and to address compliance and enforceability of the leak repair provisions. For example, the final regulations provide for initial and follow-up verification tests, as discussed below. They also specify that the leak rate must be confirmed upon the next refrigerant addition. EPA recognizes that this will result in some uncertainty because the owner or operator will not know whether the repair is successful until the leak rate is measured at a future date. There are two instances in which EPA will consider a repair to be successful beyond calculating the leak rate upon the next refrigerant addition. The first instance is if a subsequent leak inspection does not find any leaks at all.[24] EPA therefore strongly encourages the owner or operator to repair all identified leaks, and this provision provides an incentive to repair all identified leaks, although EPA is not finalizing this proposed requirement. The second instance is if there has not been a refrigerant addition in 12 months after the date of repair. If there is not a need for another refrigerant addition for at least a year after the date of repair (and thus the leak rate cannot be calculated for at least a year) EPA will consider the repairs to have been successful.

If upon the next refrigerant addition the appliance is still exceeding the threshold leak rate, EPA's presumption is that the repair failed. The burden is on the owner or operator of the appliance to show that leaks were repaired to bring the leak rate below the applicable threshold and that those repairs held.

One commenter stated that the greatest value of a leak inspection is on a system with a known leak. A comprehensive leak inspection on an appliance that has exceeded the applicable leak rate will ensure that the technician does not stop an inspection when the first leak is found. Another commenter encouraged EPA to be specific that the leak inspection be conducted on the whole system not just where the original leak was found. Another commenter stated that if a particular circuit in a rack house is found to be leaking and is subsequently repaired and passes the verification test, it would be nonsensical to require the inspection of other circuits on that particular appliance.

EPA agrees with these three commenters. The leak inspection must encompass all visible and accessible components of an appliance, with certain exceptions specified in the revised rule. The leak inspection is not complete simply because a single suspected leak is identified. Only through an inspection of the whole of the appliance can an owner or operator know that the repairs that are to be made will be sufficient to bring the appliance below the applicable leak rate. However, a leak inspection need

[24] As discussed previously in this notice, EPA is finalizing the proposed requirement that the owner or operator conduct a leak inspection of the appliance before considering the repair to be complete. Conducting a comprehensive leak inspection is the only way to ensure that the owner or operator can identify the repairs necessary to bring the leak rate below the applicable level.

not be performed on other appliances at that site. As discussed previously in this notice, EPA is clarifying the definition of appliance such that each separate circuit is a separate appliance. While there could be a benefit to proactively searching for leaks on all other circuits, there is no obligation to inspect the other circuits if only one circuit is leaking and it has been repaired and the repair verified.

8. Verification Tests

The prior regulations at § 82.156(i)(3) required verification tests for repairs to IPR and federally owned commercial and comfort cooling appliances containing an ODS refrigerant. Verification tests are performed on appliances, or portions thereof, shortly after they are repaired to confirm that leaks have been fixed. Without verification tests, it may take additional time for the owner and operator to realize that a repair has been unsuccessful and during that time refrigerant could continue to leak from the appliance. EPA is extending this requirement to all required repairs because ensuring that the repairs are done correctly the first time is vital to reducing refrigerant emissions, regardless of whether the appliance is used for IPR, commercial refrigeration, comfort cooling, or is in the category of ''other appliances.''

EPA is finalizing the requirement at § 82.157(e) that owners or operators of all types of appliances that are subject to the leak repair requirements (including those using an ODS or non-exempt substitute refrigerant) perform both an initial and follow-up verification of repairs every time the applicable leak rate is exceeded (unless a retrofit or retirement plan is being developed). Most commenters on this issue supported the requirement for a follow-up verification test. Commenters agreed that the combination of an initial and a follow-up verification test provides effective confirmation of successful repair. One commenter stated that requiring the verification of all repairs would be excessively burdensome. The commenter discusses this burden in the context of the proposal to repair ''all identified leaks.'' The commenter continues that if amendments to the rule for inspections and repairs are adopted in any form, EPA should adopt verification provisions that are limited to significant leaks or adopt an 80/20 rule to assure that the majority of leak repairs are verified by a certified technician or qualified plant personnel.

EPA disagrees with the comment about limiting verification provisions to significant leaks or adopting an 80/20 rule. Because EPA is not requiring the repair of all identified leaks in the final rule, the number of verification tests should be reduced. However, as explained above, it is important that all repairs be verified both for purposes of compliance and enforceability and for purposes of avoiding emissions from leaking appliances. Since owners or operators have flexibility to determine which leaks to repair as long as they can meet the obligation to bring the leak rate below the applicable threshold, they may generally consider what are significant leaks in their repair effort. The verification tests would only apply to the leaks that were repaired.

One commenter stated that a follow-up verification test is unnecessary if there are periodic leak inspections and thus they should be eliminated. EPA disagrees with this comment because a follow-up verification test and a leak inspection serve two separate purposes. The verification test is conducted shortly after the repairs to confirm the success of those repairs. The leak inspections are to identify over the next year or longer whether new leaks have developed or whether minor leaks have become more significant and to determine the location of such leaks.

EPA requested comments on whether to require a minimum time between initial and follow up verification tests, such as one to three hours, to allow an appliance to return to normal operating characteristics and conditions. Many commenters recommended that EPA not establish a minimum time. Commenters suggested that the follow-up verification test be allowed as soon as the appliance returns to normal operating characteristics and conditions. Requiring a waiting period would increase costs by requiring an additional service call. Furthermore, high pressure systems will reveal whether a leak was properly repaired almost immediately.

EPA has considered the burden of conducting verification tests on all appliances. The Agency understands that most technicians pressure check appliances immediately following repairs. Such pressure checks would satisfy the initial verification requirements. EPA is concerned that follow-up verifications may not be a part of normal operating procedures for all repairs. This final rule would allow both initial and follow-up verification tests to be conducted during the same service appointment. Accordingly, EPA does not expect the requirement for verification tests to result in a longer servicing event and thus we do not expect this requirement to result in incremental labor costs. However, the final rule provides, and EPA reiterates, that the technician must wait until the appliance returns to normal operating characteristics and conditions, which includes operating temperatures, pressures, fluid flows, speeds, and other characteristics, including full charge of the appliance, that would be expected for a given process load and ambient condition during normal operation.

Some commenters requested that EPA add a reporting requirement for technicians to provide owners or operators with the results of the verification tests. These commenters expressed that it is difficult to get all of the documentation that they are required to maintain from the technicians who generate those records. EPA agrees with the need to harmonize the recordkeeping provisions between technicians and owners and operators and understands that in order for owners and operators to maintain the required records of the verification tests, they would need to obtain relevant information from the person conducting those tests. For these reasons, EPA is adding a requirement for technicians to provide documentation at the conclusion of each service visit to § 82.157(l)(5).

Two commenters suggested that EPA provide an exception for situations where a follow-up verification test is impossible, for example, when it would be unsafe to be present when the system is at normal operating characteristics and conditions. One of the commenters recommended that EPA allow a standing deep vacuum test in lieu of a follow-up verification test. EPA responds that the Agency attempted to address similar concerns from commenters in 1995. Examples included leaks inside a heat exchanger, compressor internals, locations that must be insulated prior to start-up, and locations in close proximity to dangerous hot equipment or moving parts where access is not possible after reassembly (See 60 FR 40429). At that time, the Agency amended the regulation at § 82.156(i)(3) to state that ''[i]n all cases, the follow-up verification test shall be conducted at normal operating characteristics and conditions, unless sound professional judgment indicates that tests performed at normal operating characteristics and conditions will produce less reliable results, in which case the follow-up verification test shall be conducted at or near the normal operating pressure where practicable, and at or near the normal operating temperature where practicable.'' EPA had proposed to remove that provision to make the regulation clearer and less ambiguous.

Instead, EPA is modifying that provision in the revised regulations at § 82.157(e)(2) to more clearly address the concern about safety raised by the commenters as well as the original intent of that provision.

EPA is also finalizing the proposed change to clarify that owners or operators may conduct as many repair attempts as needed within the initial 30 days (or longer if an extension is available) to repair the appliance. Consequently, the Agency is explicitly allowing unlimited verification tests within the required repair window. Commenters were supportive of this clarification.

9. Extensions to the 30-Day (or 120-Day) Repair Requirement

The prior regulations contained extensions to the repair or retrofit/retirement deadlines under four conditions:

- The appliance was mothballed (available for all appliances) (§ 82.156(i)(10));
- The appliance was located in an area subject to radiological contamination or where shutting down the appliance would directly lead to radiological contamination (available for federally owned appliances) (§ 82.156(i)(1)(ii) and (i)(5)(ii));
- Applicable federal, state, or local regulations made a repair within 30 or 120 days impossible (available for IPR) (§ 82.156(i)(2)(i)); or
- Parts were unavailable (available for IPR) (§ 82.156(i)(2)(i)).

While not an extension, IPR facilities were also allowed an initial repair period of 120 days rather than 30 days if an industrial process shutdown is required to complete the repair. In addition, an exemption to the repair requirement was allowed for all types of appliances if a dated retrofit or retirement plan is developed within 30 days and is then implemented within one year of the date developed.

EPA proposed to provide these extensions to all appliance categories, not just IPR and federally owned equipment. EPA is finalizing these proposed extensions, with some changes from the proposal. Based on comments received, EPA is finalizing a modified version for the extension for when necessary parts are unavailable. More specifically, EPA is clarifying that the extension is allowed when components that must be replaced as part of the repair are not available within the initial 30 day (or 120 day) repair time frame. Also based on comments, EPA is modifying the proposed changes to allow these extensions upon notification to EPA, unless EPA notifies the source otherwise, rather than requiring owners or operators to request an extension and wait for EPA approval. Taken together, these changes significantly reduce the burden of the leak repair regulations on owners of comfort cooling and commercial refrigeration appliances and to a lesser extent IPR.

Based on comments received, EPA is modifying the extension for when necessary parts are unavailable. Many commenters supported EPA's proposal to allow additional time to acquire and install a replacement for a leaking component. While EPA views installing a component as a type of repair, the comments indicate that some owners or operators consider the replacement of a component as different than the repair of an appliance. Replacing a component is more costly, requires more time to order, and requires more system downtime to install. Owners or operators may attempt to repair a leak but upon a failed follow-up verification test may ultimately decide that the whole component where the leak is located needs to be replaced. By the time a decision is made to replace the whole component, there is little time remaining within the initial 30 day repair window to procure and install that component.

Based on these comments, EPA is modifying the extension for when necessary parts are unavailable by clarifying that the extension is allowed when components that must be replaced as part of the required repair are not available within the initial 30 day time frame (or 120 days if an industrial process shutdown is required). This extension encourages the proper repair of an appliance, which in EPA's view, includes the replacement of major components if necessary, rather than simply patching those components, an approach which may not be successful in the longer term. Furthermore, some owners or operators would prefer to replace a faulty component before they are required to retrofit or retire an entire appliance and believe this could, in many instances, be an equally effective means to address needed repairs. This extension should also reduce the potentially large burden upon owners or operators of requiring a large-scale retrofit or retirement when replacing the leaking component might satisfactorily repair the appliance.

The extensions for repair in the prior regulations are open-ended. While those regulations provided only the additional time needed to receive delivery of the necessary parts, it did not set an outer limit for delivery nor did it clearly provide time to install the components once they are received. EPA is finalizing its proposal to set a limit on the extension for the installation of a necessary component. The owner or operator must complete the repair within 30 days after receiving delivery of the component and the total extension may not exceed 180 days (or 270 days if an IPR shutdown is required).

To qualify for any of the extensions in this section, owners or operators must perform all repairs that can be completed within the initial 30 or 120 day period. Initial verification tests must be performed on all completed repairs. A final verification test may not be appropriate for the completed repairs depending on the nature of the remaining repairs and state of the appliance. The owner or operator must also document all such repair efforts and the reason for the inability to make the repair. This would include a written statement from the appliance or component manufacturer or distributor stating the unavailability of the necessary component and the expected delivery date.

Some commenters stated that any changes to nuclear generating stations must undergo extensive engineering and risk review processes, which recommends against the requirement to retrofit if they cannot repair the system. The commenter noted that extended downtime of safety systems in such facilities will increase risk to workers and may conflict with federal regulations. EPA responds that the Agency is providing extensions for any appliance type subject to radiological contamination. Previously, this extension was available only for federally owned appliances. EPA is also not changing the open-ended nature of the extensions due to radiological contamination or compliance with applicable federal, state, or local regulations. Together, this should allow repairs in accordance with the commenter's schedule.

In some instances, encouraging repair may be a preferable environmental outcome to requiring the retrofit or retirement of a leaking system. Appliances that are to be retired are not required to be repaired. Thus, an appliance may continue to leak for up to a year (in addition to extension opportunities). Under this final rule, leaks must be repaired to bring the leak rate below the applicable threshold within 30 days and any component replacement must occur within 6 months. The extension could accelerate the time by which the appliance will stop releasing refrigerants by making leak repair seem more attractive or

feasible for some owners or operators compared with retrofit or retirement of a leaking system.

Based on the comments received, EPA is allowing these extensions to be automatic, so long as EPA is notified. Previously, owners or operators would have to request these extensions from EPA and wait for them to be approved. One commenter requested that EPA automatically grant the extension where there are limiting federal, state, or local laws so long as the owner or operator maintains the proper documentation that demonstrates they satisfy the condition. Another commenter requested that EPA harmonize the timing of the request with the 30 day time frame to repair. Previously, a request had to be made within 30 days of exceeding the leak rate but EPA had an additional 30 days to approve or deny the request. There was no clear tolling of the 30 day repair clock which meant a system could be denied an extension after the repair deadline expired. EPA is resolving these conflicting schedules by considering repair requests approved unless EPA notifies the owner or operator that it is not approved.

Owners or operators must provide the same information to EPA as was contained in a request for an extension under the prior regulations. The request must include: Identification and address of the facility; the name of the owner or operator of the appliance; the leak rate; the method used to determine the leak rate and full charge; the date a leak rate above the applicable leak rate was discovered; the location of leak(s) to the extent determined to date; any repair work performed thus far, including the date that work was completed; the reasons why more than 30 days are needed to complete the repair; and an estimate of when the work will be completed.

If an extension to the earlier submitted completion date is necessary, the owner or operator must still submit a request to EPA with a new estimated date of completion and documentation of the reason for that change. The request must be within 30 days of identifying that further time is needed. The owner or operator must keep a dated copy of this submission and proof that it was submitted.

10. Retrofit or Retirement Plans

The previous regulations at § 82.156(i)(6) required an owner or operator of an appliance that exceeds the applicable leak rate to develop a retrofit or retirement plan generally within 30 days if they were unable to repair the leak or simply choose not to repair the leak and instead retire the appliance. EPA proposed four revisions to the retrofit/retirement provision. First, EPA proposed to remove the requirement to retrofit or retire an appliance after a failed follow-up verification test. Second, EPA proposed to remove the requirement to use a substitute with a lower or equivalent ODP. Third, EPA proposed to establish explicit elements of a retrofit/retirement plan. Fourth, EPA proposed to require that all identified leaks be repaired as part of implementing any retrofit plan. EPA is finalizing these four proposals, with some modifications based on comments.

Failed Verification Tests. The prior regulations required owners or operators of IPR using an ODS refrigerant that have failed a follow-up verification test to develop a retrofit or retirement plan within 30 days of the failed verification test and implement the plan within one year. Owners or operators of comfort cooling and commercial refrigeration appliances were not required to perform verification tests on their repairs and therefore were not subject to this trigger to develop a retrofit or retirement plan. As discussed in Section IV.F.8 of this notice, EPA is extending the requirement to conduct verification tests on repairs made to commercial refrigeration and comfort cooling appliances, increasing the potential universe of appliances affected.

Both prior to initiating this rulemaking and through comments received on the proposed rule, appliance owners/operators have expressed their concern to EPA that the requirement to retrofit or retire an entire appliance because it has failed a verification test is not always practical or necessary. In their view, a failed verification test should indicate to a technician that further repair work needs to be performed to properly fix the leak, not a regulatory requirement to begin retrofitting or retiring the appliance. As EPA discusses in the section on follow-up verification tests, in the revisions finalized in this rule EPA is allowing as many repairs and follow-up verification tests as are necessary to fix the appliance within the required time frame. Accordingly, consistent with these comments, the revised regulations no longer require an owner or operator to retrofit or retire an entire appliance simply because it has failed a verification test.

EPA proposed that failing to comply with ''paragraphs (e) and (f) of this section,'' which included the proposed requirement to repair all identified leaks and verify all repairs, would trigger a requirement to develop a retrofit or retirement plan within 30 days, rather than a failed verification test. As discussed above, EPA is not finalizing the proposal to repair all identified leaks; therefore, EPA is modifying the trigger to develop a retrofit or retirement plan accordingly. In this final rule, a plan must be developed within 30 days of discovering that an appliance continues to leak above the applicable leak rate after having conducted the necessary repairs and verification tests. This provision as finalized is also narrower and clearer than a ''failure to comply with paragraphs (e) and (f) of this section,'' which EPA proposed, because the proposed language could have been interpreted to also include failure to maintain records rather than failure to repair the appliance. EPA has added a provision to clarify that owners or operators are still required to develop a retrofit or retirement plan even if they do not affirmatively choose to retrofit, retire, or repair their leaking appliance.

Retrofit/Retirement ODP. EPA's prior regulations required that appliances containing an ODS refrigerant, when being retrofitted or retired/replaced, use a refrigerant with an equivalent or lower ODP. EPA created this provision to foster the transition from refrigerants with high ODPs to ones with a lower or zero ODP.

EPA proposed to remove this requirement and allow for retrofits or retired/replaced appliances to use any refrigerant (other than the one currently used in that appliance in the case of retrofits), so long as it is acceptable for use under SNAP. This proposed revision would not relax the prior requirements with respect to HCFCs since the regulations implementing sections 605 and 606 of the CAA already prohibit the use of virgin HCFCs in appliance manufacture (as of January 1, 2010, for HCFC–142b and HCFC–22; and as of January 1, 2020, for other HCFCs) and thus installation and retrofit of such appliances would not occur. As explained in the proposal, requiring the use of a refrigerant with a lower or equivalent ODP could be problematic if the requirement were read strictly because some non-exempt substitutes like HFOs that are not classified as an ODS have a negligible, but non-zero, ODP. For example, *trans*-1-chloro-3,3,3-trifluoroprop-1-ene (also known as 1233zd(E)) has an ODP between 0.00024 to 0.00034 and a GWP between 4.7 to 7 (see 77 FR 47768). Under a strict interpretation, an owner/operator would not be able to replace an R–134a chiller with a 1233zd(E) chiller in the future because R–134a has an ODP of zero and the olefinic refrigerant has an ODP greater than zero. This

could prevent transition to low-GWP alternatives.

Some commenters suggested that EPA should require a retrofit to an acceptable substitute under SNAP, with one commenter suggesting that it be a lower GWP alternative than the refrigerant currently being used. Another commenter suggested that if the SNAP-approved refrigerant with the lowest available GWP is being used, EPA should allow for documented repairs and quarterly leak inspection in place of forced system retirement.

Other commenters questioned the value of retrofitting a system that already uses substitute refrigerants and suggest that retrofit plans should not be required for non-ODS equipment. One commenter viewed the existing rules as providing an opt-out incentive to owners that voluntarily retrofit to a non-ODS. The commenter requested that EPA retain this feature so that owners that switch from a high-GWP refrigerant to a low-GWP refrigerant similarly benefit. Similarly, a commenter questioned how retrofitting helps the owner/operator if the rules for HFCs are the same as for ODS.

EPA responds that the Agency is finalizing provisions that encourage the repair of leaking systems instead of requiring the retrofitting or retirement of those systems. Most significantly, EPA is finalizing the proposal to allow all comfort cooling, commercial refrigeration, and IPR appliances the opportunity to extend the deadline to repair leaking appliances beyond 30 days (or 120 days if an industrial process shutdown is required). It is not the Agency's intention to use the retrofit or retirement requirements in the subpart F regulations to dictate specific refrigerant choices. The revisions to these regulations are intended to provide as much flexibility to the owner or operator to decide what is appropriate for their system.

Elements of a Retrofit or Retirement Plan. EPA has not previously specified what elements should be included in a retrofit or retirement plan. Due to the complex nature of refrigeration appliances, an exhaustive list may not fit all types of appliances considering the wide array of configurations and refrigerant choices. Based on requests from stakeholders, EPA proposed a minimum set of information that is likely to be needed during any type of retrofit or retirement to be included in a plan, including:

- Identification and location of the appliance;
- Type (*i.e.,* ASHRAE number) and full charge of the refrigerant currently used in the appliance;
- Type (*i.e.,* ASHRAE number) and full charge of the refrigerant to which the appliance will be converted, if retrofitted;
- Itemized procedure for converting the appliance to the new refrigerant, including changes required for compatibility (for example, procedure for flushing old refrigerant and lubricant; and changes in lubricants, filters, gaskets, o-rings, and valves), if retrofitted;
- Plan for the disposition of recovered refrigerant;
- Plan for the disposition of the appliance, if retired; and
- Schedule for completion within one year of the appliance retrofit or retirement.

Some commenters stated that this is excessively detailed and includes information that is unlikely to be known immediately upon deciding to retrofit or retire an appliance. One commenter noted that it will take time to perform the necessary engineering evaluations and investigate the costs and timing associated with the available options. The commenter provided revised regulatory text to remove reference to the type of refrigerant and full charge for the retrofitted system, the procedure for converting the appliance to a new refrigerant, and the schedule for conducting the retrofit or retirement.

EPA responds that the shortest time frame in which a retrofit or retirement plan would have to be developed is when, upon discovering a leak, the owner or operator immediately chooses to retrofit or retire the appliance upon discovering that leak. In that circumstance the plan would be developed within 30 days. In all other circumstances, the owner will have 30 days from when repair attempts have failed, including repairs attempted under various extensions, to develop the plan.

While some information may not be available in that time frame, the owner or operator can develop an initial plan within 30 days and then modify it as additional information is determined. For example, owners or operators may not know within the allotted time frame what the itemized procedure will be until they finalize plans for the retrofit or retirement. The plan could indicate what steps must be taken in order to have enough information to make the necessary determinations. The information required in the plan is not excessively detailed because the owner or operator will need to know this information in order to properly dispose of the old appliance and install the replacement.

One commenter also stated that the plan does not need to be kept onsite with the appliance, so long as it can be made available to EPA and that it is also unnecessary for a plan to be signed because staff, including the person who initially signed the plan, could change. The commenter believes it is sufficient for EPA to be told who is responsible for the plan when it is provided to the Agency. EPA responds that it is appropriate for the plan to be accessible at the site of the appliance. The previous rules required that the original plan or a legible copy be kept at the site of the appliance. This could imply maintaining a printed version of the plan with the appliance. EPA is finalizing the proposal to allow for the plan to be ''accessible'' at the site of the appliance, which includes an option to have the plan be ''accessible'' in electronic format. This provides sufficient flexibility for the plan's storage while still allowing for the plan to be quickly available upon request. It is also important that the plan be signed so that the authorized representative has taken responsibility for the plan and so that EPA can identify who that person is and the date the plan was created.

Requirement to Repair Appliances Undergoing Retrofit. Under the prior regulations at § 82.156(i)(6), owners or operators were not required to repair leaks if they developed a retrofit or retirement plan. EPA proposed to require that all identified leaks be repaired as part of any retrofit under such a plan. EPA is finalizing the requirement that a system being retrofitted must be simultaneously repaired as part of the retrofit. EPA is also finalizing the proposed requirement that the owner or operator repair ''all identified leaks'' as part of the retrofit, rather than allowing selective repairs that would bring the appliance below the applicable leak rate. Although this differs from the requirements for leak repair discussed in Section IV.F.7, a retrofit is a more extensive change to a system, during which time components may be replaced and more comprehensive leak repair can be performed.

11. Extensions To Retrofit or Retire Appliances

Under the prior regulations at § 82.156(i)(6), an owner or operator generally was required to complete the retrofit or retirement of a leaking appliance containing an ODS within one year of creating a retrofit or retirement plan. Extensions were available in the following circumstances:

- If delays were caused by requirements of other applicable federal, state, or local laws or regulations (available for IPR);
- If a suitable replacement refrigerant with a lower ODP was unavailable (available for IPR);
- If the supplier of the appliance or a critical component quoted a delivery time of more than 30 weeks from when the order was placed (available for IPR);
- If complications presented by the appropriations and/or procurement process resulted in a delivery time of more than 30 weeks (available for federally owned appliances); or
- If the appliance was located in an area subject to radiological contamination and creating a safe working environment will require more than 30 weeks (available for federally owned appliances).

EPA proposed at § 82.157(i) four substantive revisions to these extensions. First, as with all other leak repair provisions, EPA proposed to apply these extensions to appliances containing non-exempt substitute refrigerants. EPA is finalizing this revision, as proposed.

Second, EPA proposed to remove the extension for when a suitable replacement refrigerant with a lower ODP is not available. EPA established this extension when certain applications using CFCs did not have a suitable HCFC substitute. Today, there are many more substitutes for ODS refrigerants. In fact, few appliances can be newly installed or retrofitted with virgin ODS because of the HCFC use restrictions implementing section 605 of the CAA. As discussed previously in this notice, EPA is removing the requirement that a retrofit use a refrigerant with a similar or lower ODP. Therefore, the rationale for this extension no longer exists and EPA is removing it as proposed. EPA is accordingly also removing the term *suitable replacement refrigerant* from the definitions in § 82.154, as proposed.

Third, EPA proposed a new extension at § 82.157(i)(1) if the appliance is to be retrofitted to or replaced with a refrigerant that is exempt from the venting prohibition as listed in § 82.154(a). In that situation, EPA proposed to allow an extension up to 18 months. Whereas the prior extensions were only available to IPR and federally owned appliances, EPA proposed to make this extension available to comfort cooling and commercial refrigeration appliances as well.

Some commenters were supportive of this proposal as a way to encourage transition to zero-ODP and low-GWP refrigerants. Other commenters were opposed to the proposal because it encourages the use of refrigerants that are more toxic, hazardous, or flammable than HFCs.

EPA responds that the first comment is correct that the refrigerants that are exempt from the venting prohibition, such as carbon dioxide (R–744), and the hydrocarbon refrigerants ethane (R–170), propane (R–290), isobutane (R–600a), and R–441A in certain uses, have an ODP of zero and low GWPs ranging from one to eight. EPA further notes that subject to 40 CFR subpart G, many of the refrigerants exempt from the venting prohibition are not acceptable when retrofitting certain types of equipment; hence, in most cases these exempt refrigerants would be used in new equipment replacing the leaking system. One reason to provide more time for retrofitting or replacements for exempt substitutes is to allow time to purchase and install new equipment. With respect to the points made by the second comment, the refrigerant must be approved under SNAP for the end-use in order to be used. A company choosing to move to one of these alternatives would reasonably be expected to consider safety characteristics of the refrigerant. Moreover, for refrigerants that are exempt from the venting prohibition, the Agency has already determined that the release of these substances do not pose a threat to the environment as part of the decision to exempt them from the venting prohibition. Accordingly, EPA is finalizing this extension as proposed.

Fourth, the prior regulations at § 82.156(i)(3)(v) relieved owners and operators of IPR appliances of the requirement to retrofit or retire their appliances if they established that the appliance's leak rate is below the applicable rate within 180 days of an initial failed follow-up verification test and they notified EPA within 30 days of that determination. EPA proposed to remove this provision because it was infrequently used and because other extensions, in particular the extension to receive a replacement component, should provide sufficient flexibility for IPR and other appliances.

Multiple commenters recommended that EPA retain this exemption because there may be situations where the root cause of a leak is not identified until after a retrofit/retirement plan is developed. The commenters stated that an appliance need not be retrofitted or retired if it can be demonstrated that it is repaired.

Based on these comments, EPA is not finalizing its proposal to remove that provision. Just because it is not frequently used does not mean that it may not be used in the future, especially since EPA is expanding the universe of appliances subject to the retrofit/retirement plan requirements to include those that use non-exempt substitute refrigerants. EPA agrees that an appliance need not be retrofitted or retired if it can be demonstrated that the repairs bring the leak rate of the appliance below the threshold leak rates. In the instance of a retrofit, because EPA is requiring that all identified leaks be repaired, it is possible that the appliance could be repaired to such an extent as to not need to complete the retrofit.

EPA is concerned, however, about whether this provision could provide a mechanism to delay repairs. To discourage this, EPA is requiring that all identified leaks be repaired consistent with the retrofit requirements, rather than merely fixing leaks sufficient to bring the appliance below the applicable leak rate, which is what EPA is finalizing for repairs required under § 82.157(d). EPA is also revising the reporting elements that were found in the prior regulations related to this provision. Rather than allowing the owner or operator to merely provide notice to EPA, the Agency is requiring that the owner or operator request that EPA relieve them of the obligation to retrofit or retire the appliance. Like other requests in the leak repair provisions, the request will be considered approved unless EPA notifies the owners or operators otherwise within 60 days of receipt. The request must also provide other information about the equipment and the repair, such as an explanation of why the repair was not conducted within the time frames required under § 82.157(d) and (f). This approach provides flexibility for owners and operators while avoiding it becoming simply an extension of the duty to repair because of the increased level of repair and the information requirements associated with its use. EPA anticipates this will be most useful in situations where the root cause of the leak is not identified until after a retrofit/retirement plan is developed.

Finally, EPA proposed to revise the extension for IPR to implement a retrofit plan where a supplier of the appliance or a critical component has quoted a delivery time of more than 30 weeks from when the order is placed. EPA proposed to modify this to mirror the extension allowed for the repair of an appliance in this situation, such that the appliance or appliance components would have to be installed on the retrofitted appliance within 120 days after receiving delivery of the necessary parts. Previously, this extension allowed

for one additional year beyond the one-year retrofit period. EPA inadvertently removed a provision, found previously at § 82.156(i)(7)(iii), that further extended this extension for the delivery and installation of critical components without discussion in the notice of proposed rulemaking. EPA is restoring that provision at § 82.157(i)(2)(iii). EPA notes that the Agency correctly proposed a similar extension for federally owned appliances in § 82.157(i)(3)(iii).

12. Chronically Leaking Appliances

EPA proposed to add a total leak limit to the repair requirement to address chronically leaking systems. Under that proposal, an appliance containing 50 or more pounds of refrigerant may not leak more than 75 percent of its full charge in two consecutive twelve-month periods and remain in use. If an appliance exceeded the two year leak limit, the owner or operator would be out of compliance until the appliance was retired or mothballed and later retired.

For the proposed rule, EPA reviewed data reported to CARB to determine whether such a total leak limit would be necessary and, if so, what the limit should be. In 2013, approximately 8 percent of reporting appliances had leaked more than 75 percent of their full charge over the calendar year and were responsible for 38 percent of total reported emissions. Due to the high chronic leaks of such appliances, the environmental benefit of establishing a cumulative leak limit could be large. Nonetheless, the number of appliances affected by this proposed limit should be low.

Environmental NGOs and state pollution control agencies were supportive of the proposed two year leak limit, with one NGO suggesting a leak limit of 55 percent instead of 75 percent. A chemical manufacturer was also supportive if the proposal allowed an exemption for unavoidable catastrophic leaks. Many other commenters expressed strong opposition to the proposed two year leak limit, describing it as redundant, unnecessary, or punitive. Commenters state that there are many reasons why an appliance may leak in excess of 75 percent for two consecutive years even though the appliance is in good condition. For example, commenters expressed that it is possible for two large volume leaks to occur from unrelated components. Multiple commenters stated that owners should not have to mothball an appliance where the cause of the leak can be remedied by the replacement of a component. Commenters that operate supermarkets were especially concerned about the requirement to retire the appliance given that EPA's definition of appliance includes all of the display cases and coolers attached to the refrigerant circuit. This requirement would result in the scrapping and replacement of perfectly good components. Another commenter for similar reasons suggested that IPR be exempt from the retirement responsibility due to their unique nature, although the commenter believed comfort cooling and commercial refrigeration could remain subject to the 2 year leak limit. If EPA chose to finalize this leak limit, many commenters requested an off-ramp provision from the automatic retirement for catastrophic leaks resulting from accidents, vandalism, acts of nature, non-mechanical failures, or on a case-by-case decision upon notifying EPA.

In response to the significant concerns raised by commenters, EPA is not finalizing this proposed two year leak limit. EPA is aware of the many situations in which a system can leak large quantities of refrigerant in consecutive years. For instance, it is possible, though rare, for two catastrophic leaks to occur on the system through no fault of the operator. Although EPA requested comments on a possible exemption for catastrophic leaks, it is clear from the comments that there is a wide range of opinions about what a catastrophic leak is, and what can cause such a leak. Because EPA is not finalizing this provision, it is not defining the term *catastrophic leak* at this time.

EPA also assumed that, absent catastrophic leaks, it was unlikely for a system to be in compliance with other parts of subpart F while still leaking at this rate. EPA generally anticipates that a leaking appliance will be repaired within 30 days to six months. However, the leak repair regulations contemplate situations in which an owner or operator is unable to repair or subsequently retrofit a system in a timely fashion (*e.g.,* federally owned equipment located in areas subject to radiological contamination, unavailability of necessary parts for IPR, or adherence to local, State, or federal laws hinder repairs for IPR). Based on feedback from stakeholders from meetings docketed in this rule, EPA is aware of instances where appliances leak refrigerant in excess of 75 percent but are still in compliance with the other leak repair regulations.

While EPA wishes to reduce chronically leaking systems, EPA believes other practices required under this final rule will help address chronic leakers. For example, strengthening the leak repair regulations by lowering the rate at which the initial repairs must be performed, requiring leak inspections prior to those repairs, verification tests of those repairs, and subsequent leak inspections after the repair, will reduce the number of chronically leaking systems.

Data received from CARB and other sources indicate that there are systems that may not be adhering to the leak repair requirements of subpart F. Some commenters, even those opposed to the specific proposal offered by EPA, agree that the worst chronic leaking systems may warrant special consideration. However, they found the proposed provision both overly broad and overly harsh in its outcome. Some commenters proposed alternate methods of addressing chronically leaking systems. One commenter stated that a requirement to properly document causes for large leaks and to establish corrective actions would likely be more effective at reducing large leaks than simply imposing a two year leak limit that would result in a unit being retired. CARB recommended that if both (a) the annualized leak rate exceeds 100 percent more than 4 times in the previous 365 days and (b) more than 120 percent of the total charge has been added in the previous 365 days, the system or faulty component should be retired. EPA considered CARB's approach and finds it attractive for a couple of reasons. This alternative has the benefit of considering the number of refrigerant additions in addition to the total amount of refrigerant released, thereby removing appliances affected by catastrophic leaks. It also would take effect after one year, which will cut in half the time in which refrigerant is being released into the environment. However, this approach would still require the automatic retirement of these systems, which some commenters found to be too strict a penalty.

The chronically leaking appliance provision, as proposed, would apply to appliances containing 50 pounds or more of refrigerant that leak more than 75 percent of the full charge in each of two consecutive twelve-month periods. Based on the comments, EPA is revising the chronically leaking appliance provision. EPA is requiring that owners or operators of appliances that leak 125 percent of their full charge in a calendar year submit a report to EPA detailing their repair efforts. The reports must be submitted no later than March 1 of the year following the 125 percent or greater leak. Through that report, the owner or operator must demonstrate that they are

in compliance with the repair provisions or the retrofit or retirement provisions in this section. In some cases, owners or operators may have already provided information to EPA as part of a repair or retrofit extension request.

By raising the threshold, EPA intends to avoid capturing appliances affected by unavoidable losses of full charge. Systems would have to lose their full charge and then a significant quantity more. Using CARB data and scaling up to the whole U.S., EPA estimates that 1,425 appliances (or 0.1 percent of all appliances with 50 or more pounds of refrigerant) would be affected at 125 percent of full charge.

Like CARB's approach, this would apply after one year rather than waiting for a second year of high leaks. As such, it will catch chronic leakers sooner than the provision EPA proposed. Several commenters contended the opportunity for a case-by-case determination is necessary to account for the variety of situations that might trigger the chronically leaking appliance provisions. They contended that without the opportunity for a case-by-case determination, the provision will force the retirement of working equipment. EPA's revised approach is similar to what many commenters suggested in that it allows for a case-by-case discussion after notifying EPA. Adding this reporting requirement also furthers EPA's goal of revising these regulations to improve enforcement and compliance of the regulations in subpart F. This will incentivize many owners and operators to improve their systems to ensure that they do not trigger this reporting requirement.

Comments were mixed as to whether the chronically leaking appliance provisions should be calculated based on calendar year, 12-month consecutive periods, or whether regulated entities should be given the discretion to choose one or the other. These concerns are partially moot, given that EPA has changed this requirement to allow for reporting to EPA in lieu of a retrofit or retirement. EPA is finalizing provisions stating that the 125 percent is based on calendar year so that entities do not need to calculate refrigerant additions on a rolling basis.

13. Recordkeeping

The prior regulations contained recordkeeping and reporting provisions for all of subpart F at § 82.166. As proposed, EPA is finalizing a recordkeeping paragraph at § 82.157(l) and a reporting paragraph at § 82.157(m) within the leak repair section to make these requirements easier to locate.

The prior regulations also required that certain records be kept in hard copy at the site of the appliance. Under the revisions finalized in this rule, EPA is explicitly allowing, though not requiring, electronic records in this final rule. EPA recognizes that many companies employ electronic databases to store and track records. An electronic recordkeeping system has advantages to paper records, and EPA encourages owners and operators of appliances to use one of these systems to track refrigerant additions and other required records. Electronic systems allow for more comprehensive refrigerant management and can help identify leaky appliances earlier. These records must still be accessible onsite if an EPA inspector visits a facility, but that access can occur through downloading or printing the records from an online system.

Owners and operators. The previous rules required owners and operators to maintain service records documenting the date and type of service, as well as the quantity of ODS refrigerant added. EPA proposed to add specific recordkeeping requirements to ensure that the owner or operator is aware of the leak rate. EPA also proposed to require that the owner or operator maintain records of all calculations, measurements, and assumptions used to determine the full charge and any revisions made to the full charge over time. EPA also proposed records for the leak inspections or automatic leak detection equipment, verification tests, and seasonal variances.

Some commenters stated that the recordkeeping for the newly proposed requirements will be a significant burden. One commenter stated that the recordkeeping from all of the leak inspections would be a large burden and urged EPA to minimize that burden in the final rule. Another stated that requiring detailed information on the location of all repaired leaks with the type of verification test would be a substantial burden and would require enhanced service records tailored to individual equipment. The commenter suggested EPA require instead only the date and results of initial and follow-up verification tests.

EPA responds that the Agency recognizes the concerns about the extent of the proposed recordkeeping burden. EPA is finalizing the recordkeeping requirements as proposed but is modifying the final rule to reduce the number of such records. First, EPA is only requiring leak inspections on systems that have exceeded the applicable leak rate, rather than on all appliances. EPA estimates that the universe of affected appliances will decrease by 81 percent relative to the proposal (from 1.5 million to 282,000 appliances). Though there are fewer leak inspections, EPA estimates a higher total burden because the Agency has increased the estimates for the costs of each inspection based on public comments. Second, EPA is only requiring repairs sufficient to bring the leak rate below the threshold leak rate, rather than requiring the repair of all identified leaks (unless the owner or operator chooses to calculate their leak rate using the Rolling Average method). There should be fewer verification tests and thus less to record.

EPA is finalizing the leak inspection records as proposed. Specifically, owners or operators must keep records of leak inspections that include the date of inspection, the method(s) used to conduct the leak inspection, a list of the location of each leak that was identified, and a certification that all visible and accessible parts of the appliance were inspected. The specificity of the leak inspection documentation is appropriate because this information will help demonstrate that the repair has brought the appliance's leak rate below the threshold leak rate. This information would allow the owner or operator to demonstrate, if needed, that a further exceedance of the leak rate threshold after repairing leaks is due to a new leak rather than a leak that was previously identified but not repaired.

EPA is also finalizing the verification test records as proposed. Specifically, owners or operators must maintain records that include the location of the appliance, the date of the verification tests, the location of all repaired leaks that were tested, the type of verification test used, and the results of those tests. It is important to document that each specific repair was verified so as to determine whether a repair was successful and whether the leak has been addressed. EPA is not requiring such specificity as a schematic of that individual appliance showing the locations of all repairs and verification tests. However, information should allow a technician to generally know which components of the appliance were repaired.

In this final rule, EPA is establishing the recordkeeping requirements described generally in this section for owners and operators of appliances normally containing 50 or more pounds of class I, class II, or non-exempt substitute refrigerant. All records required in § 82.157(l) must be maintained for at least three years.

- Maintain records documenting the full charge of appliances;

• Maintain records, such as invoices or other documentation showing when refrigerant is added or removed from an appliance, when a leak inspection is performed, when a verification test is conducted, and when service or maintenance is performed;
• If using an automatic leak detection system, maintain documentation that the system is installed and audited or calibrated annually and records of when the monitoring system identifies a leak and the location of the leak;
• Maintain retrofit and/or retirement plans;
• Maintain retrofit and/or extension requests submitted to EPA;
• If a system is mothballed to suspend a deadline, maintain records documenting when the system was mothballed and when it was brought back on-line (*i.e.,* when refrigerant was added back into the appliance);
• Maintain records of purged and destroyed refrigerant if excluding such refrigerant from the leak rate;
• Maintain records to demonstrate a seasonal variance; and
• Maintain copies of any reports submitted to EPA under § 82.157(m).

Technicians. The prior rules required technicians to provide an invoice or other documentation that includes the amount of ODS refrigerant added to the owner or operator. This would likely already include information on the system serviced, the date, and the company/person servicing the appliance. It would likely also include some description of the service provided. However, the information that the technician was required to provide did not match the information that the owner or operator was required to maintain. The limited records that the prior regulations required from service technicians also did not provide information needed by the owner or operator to make decisions on the fate of the appliance. EPA proposed to align the records that the technician must provide to the owner or operator with the ones that the owner or operator are required to maintain.

Multiple commenters noted that owners or operators must expend a tremendous amount of effort to obtain good records from outside service providers. Often facility owners are provided incorrect or incomplete paperwork or are unable to obtain paperwork at all. The commenters were generally supportive of EPA's proposal that would make it a requirement for technicians to provide the necessary information to the owner or operator of the appliance. However, one commenter stated that the record for the proposed rule does not justify the extent of records that technicians must provide to owners/operators and suggested that EPA maintain only the current recordkeeping requirements for technicians.

Multiple commenters requested that EPA remove the proposed requirement that technicians provide the owner or operator with the full charge of the appliance or the leak rate calculations because technicians often do not have sufficient information, such as the date of last service, to make those calculations. Other commenters requested that the Agency require the technician provide the owner or operator with information about the initial and follow-up leak repair verification tests that matches what EPA proposed to require the owner or operator to maintain.

After considering the comments, EPA is finalizing its proposal to align the records that the technician must provide to the owner or operator with the records that the owner or operator are required to maintain, with a few exceptions described below. In response to the comment that EPA maintain only the current recordkeeping requirements for technicians, the service technician is generally in the better position to generate those records as they are performing the service activities and usually are the expert that the appliance owner or operator is relying on to make informed decisions about their appliances. Finalizing these requirements for technicians should help ensure that the appropriate records are created so that they can be maintained.

Specifically, EPA is requiring that whenever an appliance with 50 or more pounds of refrigerant is maintained, serviced, repaired, or disposed of, the technician must provide the owner or operator with an invoice or other documentation that indicates (1) the identity and location of the appliance; (2) the date and type of maintenance, service, repair, or disposal performed, including the location of repairs and the results of any verification tests or leak inspections (if applicable); (3) the name and contact information of the person performing the maintenance, service, repair, or disposal; and (4) the amount and type of refrigerant added to and/or removed from the appliance (if applicable).

Based on the comments, EPA is not finalizing a requirement that the technician calculate the leak rate or provide the owner or operator with a record indicating the full charge of the appliance. The rules as finalized require the technician to provide information that they are best positioned to gather and that is relevant to calculating the leak rate and full charge, but the owner or operator is well positioned to determine those numbers because they should have the historical information that informs that calculation. Accordingly, it is not necessary for the technician to calculate the leak rate and EPA has modified the requirement at § 82.157(b) to explicitly state that it is the owner or operator's responsibility to calculate the leak rate. Because the owner and operator is also required to calculate the full charge it is no longer a relevant record for the technician to provide.

The final rule also explicitly requires that persons conducting the initial or follow-up leak repair verification test must, upon conclusion of that service, provide the documentation needed to meet the owner or operator's recordkeeping requirements. This furthers the goal of aligning the technician and owner or operator's recordkeeping requirements.

14. Reporting

The existing regulations require that owners or operators report to EPA in certain circumstances. EPA is not making changes to those reporting requirements in this final rule:
• If the owner or operator is requesting an extension to the 30-day (or 120-day) requirement to complete repairs pursuant to § 82.157(f);
• If the owner or operator is requesting an extension to complete a retrofit or retirement of an appliance pursuant to § 82.157(i); or
• If the owner or operator is excluding purged refrigerants that are destroyed from annual leak rate calculations pursuant to § 82.157(k).

EPA is also finalizing two reporting requirements that were not contained in the proposed rule. First, EPA is requiring at § 82.157(j) that owners or operators submit a report if their appliance leaks 125 percent or more of the full charge in a calendar year and thereby triggers the chronically leaking appliances provision. EPA is adding this report to provide added flexibility, so that appliances that have leaked 125 percent of their full charge or greater do not necessarily need to be retired or retrofitted provided there is an explanation for the leak. This report must explain the reason for the leak rate of 125 percent or greater and could potentially include, among other things, the documentation prepared to extend the repair requirement or a description of catastrophic events. As discussed earlier in this notice, this reporting requirement is based on comments received to remove the two-year leak

limit and allow for case-by-case evaluations.

Second, this final rule contains a provision allowing owners or operators who are retrofitting or retiring an appliance to request that EPA relieve them of that obligation if they can establish within 180 days of the plan's date that the appliance no longer exceeds the applicable leak rate. This provision is contained in the prior regulations. EPA had proposed to remove it, but based on comments requesting that it be left in place, EPA is not finalizing the proposal to remove it. EPA is requiring information be included in the report that is similar to the previously existing requirement except EPA is additionally requiring a description of why the repair was not conducted within the time frames required under paragraphs (d) and (f) of this section. In addition, it must include a signed statement that all identified leaks will be repaired and an estimate of when those repairs will be completed (not to exceed one year from date of the plan). These additional elements are necessary to ensure that this provision is not used as a way to circumvent the required time frames for repair.

EPA is not finalizing the proposed requirement for the report that would have accompanied an extension request from federal agencies to conduct less frequent leak inspections in the proposed rule. EPA is not finalizing this proposed extension and thus the reporting element is no longer necessary.

EPA is also finalizing the requirement that all reports be submitted to EPA via email at *608reports@epa.gov*, as proposed. If the submission contains confidential business information, reports can be mailed to the address in § 82.160. This should reduce costs and streamline the reporting process for both EPA and those reporting. It is also consistent with EPA's Next Generation Compliance initiative. Commenters generally supported the move towards electronic reporting and recordkeeping.

Two commenters requested that the Agency require that owners and operators keep a record of the amount of refrigerant leaked annually to the atmosphere by refrigerant type and that this information be reported to EPA. Additionally, the commenters requested that EPA make the data related to the emissions of refrigerants publicly available. In accordance with the transparency element of the Next Generation Compliance initiative, the general public could then point out violations and owners and operators would have an incentive to correct excessively leaking appliances.

EPA responds that in general, EPA is not requiring that owners or operators calculate the sum total of refrigerant leaked annually or submit those data to EPA. The volume of reporting would be substantial and for a majority of appliances would be of limited value to EPA or the general public. However, owners or operators of equipment that leaks 125 percent of the total charge in a calendar year will have to calculate their total refrigerant additions to determine whether they have met that threshold. EPA finds that there is merit for those chronically leaking systems to perform this calculation and report to EPA because that will encourage those owners or operators to take steps to ensure they do not meet or exceed that threshold.

G. Revisions to the Standards for Recovery and/or Recycling Equipment in § 82.158

1. Background

Under the prior regulations, all refrigerant recovery and/or recycling equipment manufactured or imported on or after November 15, 1993, and used during the maintenance, service, repair, or disposal of appliances containing an ODS refrigerant must be certified by an approved equipment testing organization to ensure that it meets certain performance standards. These standards may vary for certain equipment intended for use with the disposal of small appliances. These performance standards were contained in tables 2 and 3 of § 82.158, as well as appendices B1, B2, and C of subpart F. EPA based these standards in large part on ARI (now AHRI) Standard 740–1993 and ARI Standard 740–1995. Recovery and/or recycling equipment intended for use during the maintenance, service, repair, or disposal of MVAC and MVAC-like appliances must meet the standards in subpart B. The regulations pertaining to MVACs refer to subpart B and state that such recovery and/or recycling equipment must meet the standards of § 82.36(a).

2. Extension to Substitute Refrigerants

In the revisions finalized in this rule, EPA is requiring that all recovery and/or recycling equipment manufactured or imported for use during the maintenance, service, repair, or disposal of appliances (except small appliances, MVACs, and MVAC-like appliances) that contain non-exempt substitute refrigerants be certified by an approved equipment testing organization as being capable of meeting certain performance standards. EPA is requiring that after January 1, 2017, all newly manufactured or imported recovery and/or recycling equipment used during the disposal of all appliances, including MVACs and MVAC-like appliances, also be certified. One commenter agreed that recovery and/or recycling equipment for use with non-exempt substitute refrigerants should be certified. This comment supports EPA's approach.

EPA proposed that all existing recovery and/or recycling equipment that met certification requirements for ODS prior to this rulemaking would be considered as certified for non-exempt substitute refrigerants. EPA is further clarifying that if a person who recovers refrigerant has recovery equipment that was certified as meeting the requirements for an ODS refrigerant, it can be used to recover other non-flammable refrigerants in that pressure category. For example, recovery equipment manufactured in 2015 that was certified to recover HCFC–22 can be used to recover other non-ODS refrigerants like R–407A, R–407C, or R–410A. However, proper care should be taken to prevent refrigerant mixing if using the same recovery device with multiple refrigerants.

One commenter noted that additional equipment testing would be required if the equipment manufacturers want older equipment to handle newer non-exempt substitute refrigerants. EPA responds that all equipment manufactured or imported on or after January 1, 2017, must be tested under the new standards. This is true of older equipment designs previously certified for ODS which have not been tested for substitute refrigerants. However, any equipment manufactured or imported prior to the effective date is grandfathered and does not have to be recertified. Technicians can continue to use previously certified recovery equipment that they already own. As has been the case when EPA has previously changed equipment standards, EPA does not require technicians to recertify or replace their existing equipment.

EPA is adding appendices B3 and B4, based on the AHRI Standard 740–2016, *Performance Rating of Refrigerant Recovery Equipment and Recovery/Recycling Equipment.* The recovery standard is the same in both appendices; the difference between the two, as discussed later in this notice, is that appendix B4 contains additional safety standards for flammable refrigerants. EPA proposed to base appendices B3 and B4 on AHRI Standard 740–2015 but is using the most recent version of that standard for the final rule. All new equipment manufactured or imported on or after

January 1, 2017, must meet the standards in appendices B3 or B4 and table 2. The evacuation level would depend upon the saturation pressure of the refrigerant. EPA is also updating appendix C ''Method for Testing Recovery Devices for Use with Small Appliances'' to reference all refrigerants, instead of the previously referenced CFC–12.

Certifying refrigerant recovery and/or recycling equipment for use with non-exempt substitutes serves multiple purposes. First, certification provides reliable information on the ability of equipment to minimize emissions of these substitute refrigerants, by measuring and/or establishing standards for recovery efficiency (vacuum level) and maximum emissions from air purging, oil draining, equipment clearing, and hose permeation. The fact that the equipment minimizes emissions is part of our consideration of whether emissions associated with using recovery equipment are considered *de minimis* releases. Second, certification provides reliable information on the equipment's ability to clear itself when switching between refrigerants. Without sufficient clearing capability, equipment may retain residual refrigerant in its condenser, which would then be mixed with the next batch of refrigerant recovered by the equipment. Because mixed refrigerant can be difficult if not impossible to reclaim (depending on how cross-contaminated the mixed refrigerant is) and expensive to destroy, it is much more likely than unmixed refrigerant to be vented to the atmosphere. Third, certification provides reliable information on the equipment's recovery speed. Without such information, technicians may purchase equipment that recovers too slowly, tempting them to interrupt recovery before it is complete. As discussed in the 1993 Rule, where EPA established the equipment certification requirements, the information on equipment performance provided by an independent third-party testing organization is more reliable than that provided by other sources, such as equipment manufacturers (58 FR 28686–28687).

Finally, certification embraces Next Generation Compliance principles. Users of certified equipment, when following the manufacturer's instructions, will be in compliance with the regulatory standards for the evacuation of refrigerant.

Flammable Refrigerants. Different treatment is warranted for non-exempt flammable refrigerants. As proposed, EPA is adding standards for the recovery of flammable non-exempt refrigerants to appendix B4. Currently, six flammable non-exempt substitute refrigerants are approved for use in stationary refrigeration and air-conditioning equipment: HFC–32, HFC–152a, R–406A, R–411A, R–411B, and HFO–1234ze(E).

EPA is using AHRI Standard 740–2016 as the basis for the recycling and/or recovery equipment requirements in appendix B3. This standard does not address the safety of recovering flammable refrigerants. EPA is therefore creating appendix B4, which requires the recovery/recycling performance of appendix B3 and the safety performance of Underwriters Laboratories (UL) Standard 1963–2011, Supplement SB—*Requirements for Refrigerant Recovery/Recycling Equipment Intended for Use with a Flammable Refrigerant.* All recycling and/or recovery equipment manufactured or imported after January 1, 2017, that are to be used with flammable non-exempt substitute refrigerants must meet this new standard. EPA is incorporating UL 1963 by reference and modifying the testing protocol in appendix B3 to account for flammability concerns during testing.

Two testing organizations supported using UL 1963 to address flammable refrigerants. One commenter preferred that EPA reference UL 1963 directly within appendix B4 rather than establishing separate requirements in appendix B4 that are based on that standard. Separate requirements published outside of that standard would make it more difficult to apply the standard. EPA responds that appendix B4 refers to UL 1963, Supplement SB, and does not reproduce the standard in the appendix due to copyright concerns.

Another commenter strongly recommended that a label be required on all products certified to handle flammable refrigerants. EPA responds that UL 1963, Supplement SB has requirements for markings that must be placed on recovery and/or recycling equipment certified to handle flammable refrigerants. Because EPA is incorporating those standards in appendix B4 by reference, EPA is requiring those markings.

3. Removing the Certification by Owners of Recovery and/or Recycling Equipment

As proposed, EPA is removing the requirement under § 82.162 that anyone who maintains, services, repairs, or disposes of appliances containing an ODS submit a signed statement to the appropriate EPA Regional office stating that they own recovery and/or recycling equipment and are complying with the applicable requirements of subpart F. EPA received one comment in support of taking this action.

EPA created this provision in 1993 when the Agency first required that recovery and/or recycling equipment be certified and that technicians use certified equipment. At the time, the use and availability of recovery and/or recycling equipment was not as commonplace as it is today. Equipment certification by owners demonstrated to EPA that equipment was available for use by certified technicians. In particular, EPA was interested in the capabilities of grandfathered, or pre-1993, equipment. Since certified recovery and/or recycling equipment is now commonly available, EPA no longer needs the information contained in the certification statement such as the number of service trucks and personally identifiable information of equipment owners.

4. Clarifications and Edits for Readability

EPA is reorganizing § 82.158 by appliance type. EPA is also combining tables 2 and 3, which contain the levels of evacuation that must be achieved by recovery and/or recycling equipment, to remove inconsistencies in terminology and formatting.

EPA also revised how the requirements for recovery equipment used on small appliances are written. In general, the requirement is that the equipment is capable of recovering 90 percent of the refrigerant in the test stand when the compressor of the test stand is operational and 80 percent of the refrigerant when the compressor of the test stand is not operational. In addition, there are secondary considerations that could allow for the certification of recovery equipment based on when that equipment was manufactured or imported.

H. Revisions to the Standards for Equipment Testing Organizations in § 82.160

EPA relies on independent third party organizations approved by the EPA Administrator to certify that refrigerant recovery and/or recycling equipment meets the standards in subpart F. Any equipment testing organization may apply for approval so long as they can verify that they have the expertise and technical capability to verify the performance of the recovery and/or recycling equipment, have no conflict of interest (*e.g.,* with equipment manufacturers), and receive no direct or indirect financial benefit from the outcome of certification testing.

Any new certifying organization must have expertise to certify equipment that is used to recover or recycle refrigerants that are subject to this subpart. This means that they must be able to evaluate and certify HFCs and other non-exempt substitute refrigerants, including flammable refrigerants. Because the same expertise is needed to test equipment used for ODS and substitute refrigerants, equipment certifying organizations that have already been approved by EPA may continue to certify equipment designed for substitute refrigerants without needing to re-apply. In comments on the proposed rule, two certifying organizations agreed that currently approved organizations should not have to reapply to certify equipment used to recycle and/or recover substitute refrigerants and that the same expertise is needed to test equipment used for ODS and substitutes.

EPA is removing the requirement that organizations provide a list of all certified equipment to EPA within 30 days of the organization's approval by EPA and annually at the end of each calendar year thereafter. Instead, EPA is requiring that the certified equipment testing organizations publish online a list of equipment that meets EPA requirements. This list must include the manufacturer and the name and/or serial number of a newly certified model line, which is the information that the certifying organizations had to provide to EPA. This list must be updated no less than once per year, but an organization can choose to update the list more frequently. Online lists must contain certified equipment until three years after that equipment is no longer offered for sale. Making the information available online will be no more burdensome for the testing organization than submitting the list to EPA. Online publication is also a better method of communicating these findings to the public and the service/repair industry than sending the information to EPA. Two certifying organizations commented that they support these revisions because they already make the information publicly available through their Web sites.

EPA is also adding to the regulatory text the timing for records retention that had previously only been found in guidance documents. The regulation now specifies that all records must be maintained for three years after the equipment is no longer offered for sale. EPA is adopting a similar timeframe for the online lists of certified equipment.

EPA also encourages the use of electronic reporting and has established the email address *608reports@epa.gov* to receive applications from organizations seeking to be approved under this section and the required notification if a previously certified model line fails to meet the standards upon retesting.

I. Revisions to the Technician Certification Requirements in § 82.161

1. Background

The prior regulations at § 82.161 required the certification of all individuals who maintain, service, or repair air-conditioning and refrigeration equipment containing an ODS, other than MVACs which are addressed in a separate subpart of the regulations. This group includes installers, contractor employees, in-house service personnel, and anyone else who performs installation, service, maintenance, or repair that might reasonably have the opportunity to release ODS refrigerants to the environment. In addition, individuals disposing of air-conditioning and refrigeration equipment other than small appliances, MVACs, and MVAC-like appliances must be certified. Individuals disposing of small appliances, MVACs, and MVAC-like appliances do not need to be certified.

Under those rules, technicians become certified by passing a test containing questions drawn from a bank developed by EPA with input from industry educational organizations with a certification program approved by EPA. The test includes questions on the role of CFCs and HCFCs in stratospheric ozone depletion, the requirements of the subpart F, and proper techniques for recycling and conserving refrigerant. EPA makes the question bank available to certifying organizations that demonstrate that they can properly generate, track, administer, and grade tests; issue certificates; and keep records.

2. Extension to Substitute Refrigerants

In this final rule, EPA is finalizing its proposal to extend the certification requirements to technicians who work with non-exempt substitute refrigerants.

Persons who are not certified technicians are more likely to intentionally or inadvertently release refrigerant in the course of servicing, maintaining, repairing, or disposing of refrigeration and air conditioning equipment. One commenter stated that they believe most of the intentional venting of refrigerant is done by individuals who are not certified technicians. Another commenter noted that they have observed a lack of competence within the equipment servicing sectors leading in many instances to the improper handling of refrigerants or servicing of mechanical equipment.

EPA responds that these comments support the importance of extending the technician certification requirement, as well as other provisions of the refrigerant management rules, to non-exempt substitute refrigerants. Certified technicians are more likely to understand how and why to recover and recycle refrigerants and to have the proper equipment to do so. Technician certification helps ensure that technicians know refrigerant recovery requirements and techniques. The prior regulations did not specifically prohibit an uncertified individual from opening an air conditioner that contains a substitute refrigerant in order to add a substitute refrigerant or replace components. Similarly, the regulations did not specifically prohibit an uncertified individual from opening an air conditioner that contains an ODS refrigerant to add ODS refrigerant (assuming a certified technician purchased the ODS refrigerant). While the venting prohibition generally applies to these actions, without training or certification the individual performing such servicing activities may not even be aware of the prohibition against knowingly venting or otherwise releasing refrigerant.

Tips reported to the Agency indicate that servicing by uncertified individuals occurs. One commenter asserted that a substantial number of technicians, possibly up to 25 percent, are operating without certification. EPA responds that this information, if true, would further support the extension of the technician certification requirement to non-exempt substitute refrigerants. Requiring that anyone opening an appliance (except those containing only exempt substitute refrigerants) be a certified technician will reduce emissions caused by uninformed service personnel and will facilitate enforcement of the venting prohibition, especially when coupled with the recordkeeping requirement for appliances containing more than five and less than 50 pounds of refrigerant.

Many companies require certification of their technicians regardless of the type of refrigerant being used. The principles of proper handling, recovery, and disposal of non-exempt substitute refrigerants are similar if not identical to those for ODS refrigerants, except that additional safeguards are advisable for flammable refrigerants. The fact that some individuals may be working on non-ODS appliances without certification and without following safe handling practices places them at a disadvantage with respect to

compliance. Because there is a reasonable expectation that an ODS or non-exempt substitute refrigerant could be released into the environment in the course of that work if appropriate precautions and practices are not followed, requiring technician certification for individuals performing such work ensures that they have the information necessary to comply with the regulatory requirements and with the venting prohibition, as well as to minimize emissions. Accordingly, to promote proper practices or at least remove barriers for compliance and for environmental protection, EPA is requiring certification for anyone working on an appliance that contains a non-exempt refrigerant.

Many commenters supported extending the technician certification requirement for the handling of substitute refrigerants. While some commenters stated that EPA does not have authority to extend section 608 regulations to substitutes, those commenters did not raise the specific issue of technician certification. EPA addresses those general comments about its authority for this action in Section III of this notice. Two commenters recommended extending the technician certification requirement to flammable refrigerants. Three commenters urged EPA to extend the technician certification requirement for the handling of all refrigerants, even if they are exempt from the venting prohibition. These commenters stated that treating all refrigerants equally will provide consistency and clarity in the industry. Other commenters stated that many of the exempt refrigerants have special considerations such as flammability or toxicity that require care during handling and servicing. As noted previously, some commenters stated that the sales restriction should be extended to hydrocarbons. These commenters noted that the flammability of these refrigerants poses far greater risks than that of R–22 when handling it and servicing equipment. One commenter recommended that if the sales restriction was extended to flammable refrigerants then it should be extended to all exempt refrigerants.

As stated in the proposed rule, EPA is not extending the technician certification requirement (and thus the sales restriction) to individuals maintaining, servicing, repairing, or disposing of appliances containing substitute refrigerants that are exempt from the venting prohibition. EPA has exempted substitutes, at least in the specified end-uses, from the venting prohibition because the Agency has determined for purposes of section 608(c) that they do not pose a threat to the environment when released. For water or nitrogen, technician certification would provide no environmental benefit nor would it increase technician safety. For ammonia or chlorine, other regulations address the risks related to those specific compounds (for example, OSHA regulations that address risk to technician safety). The types of refrigeration equipment that use these exempt substitute refrigerants are also significantly different from an engineering standpoint from the equipment that uses ODS or HFC refrigerants. Therefore, there is little potential for ODS and these exempt substitute refrigerants to be mixed and intentionally released to the environment.

Hydrocarbon refrigerants may be different than the other substitute refrigerants. EPA notes that all end-uses for hydrocarbons currently authorized under SNAP are also exempted under the venting prohibition. The Agency did not propose and is not establishing a technician certification requirement or sales restriction for those exempt substitute refrigerants. The Agency may consider in future whether there are any regulatory or other measures that would be appropriate to address the handling of exempt flammable refrigerants.

As a result of today's action, flammable substitutes that have not been exempted from the venting prohibition in a particular end-use are subject to the requirements of subpart F, including the sales restriction and the technician certification requirements. Unlike the other exempt substitutes, hydrocarbons are being sold to service existing ODS and HFC equipment for which this refrigerant is not listed as acceptable under SNAP. Specifically, R–22a, which is propane, in some cases mixed with isobutane and an odorant, has been marketed as a ''drop-in'' (or more appropriately termed a ''retrofit'') replacement for existing equipment designed for use with HCFCs and/or HFCs. Often these are MVACs or residential split systems.

R–22a has not been submitted to SNAP for review for these uses, and EPA has not listed propane as acceptable for these end-uses under the SNAP program. Accordingly, EPA considers its introduction into interstate commerce for this use a violation of the SNAP regulations. In addition, EPA has not exempted R–22a or propane used as a retrofit in existing HCFC–22 appliances from the venting prohibition. As a result, R–22a and propane are subject to the requirements of subpart F in such non-exempt end-uses, including the sales restriction and the technician certification requirements.

The Agency has learned through its recent enforcement actions against Enviro-Safe and Northcutt, two distributors of R–22a, and through other investigations that R–22a is being sold to both consumers and technicians. Often the buyers are not aware there is a difference between R–22 and R–22a, or even that R–22a is flammable. As a result, appliances have exploded and technicians have been injured. Technicians need to be aware of the safety concerns of using such refrigerant for themselves or subsequent technicians who service ODS or HFC equipment that inappropriately contains hydrocarbons. Consumers must also not have easy access to this refrigerant for their own safety. Applying the sales restriction to unapproved uses of hydrocarbon refrigerants and educating technicians through the certification program will reduce safety risks and prevent the mixing (and subsequent venting) of ODS and HFC refrigerants with these unapproved alternatives.

One commenter, while supportive of extending the technician certification requirements to those working with non-exempt substitute refrigerants, disagreed with the premise that failing to require certification will result in the release and mixture of ODS and non-ODS refrigerants.

EPA responds that information about the illegal use of R–22a as a replacement for R–22 indicates to EPA that people are purchasing their own refrigerant and mixing it with HCFCs. The consequences of inappropriately mixing refrigerants include significant losses in performance and energy efficiency, damage to equipment, the lost value of the mixed refrigerant (which is at best difficult, and often impossible, to separate into the component refrigerants), and costs for destroying mixed refrigerants. Refrigerant mixture also leads both directly and indirectly to refrigerant release. Mixture leads directly to release because mixtures of certain refrigerants, such as R–22 and R–134a, have higher pressures than either component alone. Thus, pressure-sensitive components such as air purge devices on recycling machines and relief devices on appliances may be activated by these mixtures, venting the refrigerant to the atmosphere. Purge devices in particular are often set to open when the pressure of the recovery cylinder's contents rises more than 5–10 psi above the expected saturation pressure for the refrigerant; this margin is exceeded by R–22/R–134a mixtures containing more than ten percent of the contaminating refrigerant.

Refrigerant mixture also reduces recycling and leads indirectly to release. First, mixed refrigerants lose their value for reclamation because it is difficult to separate the component refrigerants. Typically, reclaimers will pay refrigerant distributors for recovered refrigerant. Reclaimers may actually charge money to accept highly mixed refrigerant or not take it at all. Mixed refrigerants cost money to reclaim or destroy and this cost could provide a financial incentive for illegal venting. Second, the direct releases and equipment breakdowns caused by contamination lead to increased equipment servicing, which itself leads to unavoidable releases of refrigerant. Thus, failure to require certification for people working with substitute refrigerants would increase the probability of both substitute and ozone-depleting refrigerants being emitted to the atmosphere.

As noted previously in this notice, certified technicians are more likely to understand how and why to recover and recycle refrigerants and to have the proper equipment to do so. The skills and knowledge that certified technicians have reduces the likelihood that they would mix or release ODS and non-ODS refrigerants. For these reasons, EPA is requiring technician certification for persons working with non-exempt substitutes.

3. Updated Test Bank

EPA is currently updating the technician certification test bank through a process separate from this rulemaking. While this is not a regulatory change—the Agency can update the test bank when appropriate without promulgating a new regulation—it aligns with EPA's efforts to extend the refrigerant management regulations to substitute refrigerants. Currently, the questions focus on CFCs and HCFCs, even though CFCs have been phased out for nearly twenty years and the predominant HCFC, HCFC–22, will be phased out by 2020.

As part of the public participation process for this rule, stakeholders provided input regarding updating the test bank questions. Many commenters supported updating the test bank, especially given the new refrigerants and technologies that have become available since the test was initially developed. Commenters provided suggestions for numerous topics that should be covered by the exam. These include placing greater focus on the venting prohibition, recovery best practices, safe handling of flammable refrigerants, use of new refrigerants, financial benefits of refrigerant recycling, and the costs of non-compliance related to equipment efficiency, equipment life, and environmental harm. One commenter observed that the core, Type II, and Type III tests should now include questions on verification testing since this will be a new requirement of technicians servicing comfort cooling and commercial refrigeration appliances under the leak repair provisions.

EPA responds that all of these suggested topics fit into the testing topics listed in appendix D. EPA intends to consider these potential topics when updating the test bank questions. EPA has begun reviewing the test bank and consulting with certification and training organizations to identify questions that should be updated, replaced, or removed. EPA also intends to incorporate new and revised elements of the National Recycling and Emission Reduction Program that are being finalized in this action in the updated test bank. As such, the test bank will not be completed until after publication of the final rule. Testing organizations have requested time to update their training and testing materials before the new questions go into effect. EPA anticipates the new questions will be added to all exams by mid- to late 2017.

J. Revisions to the Technician Certification Program Requirements in § 82.161

1. Background

The regulations at § 82.161 require that organizations operating technician certification programs apply to EPA to have their programs approved. The application process ensures that technician certification programs meet minimum standards for generating, tracking, and grading tests, as well as keeping records. Approved technician certification programs must keep records of the names of technicians they have certified and the unique numbers assigned to each technician certified through their programs. These records allow both the Agency and the certification program to verify certification claims and to monitor the certification process. Approved technician certification programs also must submit reports to EPA every six months containing information on the number of students certified and the pass/fail rate. Such reports allow the Agency to monitor program compliance.

2. Extension to Substitute Refrigerants

As discussed previously, EPA is requiring in this final rule that technicians who work with non-exempt substitute refrigerants be certified. By extension, EPA is also requiring that technician certification programs offer tests to certify those technicians. This should not require significant changes to current practices other than using the updated test bank once available and the revisions discussed in this section. EPA is not requiring that current certification programs recertify based on any of the revisions in this final rule. EPA did not receive comment specifically on these proposed revisions.

3. Posting Lists of Certified Technicians

In regulatory revisions finalized in this rule, EPA is requiring that certifying organizations publish online lists of the technicians certified by that organization. However, EPA is not establishing a single ''database'' nor requiring certified organizations to create their own databases as was contemplated in the proposed rule. The primary intent of these published lists is to assist technicians who have lost their certification cards and reduce the burden currently facing the Agency and technician certification programs in assisting technicians who have lost their certification cards as described in the proposed rule. These goals can be accomplished for all future technicians through the publication of limited information online. Technicians should be able to find out who certified them through a simple web search.

In the proposed rule, EPA described this as a database and discussed one of its possible uses as a tool refrigerant wholesalers could use to verify their customer is a certified technician. Many commenters supported the creation of a single technician database maintained by EPA. A few of those commenters encouraged EPA to include all certified technicians, not just newly certified technicians, because an incomplete list would have only marginal value for anyone referencing the list prior to selling refrigerant. Some refrigerant distributors wanted assurance that their refrigerant sales would not be adversely affected or that they would not be held responsible for errors or omissions in the technician database. One commenter who employs in-house technicians stated that their technicians would prefer not to be included in such a database. The commenter requested that there not be a database, or if there is one that technicians should have to affirmatively opt in, rather than being given the option of opting out.

EPA responds that the Agency did consider the possibility of a database that could be used to enforce the sales restriction. EPA agrees that in order to be used for regulatory purposes the

content of the database would need to be complete and continuously updated. The only manner the Agency could ensure a complete list of technicians would be to require technicians to recertify, which EPA did not propose. EPA did not propose to require that certification programs list everyone currently in their records. While this may assist current technicians who have lost their cards, listing the hundreds of thousands of technicians certified over the last twenty-two years could be overly burdensome. This would also not provide technicians with the opportunity to opt out.

As this requirement is primarily for the benefit of the technician, EPA is requiring technician certification programs to notify individuals taking the certification exam that information will be posted online and allow them to opt out. Allowing the opt out is sufficient for those technicians who do not want to be listed; requiring an opt in to be listed, on the other hand, would reduce the utility of the lists. EPA is also exempting federal government-run programs from this requirement as proposed. The public release of government and military personnel names linking them to their federal employment could present significant privacy and security concerns.

EPA did not receive comment on the proposed information that would need to be published. EPA is therefore finalizing as proposed the following information requirements: The first name, middle initial, and last name of the certified technician, the technician's city of residence when taking the test, the type(s) of certification received, and the date each certification was received. EPA is not requiring any specific format for providing this information. EPA is aware that some certifying organizations already provide this information online to their technicians and the Agency does not intend to require that they change how they offer the information so long as the required data elements are included. Rather than continuous updating, as would have been required of a database, EPA is requiring that the lists be updated annually, although individual organizations may choose to update their lists more frequently.

4. Grandfathering Provisions

In this rulemaking, EPA is finalizing its proposal to remove provisions related to voluntary certification programs at § 82.161(g). This program was created to allow technicians who were trained prior to the establishment of approved technician certification programs to be recognized as certified technicians. This program expired in 1994 and is no longer necessary. EPA did not receive any comments on this proposal.

5. Certification Cards

As proposed, EPA is finalizing revisions to the requirements for the required text that is printed on certification cards. Some organizations told EPA prior to publication of the proposed rule that the language used on the certification card implies that a technician as defined in subpart F may be trained in other aspects of equipment installation. The primary purpose of the 608 certification card is for a technician to prove to a vendor that they understand the environmental impacts of mishandling refrigerants and are legally permitted to perform the necessary maintenance, servicing, repair, or disposal work under CAA section 608. While this certification qualifies an individual to maintain, service, repair, or dispose of appliances containing certain refrigerants for purposes of CAA section 608, the 608 exam is less focused on the operational and engineering aspects of refrigeration and air-conditioning equipment. Accordingly, the 608 certification is not intended to serve as a general license for individuals who work on such equipment.

To more accurately reflect the knowledge needed to obtain the certification, EPA is updating the card to read: ''[Name of person] has successfully passed a [Type I, Type II, Type III, and/or Universal, as appropriate] exam on how to responsibly handle refrigerants as required by EPA's National Recycling and Emission Reduction Program.''

EPA stated in the 1993 Rule establishing the technician certification requirements that standardized language will decrease administrative costs and aid in enforcement. In addition, it was intended to ease burden on refrigerant wholesalers who must inspect the cards to verify the certification of technicians. Those principles also apply to this rulemaking, and updating the information required on the certification card should improve clarity and should not result in any new administrative costs. EPA notes that the Agency is not requiring that currently certified technicians obtain new cards with the updated language. The new language applies only to cards issued to newly certified technicians. In the event where a technician is requesting a replacement for a lost card, EPA encourages that the certifying organization use the updated language whenever feasible.

6. Updates to Appendix D

In this rulemaking, EPA is also finalizing minor edits to appendix D ''Standards for Becoming a Certifying Program for Technicians.'' EPA did not receive any comments on this element of the proposal and is finalizing the revisions as proposed. More specifically, EPA is updating the description of test content to include the environmental impact of not just ODS but also substitute refrigerants. EPA is removing paragraphs (i) through (k) on approval process, grandfathering, and sample application as they are outdated, redundant, or self-explanatory. EPA is removing the reference that EPA will periodically publish information on the fees charged by the programs as the Agency no longer collects this information. To protect the private information of technicians and minimize the potential for fraud, EPA is removing social security numbers as an acceptable form of identification for Type I technicians using the mail-in format and stating that social security numbers cannot be used in the unique certification number assigned to newly certified technicians. EPA also is requiring that certifying organizations provide a hand-out or electronic communication to technicians after they have taken the certification test explaining who provided the training, who to contact with questions regarding the certification process, and when they should expect to receive their score, and if they passed, their certification cards.

K. Revisions to the Reclamation Requirements in § 82.164

1. Background

The regulations at § 82.164 required that anyone reclaiming used ODS refrigerant for sale to a new owner, except for people properly certified under subpart F prior to May 11, 2004, is required to reprocess refrigerant to standards laid out in appendix A (based on ARI Standard 700–1995, *Specification for Fluorocarbons and Other Refrigerants*), release no more than 1.5 percent of the refrigerant during the reclamation process, dispose of wastes from the reclamation process in accordance with all applicable laws and regulations, and adhere to specific recordkeeping and reporting requirements.

2. Extension to Additional Substitute Refrigerants

In this final rule, EPA is extending the reclamation standards for refrigerants in appendix A to additional non-ozone depleting substitute refrigerants. Most of the refrigerants in appendix A were

single component ODS refrigerants or blends containing an ODS component. However, appendix A had previously contained a few commonly used substitute refrigerants that have been used for a long time, such as R–407C and R–410A. EPA is updating appendix A to include newer HFCs, PFCs, HFOs, and other refrigerants based on the standards contained in the latest AHRI Standard 700, *Specifications for Refrigerants.* EPA proposed to base appendix A on AHRI Standard 740–2015, with the exception that the Agency would maintain the current unsaturates limit of 0.5 percent by weight. Recently AHRI released Standard 740–2016 which includes additional refrigerants and an impurity standard for R–40. EPA is finalizing appendix A based on the recent AHRI Standard 740–2016 by adding the new refrigerants, but not the unsaturates limit or R–40 impurity standard.

The standard in the previously existing rules was adopted in 1995. It is appropriate to update this standard to ensure that refrigerants developed in the last twenty years are reclaimed properly. While industry has established standards for these new refrigerants, EPA's regulations have not kept pace. Therefore, reclaimers have not had a legal obligation to achieve such standards. Instilling confidence in the market that reclaimed refrigerant is as good as virgin refrigerant is crucial to its widespread use. Ensuring a healthy market for reclaimed refrigerant is also crucial to support the value of used refrigerant and provide incentives through market forces to recover used gas from appliances during their maintenance, servicing, repair, or disposal.

Many refrigerant reclaimers and distributors commented that the current 0.5 percent unsaturates limit is appropriate. One commenter specifies that the reclamation industry as a whole has delivered more than 200 million pounds of reclaimed refrigerant at that unsaturates level without any known issues. Another commenter expressed concern that lowering the unsaturates limit will make successful reclamation impossible. Other commenters encouraged EPA to incorporate the AHRI Standard 700–2015, *Specifications for Refrigerants,* by reference and establish a process to automatically adopt the latest version of the AHRI–700 standard. These commenters explained that typically, the standard is updated to establish purity specifications for each new substitute refrigerant as it is developed and approved. The commenters state that this will prevent reclaimers from having to comply with regulations requiring that they reclaim new refrigerants without any EPA required standard for those refrigerants.

EPA responds that it is not incorporating either the AHRI Standard 700–2015, *Specifications for Refrigerants,* or the current AHRI Standard 700–2016, *Specifications for Refrigerants* by reference. This is because ASHRAE and AHRI are still conducting further studies on whether and how to amend the unsaturates limit. It is important to maintain the 0.5 percent unsaturates limit while the standard is still being debated. Accordingly, rather than incorporating the AHRI Standard 700–2016 by reference, EPA is updating appendix A to include HFCs, PFCs, HFOs, and other refrigerants based on the standards contained in AHRI Standard 700–2016. In response to the comment about establishing a process to automatically update the standards, it is important to understand that EPA cannot automatically incorporate future standards by reference. EPA appreciates the commenters' concerns that the Agency has not updated the standard in twenty-one years. However, any updated standard must undergo notice and comment review prior to being adopted into the regulations.

This final rule will extend the prior reporting requirements that are applicable to ODS to HFCs and other non-exempt substitutes. Reclaimers must report annually the aggregate quantity of material sent to them for reclamation (the combined mass of refrigerant and contaminants) by refrigerant type, the mass of each refrigerant reclaimed by type, and the mass of waste products. EPA has been publishing the aggregate total of each ODS refrigerant reclaimed each year on its Web site. After these revised reporting requirements take effect, EPA will begin collecting and making available reclamation data for non-exempt substitute refrigerants as well as ODS, which should provide EPA and the general public a greater understanding of the extent of HFC recovery and reclamation. One commenter encouraged EPA to publish data on the amount of refrigerant being sent to a reclaimer in addition to the amount reclaimed. The commenter does not believe that aggregated data is CBI and believes that sharing the data publicly will provide further justification for the actions taken in this rule. EPA responds that the Agency has aggregated and released the reported quantity of refrigerant received for reclamation, as well as the aggregate quantity of refrigerant reclaimed since 2010. This includes an aggregate of all of the different types of refrigerant reported to EPA as received and/or reclaimed. Because reporting on substitutes was previously not a requirement, the data on HFCs are incomplete and based only on reports from companies that chose to provide such data.

3. Revisions to Recordkeeping and Reporting

Under the prior regulations at § 82.164(b), reclaimers must certify that the refrigerant reclaimed meets the specifications in AHRI Standard 700–1995 using the analytical methodology prescribed in appendix A. In addition to updating the standard to AHRI Standard 700–2016, EPA is finalizing revisions to the regulations to clarify that the analysis must be conducted on each batch of refrigerant being reclaimed and that reclaimers must maintain records of each analysis. Requiring reclaimers to maintain records helps to ensure that refrigerant is being reclaimed to the appropriate specifications. The standard practice for reclaimers currently is to analyze by batch, and to generate records when doing so, so these revisions update the regulations to reflect current practices and do not add additional burden. EPA is also requiring that all recordkeeping and reporting requirements for reclaimers be maintained and reported by refrigerant type (*i.e.,* ASHRAE number). Information kept in this format will provide more clarity on the types and quantities of refrigerants being reclaimed when aggregated information is reported.

EPA is also clarifying what aggregate information must be reported annually to the Agency, and removing a redundant recordkeeping provision related to that report. Currently, reclaimers provide data on ODS reclamation to EPA in multiple formats. EPA intends to develop an electronic form to standardize the reporting across all reclaimers. This should reduce burden on the Agency and on reclaimers as EPA must currently engage in a back and forth process to ensure that all required data have been reported properly. This will also allow the Agency to publish reclamation data in a more timely manner.

Previously reclaimers were required to certify that the refrigerant reclaimed meets the specifications in AHRI Standard 700–1995 using the analytical methodology prescribed in appendix A. EPA proposed to specify that reclaimers must, ''[v]erify that each batch of refrigerant reclaimed meets these specifications using the analytical

methodology prescribed in appendix A,'' but did not propose a definition of the term *batch.* Multiple reclaimers supported testing each batch of refrigerant but suggested that EPA define the term batch. These commenters proposed identical or similar definitional language requesting that EPA define a batch of refrigerant as a single bulk cylinder containing the reclaimed refrigerant after all processing has been completed but prior to packaging or shipping to the market. EPA agrees that specifying what a batch is will assist reclaimers in complying with this requirement and is therefore adding *batch* to the defined terms in § 82.152. This added definition is materially similar to what commenters suggested.

One commenter suggested that a testing ID or batch number be placed on each cylinder packaged from the bulk cylinder to allow for traceability back to the analysis. EPA recognizes that some companies may want to do this for their own internal quality control. However, EPA is not presently convinced of the environmental benefit of making this change at this time.

Multiple reclaimers requested that the reclaimed refrigerant be independently analyzed by an accredited laboratory. They stated that independently verifying that reclaimed refrigerant meets the required specifications reaffirms the appropriate industry standard already being followed by most reclaimers. One commenter found that it would not be necessary to require independent analysis since all reputable reclaimers already do this. EPA responds that it did not propose to require independent third-party testing of reclaimed refrigerant and does not presently have sufficient information to finalize such a requirement. Before requiring third-party testing, EPA would want to better understand the frequency with which such testing is done, the costs involved, whether such testing would improve the quality of the reclaimed refrigerant on the market, and which and how many companies conduct such testing. Therefore, at this time EPA is not requiring independent third-party testing. However, as discussed previously in this notice, ensuring the quality of reclaimed refrigerant is very important to its use and to further the goals of the section 608 program and EPA may consider establishing such requirements in a future rulemaking.

EPA requested comment on possible future proposed revisions to the reclamation requirements including establishing more stringent certification requirements for reclaimers; establishing a third-party certification or audit program for reclaimers; and requiring labeling of reclaimed refrigerant. Many reclaimers and other commenters provided input on these questions. Because EPA was merely seeking comment for potential future actions and did not propose any specific action for this rulemaking, EPA is not responding to those comments at this time and is not taking final action with respect to any of those comments. EPA will consider the information received for a potential future rulemaking.

4. Hazardous Wastes

EPA received comments related to hazardous waste in the context of the safe disposal requirements, recovery equipment, and reclamation. Multiple commenters requested that EPA create new Resource Conservation and Recovery Act (RCRA) exclusions from the definition of hazardous waste for all recovered refrigerants, perhaps with the exception of ammonia. The commenters stated that classifying used refrigerant as a hazardous waste would prevent technicians from recovering and transporting used refrigerant and prevent reclaimers from accepting, processing, or reclaiming such refrigerant. As a result, commenters foresee less recovery and increased emissions because handling compounds classified as hazardous waste would be cost prohibitive. The commenters point to the exclusion EPA created for used CFCs at 40 CFR 261.4(b)(12) as a model.

EPA responds that to be a hazardous waste, a compound must either be specifically listed as a hazardous waste per 40 CFR 261 Subpart D or exhibit one of the following characteristics: Ignitability, reactivity, toxicity, or corrosivity per 40 CFR 261 Subpart C. In 1990, EPA revised the toxicity characteristic and as a result, became aware that certain CFCs may exhibit the toxicity characteristic. On February 13, 1991, the Agency issued an exclusion from the RCRA hazardous waste regulations for CFCs used as refrigerants, provided the refrigerant is reclaimed for further use. Most non-exempt substitute refrigerants are not listed nor do they exhibit any characteristics of a hazardous waste and therefore, are not considered hazardous wastes when they are recovered and reclaimed. However, some refrigerants are flammable (*e.g.,* HFC–32), which are likely to exhibit the hazardous waste characteristic of ignitability.

5. Clarifications and Edits for Readability

EPA is also finalizing revisions in this rule that consolidate provisions related to refrigerant reclaimers into a single section at § 82.164. This rule also clarifies what is required of the reclaimer. The prior regulations required a reclaimer to certify that he or she will meet a certain set of standards and engage in certain behaviors. The revised regulations require first, that a reclaimer meet those standards and behaviors and second, that they certify to having done so. EPA is making this revision to improve the clarity and enforceability of these provisions. EPA did not receive any comments on this proposal.

L. Revisions to the Recordkeeping and Reporting Requirements in § 82.166

1. Background

The prior regulations included all recordkeeping and reporting provisions in one section of subpart F (§ 82.166). While having all the provisions in one place can be useful, they are separated from the required practices specific to that regulated entity. This can create difficulty for the regulated community in finding what records they must keep and what reports they must make to remain in compliance with the section 608 requirements. To improve the readability of the recordkeeping and reporting provisions, EPA is moving the requirements that were in § 82.166 to the relevant section describing the required practices. The recordkeeping and reporting provisions that remain in § 82.166 relate to the leak repair provisions in § 82.156(i) that are effective until January 1, 2019.

EPA summarizes some of the key amended recordkeeping and reporting provisions for this rulemaking below and intends to prepare a guidance document for this rule that includes all of the recordkeeping and reporting requirements. Additional discussion of these provisions may be found in the section of this notice discussing the corresponding required practice. This summary is not exhaustive, so to determine all of recordkeeping requirements that apply to a particular requirement, you must consult the appropriate text in the revised regulations.

2. Summary of Recordkeeping Provisions

A summary of some key, revised recordkeeping requirements for subpart F is included here. Unless otherwise noted, all records must be maintained for at least three years.

• *Disposal of Small Appliances, MVACs, and MVAC-like Appliances:* Persons who take the final step in the disposal process of such appliances

must keep a copy of all the signed statements indicating refrigerant was recovered properly. This statement must include the name and address of the person who recovered the refrigerant and the date the refrigerant was recovered. Alternatively, the statement may be a signed contract stating either that the supplier will recover any remaining refrigerant from the appliance in accordance with § 82.155 prior to delivery or will verify that the refrigerant has been properly recovered before receipt by the supplier.

• *Disposal of Appliances Containing More than 5 and Less than 50 Pounds of Refrigerant:* Persons evacuating refrigerant from appliances with a full charge of more than 5 and less than 50 pounds of refrigerant for purposes of disposal of that appliance must maintain records documenting their company name, location of the appliance, date of recovery, and type of refrigerant recovered for each appliance. They must also keep records of the quantity of refrigerant, by type, recovered from such appliances in each calendar month and the quantity and type of refrigerant transferred for reclamation, the person to whom it was transferred, and the date of transfer.

• *Leak Inspection:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant must maintain documentation from quarterly or annual leak inspections that includes the date of inspection, method used for the inspection, a list of locations where leaks were discovered, and a certification that all visible and accessible parts of the appliance were inspected. Technicians conducting leak inspections must provide such documentation to the owner or operator. Alternatively, owners or operators may install an automatic leak detection system and maintain records for that system, including records showing that the system is audited or calibrated annually and records related to the leaks that the system identifies.

• *Full Charge:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant must maintain records relating to the full charge of the appliance, including records documenting what the full charge amount is for such appliances, how it was determined, the range and its midpoint for the full charge, and any revisions to the full charge. The record for the current full charge must be maintained until three years after the appliance is retired.

• *Service Records Provided by Technicians:* Persons adding or removing refrigerant from an appliance with a full charge of 50 or more pounds of refrigerant must provide the owner or operator with documentation containing the identity and location of the appliance; the date and type of maintenance, service, repair, or disposal performed; the parts of the appliance serviced, maintained, repaired, or disposed of; the name of the person performing the maintenance, service, repair or disposal; and the amount and type of refrigerant added to or removed from the appliance. The appliance owner or operator must maintain service records provided by technicians.

• *Verification Tests:* Owners or operators of any appliance with a full charge of 50 or more pounds of refrigerant must maintain records relating to any verification tests, including records of the dates, types, and results of all initial and follow-up verification tests. Technicians conducting verification tests must provide documentation of such activities to the owner or operator.

• *Retrofit/Retirement Plans:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant that are subject to retrofit/retirement requirements must maintain retrofit or retirement plans. The plan must contain the following information: Identification and location of the appliance; type and full charge of the refrigerant used; type and full charge of the refrigerant to which the appliance will be converted, if retrofitted; itemized procedure for converting the appliance to a different refrigerant, including changes required for compatibility with the new substitute, if retrofitted; plan for the disposition of recovered refrigerant; plan for the disposition of the appliance, if retired; and a schedule, not to exceed one year, for completion of the appliance retrofit or retirement.

• *Requests to Extend the Deadline to Repair or Retrofit/Retire Appliances:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant must maintain copies of extension requests.

• *Chronically Leaking Systems:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant that leak 125 percent or more of the full charge in a calendar year period must maintain copies of reports submitted to EPA.

• *Mothballing:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant that mothball an appliance must keep records documenting when the system was mothballed and when they add refrigerant back into the appliance.

• *Purged Refrigerant:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant who exclude from their leak rate calculation purged refrigerant that is destroyed must maintain records related to the destruction of that purged refrigerant, including records that demonstrate that a 98 percent or greater destruction efficiency is met and that include flow rate, quantity or concentration of the refrigerant in the vent stream, and periods of purge flow.

• *Seasonal Variances:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant who exclude additions of refrigerant due to seasonal variance from their leak rate calculation must maintain records stating that they are using the seasonal variance flexibility and documenting the amount added and removed.

• *Lists of Certified Recovery Equipment and Testing Results:* Organizations that are approved to certify refrigerant recovery and/or recycling equipment must maintain records of equipment testing and performance and a list of equipment that meets EPA requirements. These records must be maintained for three years after the equipment is no longer offered for sale.

• *Proof of Certification for Technicians:* Technicians who have passed the section 608 Type I, II, III or Universal test, must keep a copy of their certification at their place of business. These records must be maintained for three years after a certified individual no longer operates as a technician.

• *Sales Restriction:* Anyone selling ODS or a non-exempt substitute refrigerant must document the name of the purchaser, the date of sale, and the quantity of refrigerant purchased. In instances where the buyer employs a certified technician, the seller must keep the information provided by the buyer to demonstrate that at least one technician is properly certified. Copies of technician certifications must be maintained for three years after each purchase. These records would not apply to the sale of small cans of substitute refrigerant for servicing MVACs.

• *Small Cans of Substitute Refrigerant for MVAC Servicing:* Anyone manufacturing small cans of substitute refrigerant with a self-sealing valve for use in an MVAC must maintain records verifying that the self-sealing valves do not leak more than 3.00 grams per year when the self-sealing valve is closed, consistent with appendix E to subpart F, as revised.

• *Technician Certification Programs:* Organizations that certify technicians must maintain records of who they

certify, the scores of all certification tests administered, and the dates and locations of all tests administered. These records must be maintained as long as they are in operation, not just for three years. If a previously approved technician certifying organization stops certifying technicians for any reason, they must ensure those records are transferred to another certifying program or EPA. The recordkeeping requirements can be found in section (g) of appendix D of this subpart.

• *Reclaimers:* Reclaimers must maintain records, by batch, of the analyses conducted to verify that reclaimed refrigerant meets the necessary specifications. On a transactional basis, reclaimers must maintain records of the names and addresses of persons sending them material for reclamation and the quantity of the material (the combined mass of refrigerant and contaminants) by refrigerant type sent to them for reclamation.

4. Summary of Reporting and Notification Provisions

Reporting and notification are important components of the National Recycling and Emission Reduction Program and allow EPA to track compliance with the requirements. A summary of some key requirements is included here, and additional discussion may be found in other sections of this notice. Please consult the appropriate regulatory provision for a complete list of reporting and notification requirements. All of these reporting requirements are new for equipment containing non-exempt substitutes. Unless the information is claimed as confidential business information or as otherwise noted, all notifications must be submitted electronically to *608reports@epa.gov*. Electronic submission of reports should decrease burden on both EPA and the regulated community.

• *Extensions to the 30-day or 120-day Leak Repair Requirement:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant must request an extension from EPA when seeking additional time to complete repairs.

• *Extensions to Retrofit or Retire Appliances:* Owners or operators of appliances with a full charge of 50 or more pounds of refrigerant must request an extension from EPA when seeking additional time to complete a retrofit or retirement.

• *Relief from the Obligation to Retrofit or Retire an Appliance:* Owners or operators who are retrofitting or retiring an appliance with a full charge of 50 or more pounds of refrigerant may request that EPA relieve them of that obligation if they can establish within 180 days of the plan's date that the appliance no longer exceeds the applicable leak rate. The owner or operator must provide the retrofit or retirement plan; the date that the requirement to develop a retrofit or retirement plan was triggered; the leak rate; the method used to determine the leak rate and full charge; the location of the leak(s) identified in the leak inspection; a description of repair work that has been completed; a description of repair work that has not been completed; and a description of why the repair was not conducted within the required time frames.

• *Chronically Leaking Systems:* Owners or operators must submit a report to EPA for any appliance with a full charge of 50 or more pounds of refrigerant that leaks 125 percent or more of the full charge in a calendar year. This report must describe efforts to identify leaks and repair the appliance.

• *Purged Refrigerant:* The first time that owners or operators of appliances with a full charge of 50 or more pounds of refrigerant exclude purged refrigerant that has been destroyed from their leak rate calculation, they must provide a one-time report to EPA that includes the identification of the facility and a contact person; a description of the appliance; a description of the methods used to determine the quantity of refrigerant sent for destruction and type of records that are being kept; the frequency of monitoring and data-recording; and a description of the control device, and its destruction efficiency.

• *Previously Certified Recovery/Recycling Equipment:* Organizations that are approved to certify refrigerant recovery and/or recycling equipment must inform EPA if subsequent tests indicate a previously certified model line for recovery and/or recycling devices does not meet EPA requirements.

• *Technician Certification Programs:* Organizations that certify technicians must publish online lists/databases of the people that they certify. Organizations must report to EPA twice a year the pass/fail rate and testing schedules. Organizations that receive records from a program that no longer offers the certification test must inform EPA within 30 days of receiving these records. The notification must include the name and address of the program to which the records have been transferred. The reporting requirements can be found in section (g) of appendix D of this subpart.

• *Reclaimer Change of Business Information, Location or Contact Information:* If a reclaimer changes address or management, they must notify EPA within 30 days. Since reclaimer certification is not transferable, if ownership changes, the new owner must certify to EPA that they will meet the reclaimer certification requirements.

• *Amounts Reclaimed:* Reclaimers must report annually the total aggregate quantity of material sent to them for reclamation (the combined mass of refrigerant and contaminants) by refrigerant type, the total mass of each refrigerant reclaimed, and the total mass of waste products.

M. Effective and Compliance Dates

EPA proposed that the final rule become effective on January 1, 2017, with later compliance dates for specific provisions that stakeholders may need additional time to implement. The ''effective date'' is the date that the regulatory text in the Code of Federal Regulations at 40 CFR part 82, subpart F will change. Unless otherwise specified, it is also the date by which the regulated community must comply with the revised regulation. Additional ''compliance dates'' are the dates by which the regulated community must comply with specific provisions of the revised regulation.

One commenter stated that January 1, 2017, is too aggressive a compliance date, given the length of time needed to issue the final rule and the rule's size and complexity. EPA responds that while the Agency is finalizing an effective date of January 1, 2017, as proposed, it is also establishing later compliance dates for some new provisions as well as for the application of some existing provisions to non-exempt substitutes. Where a later compliance date applies, the revised regulations explicitly specify that later compliance date.

The existing provisions related to ODS that were not substantively modified by the rule continue to apply with respect to ODS. For minor changes to existing ODS provisions, the compliance date is the same as the effective date of the rule. Provisions in this final rule for which there is no delayed compliance date with respect to ODS include the sales restriction, technician certification requirements, safe disposal requirements, evacuation requirements, restriction on the sale of used refrigerant, requirement that appliances include a process stub or servicing aperture, and the recordkeeping associated with those provisions. While in most instances this

rule establishes a later compliance date for application of these provisions to non-exempt substitutes, the restriction on the sale of used substitute refrigerant and the requirement that appliances containing non-exempt substitutes include a process stub or servicing aperture apply for non-exempt substitutes as of January 1, 2017. In addition, the revised standards for the sale or import of recovery and/or recycling equipment apply for both ODS and non-exempt substitutes as of January 1, 2017.

This rule establishes a compliance date of January 1, 2018, for many provisions that are newly applicable to substitute refrigerants. These include the sales restriction, technician certification requirements, safe disposal requirements, evacuation requirements, and the recordkeeping associated with those provisions. The new requirement that small cans of substitute MVAC refrigerant be equipped with self-sealing valves will also apply as of January 1, 2018. In addition, this rule establishes a compliance date of January 1, 2018, for the new recordkeeping requirement associated with the disposal of appliances containing more than five and less than 50 pounds of either ODS or non-exempt substitute refrigerant.

Lastly, this rule establishes a compliance date of January 1, 2019, for the revised leak repair provisions, regardless of whether the appliance contains an ODS or a non-exempt substitute refrigerant.

The following sections discuss EPA's rationale for these staggered compliance dates.

1. Section 82.154(c)—Refrigerant Sales Restriction

EPA proposed January 1, 2017, as the compliance date for the sales restriction of all refrigerant (non-exempt substitutes or ODS). EPA also proposed to require that small cans of MVAC refrigerant be manufactured with self-sealing valves by one year from the publication of the final rule and that the sale of small cans without self-sealing valves cease by two years from publication of the final rule.

EPA is finalizing a compliance date of January 1, 2018, for the sales restriction as applied to non-exempt substitute refrigerants. Changes related to the sales restriction, as applied to ODS, apply January 1, 2017, as proposed. EPA is also finalizing a compliance date of January 1, 2018, to equip small cans with a self-sealing valve. EPA is not finalizing a sell-through requirement in this rule.

EPA is delaying the compliance date for the sales restriction so that it matches the compliance dates for other aspects of the rule related to sales of non-exempt substitute refrigerants. Specifically, EPA proposed one year from the date of publication of the final rule as the date by which technicians working with appliances containing non-exempt substitutes must be certified and the date by which small cans of MVAC refrigerant must be equipped with a self-sealing valve. As discussed below, EPA is finalizing January 1, 2018, as the compliance date for both of those provisions. To minimize potential conflicts by having different compliance dates, EPA is extending the compliance date for the sales restriction of substitute refrigerants to January 1, 2018.

With regards to small cans of MVAC refrigerant, manufacturers, distributors and retailers of automotive refrigerant supported the proposed ''manufacture-by'' date of one year from publication of the final rule, but commented that they oppose a sell-through date for small cans that do not have self-sealing valves. They commented that such a requirement would be inefficient, burdensome, costly, and environmentally problematic. It would require all retailers to know of the requirement and establish processes for returning unsold cans back to the manufacturer for destruction. More likely, the cans may be improperly disposed of, which would negate the environmental benefit of the new provisions. One commenter stated that a ''manufacture-by'' date would shift EPA's burden in ensuring compliance from a few manufacturers to thousands of retailers. Furthermore, commenters cited EPA's July 2015 SNAP rule (80 FR 42901; July 20, 2015) which listed HFC–134a as unacceptable for use as an aerosol as of a ''manufacture-by'' date, rather than a ''sell-by'' date. CARB commented on EPA's proposal for a two-year sell-through period that a one-year sell-through period has been found to be acceptable in their experience.

EPA responds that to allow all entities in the distribution chain time to plan for and communicate changes to the sales restriction on non-exempt substitute refrigerants, as well as the requirement for self-sealing valves on small cans, EPA is finalizing a sales restriction date and ''manufacture-by'' or ''import-by'' date of January 1, 2018. This will provides slightly more time than one year from publication of the final rule, which EPA proposed for the self-sealing valve requirement. Generally speaking, EPA has attempted to simplify the compliance dates so they do not fall in the middle of a month or during the middle of the cooling season.

In response to the comments received on EPA's proposal to allow small cans manufactured and placed into initial inventory or imported before that date to be sold for one additional year, EPA is not finalizing the sell-through requirement and is finalizing only a date by which small cans must be manufactured or imported with a self-sealing valve. EPA agrees that this is the least-burdensome option and that it avoids the potential for any unintended consequences of a ''sell-by'' date.

2. Section 82.155—Safe Disposal of Small Appliances, MVAC, and MVAC-Like Appliances

EPA proposed that the extension of the requirements for the recovery of non-exempt substitute refrigerant prior to disposal/recycling of small appliances, MVACs, and MVAC-like appliances take effect one year from publication of the final rule. EPA proposed that changes related to ODS equipment be effective January 1, 2017.

One commenter supported the proposed one-year extension to the compliance date for substitute refrigerants. EPA is finalizing a compliance date of January 1, 2018, for the extension to non-exempt substitute refrigerants. This will provide sufficient time for final disposers such as scrap recyclers to learn about the extension to non-exempt substitutes and make any adjustments needed to start maintaining records associated with disposal of appliances containing non-exempt substitutes. Using January 1, 2018, rather than one year from publication will also make communicating the compliance date for the rule easier.

Because EPA is not making substantive changes to the existing requirements for appliances containing ODS, EPA does not expect that final disposers will need extra time to adjust to the updates in this rule for those appliances. Accordingly, EPA is finalizing a compliance date for ODS appliances of January 1, 2017.

3. Section 82.156—Proper Evacuation of Refrigerant From Appliances

EPA proposed that the extension of the requirements related to the evacuation of non-exempt substitute refrigerants before the maintenance, servicing, repair, or disposal of appliances apply one year from publication of the final rule. EPA proposed that changes related to ODS equipment apply January 1, 2017.

Two commenters supported the proposed one year extension to the compliance date for non-exempt substitutes. Another commenter requested two years on the ground that

recovery and reclamation equipment may need to be modified to meet the requirements of the final rule. EPA responds that the Agency is not requiring that existing recovery and/or recycling equipment be modified or replaced with new equipment.

EPA is finalizing a compliance date of January 1, 2018, for the extension of the requirements to appliances containing non-exempt refrigerants. This will provide affected entities time to learn about the extension and make any adjustments needed to apply the required practices to the evacuation of appliances containing non-exempt substitutes. Because EPA is not making substantive changes to the existing requirements for appliances containing ODS, EPA does not expect that affected entities will need extra time to adjust to the updates in this rule for those appliances. Accordingly, EPA is finalizing a compliance date for ODS appliances of January 1, 2017.

EPA is establishing a delayed compliance date of January 1, 2018, for the new requirement to keep records upon disposal of appliances containing either a class I, class II, or non-exempt substitute refrigerant. This is slightly more than one year from publication of the final rule, which was what EPA proposed. The delayed compliance date will allow affected entities to establish a recordkeeping program to track the amount of refrigerant recovered from appliances that are disposed of in the field. EPA expects that the same amount of time will be needed for ODS and non-ODS appliances because this is a new requirement, not an update to an existing requirement.

4. Section 82.157—Appliance Maintenance and Leak Repair

This rule makes significant revisions to the leak repair provisions, including lowering the leak rates, requiring leak repair verification tests on new types of equipment, and modifying the recordkeeping and reporting requirements. In addition, owners and operators of appliances using non-exempt substitute refrigerants that were previously not covered by any subpart F required practices will have to familiarize themselves with the requirements. EPA is therefore establishing a later compliance date for the appliance maintenance and leak repair requirements than for most other provisions.

EPA proposed a compliance date 18 months from publication of the final rule. One commenter suggested that EPA shorten the compliance date to 12 months and two commenters agreed that it should be at minimum 18 months. Five commenters recommended more than 18 months, with the longest extensions ranging from 24 to 36 months after the publication of the final rule. These commenters stated that later dates would decrease the costs of compliance and give companies adequate time to train employees and update current systems to meet the requirements of the rule. Extending the compliance dates would also allow more time for owners or operators to bring equipment up to the new standards, and avoid having to potentially conduct numerous repairs or replacements at once. Commenters who supported a 36-month extension noted constraints with the federal budget cycle and acquisition requirements or referred to Maximum Achievable Control Technology rules that typically provide three years to comply.

Because the leak repair provisions already provide the opportunity for extensions for delays caused by the federal agency appropriations and/or procurement process, EPA disagrees with federal agencies requesting a 36 month extension to the compliance date. EPA agrees with commenters that additional time may be needed to understand the regulations and to make repairs on systems that have not previously been subject to the subpart F required practices. Therefore, EPA is establishing a compliance date of January 1, 2019. This date is two years from the effective date, and more than 24 months from publication of the final rule. This is sufficient time for owners and operators of appliances with 50 or more pounds of refrigerant to learn about the updated requirements; update systems, standard operating procedures, and training materials to best administer the requirements; and fix leakier systems.

Until January 1, 2019, the leak repair provisions at § 82.156(i) and the associated recordkeeping requirements at § 82.166 continue to apply as specified to appliances containing ODS refrigerant. Those leak repair provisions use terminology contained in the definitions as they existed prior to this rulemaking. EPA has added those unmodified definitions to § 82.156(j) for the purposes of implementing § 82.156(i) until the new provisions take effect January 1, 2019.

5. Section 82.158—Recovery and Recycling Equipment

EPA proposed that the standards for recovery and recycling equipment apply to the manufacture and import of equipment for non-exempt substitutes as of January 1, 2017. One commenter requested additional time on the ground that recovery and recycling equipment may need to be modified to meet the requirements of the final rule. EPA responds that the Agency is not requiring that existing recovery and/or recycling equipment be modified or replaced with new equipment certified for use with non-exempt substitute refrigerants. Rather, EPA is requiring only that *newly manufactured or imported* recovery and/or recycling equipment meet the new standards upon the compliance date.

6. Section 82.161—Technician Certification Requirements

EPA proposed that technicians be certified to handle non-exempt substitute refrigerants by one year from publication of the final rule. EPA proposed that changes related to ODS apply January 1, 2017.

One commenter supported the one year extension to the compliance date for non-exempt substitute refrigerants. Another commenter requested two years so as to allow time for certifying organizations to write and review the certification test questions as well as train, or re-train, technicians on that new material.

EPA is establishing a compliance date of January 1, 2018, for technicians to be certified to handle non-exempt substitute refrigerants. This is slightly more than the proposal of one year from publication of the final rule. This will provide time for EPA to update the test bank with questions related to non-exempt substitute refrigerants and for certifying organizations to update their testing materials to use the new questions. EPA does not anticipate that a two year extension would be necessary because HVACR contractors are generally working on both ODS refrigerants and non-exempt substitute refrigerants, and there is not likely to be a rush of contractors needing to be certified.

EPA is also finalizing the compliance dates for the publication of lists of certified technicians as proposed. As such, any technician certified on or after January 1, 2017, must be included in a publicly accessible list of certified technicians or provided the ability to opt out. Technician certification programs must make these lists available starting January 1, 2018.

V. Possible Future Revisions to Subpart F

EPA requested input on other aspects of the National Recycling and Emission Reduction Program that might be addressed in a future rulemaking. Specifically EPA requested feedback on (1) establishing a voluntary program for

supermarkets based on their corporate-wide average leak rate; (2) establishing more stringent certification requirements for reclaimers; (3) establishing a third-party certification or audit program for reclaimers; (4) requiring labeling of reclaimed refrigerant; (5) moving further upstream the responsibility to recapture refrigerant from appliances being disposed of; (6) requiring recertification of currently certified technicians; and (7) establishing a technician certification requirement or sales restriction for flammable refrigerants. EPA is not taking any final action on these topics in this rule but does greatly value the information provided by commenters. EPA has prepared a summary of these comments that is available in the docket for this rule.

VI. Economic Analysis

For the reasons explained in Section III of this preamble, EPA considered economic factors in the development of this rule. EPA considered the costs of different actions that would achieve the goals of this rule to individual entities and the United States economy as a whole. While selecting regulatory actions that would achieve the goals of this rule, EPA elected to consider the costs of different actions to individual entities and the United States economy as a whole. Many commenters claimed that the benefits of the proposed regulatory provisions do not justify the costs, while four comments supported the cost effectiveness of the proposed rule. EPA has taken these comments into consideration and is finalizing several provisions that will be less burdensome than proposed. This section provides a brief overview of how the Agency calculated costs and then discusses major revisions to the final rule that affect EPA's economic analysis. A full description of the cost analyses is included in the technical support document *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program,* which can be found in the docket.

To estimate the incremental costs of the regulatory revisions, the Agency developed a set of model entities with a distribution of different model facilities, each of which could contain a set of model appliances. This set of model entities was used to represent the potentially affected entities in a variety of economic sectors in the United States, and they were developed based on EPA's Vintaging Model and cross-checked with the 2013 dataset of repair records developed under California's RMP. Each model entity reflects information about the typical number of facilities in a given sector and size category and the number of pieces of equipment in each equipment category that are likely to be owned and/or operated by each facility. By combining the model entities with economic data on potentially affected industries from the United States Census, EPA obtained a model for the potentially affected population. By applying the costs of leak inspections, repairs, recordkeeping and reporting, self-sealing cans for MVAC servicing, and other regulatory revisions to this population, EPA estimated the costs to individual entities and the total cost to the economy.

Some regulatory revisions in this action, such as providing extensions to owners or operators of comfort cooling and commercial refrigeration before having to replace leaking appliances reduce the cost of compliance to owners of ODS-containing equipment. These reductions were included in the incremental cost of the action.

As detailed more fully in the technical support document, the rulemaking includes new compliance costs of approximately $75.5 million split into approximately $32.5 million for owners and operators of equipment containing ODS and $43 million in non-ODS systems. Offsetting the new compliance costs are reductions in cost due to the removal of some regulatory requirements and increasing flexibility for repairs. These offsetting costs total $51 million, all related to equipment containing ODS. Taken together (the new compliance costs less the offsetting costs), EPA estimates that the net total cost to comply with the requirements of this final rule is $24.5 million per year (Table 3 shows these net costs at both the rule component level and for the total rule).

TABLE 3—INCREMENTAL ANNUAL COMPLIANCE COSTS BY RULE COMPONENT (2014$) WITH 7% AND 3% DISCOUNT RATES

Rule component	Total incremental compliance costs (7% discount rate)			Total incremental compliance costs (3% discount rate)		
	HFC	ODS	Total	HFC	ODS	Total
Leak Repair:						
Comfort Cooling	$5,046,000	−$38,191,000	−$33,145,000	$2,437,000	−$18,705,000	−$16,268,000
Commercial Refrigeration	1,709,000	−10,137,000	−8,428,000	823,000	−4,963,000	−4,139,000
IPR	385,000	31,000	417,000	186,000	13,000	200,000
Leak Inspection	21,703,000	27,460,000	49,163,000	21,703,000	27,460,000	49,163,000
Reporting & Recordkeeping	11,101,000	2,350,000	13,451,000	11,101,000	2,350,000	13,451,000
Self-sealing Valves on Small Cans	3,070,000	.....	3,070,000	3,070,000	.....	3,070,000
Total	43,014,000	−$18,487,000	24,528,000	39,320,000	6,155,000	45,477,000

Totals may not sum due to independent rounding.

Some regulatory revisions, by reducing the amount of refrigerant lost to leaks, also result in savings for equipment owners or operators of the cost of purchasing replacement refrigerant. EPA estimates that affected entities would avoid spending over $44 million in refrigerant purchases alone due to the regulatory revisions. The compliance costs and refrigerant savings combined are estimated to be savings of $19.6 million per year. Furthermore, costs could additionally be lower because appliances running with the correct amount of refrigerant are generally more energy efficient to operate and last longer.

TABLE 4—TOTAL ANNUAL REFRIGERANT SAVINGS (2014$) AND COMBINED ANNUAL COST AND ANNUAL SAVINGS 2ITH 7% AND 3% DISCOUNT RATE

Rule component	Annual refrigerant savings			7% Discount rate		3% Discount rate	
	HFC	ODS	Total	Incremental compliance costs	Combined annual savings and compliance costs	Incremental compliance costs	Combined annual savings and compliance costs
Leak Repair:							
Comfort Cooling	−$9,853,000	−$20,221,000	−$30,073,000	−$33,145,000	−$63,218,000	−$16,268,000	−$46,341,000
Commercial Refrigeration	−3,439,000	−7,514,000	−10,953,000	−8,428,000	−19,381,000	−4,139,000	−15,092,000
IPR	−1,582,000	−1,533,000	−3,115,000	417,000	−2,698,000	200,000	−2,915,000
Leak Inspection				49,163,000	49,163,000	49,163,000	49,163,000
Reporting & Recordkeeping				13,451,000	13,451,000	13,451,000	13,451,000
Self-sealing Valves on Small Cans				3,070,000	3,070,000	3,070,000	3,070,000
Total	−14,874,000	−29,268,000	−44,141,000	24,528,000	−19,613,000	45,477,000	1,336,000

Totals may not sum due to independent rounding.

Several commenters questioned the validity of EPA's cost estimates and some provided examples of costs from their own business/organizations. One commenter said that, given the amount of paperwork and added compliance requirements in the proposed rule, the cost estimates are implausibly low and call into question the fundamental integrity of the Agency's economic analysis. Another said that they would estimate the cost to implement the new requirements to be well in excess of $100 million just to repair and potentially replace IPR systems, noting that the replacement of a single complex IPR system can be as high as $10 million.

EPA responds that the aggregate costs and savings for the economy as a whole would not be expected to be distributed evenly across affected entities. For example, owners of ODS-containing equipment with low leak rates might only incur costs for recordkeeping. On the other hand, owners of HFC-containing equipment with high leak rates might incur costs of repairing leaks, though they would also realize savings due to reduced refrigerant purchases. Owners of ODS-containing comfort cooling or commercial refrigeration appliance with high leak rates may also incur costs of repairing leaks but also substantial cost savings by not having to retrofit or retire the appliance if unable to repair within 30 days, given the extensions provided in the final rule.

Several commenters claimed that requiring all systems to have annual or quarterly leak inspections would impose significant costs on owners of all systems including those systems that do not leak or leak very little. One commenter, using their estimate for the cost of each leak inspection of a particular facility's appliances, when taken quarterly across some 5,200 retail stores and supporting business units, stated that the impact on their company would exceed $10 million. Another commenter called quarterly leak inspections redundant if it is already required that leaks be fixed in a timely manner. Two commenters supported leak inspections and trade group supported periodic leak inspections as a proactive means to detect leaks, reduce refrigerant emissions, and maintain energy efficiency of equipment.

The Agency responds that a proactive plan of maintenance leads to reduced emissions of refrigerant and is part of the best practices for operation of these systems. Discussions with members of industry and reports from the GreenChill program support the effectiveness of a program of regular inspections to lower average leak rates. However, to allow for flexibility in how system owners and operators implement their refrigeration management programs, especially for the least leaky equipment, EPA is not finalizing a requirement that all systems undergo periodic leak inspections. Only systems that show a history of excessive emissions by exceeding the leak rate threshold will require periodic inspections, and then only for a limited time if the leak rate of the system is addressed effectively. This will reduce the burden on owners of systems that are not responsible for emissions, while focusing attention on systems that require it. EPA estimates that this will affect 282,000 appliances, compared to approximately 1.5 million under the proposed rule.

EPA's analysis of the costs of leak inspection used the median hourly rate for heating, air-conditioning, and refrigeration mechanics and installers provided by the Bureau of Labor Statistics, along with an additional 110% for overhead. EPA assumed that leak inspections could be carried out quickly because the proposal allowed employees and not certified technicians to conduct the inspections. However, as discussed previously, a number of stakeholders claimed that inspections by employees not specialized in refrigeration would be far less effective and pointed out that the standard practice for many entities is to hire technicians for inspections. EPA is requiring in this final rule that leak inspections be conducted by certified technicians. EPA's final analysis continues to use the average rate provided by the Bureau of Labor Statistics but has increased the number of hours for each inspection.

Several commenters said that the costs of completely replacing a system if it leaked more than 75 percent of its full charge in two consecutive years were very high, and that these costs would not necessarily fall on those whose poor maintenance practices allowed for excessive emissions. They also commented that the provision was inefficient because all of the system components would need to be replaced, even those that were known not to be leaking, imposing additional costs with no additional benefit.

In response to the potential significant costs that commenters said the proposed ''chronic leaker'' provision would incur, EPA is finalizing a modification of this provision that would instead require reporting to EPA rather than retirement

of an appliance. This will greatly reduce the costs on owners of systems with very high emissions. While EPA had not estimated the costs or benefits of the proposed chronic leaker provision, EPA has calculated the total annual reporting burden associated with the final provision to be $126,000.

Two commenters said that requiring all leaks be fixed after a system exceeds the threshold leak rate would lead to high costs with diminishing returns as smaller and smaller leaks were repaired.

EPA maintains that once a system has been evacuated for repair it is a best practice to repair any significant leaks. Doing so makes financial sense because allowing leaks to continue leads to the purchase of more refrigerant, reduced energy efficiency, possible increased service costs if the system must be shut down and repaired again, and increased risk of loss of cooling. However, EPA agrees that some leaks may allow very small amounts of refrigerant to escape and that some leaks are difficult to access or repair. Therefore, taking into account the comments, EPA is not finalizing the requirement that all identified leaks be repaired.

Two commenters claimed that lowering the maximum leak rate for IPR systems to 20 percent would lead to significant economic burden for some businesses, and one of whom said that EPA has not provided adequate benefits to justify this requirement.

EPA has estimated that lowering the maximum rate at which systems may be allowed to leak perpetually without being repaired protects the environment by reducing emissions of pollutants. EPA recognizes that maintenance of IPR systems presents particular challenges. These systems are often very large and complex, making finding leaks more difficult. They can also be extremely costly to shut down to allow for repairs. Therefore, in consideration of comments and other feedback from stakeholders, the Agency is finalizing a leak rate of 30 percent for IPR systems. While this will reduce benefits, we hope to strike a balance between the costs and benefits of this provision that will allow greater flexibility in the management of these systems. Under the proposed leak rate of 20 percent, the EPA estimates benefits of 0.63 $MMTCO_2eq$ with costs of $7 million for leak inspections and repair. With the final leak rate of 30 percent, estimated benefits are 0.44 $MMTCO_2eq$ with costs of $5.5 million.

One commenter stated that there is substantial uncertainty in the transition pathway away from HFCs due to EPA's SNAP rule that changed the listing status for certain substitute refrigerants (80 FR 42870) (''SNAP Program Status Change Rule''). The commenter encouraged EPA to consider a wider range of possible baseline futures when calculating the 2020 and 2025 benefits of the rule.

EPA responds that the Agency has considered that many end users will change the ODS substitutes being used because of the SNAP rule and EPA considered such change when estimating the benefits of this final action. EPA assumed transitions away from substitutes that are no longer acceptable in some end-uses, most notably in commercial refrigeration based on the most likely scenario detailed in *Climate Benefits of the SNAP Program Status Change Rule* found in docket number EPA–HQ–OAR–2014–0198–0239. However, many of the differences between the scenarios in that analysis have little or no effect on the estimated benefits of the present action. For example, the analysis of the SNAP rule looked only at transitions of MVAC units for exports, as it is assumed that the domestic market will already have transitioned away from HFC–134a by 2020 due to EPA's earlier Light Duty Vehicle rule. Therefore the SNAP rule would not be expected to introduce uncertainty in the benefits in 2020 or 2025 in MVAC servicing. As another example, the different SNAP scenarios assumed that low-temperature commercial refrigeration appliances would begin to transition from HFC–134a to R–450A or R–513A in different years, but all three scenarios assume that transition will reach a maximum of 50 percent by 2020. Given the small differences in the expected equipment stock related to uncertainty in the effects of the SNAP Program Status Change Rule, we believe that assuming the effects of the ''most likely'' scenario from the SNAP analysis provides a model universe of appliances that is realistic and that avoids any possibility of double counting benefits between the two rules.

Under the Small Business Regulatory Enforcement Fairness Act (SBREFA), federal agencies must consider the effects regulations may have on small entities. If a rule may have a significant economic impact on a substantial number of small entities (SISNOSE), the Agency would be required to take certain steps to ensure that the interests of small entities were represented in the rulemaking process. To determine if this was necessary, EPA used the model entity analysis to ascertain the likelihood that the revisions would have a SISNOSE. EPA estimates that approximately 740 of the approximately 854,580 affected small businesses could incur costs in excess of 1 percent of annual sales and that fewer than 80 small businesses could incur costs in excess of 3 percent of annual sales. These levels are below the thresholds used in other Title VI rulemakings under which it can be presumed that an action will have no SISNOSE. Nevertheless, EPA consulted numerous stakeholders, including small businesses, in the development of this rule.

The full description of the cost analyses, including sensitivity analyses of key assumptions and alternate options, is included in the technical support document *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program,* which can be found in the docket for this action.

VII. 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 a significant regulatory action that was submitted to OMB for review. This action was deemed to raise novel legal or policy issues. Any changes made in response to OMB recommendations have been documented in the docket. EPA prepared an economic analysis of the potential costs and benefits associated with this action. This analysis is summarized in Section VI of the notice and is available in the docket.

B. Paperwork Reduction Act

The information collection activities in this rule have been submitted for approval to the Office of Management and Budget (OMB) under the PRA. The Information Collection Request (ICR) document that EPA prepared has been assigned EPA ICR number 1626.15. You can find a copy of the ICR in the docket for this rule, and it is briefly summarized here. The information collection requirements are not enforceable until OMB approves them.

All recordkeeping and reporting requirements under this program are specifically described in Section IV.L of this notice. In order to facilitate compliance with and enforce the refrigerant management requirements of section 608 of the CAA, EPA requires reporting and recordkeeping by technicians, technician certification programs, refrigerant recovery/recycling equipment testing organizations, refrigerant wholesalers and purchasers, refrigerant reclaimers, refrigeration and air-conditioning equipment owners, and other establishments that perform

refrigerant removal, service, or disposal. EPA has used and will continue to use these records and reports to ensure that refrigerant releases are minimized during the recovery, recycling, and reclamation processes. The handling and confidentiality of the reporting requirements follow EPA's confidentiality regulations at 40 CFR 2.201 *et seq.* for assuring computer data security, preventing disclosure, proper storage, and proper disposal.

Respondents/affected entities: Entities required to comply with reporting and recordkeeping requirements include technicians; technician certification programs; refrigerant wholesalers; refrigerant reclaimers; refrigeration and air-conditioning equipment owners and/or operators; and other establishments that perform refrigerant removal, service, or disposal.

Respondent's obligation to respond: Mandatory (40 CFR part 82, subpart F).

Estimated number of respondents: The total number of respondents is estimated to be approximately 861,374.

Frequency of response: The frequency of responses vary from once a year to daily. Public reporting burden for this collection of information is estimated to vary from one minute to 9.4 hours per response, including time for reviewing instructions and gathering, maintaining, and submitting information.

Total estimated burden: The total estimated burden is 580,473 hours (per year). Burden is defined at 5 CFR 1320.3(b).

Total estimated cost: The total estimated cost is $34,627,299 (per year). There are no estimated annualized capital or operation & maintenance costs associated with the reporting or recordkeeping requirements.

Much of this burden is already covered by the existing requirements in 40 CFR part 82, subpart F, and the existing ICR, which was last approved by OMB in December 2014. The OMB control number for this information collection is 2060–0256.

An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for the EPA's regulations in 40 CFR are listed in 40 CFR part 9. When OMB approves this ICR, the Agency will announce that approval in the **Federal Register** and publish a technical amendment to 40 CFR part 9 to display the OMB control number for the approved information collection activities contained in this final rule.

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. The small entities subject to the requirements of this action are businesses and small governmental jurisdictions that own or service comfort cooling, commercial refrigeration, or IPR equipment. EPA estimates that approximately 740 of the approximately 854,580 affected small businesses could incur costs in excess of 1 percent of annual sales and that fewer than 80 small businesses could incur costs in excess of 3 percent of annual sales. These levels are below the thresholds under which it can be presumed that an action will have no SISNOSE, as used in other Title VI rulemakings. Details of this analysis are presented in the *Analysis of the Economic Impact and Benefits of Final Revisions to the National Recycling and Emission Reduction Program* available in the docket.

D. Unfunded Mandates Reform Act (UMRA)

This action does not contain an unfunded mandate of $100 million or more as described in UMRA, 2 U.S.C. 1531–1538, and does not significantly or uniquely affect small governments. This rule supplements the statutory self-effectuating prohibition against venting refrigerants by ensuring that certain service practices are conducted that reduce the emissions of ozone-depleting refrigerants and their substitutes. For example, this rule strengthens the leak repair requirements, establishes recordkeeping requirements for the disposal of appliances containing more than five and less than 50 pounds of refrigerant, and modifies the technician certification program.

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. This rule does not significantly or uniquely affect the communities of Indian tribal governments. This rule supplements the statutory self-effectuating prohibition against venting refrigerants by ensuring that certain service practices are conducted that reduce the emissions of ozone-depleting refrigerants and their substitutes. For example, this rule strengthens the leak repair requirements, establishes recordkeeping requirements for the disposal of appliances containing more than five and less than 50 pounds of refrigerant, and modifies the technician certification program. Thus, Executive Order 13175 does not apply to this action.

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

This action is not subject to Executive Order 13045 (62 FR 19885, April 23, 1997) because it is not economically significant as defined in Executive Order 12866. Nonetheless, the environmental health or safety risk addressed by this action may have a disproportionate effect on children. Depletion of stratospheric ozone results in greater transmission of the sun's ultraviolet (UV) radiation to the earth's surface. The following studies describe the effects of excessive exposure to UV radiation on children: (1) Westerdahl J, Olsson H, Ingvar C. ''At what age do sunburn episodes play a crucial role for the development of malignant melanoma,'' Eur J Cancer 1994: 30A: 1647–54; (2) Elwood JM Japson J. ''Melanoma and sun exposure: an overview of published studies,'' Int J Cancer 1997; 73:198–203; (3) Armstrong BK, ''Melanoma: childhood or lifelong sun exposure,'' In: Grobb JJ, Stern RS Mackie RM, Weinstock WA, eds. ''Epidemiology, causes and prevention of skin diseases,'' 1st ed. London, England: Blackwell Science, 1997: 63–6; (4) Whiteman D., Green A. ''Melanoma and Sunburn,'' Cancer Causes Control, 1994: 5:564–72; (5) Heenan, PJ. ''Does intermittent sun exposure cause basal cell carcinoma? A case control study in Western Australia,'' Int J Cancer 1995; 60: 489–94; (6) Gallagher, RP, Hill, GB, Bajdik, CD, et al. ''Sunlight exposure, pigmentary factors, and risk of nonmelanocytic skin cancer I, Basal cell carcinoma,'' Arch Dermatol 1995; 131: 157–63; (7) Armstrong, DK. ''How sun exposure causes skin cancer: an epidemiological perspective,'' Prevention of Skin Cancer. 2004. 89–116.

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

This action is not a ''significant energy action'' because it is not likely to have a significant adverse effect on the supply, distribution or use of energy.

I. National Technology Transfer and Advancement Act

This action involves technical standards. In some instances, EPA is deciding to use a modified version of an industry standard for purposes of this rule; in others, EPA is deciding to use an industry standard by reference exactly as written.

EPA is incorporating by reference UL 1963, Supplement SB, *Requirements for Refrigerant Recovery/Recycling Equipment Intended for Use with a Flammable Refrigerant,* Fourth Edition, June 1, 2011. This establishes standards for refrigerant recovery and refrigerant recovery/recycling equipment to ensure the equipment can be used safely with flammable refrigerants. The standard is available at *www.comm-2000.com* or by writing to Comm 2000, 151 Eastern Avenue, Bensenville, IL 60106. The cost is $798 for an electronic copy and $998 for hardcopy. UL also offers a subscription service to the Standards Certification Customer Library (SCCL) 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. Therefore, EPA concludes that the UL standard being incorporated by reference is reasonably available.

EPA is incorporating by reference standards referenced in AHRI Standard 700–2016. Specifically, these standards are:

—*2008 Appendix C for Analytical Procedures for AHRI Standard 700–2014-Normative,* 2008. This document establishes definitive test procedures for determining the quality of new, reclaimed and/or repackaged refrigerants in support of the standards established in AHRI–700. An electronic copy of the appendix is available at *www.ahrinet.org*. It is also available by mail at Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—*2012 Appendix D for Gas Chromatograms for AHRI Standard 700–2014- Informative,* 2012, Air-Conditioning, Heating, and Refrigeration Institute. This appendix provides figures for the gas chromatograms used with Appendix C to AHRI Standard 700–2015: Analytical Procedures for AHRI Standard 700–2015, Normative, Specification for Fluorocarbon Refrigerants. An electronic copy of the appendix is available at *www.ahrinet.org*. It is also available by mail at Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—Federal Specification for ''Fluorocarbon Refrigerants,'' BB–F–1421 B, dated March 5, 1982. This section of this standard establishes a method to determine the boiling point and boiling point range of a refrigerant. The standard is available in the docket for this rulemaking. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—GPA STD–2177, *Analysis of Natural Gas Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography,* 2013, Gas Processors Association. This standard establishes methods for analyzing demethanized liquid hydrocarbon streams containing nitrogen/air and carbon dioxide, and purity products such as ethane/propane mix that fall within compositional ranges indicated in the standard. The standard is available at *www.techstreet.com* or by writing to Techstreet, 6300 Interfirst Drive, Ann Arbor, MI 48108. The cost of this standard is $55 for an electronic copy or $65 for a printed edition. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—ASTM Standard D1296–01–2012, *Standard Test Method for Odor of Volatile Solvents and Diluents,* July 1, 2012, ASTM International. This test method covers a comparative procedure for observing the characteristic and residual odors of volatile organic solvents and diluents to determine their odor acceptability in a solvent system. The standard is available at *www.astm.org* or by writing to ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428–2959. The cost of this standard is $39. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

EPA is incorporating by reference standards referenced in AHRI Standard 740–2016.

Specifically, these standards are:

—ANSI/ASHRAE Standard 63.2–1996 (RA 2010) Method of Testing Liquid-Line Filter Drier Filtration Capability, 2010, American National Standards Institute/American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. The purpose of this standard is to prescribe a laboratory test method for evaluating the filtration capability of filters and filter driers used in liquid lines of refrigeration systems. The standard is available at *www.ashrae.org* or by mail at AHSRAE, 1791 Tullie Circle NE., Atlanta, GA 30329. The cost is $39 for an electronic copy or printed edition. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—UL Standard 1963–2011, *Refrigerant Recovery/Recycling Equipment,* Fourth Edition, 2011, American National Standards Institute/Underwriters Laboratories, Inc. This standard establishes safety requirements for and methods to evaluate refrigerant recovery and refrigerant recovery/recycling equipment. The standard is available at *http://www.comm-2000.com* or by writing to Comm 2000, 151 Eastern Avenue, Bensenville, IL 60106. The cost is $798 for an electronic copy and $998 for hardcopy. UL also offers a subscription service to the Standards Certification Customer Library (SCCL) 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. Therefore, EPA concludes that the UL standard being incorporated by reference is reasonably available.

—AHRI Standard 110–2016, *Air-Conditioning, Heating and Refrigerating Equipment Nameplate Voltages,* 2016, Air-Conditioning, Heating, and Refrigeration Institute. This standard establishes voltage rating requirements, equipment performance requirements, and conformance conditions for air-conditioning, heating, and refrigerating equipment. A free electronic copy of this standard is available at *www.ahrinet.org*. It is also available by mail at Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201. The cost of obtaining this standard is not a

significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

—International Standard IEC 60038, *IEC Standard Voltages,* Edition 7.0, 2009–06, International Electrotechnical Commission. This standard specifies standard voltage values which are intended to serve as preferential values for the nominal voltage of electrical supply systems, and as reference values for equipment and system design. The standard is available at *http://www.iec.ch* or by writing to Techstreet, 6300 Interfirst Drive, Ann Arbor, MI 48108. The cost of this standard is $50. The cost of obtaining this standard is not a significant financial burden. Therefore, EPA concludes that the standard being incorporated by reference is reasonably available.

EPA is not incorporating by reference California Air Resources Board, *Test Procedure for Leaks from Small Containers of Automotive Refrigerant,* TP–503, as amended January 5, 2010. Rather EPA is basing the content found in appendix E on this standard. This standard establishes methods for assessing the leak rate from small containers of refrigerant. A copy of this standard is available in the docket and *www.arb.ca.gov/regact/2009/hfc09/hfc09.htm.www.arb.ca.gov/regact/2009/hfc09/hfc09.htm.*

At this time EPA is not finalizing an incorporation by reference for the ASHRAE terminology found at *https://www.ashrae.org/resources—publications/free-resources/ashrae-terminology.*

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

EPA believes this action will not have disproportionately high and adverse human health or environmental effects on minority or low-income populations because it affects the level of environmental protection equally for all affected populations. This rule amends the leak repair requirements for appliances using ozone-depleting substances, thereby protecting human health and the environment from increased amounts of UV radiation and increased incidence of skin cancer. The effects of exposure to UV radiation and the estimated reduction in emissions of ozone-depleting substances from this rule is contained in Section II.D.1 of this notice.

K. Congressional Review Act (CRA)

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

List of Subjects in 40 CFR Part 82

Environmental protection, Air pollution control, Chemicals, Incorporation by reference, Reporting and recordkeeping requirements.

Dated: September 26, 2016.

Gina McCarthy,

Administrator.

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

PART 82—PROTECTION OF STRATOSPHERIC OZONE

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

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

■ 2. Revise § 82.150 to read as follows:

§ 82.150 Purpose and scope.

(a) The purpose of this subpart is to reduce emissions of class I and class II refrigerants and their non-exempt substitutes to the lowest achievable level by maximizing the recapture and recycling of such refrigerants during the maintenance, service, repair, and disposal of appliances and restricting the sale of refrigerants consisting in whole or in part of a class I or class II ozone-depleting substance or their non-exempt substitutes in accordance with Title VI of the Clean Air Act.

(b) This subpart applies to any person maintaining, servicing, or repairing appliances containing class I, class II or non-exempt substitute refrigerants. This subpart also applies to persons disposing of such appliances (including small appliances and motor vehicle air conditioners), refrigerant reclaimers, technician certifying programs, appliance owners and operators, manufacturers of appliances, manufacturers of recovery and/or recycling equipment, approved recovery and/or recycling equipment testing organizations, and persons buying, selling, or offering to sell class I, class II, or non-exempt substitute refrigerants.

■ 3. Amend § 82.152 by:

■ a. Adding definitions for ''Batch,'' ''Class I,'' ''Class II,'' ''Comfort cooling,'' ''Component,'' ''Leak inspection,'' ''Mothball,'' ''Normal operating characteristics and conditions,'' ''Reclaim,'' ''Recover,'' ''Recycle,'' ''Retire,'' ''Retrofit,'' ''Seasonal variance,'' ''Self-sealing valve,'' and ''System receiver.''

■ b. Revising the definitions for ''Appliance,'' ''Apprentice,'' ''Commercial refrigeration,'' ''Custom-built,'' ''Disposal,'' ''Follow-up verification test,'' ''Full charge,'' ''High-pressure appliance,'' ''Industrial process refrigeration,'' ''Industrial process shutdown,'' ''Initial verification test,'' ''Leak rate,'' ''Low-loss fitting,'' ''Low-pressure appliance,'' ''Medium-pressure appliance,'' ''MVAC-like appliance,'' ''One-time expansion device,'' ''Opening an appliance,'' ''Recovery efficiency,'' ''Refrigerant,'' ''Self-contained recovery equipment,'' ''Small appliance,'' ''Substitute,'' ''Technician,'' and ''Very high-pressure appliance.''

■ c. Removing the definitions for ''Critical Component,'' ''Normal operating characteristics or conditions,'' ''Normally containing a quantity of refrigerant,'' ''Reclaim refrigerant,'' ''Recover refrigerant,'' ''Recycle refrigerant,'' ''Suitable replacement refrigerant,'' ''System mothballing,'' and ''Voluntary certification program.''

The revisions and additions to read as follows:

§ 82.152 Definitions.

As used in this subpart, the term:

Appliance means any device which contains and uses a class I or class II substance or substitute as a refrigerant and which is used for household or commercial purposes, including any air conditioner, motor vehicle air conditioner, refrigerator, chiller, or freezer. For a system with multiple circuits, each independent circuit is considered a separate appliance.

Apprentice means any person who is currently registered as an apprentice in maintenance, service, repair, or disposal of appliances with the U.S. Department of Labor's Office of Apprenticeship (or a State Apprenticeship Council recognized by the Office of Apprenticeship). A person may only be an apprentice for two years from the date of first registering with that office.

* * * * *

Batch means a single bulk cylinder of refrigerant after all reclamation has been completed prior to packaging or shipping to the market.

Class I refers to an ozone-depleting substance that is listed in 40 CFR part 82 subpart A, appendix A.

Class II refers to an ozone-depleting substance that is listed in 40 CFR part 82 subpart A, appendix B.

Comfort cooling means the air-conditioning appliances used to provide cooling in order to control heat and/or

humidity in occupied facilities including but not limited to residential, office, and commercial buildings. Comfort cooling appliances include but are not limited to chillers, commercial split systems, and packaged roof-top units.

Commercial refrigeration means the refrigeration appliances used in the retail food and cold storage warehouse sectors. Retail food appliances include the refrigeration equipment found in supermarkets, convenience stores, restaurants and other food service establishments. Cold storage includes the refrigeration equipment used to store meat, produce, dairy products, and other perishable goods.

Component means a part of the refrigerant circuit within an appliance including, but not limited to, compressors, condensers, evaporators, receivers, and all of its connections and subassemblies.

Custom-built means that the industrial process equipment or any of its components cannot be purchased and/or installed without being uniquely designed, fabricated and/or assembled to satisfy a specific set of industrial process conditions.

Disposal means the process leading to and including:

(1) The discharge, deposit, dumping or placing of any discarded appliance into or on any land or water;

(2) The disassembly of any appliance for discharge, deposit, dumping or placing of its discarded component parts into or on any land or water;

(3) The vandalism of any appliance such that the refrigerant is released into the environment or would be released into the environment if it had not been recovered prior to the destructive activity;

(4) The disassembly of any appliance for reuse of its component parts; or

(5) The recycling of any appliance for scrap.

Follow-up verification test means those tests that involve checking the repairs to an appliance after a successful initial verification test and after the appliance has returned to normal operating characteristics and conditions to verify that the repairs were successful. Potential methods for follow-up verification tests include, but are not limited to, the use of soap bubbles as appropriate, electronic or ultrasonic leak detectors, pressure or vacuum tests, fluorescent dye and black light, infrared or near infrared tests, and handheld gas detection devices.

Full charge means the amount of refrigerant required for normal operating characteristics and conditions of the appliance as determined by using one or a combination of the following four methods:

(1) Use of the equipment manufacturer's determination of the full charge;

(2) Use of appropriate calculations based on component sizes, density of refrigerant, volume of piping, and other relevant considerations;

(3) Use of actual measurements of the amount of refrigerant added to or evacuated from the appliance, including for seasonal variances; and/or

(4) Use of an established range based on the best available data regarding the normal operating characteristics and conditions for the appliance, where the midpoint of the range will serve as the full charge.

High-pressure appliance means an appliance that uses a refrigerant with a liquid phase saturation pressure between 170 psia and 355 psia at 104 °F. Examples include but are not limited to appliances using R–22, R–407A, R–407C, R–410A, and R–502.

Industrial process refrigeration means complex customized appliances that are directly linked to the processes used in, for example, the chemical, pharmaceutical, petrochemical, and manufacturing industries. This sector also includes industrial ice machines, appliances used directly in the generation of electricity, and ice rinks. Where one appliance is used for both industrial process refrigeration and other applications, it will be considered industrial process refrigeration equipment if 50 percent or more of its operating capacity is used for industrial process refrigeration.

Industrial process shutdown means when an industrial process or facility temporarily ceases to operate or manufacture whatever is being produced at that facility.

Initial verification test means those leak tests that are conducted after the repair is finished to verify that a leak or leaks have been repaired before refrigerant is added back to the appliance.

Leak inspection means the examination of an appliance to determine the location of refrigerant leaks. Potential methods include, but are not limited to, ultrasonic tests, gas-imaging cameras, bubble tests as appropriate, or the use of a leak detection device operated and maintained according to manufacturer guidelines. Methods that determine whether the appliance is leaking refrigerant but not the location of a leak, such as standing pressure/vacuum decay tests, sight glass checks, viewing receiver levels, pressure checks, and charging charts, must be used in conjunction with methods that can determine the location of a leak.

Leak rate means the rate at which an appliance is losing refrigerant, measured between refrigerant charges. The leak rate is expressed in terms of the percentage of the appliance's full charge that would be lost over a 12-month period if the current rate of loss were to continue over that period. The rate must be calculated using one of the following methods. The same method must be used for all appliances subject to the leak repair requirements located at an operating facility.

(1) Annualizing Method. (i) Step 1. Take the number of pounds of refrigerant added to the appliance to return it to a full charge, whether in one addition or if multiple additions related to same leak, and divide it by the number of pounds of refrigerant the appliance normally contains at full charge;

(ii) Step 2. Take the shorter of the number of days that have passed since the last day refrigerant was added or 365 days and divide that number by 365 days;

(iii) Step 3. Take the number calculated in Step 1 and divide it by the number calculated in Step 2; and

(iv) Step 4. Multiply the number calculated in Step 3 by 100 to calculate a percentage. This method is summarized in the following formula:

$$\text{Leak rate (\% per year)} = \frac{\text{pounds of refrigerant added}}{\text{pounds of refrigerant in full charge}} \times \frac{365\ \textit{days/year}}{\textit{shorter of: \# days since refrigerant last added or 365 days}} \times 100\%$$

(2) Rolling Average Method. (i) Step 1. Take the sum of the pounds of refrigerant added to the appliance over the previous 365-day period (or over the period that has passed since the last successful follow-up verification test

showing all identified leaks in the appliance were repaired, if that period is less than one year);

(ii) Step 2. Divide the result of Step 1 by the pounds of refrigerant the appliance normally contains at full charge; and

(iii) Step 3. Multiply the result of Step 2 by 100 to obtain a percentage. This method is summarized in the following formula:

$$\text{Leak rate (\% per year)} = \frac{\text{pounds of refrigerant added over past 365 days (or since the last successful follow-up verification test showing all identified leaks in the appliance were repaired, if that period is less than one year)}}{\text{pounds of refrigerant in full charge}} \times 100\%$$

Low-loss fitting means any device that is intended to establish a connection between hoses, appliances, or recovery and/or recycling machines and that is designed to close automatically or to be closed manually when disconnected, minimizing the release of refrigerant from hoses, appliances, and recovery and/or recycling machines.

Low-pressure appliance means an appliance that uses a refrigerant with a liquid phase saturation pressure below 45 psia at 104 °F. Examples include but are not limited to appliances using R–11, R–123, R–113, and R–245fa.

* * * * *

Medium-pressure appliance means an appliance that uses a refrigerant with a liquid phase saturation pressure between 45 psia and 170 psia at 104 °F. Examples include but are not limited to appliances using R–114, R–124, R–12, R–134a, and R–500.

Mothball means to evacuate refrigerant from an appliance, or the affected isolated section or component of an appliance, to at least atmospheric pressure, and to temporarily shut down that appliance.

* * * * *

MVAC-like appliance means a mechanical vapor compression, open-drive compressor appliance with a full charge of 20 pounds or less of refrigerant used to cool the driver's or passenger's compartment of off-road vehicles or equipment. This includes, but is not limited to, the air-conditioning equipment found on agricultural or construction vehicles. This definition is not intended to cover appliances using R–22 refrigerant.

Normal operating characteristics and conditions means appliance operating temperatures, pressures, fluid flows, speeds, and other characteristics, including full charge of the appliance, that would be expected for a given process load and ambient condition during normal operation. Normal operating characteristics and conditions are marked by the absence of atypical conditions affecting the operation of the appliance.

One-time expansion device means an appliance that relies on the release of its refrigerant charge to the environment in order to provide a cooling effect. These are typically single releases but could also include products that are designed to release refrigerant to the environment through multiple individual charges.

Opening an appliance means any maintenance, service, repair, or disposal of an appliance that would release any refrigerant in the appliance to the atmosphere. Connecting and disconnecting hoses and gauges to measure pressures, add refrigerant, or recover refrigerant from the appliance are not considered ''opening an appliance.''

* * * * *

Reclaim means to reprocess recovered refrigerant to all of the specifications in appendix A of this subpart (based on AHRI Standard 700–2016, *Specifications for Refrigerants*) that are applicable to that refrigerant and to verify that the refrigerant meets these specifications using the analytical methodology prescribed in section 5 of appendix A of this subpart.

Recover means to remove refrigerant in any condition from an appliance and to store it in an external container without necessarily testing or processing it in any way.

Recovery efficiency means the percentage of refrigerant in an appliance that is recovered by a piece of recovery and/or recycling equipment.

Recycle, when referring to refrigerant, means to extract refrigerant from an appliance (except MVACs) and clean it for reuse in equipment of the same owner without meeting all of the requirements for reclamation. In general, recycled refrigerant is cleaned using oil separation and single or multiple passes through devices, such as replaceable core filter-driers, which reduce moisture, acidity, and particulate matter.

Refrigerant means, for purposes of this subpart, any substance, including blends and mixtures, consisting in part or whole of a class I or class II ozone-depleting substance or substitute that is used for heat transfer purposes and provides a cooling effect.

Refrigerant circuit means the parts of an appliance that are normally connected to each other (or are separated only by internal valves) and are designed to contain refrigerant.

Retire, when referring to an appliance, means the removal of the refrigerant and the disassembly or impairment of the refrigerant circuit such that the appliance as a whole is rendered unusable by any person in the future.

Retrofit means to convert an appliance from one refrigerant to another refrigerant. Retrofitting includes the conversion of the appliance to achieve system compatibility with the new refrigerant and may include, but is not limited to, changes in lubricants, gaskets, filters, driers, valves, o-rings or appliance components.

Seasonal variance means the removal of refrigerant from an appliance due to a change in ambient conditions caused by a change in season, followed by the subsequent addition of an amount that is less than or equal to the amount of refrigerant removed in the prior change in season, where both the removal and addition of refrigerant occurs within one consecutive 12-month period.

Self-contained recovery equipment means refrigerant recovery and/or recycling equipment that is capable of removing the refrigerant from an appliance without the assistance of components contained in the appliance.

Self-sealing valve means a valve affixed to a container of refrigerant that automatically seals when not dispensing refrigerant and meets or exceeds established performance criteria as identified in § 82.154(c)(2).

Small appliance means any appliance that is fully manufactured, charged, and hermetically sealed in a factory with five (5) pounds or less of refrigerant, including, but not limited to, refrigerators and freezers (designed for home, commercial, or consumer use), medical or industrial research refrigeration equipment, room air

conditioners (including window air conditioners, portable air conditioners, and packaged terminal air heat pumps), dehumidifiers, under-the-counter ice makers, vending machines, and drinking water coolers.

Substitute means any chemical or product, whether existing or new, that is used as a refrigerant to replace a class I or II ozone-depleting substance. Examples include, but are not limited to hydrofluorocarbons, perfluorocarbons, hydrofluoroolefins, hydrofluoroethers, hydrocarbons, ammonia, carbon dioxide, and blends thereof. As used in this subpart, the term ''exempt substitutes'' refers to certain substitutes when used in certain end-uses that are specified in § 82.154(a)(1) as exempt from the venting prohibition and the requirements of this subpart, and the term ''non-exempt substitutes'' refers to all other substitutes and end-uses not so specified in § 82.154(a)(1).

* * * * *

System receiver means the isolated portion of the appliance, or a specific vessel within the appliance, that is used to hold the refrigerant charge during the servicing or repair of that appliance.

Technician means any person who in the course of maintenance, service, or repair of an appliance (except MVACs) could be reasonably expected to violate the integrity of the refrigerant circuit and therefore release refrigerants into the environment. Technician also means any person who in the course of disposal of an appliance (except small appliances, MVACs, and MVAC-like appliances) could be reasonably expected to violate the integrity of the refrigerant circuit and therefore release refrigerants from the appliances into the environment. Activities reasonably expected to violate the integrity of the refrigerant circuit include but are not limited to: Attaching or detaching hoses and gauges to and from the appliance; adding or removing refrigerant; adding or removing components; and cutting the refrigerant line. Activities such as painting the appliance, rewiring an external electrical circuit, replacing insulation on a length of pipe, or tightening nuts and bolts are not reasonably expected to violate the integrity of the refrigerant circuit. Activities conducted on appliances that have been properly evacuated pursuant to § 82.156 are not reasonably expected to release refrigerants unless the activity includes adding refrigerant to the appliance. Technicians could include but are not limited to installers, contractor employees, in-house service personnel, and owners and/or operators of appliances.

Very high-pressure appliance means an appliance that uses a refrigerant with a critical temperature below 104 °F or with a liquid phase saturation pressure above 355 psia at 104 °F. Examples include but are not limited to appliances using R–13, R–23, R–503, R–508A, and R–508B.

■ 4. Revise § 82.154 to read as follows:

§ 82.154 Prohibitions.

(a) *Venting Prohibition.* (1) No person maintaining, servicing, repairing, or disposing of an appliance or industrial process refrigeration may knowingly vent or otherwise release into the environment any refrigerant from such appliances. Notwithstanding any other provision of this subpart, the following substitutes in the following end-uses are exempt from this prohibition and from the requirements of this subpart:

(i) Carbon dioxide in any application;

(ii) Nitrogen in any application;

(iii) Water in any application;

(iv) Ammonia in commercial or industrial process refrigeration or in absorption units;

(v) Chlorine in industrial process refrigeration (processing of chlorine and chlorine compounds);

(vi) Hydrocarbons in industrial process refrigeration (processing of hydrocarbons);

(vii) Ethane (R–170) in very low temperature refrigeration equipment and equipment for non-mechanical heat transfer;

(viii) Propane (R–290) in retail food refrigerators and freezers (stand-alone units only); household refrigerators, freezers, and combination refrigerators and freezers; self-contained room air conditioners for residential and light commercial air-conditioning; heat pumps; and vending machines;

(ix) Isobutane (R–600a) in retail food refrigerators and freezers (stand-alone units only); household refrigerators, freezers, and combination refrigerators and freezers; and vending machines;

(x) R–441A in retail food refrigerators and freezers (stand-alone units only); household refrigerators, freezers, and combination refrigerators and freezers; self-contained room air conditioners for residential and light commercial air-conditioning; heat pumps; and vending machines.

(2) *De minimis* releases associated with good faith attempts to recycle or recover refrigerants are not subject to this prohibition. Except for exempt substitutes, refrigerant releases are *de minimis* only if they occur when:

(i) The applicable practices in § 82.155, § 82.156, and § 82.157 are observed, recovery and/or recycling machines that meet the requirements in § 82.158 are used whenever refrigerant is removed from an appliance, the technician certification provisions in § 82.161 are observed, and the reclamation requirements in § 82.164 are observed; or

(ii) The requirements in subpart B of this part are observed.

(3) The knowing release of a class I or class II refrigerant or a non-exempt substitute refrigerant after its recovery from an appliance is a violation of the venting prohibition.

(b) No person may maintain, service, repair, or dispose of an appliance containing a class I or class II refrigerant or a non-exempt substitute refrigerant without:

(1) Observing the applicable practices in § 82.155, § 82.156, and § 82.157; and

(2) Using recovery and/or recycling equipment that is certified for that type of refrigerant and appliance under § 82.158.

(c) *Sales Restriction.* (1) No person may sell or distribute, or offer for sale or distribution, any substance that consists in whole or in part of a class I or class II substance or, starting on January 1, 2018, any non-exempt substitute for use as a refrigerant unless:

(i) The buyer has been certified as a Type I, Type II, Type III, or Universal technician under § 82.161;

(ii) The buyer employs at least one technician who is certified as a Type I, Type II, Type III, or Universal technician under § 82.161 and provides proof of such to the seller;

(iii) The buyer has been certified in accordance with 40 CFR part 82, subpart B and the refrigerant is acceptable for use in MVACs under 40 CFR part 82, subpart G;

(iv) The buyer employs at least one person who is certified under 40 CFR part 82, subpart B, and provides proof of such to the seller and the refrigerant is acceptable for use in MVACs under 40 CFR part 82, subpart G. Nothing in this provision relieves persons of the requirements of § 82.34(b) or § 82.42(b);

(v) The refrigerant is sold only for eventual resale to persons certified under § 82.161 or 40 CFR part 82, subpart B or to appliance manufacturers (*e.g.,* sold by a manufacturer to a wholesaler, sold by a technician to a reclaimer);

(vi) The refrigerant is sold to an appliance manufacturer;

(vii) The refrigerant is contained in an appliance with a fully assembled refrigerant circuit or an appliance component;

(viii) The refrigerant is charged into an appliance by a certified technician or an apprentice during maintenance, service, or repair of the appliance; or

(ix) The non-exempt substitute refrigerant is intended for use in an MVAC and is sold in a container designed to hold two pounds or less of refrigerant, has a unique fitting, and has a self-sealing valve.

(2) *Self-sealing valve specifications.* This provision applies starting January 1, 2018, for all containers holding two pounds or less of non-exempt substitute refrigerant for use in an MVAC that are manufactured or imported on or after that date.

(i) Each container holding two pounds or less of non-exempt substitute refrigerant for use in an MVAC must be equipped with a single self-sealing valve that automatically closes and seals when not dispensing refrigerant.

(ii) The leakage rate from each container must not exceed 3.00 grams per year when the self-sealing valve is closed. This leakage rate applies to new, full containers as well as containers that may be partially full.

(iii) The leakage rate must be determined using the standards described in appendix E (incorporated by reference, see § 82.168).

(iv) All testing to demonstrate compliance with this paragraph must be conducted by an independent test laboratory in the United States. For purposes of this requirement, an independent test laboratory is one that is not owned, operated, or affiliated with the applicant certifying equipment and/or products.

(3) *Recordkeeping.* (i) Persons who sell or distribute, or offer to sell or distribute, any class I or class II refrigerant, or, starting on January 1, 2018, any non-exempt substitute refrigerant must keep invoices that indicate the name of the purchaser, the date of sale, and the quantity of refrigerant purchased unless they are selling exempt substitutes (those substitutes used in the end-uses specified as exempt in paragraph (a)(1) of this section) or small cans of MVAC refrigerant in accordance with paragraph (c)(1)(ix) of this section. In instances where the buyer employs a person certified under § 82.161 or 40 CFR part 82, subpart B, the seller must keep the documentation provided by the buyer to demonstrate such employment. All records must be kept for three years.

(ii) Electronic or paper copies of all records described in appendix E must be maintained by manufacturers of containers holding two pounds or less of non-exempt substitute refrigerant for use in an MVAC to verify self-sealing valves meet the requirements specified in paragraph (c)(2) of this section. All records must be kept for three years after each purchase.

(d) *Sale of Used Refrigerant.* No person may sell or distribute, or offer for sale or distribution, for use as a refrigerant any class I or class II substance or non-exempt substitute consisting wholly or in part of used refrigerant unless the refrigerant:

(1) Has been reclaimed by a person who has been certified as a reclaimer under § 82.164;

(2) was used only in an MVAC or MVAC-like appliance and is to be used only in an MVAC or MVAC-like appliance and recycled in accordance with 40 CFR part 82, subpart B;

(3) is contained in an appliance that is sold or offered for sale together with a fully assembled refrigerant circuit;

(4) is being transferred between or among a parent company and one or more of its subsidiaries, or between or among subsidiaries having the same parent company; or

(5) is being transferred between or among a Federal agency or department and a facility or facilities owned by the same Federal agency or department.

(e) *Manufacture and Sale of Appliances.* (1) No person may sell or distribute, or offer for sale or distribution, any appliance (except small appliances and appliances containing only refrigerants that have been exempted under paragraph (a)(1) of this section) unless it is equipped with a servicing aperture to facilitate the removal of refrigerant at servicing and disposal.

(2) No person may sell or distribute, or offer for sale or distribution, any small appliance (except appliances containing only refrigerants that have been exempted under paragraph (a)(1) of this section) unless it is equipped with a process stub to facilitate the removal of refrigerant at servicing and disposal.

(f) *One-time expansion devices.* No person may manufacture or import a one-time expansion device unless the only refrigerants it contains have been exempted under paragraph (a)(1) of this section.

(g) Rules stayed for consideration. Notwithstanding any other provisions of this subpart, the effectiveness of 40 CFR 82.154(c), only as it applies to refrigerant contained in appliances without fully assembled refrigerant circuits, is stayed from April 27, 1995, until EPA takes final action on its reconsideration of these provisions. EPA will publish any such final action in the **Federal Register**.

■ 5. Add § 82.155 to subpart F to read as follows:

§ 82.155 Safe disposal of appliances.

Until January 1, 2018, this section applies only to disposal of appliances containing class I and class II refrigerants. Starting on January 1, 2018, this section applies to disposal of appliances containing any class I or class II refrigerant or any non-exempt substitute refrigerant.

(a) Persons recovering refrigerant from a small appliance, MVAC, or MVAC-like appliance for purposes of disposal of these appliances must evacuate refrigerant to the levels in § 82.156(b) through (d) using recovery equipment that meets the standards in § 82.158(e) through (g), or 40 CFR part 82 subpart B, as applicable.

(b) The final processor—*i.e.,* persons who take the final step in the disposal process (including but not limited to scrap recyclers and landfill operators) of a small appliance, MVAC, or MVAC-like appliance—must either:

(1) Recover any remaining refrigerant from the appliance in accordance with paragraph (a) of this section; or

(2) Verify using a signed statement or a contract that all refrigerant that had not leaked previously has been recovered from the appliance or shipment of appliances in accordance with paragraph (a) of this section. If using a signed statement, it must include the name and address of the person who recovered the refrigerant and the date the refrigerant was recovered. If using a signed contract between the supplier and the final processor, it must either state that the supplier will recover any remaining refrigerant from the appliance or shipment of appliances in accordance with paragraph (a) of this section prior to delivery or verify that the refrigerant had been properly recovered prior to receipt by the supplier.

(i) It is a violation of this subpart to accept a signed statement or contract if the person receiving the statement or contract knew or had reason to know that the signed statement or contract is false.

(ii) The final processor must notify suppliers of appliances that refrigerant must be properly recovered in accordance with paragraph (a) of this section before delivery of the items to the facility. The form of this notification may be signs, letters to suppliers, or other equivalent means.

(iii) If all the refrigerant has leaked out of the appliance, the final processor must obtain a signed statement that all the refrigerant in the appliance had leaked out prior to delivery to the final processor and recovery is not possible. ''Leaked out'' in this context means those situations in which the refrigerant has escaped because of system failures, accidents, or other unavoidable occurrences not caused by a person's

negligence or deliberate acts such as cutting refrigerant lines.

(c) *Recordkeeping.* The final processor of a small appliance, MVAC, or MVAC-like appliance must keep a copy of all the signed statements or contracts obtained under paragraph (b)(2) of this section on site, in hard copy or in electronic format, for three years.

■ 6. Amend § 82.156 by:
■ (a) Revising the section heading;
■ (b) Adding an introductory paragraph;
■ (c) Revising paragraphs (a) through (h); and
■ (d) Adding paragraph (i) introductory text; and
■ (e) Adding paragraph (j).

The revisions and additions to read as follows:

§ 82.156 Proper evacuation of refrigerant from appliances.

Until January 1, 2018, this section applies only to evacuation of refrigerant from appliances containing class I or class II refrigerants. Starting on January 1, 2018, this section applies to evacuation of refrigerant from appliances containing any class I or class II refrigerant or any non-exempt substitute refrigerant, excluding paragraph (i) of this section which applies only to appliances containing class I or class II refrigerants until January 1, 2019. Starting January 1, 2019, the provisions in § 82.157 apply in lieu of paragraph (i) of this section.

(a) *Appliances (except small appliances, MVACs, and MVAC-like appliances).* Before opening appliances (except small appliances, MVACs, and MVAC-like appliances) or disposing of such appliances, technicians must evacuate the refrigerant, including all the liquid refrigerant, to the levels in Table 1 using a recovery and/or recycling machine certified pursuant to § 82.158 unless the situations in paragraphs (a)(1) or (2) of this section apply. Technicians may evacuate either the entire appliance or the part to be serviced, if the refrigerant in the part can be isolated to a system receiver. A technician must verify that the applicable level of evacuation has been reached in the appliance or the part before it is opened.

(1) If evacuation of the appliance to the atmosphere is not to be performed after completion of the maintenance, service, or repair, and if the maintenance, service, or repair is not major as defined at § 82.152, the appliance must:

(i) Be evacuated to a pressure no higher than 0 psig before it is opened if it is a medium-, high- or very high-pressure appliance;

(ii) Be pressurized to a pressure no higher than 0 psig before it is opened if it is a low-pressure appliance. Persons must cover openings when isolation is not possible. Persons pressurizing low-pressure appliances that use refrigerants with boiling points at or below 85 degrees Fahrenheit at 29.9 inches of mercury (standard atmospheric pressure), must not use methods such as nitrogen that require subsequent purging. Persons pressurizing low-pressure appliances that use refrigerants with boiling points above 85 degrees Fahrenheit at 29.9 inches of mercury, must use heat to raise the internal pressure of the appliance as much as possible, but may use nitrogen to raise the internal pressure of the appliance from the level attainable through use of heat to atmospheric pressure; or

(iii) For the purposes of oil changes, be evacuated or pressurized to a pressure no higher than 5 psig, before it is opened; or drain the oil into a system receiver to be evacuated or pressurized to a pressure no higher than 5 psig.

(2) If leaks in the appliance make evacuation to the levels in Table 1 unattainable or would substantially contaminate the refrigerant being recovered, persons opening or disposing of the appliance must:

(i) Isolate leaking from non-leaking components wherever possible;

(ii) Evacuate non-leaking components to be opened or disposed of to the levels specified in Table 1; and

(iii) Evacuate leaking components to be opened or disposed of to the lowest level that can be attained without substantially contaminating the refrigerant. This level may not exceed 0 psig.

(3) *Recordkeeping.* As of January 1, 2018, technicians evacuating refrigerant from appliances with a full charge of more than 5 and less than 50 pounds of refrigerant for purposes of disposal of that appliance must keep records documenting the following for three years:

(i) The company name, location of the appliance, date of recovery, and type of refrigerant recovered for each appliance;

(ii) The total quantity of refrigerant, by type, recovered from all disposed appliances in each calendar month; and

(iii) The quantity of refrigerant, by type, transferred for reclamation and/or destruction, the person to whom it was transferred, and the date of transfer.

TABLE 1—REQUIRED LEVELS OF EVACUATION FOR APPLIANCES

[Except for small appliances, MVACs, and MVAC-like appliances]

Type of appliance	Inches of Hg vacuum (relative to standard atmospheric pressure of 29.9 inches Hg)	
	Using recovery and/or recycling equipment manufactured or imported before November 15, 1993	Using recovery and/or recycling equipment manufactured or imported on or after November 15, 1993
Very high-pressure appliance	0	0.
High-pressure appliance, or isolated component of such appliance, with a full charge of less than 200 pounds of refrigerant.	0	0.
High-pressure appliance, or isolated component of such appliance, with a full charge of 200 pounds or more of refrigerant.	4	10.
Medium-pressure appliance, or isolated component of such appliance, with a full charge of less than 200 pounds of refrigerant.	4	10.
Medium-pressure appliance, or isolated component of such appliance, with a full charge of 200 pounds or more of refrigerant.	4	15.
Low-pressure appliance	25 mm Hg absolute	25 mm Hg absolute.

(b) *Small appliances.* Before opening a small appliance or when disposing of a small appliance, persons must recover refrigerant, using a recovery and/or recycling machine certified pursuant to § 82.158, according to the following conditions:

(1) When using recovery equipment manufactured before November 15, 1993, recover 80 percent of the refrigerant in the small appliance; or

(2) When using recovery equipment manufactured on or after November 15, 1993, recover 90 percent of the refrigerant in the appliance when the compressor in the appliance is functioning, or 80 percent of the refrigerant in the appliance when the compressor in the appliance is not functioning; or

(3) Evacuate the appliance to four inches of mercury vacuum.

(c) *MVAC-like appliances.* Persons may only open MVAC-like appliances while properly using, as defined at § 82.32(e), recovery and/or recycling equipment certified pursuant to § 82.158(f) or § 82.36, as applicable. All persons recovering refrigerant from MVAC-like appliances for purposes of disposal of these appliances must evacuate the appliance in accordance with 40 CFR part 82, subpart B or reduce the system pressure to or below 102 mm of mercury vacuum.

(d) *MVACs.* All persons recovering refrigerant from MVACs for purposes of disposal of these appliances must evacuate the appliance in accordance with 40 CFR part 82, subpart B or reduce the system pressure to or below 102 mm of mercury vacuum.

(e) System-dependent equipment may not be used with appliances with a full charge of more than 15 pounds of refrigerant, unless the system-dependent equipment is permanently attached to the appliance as a pump-out unit.

(f) Persons who maintain, service, repair, or dispose of only appliances that they own and that contain pump-out units are exempt from the requirement to use certified, self-contained recovery and/or recycling equipment.

(g) All recovery and/or recycling equipment must be used in accordance with the manufacturer's directions unless such directions conflict with the requirements of this subpart.

(h) Refrigerant may be returned to the appliance from which it is recovered or to another appliance owned by the same person without being recycled or reclaimed, unless the appliance is an MVAC or MVAC-like appliance.

(i) The provisions in this paragraph (i) apply to owners and operators of appliances containing 50 or more pounds of class I and class II refrigerants only until January 1, 2019. The definitions in paragraph (j) of this section apply for purposes of this paragraph (i) in lieu of the definitions in § 82.152.

* * * * *

(j) *Definitions for the leak repair provisions in 82.156(i).* These definitions are not applicable to any other portion of subpart F other than 82.156(i). Along with paragraph (i) of this section, the definitions in this section apply only until January 1, 2019.

Appliance means, for the purposes of paragraph (i) of this section, any device which contains and uses a refrigerant and which is used for household or commercial purposes, including any air conditioner, refrigerator, chiller, or freezer.

Commercial refrigeration means, for the purposes of paragraph (i) of this section, the refrigeration appliances utilized in the retail food and cold storage warehouse sectors. Retail food includes the refrigeration equipment found in supermarkets, convenience stores, restaurants and other food service establishments. Cold storage includes the equipment used to store meat, produce, dairy products, and other perishable goods. All of the equipment contains large refrigerant charges, typically over 75 pounds.

Critical component means, for the purposes of paragraph (i) of this section, a component without which industrial process refrigeration equipment will not function, will be unsafe in its intended environment, and/or will be subject to failures that would cause the industrial process served by the refrigeration appliance to be unsafe.

Custom-built means, for the purposes of paragraph (i) of this section, that the equipment or any of its critical components cannot be purchased and/or installed without being uniquely designed, fabricated and/or assembled to satisfy a specific set of industrial process conditions.

Follow-up verification test means, for the purposes of paragraph (i) of this section, those tests that involve checking the repairs within 30 days of the appliance's returning to normal operating characteristics and conditions. Follow-up verification tests for appliances from which the refrigerant charge has been evacuated means a test conducted after the appliance or portion of the appliance has resumed operation at normal operating characteristics and conditions of temperature and pressure, except in cases where sound professional judgment dictates that these tests will be more meaningful if performed prior to the return to normal operating characteristics and conditions. A follow-up verification test with respect to repairs conducted without evacuation of the refrigerant charge means a reverification test conducted after the initial verification test and usually within 30 days of normal operating conditions. Where an appliance is not evacuated, it is only necessary to conclude any required changes in pressure, temperature or other conditions to return the appliance to normal operating characteristics and conditions.

Full charge means, for the purposes of paragraph (i) of this section, the amount of refrigerant required for normal operating characteristics and conditions of the appliance as determined by using one or a combination of the following four methods:

(i) Use the equipment manufacturer's determination of the correct full charge for the equipment;

(ii) Determine the full charge by making appropriate calculations based on component sizes, density of refrigerant, volume of piping, and other relevant considerations;

(iii) Use actual measurements of the amount of refrigerant added or evacuated from the appliance; and/or

(iv) Use an established range based on the best available data regarding the normal operating characteristics and conditions for the appliance, where the midpoint of the range will serve as the full charge, and where records are maintained in accordance with § 82.166(q).

Industrial process refrigeration means, for the purposes of paragraph (i) of this section, complex customized appliances used in the chemical, pharmaceutical, petrochemical and manufacturing industries. These appliances are directly linked to the industrial process. This sector also includes industrial ice machines, appliances used directly in the generation of electricity, and ice rinks. Where one appliance is used for both industrial process refrigeration and other applications, it will be considered industrial process refrigeration equipment if 50 percent or more of its operating capacity is used for industrial process refrigeration.

Industrial process shutdown means, for the purposes of paragraph (i) of this section, that an industrial process or facility temporarily ceases to operate or manufacture whatever is being produced at that facility.

Initial verification test means, for the purposes of paragraph (i) of this section, those leak tests that are conducted as soon as practicable after the repair is

completed. An initial verification test, with regard to the leak repairs that require the evacuation of the appliance or portion of the appliance, means a test conducted prior to the replacement of the full refrigerant charge and before the appliance or portion of the appliance has reached operation at normal operating characteristics and conditions of temperature and pressure. An initial verification test with regard to repairs conducted without the evacuation of the refrigerant charge means a test conducted as soon as practicable after the conclusion of the repair work.

Leak rate means, for the purposes of paragraph (i) of this section, the rate at which an appliance is losing refrigerant, measured between refrigerant charges. The leak rate is expressed in terms of the percentage of the appliance's full charge that would be lost over a 12-month period if the current rate of loss were to continue over that period. The rate is calculated using only one of the following methods for all appliances located at an operating facility.

(i) Method 1. (A) Step 1. Take the number of pounds of refrigerant added to the appliance to return it to a full charge and divide it by the number of pounds of refrigerant the appliance normally contains at full charge;

(B) Step 2. Take the shorter of the number of days that have passed since the last day refrigerant was added or 365 days and divide that number by 365 days;

(C) Step 3. Take the number calculated in Step 1. and divide it by the number calculated in Step 2.; and

(D) Step 4. Multiply the number calculated in Step 3. by 100 to calculate a percentage. This method is summarized in the following formula:

$$\underset{(\%\ \text{per year})}{\text{Leak rate}} = \frac{\text{pounds of refrigerant added}}{\text{pounds of refrigerant in full charge}} \times \frac{365\ \textit{days/year}}{\textit{shorter of:}\ \#\ \text{days since refrigerant last added or 365 days}} \times 100\%$$

(ii) Method 2. (A) Step 1. Take the sum of the quantity of refrigerant added to the appliance over the previous 365-day period (or over the period that has passed since leaks in the appliance were last repaired, if that period is less than one year),

(B) Step 2. Divide the result of Step 1. by the quantity (*e.g.,* pounds) of refrigerant the appliance normally contains at full charge, and

(C) Step 3. Multiply the result of Step 2. by 100 to obtain a percentage. This method is summarized in the following formula:

$$\underset{(\%\ \text{per year})}{\text{Leak rate}} = \frac{\begin{array}{c}\text{pounds of refrigerant added over past 365 days}\\ \text{(or since leaks were last repaired,}\\ \text{if that period is less than one year)}\end{array}}{\text{pounds of refrigerant in full charge}} \times 100\%$$

Normal operating characteristics or conditions means, for the purposes of paragraph (i) of this section, temperatures, pressures, fluid flows, speeds and other characteristics that would normally be expected for a given process load and ambient condition during operation. Normal operating characteristics and conditions are marked by the absence of atypical conditions affecting the operation of the refrigeration appliance.

Normally containing a quantity of refrigerant means, for the purposes of paragraph (i) of this section, containing the quantity of refrigerant within the appliance or appliance component when the appliance is operating with a full charge of refrigerant.

Refrigerant means, for the purposes of paragraph (i) of this section, any substance consisting in part or whole of a class I or class II ozone-depleting substance that is used for heat transfer purposes and provides a cooling effect.

Substitute means, for the purposes of paragraph (i) of this section, any chemical or product, whether existing or new, that is used by any person as an EPA approved replacement for a class I or II ozone-depleting substance in a given refrigeration or air-conditioning end-use.

Suitable replacement refrigerant means, for the purposes of paragraph (i) of this section, a refrigerant that is acceptable under section 612(c) of the Clean Air Act Amendments of 1990 and all regulations promulgated under that section, compatible with other materials with which it may come into contact, and able to achieve the temperatures required for the affected industrial process in a technically feasible manner.

System mothballing means, for the purposes of paragraph (i) of this section, the intentional shutting down of a refrigeration appliance undertaken for an extended period of time by the owners or operators of that facility, where the refrigerant has been evacuated from the appliance or the affected isolated section of the appliance, at least to atmospheric pressure.

■ 7. Add § 82.157 to Subpart F to read as follows:

§ 82.157 Appliance maintenance and leak repair.

(a) *Applicability.* This section applies as of January 1, 2019. This section applies only to appliances with a full charge of 50 or more pounds of any class I or class II refrigerant or any non-exempt substitute refrigerant. Unless otherwise specified, the requirements of this section apply to the owner or operator of the appliance.

(b) *Leak Rate Calculation.* Persons adding or removing refrigerant from an appliance must, upon conclusion of that service, provide the owner or operator with documentation that meets the applicable requirements of paragraph (l)(2) of this section. The owner or operator must calculate the leak rate every time refrigerant is added to an appliance unless the addition is made immediately following a retrofit, installation of a new appliance, or qualifies as a seasonal variance.

(c) *Requirement to Address Leaks through Appliance Repair, or Retrofitting or Retiring an Appliance.* (1) Owners or operators must repair appliances with a leak rate over the

applicable leak rate in this paragraph in accordance with paragraphs (d) through (f) of this section unless the owner or operator elects to retrofit or retire the appliance in compliance with paragraphs (h) and (i) of this section. If the owner or operator elects to repair leaks, but fails to bring the leak rate below the applicable leak rate, the owner or operator must create and implement a retrofit or retirement plan in accordance with paragraphs (h) and (i) of this section.

(2) Leak Rates:

(i) 20 percent leak rate for commercial refrigeration equipment;

(ii) 30 percent leak rate for industrial process refrigeration equipment; and

(iii) 10 percent leak rate for comfort cooling appliances or other appliances with a full charge of 50 or more pounds of refrigerant not covered by (c)(2)(i) or (ii) of this section.

(d) *Appliance Repair.* Owners or operators must identify and repair leaks in accordance with this paragraph within 30 days (or 120 days if an industrial process shutdown is required) of when refrigerant is added to an appliance exceeding the applicable leak rate in paragraph (c) of this section.

(1) A certified technician must conduct a leak inspection, as described in paragraph (g) of this section, to identify the location of leaks.

(2) Leaks must be repaired such that the leak rate is brought below the applicable leak rate. This must be confirmed by the leak rate calculation performed upon the next refrigerant addition. The leaks will be presumed to be repaired if there is no further refrigerant addition for 12 months after the repair or if the leak inspections required under paragraph (g) do not find any leaks in the appliance. Repair of leaks must be documented by both an initial and a follow-up verification test or tests.

(3) The time frames in paragraphs (d) through(f) of this section are temporarily suspended when an appliance is mothballed. The time will resume on the day additional refrigerant is added to the appliance (or component of an appliance if the leaking component was isolated).

(e) *Verification tests.* The owner or operator must conduct both initial and follow-up verification tests on each leak that was repaired under paragraph (d) of this section.

(1) *Initial verification test.* Unless granted additional time, an initial verification test must be performed within 30 days (or 120 days if an industrial process shutdown is required) of an appliance exceeding the applicable leak rate in paragraph (c) of this section. An initial verification test must demonstrate that leaks where a repair attempt was made are repaired.

(i) For repairs that can be completed without the need to open or evacuate the appliance, the test must be performed after the conclusion of the repair work and before any additional refrigerant is added to the appliance.

(ii) For repairs that require the evacuation of the appliance or portion of the appliance, the test must be performed before adding any refrigerant to the appliance.

(iii) If the initial verification test indicates that the repairs have not been successful, the owner or operator may conduct as many additional repairs and initial verification tests as needed within the applicable time period.

(2) *Follow-up verification test.* A follow-up verification test must be performed within 10 days of the successful initial verification test or 10 days of the appliance reaching normal operating characteristics and conditions (if the appliance or isolated component was evacuated for the repair(s)). Where it is unsafe to be present or otherwise impossible to conduct a follow-up verification test when the system is operating at normal operating characteristics and conditions, the verification test must, where practicable, be conducted prior to the system returning to normal operating characteristics and conditions.

(i) A follow-up verification test must demonstrate that leaks where a repair attempt was made are repaired. If the follow-up verification test indicates that the repairs have not been successful, the owner or operator may conduct as many additional repairs and verification tests as needed to bring the appliance below the leak rate within the applicable time period and to verify the repairs.

(f) *Extensions to the appliance repair deadlines.* Owners or operators are permitted more than 30 days (or 120 days if an industrial process shutdown is required) to comply with paragraphs (d) and (e) of this section if they meet the requirements of (f)(1) through (4) of this section or the appliance is mothballed. The request will be considered approved unless EPA notifies the owners or operators otherwise.

(1) One or more of the following conditions must apply:

(i) The appliance is located in an area subject to radiological contamination or shutting down the appliance will directly lead to radiological contamination. Additional time is permitted to the extent needed to conduct and finish repairs in a safe working environment.

(ii) Requirements of other applicable Federal, state, or local regulations make a repair within 30 days (or 120 days if an industrial process shutdown is required) impossible. Additional time is permitted to the extent needed to comply with the pertinent regulations.

(iii) Components that must be replaced as part of the repair are not available within 30 days (or 120 days if an industrial process shutdown is required). Additional time is permitted up to 30 days after receiving delivery of the necessary components, not to exceed 180 days (or 270 days if an industrial process shutdown is required) from the date the appliance exceeded the applicable leak rate.

(2) Repairs to leaks that the technician has identified as significantly contributing to the exceedance of the leak rate and that do not require additional time must be completed and verified within the initial 30 day repair period (or 120 day repair period if an industrial process shutdown is required);

(3) The owner or operator must document all repair efforts and the reason for the inability to make the repair within the initial 30 day repair period (or 120 day repair period if an industrial process shutdown is required); and

(4) The owner or operator must request an extension from EPA at the address specified in paragraph (m) of this section within 30 days (or 120 days if an industrial process shutdown is required) of the appliance exceeding the applicable leak rate in paragraph (c) of this section. Extension requests must include: Identification and address of the facility; the name of the owner or operator of the appliance; the leak rate; the method used to determine the leak rate and full charge; the date the appliance exceeded the applicable leak rate; the location of leak(s) to the extent determined to date; any repair work that has been performed thus far, including the date that work was completed; the reasons why more than 30 days (or 120 days if an industrial process shutdown is required) are needed to complete the repair; and an estimate of when the work will be completed. If the estimated completion date is to be extended, a new estimated date of completion and documentation of the reason for that change must be submitted to EPA within 30 days of identifying that the completion date must be extended. The owner or operator must keep a dated copy of this submission.

(g) *Leak Inspections.* (1) The owner or operator must conduct a leak inspection in accordance with the following schedule on any appliance exceeding

the applicable leak rate in paragraph (c)(2) of this section.

(i) For commercial refrigeration and industrial process refrigeration appliances with a full charge of 500 or more pounds, leak inspections must be conducted once every three months until the owner or operator can demonstrate through the leak rate calculations required under paragraph (b) of this section that the appliance has not leaked in excess of the applicable leak rate for four quarters in a row.

(ii) For commercial refrigeration and industrial process refrigeration appliances with a full charge of 50 or more pounds but less than 500 pounds, leak inspections must be conducted once per calendar year until the owner or operator can demonstrate through the leak rate calculations required under paragraph (b) of this section that the appliance has not leaked in excess of the applicable leak rate for one year.

(iii) For comfort cooling appliances and other appliances not covered by paragraphs (g)(1)(i) and (ii) of this section, leak inspections must be conducted once per calendar year until the owner or operator can demonstrate through the leak rate calculations required under paragraph (b) of this section that the appliance has not leaked in excess of the applicable leak rate for one year.

(2) Leak inspections must be conducted by a certified technician using method(s) determined by the technician to be appropriate for that appliance.

(3) All visible and accessible components of an appliance must be inspected, with the following exceptions:

(i) Where components are insulated, under ice that forms on the outside of equipment, underground, behind walls, or are otherwise inaccessible;

(ii) Where personnel must be elevated more than two meters above a support surface; or

(iii) Where components are unsafe to inspect, as determined by site personnel.

(4) Quarterly or annual leak inspections are not required on appliances, or portions of appliances, continuously monitored by an automatic leak detection system that is audited or calibrated annually. An automatic leak detection system may directly detect refrigerant in air, monitor its surrounding in a manner other than detecting refrigerant concentrations in air, or monitor conditions of the appliance.

(i) For systems that directly detect the presence of a refrigerant in air, the system must:

(A) Only be used to monitor components located inside an enclosed building or structure;

(B) Have sensors or intakes placed so that they will continuously monitor the refrigerant concentrations in air in proximity to the compressor, evaporator, condenser, and other areas with a high potential for a refrigerant leak;

(C) Accurately detect a concentration level of 10 parts per million of vapor of the specific refrigerant or refrigerants used in the refrigeration appliance(s); and

(D) Alert the owner or operator when a refrigerant concentration of 100 parts per million of vapor of the specific refrigerant or refrigerants used in the refrigeration appliance(s) is reached.

(ii) For a system that monitors its surrounding in a manner other than detecting refrigerant concentrations in air or monitor conditions of the appliance, the system must automatically alert the owner or operator when measurements indicate a loss of 50 pounds of refrigerant or 10 percent of the full charge, whichever is less.

(iii) When automatic leak detection equipment is only being used to monitor portions of an appliance, the remainder of the appliance continues to be subject to any applicable leak inspection requirements.

(h) *Retrofit or retirement plans.* (1) The owner or operator must create a retrofit or retirement plan within 30 days of:

(i) an appliance leaking above the applicable leak rate in paragraph (c) of this section if the owner or operator intends to retrofit or retire rather than repair the leak;

(ii) an appliance leaking above the applicable leak rate in paragraph (c) of this section if the owner or operator fails to take any action to identify or repair the leak; or

(iii) an appliance continues to leak above the applicable leak rate after having conducted the required repairs and verification tests under paragraphs (d) and (e) of this section.

(2) A retrofit or retirement plan must, at a minimum, contain the following information:

(i) Identification and location of the appliance;

(ii) Type and full charge of the refrigerant used in the appliance;

(iii) Type and full charge of the refrigerant to which the appliance will be converted, if retrofitted;

(iv) Itemized procedure for converting the appliance to a different refrigerant, including changes required for compatibility with the new substitute, if retrofitted;

(v) Plan for the disposition of recovered refrigerant;

(vi) Plan for the disposition of the appliance, if retired; and

(vii) A schedule, not to exceed one-year, for completion of the appliance retrofit or retirement.

(3) The retrofit or retirement plan must be signed by an authorized company official, dated, accessible at the site of the appliance in paper copy or electronic format, and available for EPA inspection upon request.

(4) All identified leaks must be repaired as part of any retrofit under such a plan.

(5)(i) Unless granted additional time, all work performed in accordance with the plan must be finished within one year of the plan's date (not to exceed 13 months from when the plan was required in paragraph (h)(1) of this section).

(ii) The owner or operator may request that EPA relieve it of the obligation to retrofit or retire an appliance if the owner or operator can establish within 180 days of the plan's date that the appliance no longer exceeds the applicable leak rate and if the owner or operator agrees in writing to repair all identified leaks within one year of the plan's date consistent with paragraph (h)(4) and (h)(5)(i) of this section. The owner or operator must submit to EPA the retrofit or retirement plan as well as the following information: The date that the requirement to develop a retrofit or retirement plan was triggered; the leak rate; the method used to determine the leak rate and full charge; the location of the leak(s) identified in the leak inspection; a description of repair work that has been completed; a description of repair work that has not been completed; a description of why the repair was not conducted within the time frames required under paragraphs (d) and (f) of this section; and a statement signed by an authorized official that all identified leaks will be repaired and an estimate of when those repairs will be completed (not to exceed one year from date of the plan). The request will be considered approved unless EPA notifies the owners or operators within 60 days of receipt of the request that it is not approved.

(i) *Extensions to the one-year retrofit or retirement schedule.* Owners or operators may request more than one year to comply with paragraph (h) of this section if they meet the requirements of this paragraph. The request will be considered approved unless EPA notifies the owners or

operators within 60 days of receipt of the request that it is not approved. The request must be submitted to EPA at the address specified in § 82.157(m) within seven months of discovering the appliance exceeded the applicable leak rate. The request must include the identification of the appliance; name of the owner or operator; the leak rate; the method used to determine the leak rate and full charge; the date the appliance exceeded the applicable leak rate; the location of leaks(s) to the extent determined to date; any repair work that has been finished thus far, including the date that work was finished; a plan to finish the retrofit or retirement of the appliance; the reasons why more than one year is necessary to retrofit or retire the appliance; the date of notification to EPA; and an estimate of when retrofit or retirement work will be finished. A dated copy of the request must be available on-site in either electronic or paper copy. If the estimated completion date is to be revised, a new estimated date of completion and documentation of the reason for that change must be submitted to EPA at the address specified in § 82.157(m) within 30 days. Additionally, the time frames in paragraphs (h) and (i) of this section are temporarily suspended when an appliance is mothballed. The time will resume running on the day additional refrigerant is added to the appliance (or component of an appliance if the leaking component was isolated).

(1) *Extensions available to any appliance.* Owners or operators of commercial refrigeration, industrial process refrigeration, comfort-cooling, or other equipment are automatically allowed 18 months to retire an appliance if the replacement appliance uses a substitute refrigerant exempted under § 82.154(a).

(2) *Extensions available to industrial process refrigeration.* Owners or operators of industrial process refrigeration equipment may request additional time beyond the one-year period in paragraph (h) of this section to finish the retrofit or retirement under the following circumstances.

(i) Requirements of other applicable Federal, state, or local regulations make a retrofit or retirement within one year impossible. Additional time is permitted to the extent needed to comply with the pertinent regulations;

(ii) The new or the retrofitted equipment is custom-built as defined in this subpart and the supplier of the appliance or one of its components has quoted a delivery time of more than 30 weeks from when the order is placed. The appliance or appliance components must be installed within 120 days after receiving delivery of the necessary parts; or

(iii) After receiving an extension under paragraph (i)(2)(ii) of this section, owners or operators may request additional time if necessary to finish the retrofit or retirement of equipment. The request must be submitted to EPA before the end of the ninth month of the initial extension and must include the same information submitted for that extension, with any necessary revisions. A dated copy of the request must be available on-site in either electronic or paper copy. The request will be considered approved unless EPA notifies the owners or operators within 60 days of receipt of the request that it is not approved.

(3) *Extensions available to Federally owned equipment.* Owners or operators of federally owned commercial or comfort-cooling equipment may request an additional year beyond the one-year period in paragraph (h) of this section to finish the retrofit or retirement under the following circumstances:

(i) A delivery time of more than 30 weeks from the beginning of the official procurement process is quoted due to complications presented by the Federal agency appropriations and/or procurement process;

(ii) The appliance is located in an area subject to radiological contamination and creating a safe working environment will require more than 30 weeks; or

(iii) After receiving a one-year extension under paragraphs (i)(3)(i) or (ii) of this section, additional time may be requested if necessary to finish the retrofit or retirement of equipment. The request must be submitted to EPA before the end of the ninth month of the one-year extension and must include the same information submitted for that one-year extension, with any necessary revisions. A dated copy of the request must be available on-site in either electronic or paper copy. The request will be considered approved unless EPA notifies the owners or operators within 60 days of receipt of the request that it is not approved.

(j) *Chronically leaking appliances.* Owners or operators of appliances containing 50 pounds or more of refrigerant that leak 125 percent or more of the full charge in a calendar year must submit a report to EPA at the address in paragraph (m) of this section. This report must be submitted by March 1 of the subsequent year and describe efforts to identify leaks and repair the appliance.

(k) *Purged refrigerant.* In calculating annual leak rates, purged refrigerant that is destroyed at a verifiable destruction efficiency of 98 percent or greater will not be counted toward the leak rate.

(l) *Recordkeeping.* All records identified in this paragraph must be kept for at least three years in electronic or paper format, unless otherwise specified.

(1) Owners or operators must determine the full charge of all appliances with 50 or more pounds of refrigerant and maintain the following information for each appliance until three years after the appliance is retired:

(i) The identification of the owner or operator of the appliance;

(ii) The address where the appliance is located;

(iii) The full charge of the appliance and the method for how the full charge was determined;

(iv) If using method 4 (using an established range) for determining full charge, records must include the range for the full charge of the appliance, its midpoint, and how the range was determined;

(v) Any revisions of the full charge, how they were determined, and the dates such revisions occurred.

(2) Owners or operators must maintain a record including the following information for each time an appliance with a full charge of 50 or more pounds is maintained, serviced, repaired, or disposed of, when applicable. If the maintenance, service, repair, or disposal is done by someone other than the owner or operator, that person must provide a record containing the following information, with the exception of (l)(2)(vii) and (viii) of this section, to the owner or operator:

(i) The identity and location of the appliance;

(ii) The date of the maintenance, service, repair, or disposal performed;

(iii) The part(s) of the appliance being maintained, serviced, repaired, or disposed;

(iv) The type of maintenance, service, repair, or disposal performed for each part;

(v) The name of the person performing the maintenance, service, repair, or disposal;

(vi) The amount and type of refrigerant added to, or in the case of disposal removed from, the appliance;

(vii) The full charge of the appliance; and

(viii) The leak rate and the method used to determine the leak rate (not applicable when disposing of the appliance, following a retrofit, installing a new appliance, or if the refrigerant addition qualifies as a seasonal variance).

(3) Owners or operators must keep records of leak inspections that include

the date of inspection, the method(s) used to conduct the leak inspection, a list of the location of each leak that was identified, and a certification that all visible and accessible parts of the appliance were inspected. Technicians conducting leak inspections must, upon conclusion of that service, provide the owner or operator of the appliance with documentation that meets these requirements.

(4) If using an automatic leak detection system, the owner or operator must maintain records regarding the installation and the annual audit and calibration of the system, a record of each date the monitoring system identified a leak, and the location of the leak.

(5) Owners or operators must maintain records of the dates and results of all initial and follow-up verification tests. Records must include the location of the appliance, the date(s) of the verification tests, the location(s) of all repaired leaks that were tested, the type(s) of verification test(s) used, and the results of those tests. Technicians conducting initial or follow-up verification tests must, upon conclusion of that service, provide the owner or operator of the appliance with documentation that meets these requirements.

(6) Owners or operators must maintain retrofit or retirement plans developed in accordance with paragraph (h) of this section.

(7) Owners or operators must maintain retrofit and/or extension requests submitted to EPA in accordance with paragraph (i) of this section.

(8) Owners or operators that suspend the deadlines in this section by mothballing an appliance must keep records documenting when the appliance was mothballed and when additional refrigerant was added to the appliance (or isolated component).

(9) Owners or operators who exclude purged refrigerants that are destroyed from annual leak rate calculations must maintain records to support the amount of refrigerant claimed as sent for destruction. Records must be based on a monitoring strategy that provides reliable data to demonstrate that the amount of refrigerant claimed to have been destroyed is not greater than the amount of refrigerant actually purged and destroyed and that the 98 percent or greater destruction efficiency is met. Records must include flow rate, quantity or concentration of the refrigerant in the vent stream, and periods of purge flow. Records must include:

(i) The identification of the facility and a contact person, including the address and telephone number;

(ii) A description of the appliance, focusing on aspects relevant to the purging of refrigerant and subsequent destruction;

(iii) A description of the methods used to determine the quantity of refrigerant sent for destruction and type of records that are being kept by the owners or operators where the appliance is located;

(iv) The frequency of monitoring and data-recording; and

(v) A description of the control device, and its destruction efficiency.

(10) Owners or operators that exclude additions of refrigerant due to seasonal variance from their leak rate calculation must maintain records stating that they are using the seasonal variance flexibility and documenting the amount added and removed under § 82.157(l)(2).

(11) Owners or operators that submit reports to EPA in accordance with paragraph (m) of this section must maintain copies of the submitted reports and any responses from EPA.

(m) *Reporting.* All notifications must be submitted electronically to *608reports@epa.gov* unless the notification contains confidential business information. If the notification contains confidential business information, the information should be submitted to: Section 608 Program Manager; Stratospheric Protection Division; Mail Code: 6205T; U.S. Environmental Protection Agency; 1200 Pennsylvania Avenue NW., Washington, DC 20460.

(1) Owners or operators must notify EPA at this address in accordance with paragraph (f) of this section when seeking an extension of time to complete repairs.

(2) Owners or operators must notify EPA at this address in accordance with paragraph (h)(5)(ii) of this section when seeking relief from the obligation to retrofit or retire an appliance.

(3) Owners or operators must notify EPA at this address in accordance with paragraph (i) of this section when seeking an extension of time to complete the retrofit or retirement of an appliance.

(4) Owners or operators must notify EPA at this address in accordance with paragraph (j) of this section for any appliance that leaks 125 percent or more of the full charge in a calendar year.

(5) When excluding purged refrigerants that are destroyed from annual leak rate calculations, owners or operators must notify EPA at this address within 60 days after the first time the exclusion is used by the facility where the appliance is located. The report must include the information included in paragraph (l)(9) of this section.

■ 8. Revise § 82.158 to read as follows:

§ 82.158 Standards for recovery and/or recycling equipment.

Starting January 1, 2017, this section applies to recovery and/or recycling equipment for use during the maintenance, service, repair, or disposal of appliances containing any class I or class II refrigerant or any non-exempt substitute refrigerant.

(a) No person may manufacture or import recovery and/or recycling equipment for use during the maintenance, service, repair, or disposal of appliances unless the equipment is certified in accordance with this section.

(b) No person may alter the design of certified refrigerant recovery and/or recycling equipment in a way that would affect the equipment's ability to meet the certification standards in this section without resubmitting the altered design for certification testing. Until it is tested and shown to meet the certification standards in this section, equipment so altered will be considered uncertified.

(c) Recovery and/or recycling equipment manufactured or imported before November 15, 1993, intended for use during the maintenance, service, repair, or disposal of appliances (except small appliances, MVACs, and MVAC-like appliances) will be considered certified if it is capable of achieving the level of evacuation specified in Table 2 of this section when tested using a properly calibrated pressure gauge.

(d) Manufacturers and importers of recovery and/or recycling equipment must have such equipment certified by an approved equipment testing organization as follows:

(1) Recovery and/or recycling equipment manufactured or imported on or after November 15, 1993, and before September 22, 2003, intended for use during the maintenance, service, repair, or disposal of appliances (except small appliances, MVACs, and MVAC-like appliances) must be certified by an approved equipment testing organization as being capable of achieving the level of evacuation specified in Table 2 of this section under the conditions of appendix B1 of this subpart (based upon the ARI Standard 740–1993, *Performance of Refrigerant Recovery, Recycling and/or Reclaim Equipment*).

(2) Recovery and/or recycling equipment manufactured or imported on or after September 22, 2003, and

before January 1, 2017, intended for use during the maintenance, service, repair, or disposal of appliances (except small appliances, MVACs, and MVAC-like appliances) must be certified by an approved equipment testing organization as being capable of achieving the level of evacuation specified in Table 2 of this section under the conditions of appendix B2 of this subpart (based upon the ARI Standard 740–1995, *Performance of Refrigerant Recovery, Recycling and/or Reclaim Equipment*).

(3) Recovery and/or recycling equipment manufactured or imported on or after January 1, 2017, intended for use during the maintenance, service, repair, or disposal of appliances (except small appliances, MVACs, and MVAC-like appliances) must be certified by an approved equipment testing organization as being capable of achieving the level of evacuation specified in Table 2 of this section under the conditions of appendix B3 (for non-flammable refrigerants) based upon AHRI Standard 740–2016 or appendix B4 (for flammable refrigerants) of this subpart.

TABLE 2—LEVELS OF EVACUATION WHICH MUST BE ACHIEVED BY RECOVERY AND/OR RECYCLING EQUIPMENT

[Except for small appliances, MVACs, and MVAC-like appliances.]

Type of appliance with which recovery and/or recycling machine is intended to be used	Inches of Hg vacuum (relative to standard atmospheric pressure of 29.9 inches Hg)	
	Manufactured or imported before November 15, 1993	Manufactured or imported on or after November 15, 1993
HCFC–22 appliances, or isolated component of such appliances, with a full charge of less than 200 pounds of refrigerant.	0	0.
HCFC–22 appliances, or isolated component of such appliances, with a full charge of 200 pounds or more of refrigerant.	4	10.
Very high-pressure appliances	0	0.
Other high-pressure appliances, or isolated component of such appliances, with a full charge of less than 200 pounds of refrigerant.	4	10.
Other high-pressure appliances, or isolated component of such appliances, with a full charge of 200 pounds or more of refrigerant.	4	15.
Medium-pressure appliances, or isolated component of such appliances, with a full charge of less than 200 pounds of refrigerant.	4	10.
Medium-pressure appliances, or isolated component of such appliances, with a full charge of 200 pounds or more of refrigerant.	4	15.
Low-pressure appliances	25 mm Hg absolute	25 mm Hg absolute.

(4) Recovery and/or recycling equipment whose recovery efficiency cannot be tested according to the procedures in appendix B1, B2, B3, or B4 of this subpart as applicable may be certified if an approved third-party testing organization adopts and performs a test that demonstrates, to the satisfaction of the Administrator, that the recovery efficiency of that equipment is equal to or better than that of equipment that:

(i) Is intended for use with the same type of appliance; and

(ii) Achieves the level of evacuation in Table 2. The manufacturer's instructions must specify how to achieve the required recovery efficiency, and the equipment must be tested when used according to these instructions.

(5) The equipment must meet the minimum requirements for certification under appendix B1, B2, B3, or B4 of this subpart as applicable.

(6) If the equipment is equipped with a noncondensables purge device, the equipment must not release more than 3 percent of the quantity of refrigerant being recycled through noncondensables purging under the conditions of appendix B1, B2, B3, or B4 of this subpart as applicable.

(7) The equipment must be equipped with low-loss fittings on all hoses.

(8) The equipment must have its liquid recovery rate and its vapor recovery rate measured under the conditions of appendix B1, B2, B3, or B4 as applicable, unless the equipment has no inherent liquid or vapor recovery rate.

(e) *Small Appliances.* Equipment used during the maintenance, service, repair, or disposal of small appliances must be certified by an approved equipment testing organization to be capable of recovering 90 percent of the refrigerant in the test stand when the compressor of the test stand is operational and 80 percent of the refrigerant when the compressor of the test stand is not operational, when used in accordance with the manufacturer's instructions under the conditions of appendix C, Method for Testing Recovery Devices for Use with Small Appliances.

(1) Equipment manufactured or imported before November 15, 1993, will be considered certified if it is capable of either recovering 80 percent of the refrigerant in the system, whether or not the compressor of the test stand is operational, or achieving a four-inch vacuum when tested using a properly calibrated pressure gauge.

(2) Equipment manufactured or imported on or after November 15, 1993, may also be certified if it is capable of achieving a four-inch vacuum under the conditions of appendix B1 of this subpart, based upon ARI Standard 740–1993.

(3) Equipment manufactured or imported on or after September 22, 2003, and before January 1, 2017, may also be certified if it is capable of achieving a four-inch vacuum under the conditions of appendix B2 of this subpart, based upon ARI Standard 740–1995.

(4) Equipment manufactured or imported on or after January 1, 2017, may also be certified if it is capable of achieving a four-inch vacuum under the conditions of appendix B3 of this subpart (for non-flammable refrigerants), based upon AHRI Standard 740–2016 or appendix B4 of this subpart (for flammable refrigerants), based upon both AHRI Standard 740–2016 and UL 1963, Supplement SB, *Requirements for Refrigerant Recovery/Recycling Equipment Intended for Use with a Flammable Refrigerant,* Fourth Edition, June 1, 2011.

(5) Equipment used to evacuate any class I or class II refrigerant or any non-exempt substitute refrigerant from small

appliances before they are disposed of may also be certified if it is capable of achieving a four-inch vacuum when tested using a properly calibrated pressure gauge.

(f) *MVAC-like appliances.* (1) Manufacturers and importers of recovery and/or recycling equipment intended for use during the maintenance, service, repair, or disposal of MVAC-like appliances must certify such equipment in accordance with subpart B of this part.

(2) Equipment manufactured or imported before November 15, 1993, intended for use during the maintenance, service, or repair of MVAC-like appliances must be capable of reducing the system pressure to 102 mm of mercury vacuum under the conditions of appendix A of subpart B of this part.

(g) *MVACs.* Manufacturers and importers of recovery and/or recycling equipment intended for use during the maintenance, service, repair, or disposal of MVACs must certify such equipment in accordance with subpart B of this part.

(h) *Labeling.* (1) Manufacturers and importers of equipment certified under paragraphs (d) and (e) of this section must place a label on each piece of equipment stating the following:

THIS EQUIPMENT HAS BEEN CERTIFIED BY [APPROVED EQUIPMENT TESTING ORGANIZATION] TO MEET EPA's MINIMUM REQUIREMENTS FOR RECYCLING OR RECOVERY EQUIPMENT INTENDED FOR USE WITH [APPROPRIATE CATEGORY OF APPLIANCE].

(2) The label must also show the date of manufacture and the serial number (if applicable) of the equipment. The label must be affixed in a readily visible or accessible location, be made of a material expected to last the lifetime of the equipment, present required information in a way that it is likely to remain legible for the lifetime of the equipment, and be affixed in such a way that it cannot be removed from the equipment without damage to the label.

(i) *Retesting.* At least once every three years, manufacturers or importers of certified recovery and/or recycling equipment intended for use during the maintenance, service, or repair of appliances (except MVACs or MVAC-like appliances) or during the disposal of appliances (except small appliances, MVACs, and MVAC-like appliances) must have approved equipment testing organizations conduct either:

(1) Retests of certified recovery and/or recycling equipment in accordance with paragraphs (d) and (e) of this section; or

(2) Inspections of recovery and/or recycling equipment at manufacturing facilities to ensure that each equipment model line that has been certified under this section continues to meet the certification criteria.

(j) *Revocation.* An equipment model line that has been certified under this section may have its certification revoked if it is subsequently determined to fail to meet the certification criteria. In such cases, the Administrator must give notice to the manufacturer or importer setting forth the basis for the determination.

(k) Equipment that is advertised or marketed as ''recycling equipment'' must be capable of recycling the standard contaminated refrigerant sample of appendix B2, B3, or B4 of this subpart (as applicable) to the levels in the following table when tested under the conditions of appendix B2, B3 or B4 of this subpart:

MAXIMUM LEVELS OF CONTAMINANTS PERMISSIBLE IN REFRIGERANT PROCESSED THROUGH EQUIPMENT ADVERTISED AS ''RECYCLING'' EQUIPMENT

Contaminants	Low-pressure (R–11, R–123, R–113) systems	R–12 systems	All other systems
Acid Content (by wt.)	1.0 PPM	1.0 PPM	1.0 PPM.
Moisture (by wt.)	20 PPM	10 PPM	20 PPM.
Noncondensable Gas (by vol.)	N/A	2.0%	2.0%.
High Boiling Residues (by vol.)	1.0%	0.02%	0.02%.
Chlorides by Silver Nitrate Test	No turbidity	No turbidity	No turbidity.
Particulates	Visually clean	Visually clean	Visually clean.

■ 9. Revise § 82.160 to read as follows:

§ 82.160 Approved equipment testing organizations.

(a) Any equipment testing organization may apply for approval by the Administrator to certify equipment under the standards in § 82.158 and appendices B2, B3, B4, or C of this subpart. Applications must be sent to *608reports@epa.gov*, or if containing confidential business information, mailed to: Section 608 Program Manager, Stratospheric Protection Division, Mail Code: 6205T, U.S. Environmental Protection Agency, 1200 Pennsylvania Avenue NW., Washington, DC 20460.

(b) Applications for approval must include:

(1) A list of equipment present at the organization that will be used for equipment testing.

(2) Verification of the organization's expertise in equipment testing and the technical experience of the organization's personnel.

(3) Verification of the organization's knowledge of the standards and recordkeeping and reporting requirements of this subpart.

(4) A description of the organization's program for verifying the performance of certified recovery and/or recycling equipment manufactured over the long term, specifying whether retests of equipment or inspections of equipment at manufacturing facilities will be used.

(5) Verification that the organization has no conflict of interest and receives no direct or indirect financial benefit from the outcome of certification testing.

(6) Agreement to allow the Administrator access to records and personnel to verify the information contained in the application.

(c) Organizations may not certify equipment before receiving approval from EPA. If approval is denied under this section, the Administrator must give written notice to the organization setting forth the basis for the determination.

(d) If an approved testing organization conducts certification tests in a way not consistent with the representations made in its application or with the provisions of this subpart, the Administrator may revoke approval in accordance with § 82.169. In such cases, the Administrator must give notice to the organization setting forth the basis for the determination.

(e) *Recordkeeping and reporting.* (1) Approved equipment testing organizations must maintain records of

equipment testing and performance and a list of equipment that meets EPA requirements. This list must include the name of the manufacturer and the name and/or serial number of the model line. Approved equipment testing organizations must publish online a list of all certified equipment that includes the information specified above and update the list annually.

(2) Approved equipment testing organizations must notify EPA at *608reports@epa.gov* if retests of equipment or inspections of manufacturing facilities conducted under to § 82.158(i) show that a previously certified model line fails to meet EPA requirements. Such notification must be received within thirty days of the retest or inspection.

(3) All records must be maintained for three years after the equipment is no longer offered for sale. Online lists must contain certified equipment until three years after that equipment is no longer offered for sale.

■ 10. Revise § 82.161 to read as follows:

§ 82.161 Technician certification.

Until January 1, 2018, this section applies only to technicians and organizations certifying technicians that maintain, service, or repair appliances containing class I or class II refrigerants. Starting on January 1, 2018, this section applies to technicians and organizations certifying technicians that maintain, service, or repair appliances containing any class I or class II refrigerant or any non-exempt substitute refrigerant.

(a) *Certification Requirements.* (1) Any person who could be reasonably expected to violate the integrity of the refrigerant circuit during the maintenance, service, repair, or disposal of appliances (as follows in this paragraph) containing a class I or class II refrigerant or a non-exempt substitute refrigerant must pass a certification exam offered by an approved technician certification program.

(i) Persons who maintain, service, or repair small appliances must be certified as Type I technicians.

(ii) Persons who maintain, service, repair, or dispose of medium-, high-, or very high-pressure appliances (except small appliances, MVACs, and MVAC-like appliances) must be certified as Type II technicians.

(iii) Persons who maintain, service, repair, or dispose of low-pressure appliances must be certified as Type III technicians.

(iv) Persons who maintain, service, repair, or dispose of all appliances described in paragraph (a)(1)(i) through (iii) of this section must be certified as Universal technicians.

(v) Technicians who maintain, service, or repair MVAC-like appliances must either be certified as Type II technicians or be certified in accordance with 40 CFR part 82, subpart B.

(vi) Persons who maintain, service, or repair MVAC appliances for consideration must be certified in accordance with 40 CFR part 82, subpart B.

(vii) Persons who dispose of small appliances, MVACs, and MVAC-like appliances are not required to be certified.

(2) Apprentices are exempt from the requirement in paragraph (a)(1) of this section provided the apprentice is closely and continually supervised by a certified technician while performing any maintenance, service, repair, or disposal that could reasonably be expected to release refrigerant from an appliance into the environment, except those substitute refrigerants exempted under paragraph (a)(1) of this section. The supervising certified technician and the apprentice have the responsibility to ensure that the apprentice complies with this subpart.

(3) The Administrator may require technicians to demonstrate at their place of business their ability to perform proper procedures for recovering and/or recycling refrigerant, except those substitute refrigerants exempted under paragraph (a)(1) of this section. Failure to demonstrate or failure to properly use the equipment may result in revocation or suspension of the certificate. Failure to abide by any of the provisions of this subpart may also result in revocation or suspension of the certificate. If a technician's certificate is revoked, the technician would need to recertify before maintaining, servicing, repairing, or disposing of any appliances.

(4) (i) Technicians certified under this section must keep a copy of their certificate at their place of business.

(ii) Technicians must maintain a copy of their certificate until three years after no longer operating as a technician.

(5) *Recertification.* The Administrator reserves the right to specify a requirement for technician recertification at some future date, if necessary, by placing a notice in the **Federal Register**.

(b) *Requirements for Technician Certification Programs.* (1) No technician training or testing program may issue certificates under this section unless the program complies with all the standards of this section and appendix D, and has been granted approval by the Administrator.

(2) *Program Approval.* Persons may seek approval of any technician certification program (program), in accordance with this paragraph, by submitting to the Administrator at the address in § 82.160(a) verification that the program meets all the standards listed in appendix D of this subpart. The Administrator reserves the right to consider other relevant factors to ensure the effectiveness of certification programs. If approval is denied under this section, the Administrator must give written notice to the program setting forth the basis for the determination.

(3) *Alternative Examinations.* Programs are encouraged to make provisions for non-English speaking technicians by providing tests in other languages or allowing the use of a translator when taking the test. A test may be administered orally to any person who makes this request, in writing, to the program at least 30 days before the scheduled date for the examination. The written request must explain why the request is being made.

(4) *Proof of Certification.* Programs certifying technicians must provide technicians with identification cards in accordance with section (f) of appendix D of this subpart.

(5) Programs certifying technicians must maintain records in accordance with section (g) of appendix D of this subpart.

(6) Starting January 1, 2018, programs certifying technicians, excluding Federally-run programs, must publish online a list of all technicians they have certified on or after January 1, 2017. Certifying organizations must update these lists at least annually.

(i) The list must include the first name, middle initial, and last name of the certified technician, the technician's city of residence when taking the test, the type(s) of certification received, and the date each certification was received.

(ii) Programs certifying technicians must provide notice to technicians that such information will be published online in compliance with any other Federal, state or local regulations, and allow technicians to opt out of being included in such lists.

(7) If an approved program violates any of the above requirements, the Administrator may revoke approval in accordance with § 82.169. In such cases, the Administrator must give notice to the organization setting forth the basis for the determination.

(c) *Test Subject Material.* A bank of test questions developed by the Administrator consists of groups, including a core group and technical groups. The Administrator will release this bank of questions only to approved technician certification programs. Each test for each type of certification must

include at least 25 questions drawn from the core group and at least 25 questions drawn from each relevant technical group. These questions must address the subject areas in appendix D of this subpart.

§ 82.162 [Removed and Reserved]

■ 11. Remove and reserve § 82.162.

■ 12. Revise § 82.164 to read as follows:

§ 82.164 Reclaimer certification.

(a) All persons reclaiming used class I or II refrigerant or non-exempt substitute refrigerant for sale to a new owner must meet the following requirements:

(1) Reclaim such refrigerant to all the specifications in appendix A of this subpart (based on AHRI Standard 700–2016, *Specifications for Refrigerants*) that are applicable to that refrigerant;

(2) Verify that each batch of such refrigerant reclaimed meets these specifications using the analytical methodology prescribed in appendix A of this subpart, which includes the primary methodologies included in appendix A of AHRI Standard 700–2016;

(3) Release no more than 1.5 percent of the refrigerant during the reclamation process;

(4) Dispose of wastes from the reclamation process in accordance with all applicable laws and regulations; and

(5) Maintain records and submit reports in accordance with paragraph (d) of this section.

(b) The owner or a responsible officer reclaiming used refrigerant for sale to a new owner, except for persons who properly certified under this section before May 11, 2004, must certify to the Administrator at the address in § 82.160(a) that they will meet the requirements in paragraph (a) of this section. The certification must include the name and address of the reclaimer and a list of equipment used to reclaim the refrigerant to the required standard, and to analyze the refrigerant to ensure it meets these specifications.

(c) Certificates are not transferable. In the event of a change in ownership of an entity which reclaims refrigerant, the new owner of the entity must certify with the Administrator within 30 days of the change that they will meet the reclaimer certification requirements. In the event of a change in business management, location, or contact information, the owner of the entity must notify EPA within 30 days of the change at the address in § 82.160(a).

(d) *Recordkeeping and reporting.* (1) Reclaimers must maintain records, by batch, of the results of the analysis conducted to verify that reclaimed refrigerant meets the necessary specifications in paragraph (a)(2) of this section.

(2) Reclaimers must maintain records of the names and addresses of persons sending them material for reclamation and the quantity of the material (the combined mass of refrigerant and contaminants) by refrigerant type sent to them for reclamation. Such records must be maintained on a transactional basis for three years.

(3) Reclaimers must report to the Administrator annually by February 1 of the next calendar year the total annual quantity of material (the combined mass of refrigerant and contaminants) by refrigerant type sent to them for reclamation, the total annual mass of each refrigerant reclaimed, and the total annual mass of waste products.

(e) Failure to abide by any of the provisions of this subpart may result in revocation or suspension of the certification of the reclaimer in accordance with § 82.169. In such cases, the Administrator must give notice to the organization setting forth the basis for the determination.

■ 13. Amend § 82.166 by:

■ a. Revising the section heading;

■ b. Adding the introductory paragraph;

■ c. Removing and reserving paragraphs (a) through (i), and (l); and

■ d. Revising paragraph (m) and the introductory text of paragraph (q).

Revisions and addition to read as follows:

§ 82.166 Reporting and recordkeeping requirements for leak repair.

This section contains leak repair reporting and recordkeeping requirements that apply to owners and operators of appliances containing 50 or more pounds of class I or class II refrigerants until January 1, 2019. Starting January 1, 2019, the recordkeeping and reporting requirements in the leak repair provisions in § 82.157(l) and (m) apply to owners and operators of appliances containing 50 or more pounds of class I or class II refrigerants or non-exempt substitutes.

(a)–(i) [Reserved]

* * * * *

(l) [Reserved]

(m) All records required to be maintained pursuant to this section must be kept for a minimum of three years unless otherwise indicated.

* * * * *

(q) Owners or operators choosing to determine the full charge as defined in § 82.156(j) of an affected appliance by using an established range or using that methodology in combination with other methods for determining the full charge as defined in § 82.156(j) must maintain the following information:

* * * * *

■ 14. Add § 82.168 to read as follows:

§ 82.168 Incorporation by Reference.

(a) Certain material is incorporated by reference into this subpart part with the approval of the Director of the Federal Register under 5 U.S.C. 552(a) and 1 CFR part 51. You can obtain the material from the sources listed below. You may inspect a copy of the approved material at U.S. EPA's Air and Radiation Docket; EPA West Building, Room 3334, 1301 Constitution Ave. NW., Washington, DC, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call (202) 741–6030 or go to *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html*.

(b) Air-Conditioning, Heating, and Refrigeration Institute (AHRI), 2111 Wilson Boulevard, Suite 500, Arlington, VA 22201, *www.ahrinet.org*.

(1) AHRI Standard 110–2016, *2016 Standard for Air-Conditioning, Heating and Refrigerating Equipment Nameplate Voltages*, copyright 2016, into Appendix B3 to subpart F.

(2) 2008 Appendix C to AHRI Standard 700–2014, *2008 Appendix C for Analytical Procedures for AHRI Standard 700–2014—Normative*, copyright 2008, into Appendix A to subpart F.

(3) 2008 Appendix D to AHRI Standard 700–2014, *2012 Appendix D for Gas Chromatograms for AHRI Standard 700–2014—Informative*, copyright 2012, into Appendix A to subpart F.

(c) American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., (ASHRAE), 1791 Tullie Circle NE., Atlanta, GA 30329, U.S.A.

(1) ANSI/ASHRAE Standard 63.2–1996 (RA 2010), *Method of Testing Liquid-Line Filter Drier Filtration Capability,* Reaffirmed June 26, 2010, into Appendix B3 to subpart F.

(d) ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428–2959, *www.astm.org*.

(1) ASTM D1296–01 (Reapproved 2012), *Standard Test Method for Odor of Volatile Solvents and Diluents*, approved July 1, 2012, into Appendix A to subpart F.

(2) [Reserved]

(e) Gas Processors Association, 6526 East 60th Street, Tulsa, Oklahoma 74145.

(1) GPA Standard STD–2177–13, *Analysis of Natural Gas Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography*, Revised, copyright 2013, into Appendix A to subpart F.

(2) [Reserved]

(f) General Services Administration, 301 7th St. SW., Washington, DC 20410.

(1) BB–F–1421B, Federal Specification for ''Fluorocarbon Refrigerants,'' dated March 5, 1982, IBR approved for Appendix A to subpart F.

(2) [Reserved]

(g) International Electrotechnical Commission (IEC), 3, rue de Varembé, P.O. Box 131. CH–1211 Geneva 20—Switzerland, 41 22 919 02 11, *http://www.iec.ch*.

(1) IEC 60038, *IEC Standard Voltages*, Edition 7.0, 2009–06, into Appendix B3 to subpart F.

(2) [Reserved]

(h) Underwriters Laboratories (UL), 333 Pfingsten Road, Northbrook, IL 60062, 847–272–8800, *http://www.ul.com*.

(1) UL 1963, *Standard for Safety Requirements for Refrigerant Recovery/Recycling Equipment*, Fourth Edition (with revisions through October 13, 2013), June 1, 2011, in appendix B3 to subpart F, appendix B4 to subpart F.

(2) [Reserved]

■ 15. Amend subpart F by revising appendix A to read as follows:

Appendix A to Subpart F of Part 82—Specifications for Refrigerants

This appendix is based on the Air-Conditioning, Heating, and Refrigeration Institute Standard 700–2016, *Specifications for Refrigerants.*

Section 1. Purpose

1.1 *Purpose.* The purpose of this standard is to evaluate and accept/reject refrigerants regardless of source (*i.e.*, new, reclaimed and/or repackaged) for use in new and existing refrigeration and air-conditioning products as required under 40 CFR part 82.

1.1.1 *Intent.* This standard is intended for the guidance of the industry including manufacturers, refrigerant reclaimers, repackagers, distributors, installers, servicemen, contractors and for consumers.

1.1.2 *Review and Amendment.* This standard is subject to review and amendment as the technology advances.

Section 2. Scope

2.1 *Scope.* This standard specifies acceptable levels of contaminants (purity requirements) for various fluorocarbon and other refrigerants regardless of source and lists acceptable test methods. These refrigerants are as referenced in the ANSI/ASHRAE Standard 34 with Addenda:

2.1.1 Single-Component Fluorocarbon Refrigerants: R–11, R–12, R–13, R–22, R–23, R–32, R–113, R–114, R–115, R–116, R–123, R–124, R–125, R–134a, R–141b, R–142b, R–143a, R–152a, R–218, R–227ea, R–236fa, R–245fa, R–1233zd(E), R–1234yf, R–1234ze(E);

2.1.2 Single Component Hydrocarbon Refrigerants: R–50, R–170, R–E170, R–290, R–600, R–600a, R–601, R–601a, R–610, R–1150, R–1270;

2.1.3 Carbon Dioxide Refrigerant: R–744;

2.1.4 Zeotropic Blend Refrigerants: R–401A, R–401B, R–402A, R–402B, R–403A, R–403B, R–404A, R–405A, R–406A, R–407A, R–407B, R–407C, R–407D, R–407E, R–407F, R–408A, R–409A, R–409B, R–410A, R–410B, R–411A, R–411B, R–412A, R–413A, R–414A, R–414B, R–415A, R–415B, R–416A, R–417A, R–417B, R–417C, R–418A, R–419A, R–419B, R–420A, R–421A, R–421B, R–422A, R–422B, R–422C, R–422D, R–422E, R–423A, R–424A, R–425A, R–426A, R–427A, R–428A, R–429A, R–430A, R–431A, R–434A, R–435A, R–437A, R–438A, R–439A, R–440A, R–442A, R–444A, R–444B, R–445A, R–446A, R–447A, R–448A, R–449A, R–450A;

2.1.5 Zeotropic Hydrocarbon Blend Refrigerants: R–432A, R–433A, R–433B, R–433C, R–436A, R–436B, R–441A, R–443A; and

2.1.6 Azeotropic Blend Refrigerants: R–500, R–502, R–503, R–507A, R–508A, R–508B, R–509A, R–510A, R–511A, and R–512A.

Section 3. Definitions

3.1 *Definitions.* All terms in this appendix will follow the definitions in § 82.152 unless otherwise defined in this appendix.

3.2 *Shall, Should, Recommended,* or *It Is Recommended* shall be interpreted as follows:

3.2.1 *Shall.* Where ''shall'' or ''shall not'' is used for a provision specified, that provision is mandatory if compliance with this appendix is claimed.

3.2.2 *Should, Recommended,* or *It is Recommended* is used to indicate provisions which are not mandatory but which are desirable as good practice.

Section 4. Characterization of Refrigerants and Contaminants

4.1 *Characterization.* Characterization of single component fluorocarbon (Table 1A) and zeotropic/azeotropic blend (Table 2A/3) refrigerants and contaminants are listed in the following general classifications:

4.1.1 Isomer content (see Table 1A)

4.1.2 Air and other non-condensables (see Tables 1A, 2A, 3)

4.1.3 Water (see Tables 1A, 2A, 3)

4.1.4 All other volatile impurities (see Tables 1A, 2A, 3)

4.1.5 High boiling residue (see Tables 1A, 2A, 3)

4.1.6 Halogenated unsaturated volatile impurities (see Table 1A)

4.1.7 Particulates/solids (see Tables 1A, 2A, 3)

4.1.8 Acidity (see Tables 1A, 2A, 3)

4.1.9 Chloride (see Tables 1A, 2A, 3)

4.2 Hydrocarbon Characterization. Characterization of hydrocarbon refrigerants (Tables 1B and 2B) and contaminants are listed in the following general classifications:

4.2.1 Nominal composition

4.2.2 Other allowable impurities

4.2.3 Air and other non-condensables

4.2.4 Sulfur odor

4.2.5 High boiling residue

4.2.6 Particulates/solids

4.2.7 Acidity

4.2.8 Water

4.2.9 All other volatile impurities

4.2.10 Total C3, C4, and C5 polyolefins

4.3 *Carbon Dioxide Characterization.* Characterization of carbon dioxide (Table 1C) and its contaminants are listed in the following general classifications:

4.3.1 Purity

4.3.2 Air and other non-condensables

4.3.3 Water

4.3.4 High boiling residue

4.3.5 Particulates/solids

Section 5. Sampling and Summary of Test Procedures

5.1 *Referee Test.* The referee test methods for the various contaminants are summarized in the following paragraphs. Detailed test procedures are included in *2008 Appendix C to AHRI Standard 700–2014* (incorporated by reference, see § 82.168). If alternative test methods are employed, the user must be able to demonstrate that they produce results at least equivalent to the specified referee test method.

5.2 *Refrigerant Sampling*

5.2.1 *Sampling Precautions.* Special precautions should be taken to ensure that representative samples are obtained for analysis. Sampling shall be done by qualified personnel following accepted sampling and safety procedures. Refrigerants with critical temperatures near or below ambient temperature cannot be reliably sampled for both liquid and vapor phase without special handling.

Note: Flammable refrigerants which are ASHRAE 34 class 2L, 2, or 3 present additional safety challenges and require additional measures for sampling safety procedures compared to nonflammable halocarbons documented in this standard.

5.2.2 *Cylinder Preparation.* Place a clean, empty sample cylinder with the valve open in an oven at 110 °C (230 °F) for one hour. Remove it from the oven while hot, immediately connect it to an evacuation system and evacuate to less than 56 kPa. Close the valve and allow it to cool. Weigh the empty cylinder.

5.2.3 *Vapor Phase Sampling.* A vapor phase sample shall be obtained for determining the non-condensables. The source temperature shall be measured and recorded at the time the sample is taken.

5.2.3.1 *Special Handling for Low Critical Temperature Refrigerant.* A vapor phase sample is required to determine non-condensables and volatile impurities, including other refrigerants. The vapor phase sample is obtained by regulating the sample container temperature to 5 K or more above the refrigerant critical temperature.

5.2.3.2 *Handling for Liquid Refrigerants with Boiling Points Near or Above Room Temperature.* Since R–11, R–113, R–123, R–141b, R–245fa, and R–1233zd(E) have normal boiling points near or above room temperature, non-condensable determination is not required for these refrigerants.

Note: Non-condensable gases, if present, will concentrate in the vapor phase of the

refrigerant; care must be exercised to eliminate introduction of either air or liquid phase refrigerant during the sample transfer.

5.2.4 *Liquid Phase Sampling.* A liquid phase sample is required for all tests listed in this standard except the test for non-condensables.

5.2.4.1 *Liquid Sampling.* Accurate analysis requires that the sample cylinder, at ambient temperature, be filled to at least 60 percent by volume; however, under no circumstances should the cylinder be filled to more than 80 percent by volume. This can be accomplished by weighing the empty cylinder and then the cylinder with refrigerant. When the desired amount of refrigerant has been collected, close the valve(s) and immediately disconnect the sample cylinder.

Note: Care should be taken to ensure that all connections and transfer lines are dry and evacuated to avoid contaminating the sample.

Note: Low critical temperature refrigerants can have extremely high pressure and the sampling vessel, all connections, and transfer lines must be designed to handle high pressures.

5.2.4.2 *Special Handling for Low Critical Temperature Refrigerant.* A liquid phase sample is required for all testing except volatile impurities, including other refrigerants. The liquid phase sample is obtained by regulating the sample cylinder temperature to 2 °C below the critical temperature of the refrigerant.

Note: If free water is present in the sample, cooling to below 0 °C may result in the formation of ice. Clathrates may form at temperatures above 0 °C with some fluorocarbon refrigerants.

5.2.4.3 *Record Weight.* Check the sample cylinder for leaks and record the gross weight.

5.3 *Refrigerant Identification.* The required method shall be gas chromatography (GC) as described in *2008 Appendix C to AHRI Standard 700–2014* (incorporated by reference, see § 82.168) with the corresponding gas chromatogram figures as illustrated in *2012 Appendix D to AHRI Standard 700–2014* (incorporated by reference, see § 82.168). The chromatogram of the sample shall be compared to known standards.

5.3.2 *Alternative Method.* Determination of the boiling point and boiling point range is an acceptable alternative test method which can be used to characterize refrigerants. The test method shall be that described in section 4.4.3 of BB–F–1421B (incorporated by reference, see § 82.168).

5.3.3 *Required Values.* The required values for boiling point and boiling point range are given in Table 1A, *Physical Properties of Single Component Refrigerants*; Table 1B, *Physical Properties of Zeotropic Blends (400 Series Refrigerants)*; and Table 1C, *Physical Properties of Azeotropic Blends (500 Series Refrigerants).*

5.4 *Water Content.*

5.4.1 *Method.* The Coulometric Karl Fischer Titration shall be the primary test method for determining the water content of refrigerants. This method is described in *2008 Appendix C to AHRI Standard 700–2014* (incorporated by reference, see § 82.168). This method can be used for refrigerants that are either a liquid or a gas at room temperature. For all refrigerants, the sample for water analysis shall be taken from the liquid phase of the container to be tested.

5.4.2 *Limits.* The value for water content shall be expressed in parts per million (ppm) by weight and shall not exceed the maximum specified in Tables 1A, 1B, 1C, 2A, 2B, and 3.

5.5 *Conductivity.* (Alternative to chloride and acidity tests).

5.5.1 *Method.* A refrigerant may be tested for conductivity as an indication of the presence of acids, metal chlorides, and any compound that ionizes in water. This alternative procedure is intended for use with new or reclaimed refrigerants, however, significant amounts of oil can interfere with the test results.

5.5.2 *Limits.* The value for conductivity shall be converted to and expressed in ppm by weight calculated as HCl and shall be compared with the maximum acidity value specified (see in Tables 1A, 1B, 1C, 2A, 2B, and 3). If the conductivity is above this amount, then the chloride and acidity tests shall be conducted. If the conductivity is not greater than this amount, then the chloride and acidity tests may be omitted.

5.6 *Chloride.* The refrigerant shall be tested for chloride as an indication of the presence of hydrochloric acid and/or metal chlorides. The referee procedure is intended for use with new or reclaimed halogenated refrigerants; however, high boiling residue in excess of the amounts in Tables 1A, 1B, 1C, 2A, 2B, and 3 can interfere with the test results.

5.6.1 *Method.* The test method shall be that described in *2008 Appendix C to AHRI Standard 700–2014* (incorporated by reference, see § 82.168). The test will show noticeable turbidity at chloride levels of about 3 ppm or greater by weight.

5.5.2 *Limits.* The results of the test shall not exhibit any sign of turbidity. Report the results as ''pass'' or ''fail.''

5.7 *Acidity.*

5.7.1 *Method.* The acidity test uses the titration principle to detect any compound that is soluble in water and ionizes as an acid. The test method shall be that described in *2008 Appendix C to AHRI Standard 700–2014* (incorporated by reference, see § 82.168). This test may not be suitable for determination of high molecular weight organic acids; however these acids will be found in the high boiling residue test outlined in Section 5.8. The test requires a 50 to 60 gram sample and has a detection limit of 0.1 ppm by weight calculated as HCl.

5.7.2 *Limits.* The value for acidity shall be expressed in ppm by weight as HCl and shall not exceed the limits in Tables 1A, 1B, 2A, 2B, and 3.

5.8 *High Boiling Residue.*

5.8.1 *Method.* High boiling residue shall be determined by either volume or weight. The volume method measures the residue from a standard volume of refrigerant after evaporation. The gravimetric method is described in *2008 Appendix C to AHRI Standard 700–2014* (incorporated by reference, see § 82.168). Oils and/or organic acids will be captured by these methods.

5.8.2 *Limits.* The value for high boiling residue shall be expressed as a percentage by volume or weight and shall not exceed the maximum percent specified in Tables 1A, 1B, 1C, 2A, 2B, and 3.

5.9 *Particulates and Solids.*

5.9.1 *Method.* A measured amount of sample shall be placed in a Goetz bulb under controlled temperature conditions. The particulates/solids shall be determined by visual examination of the Goetz bulb prior to the evaporation of refrigerant. For details of this test method, refer to Part 3 of *2008 Appendix C to AHRI Standard 700–2014* (incorporated by reference, see § 82.168).

Note: R–744 will partially sublimate when measuring a known amount of liquid sample into the dry Goetz bulb and the solid R–744 will interfere with the visual examination of particulates/solids. Determining the particulates/solids shall be completed by visual examination of the Goetz bulb after the evaporation of the refrigerant.

5.9.2 *Limits.* Visual presence of dirt, rust, or other particulate contamination is reported as ''fail.''

5.10 *Non-Condensables.*

5.10.1 *Method.* A vapor phase sample shall be used for determination of non-condensables. Non-condensable gases consist primarily of air accumulated in the vapor phase of refrigerants where the solubility of air in the refrigerant liquid phase is extremely low and air is not significant as a liquid phase contaminant. The presence of non-condensable gases may reflect poor quality control in transferring refrigerants to storage tanks and cylinders.

The test method shall be gas chromatography with a thermal conductivity detector as described in *2008 Appendix C to AHRI Standard 700–2014* (incorporated by reference, see § 82.168).

5.10.2 *Limits.* The maximum level of non-condensables in the vapor phase of a test sample shall not exceed the maximum at 25 °C as shown in Tables 1A, 1B, 1C, 2A, 2B, and 3.

5.11 *All Other Volatile Impurities and/or Other Refrigerants.*

5.11.1 *Method.* The amount of volatile impurities including other refrigerants in the subject refrigerant shall be determined by gas chromatography as described in *2008 Appendix C to AHRI Standard 700–2014* (incorporated by reference, see § 82.168).

5.11.2 *Limits.* The test sample shall not contain more than 0.5 percent by weight of volatile impurities including other refrigerants as shown in Tables 1A, 1B, 1C, 2A, 2B and 3.

5.12 *Total C_3, C_4 and C_5 Polyolefins in Hydrocarbon Refrigerants.*

5.12.1 *Method.* The amount of polyolefin impurities in the hydrocarbon shall be determined by gas chromatography as described in GPA Standard 2177–13 (incorporated by reference, see § 82.168).

5.12.2 *Limits.* The test sample shall not contain more than 0.05 percent by weight in the hydrocarbon sample as shown in Tables 1B and 2B. Report the results as ''pass'' or ''fail.''

5.13 *Sulfur Odor in Hydrocarbon Refrigerants.*

5.13.1 *Method.* The amount of sulfur containing compounds or other compounds

with an odor shall be determined by ASTM D1296–01 (Reapproved 2012) (incorporated by reference, see § 82.168).

5.13.2 *Limits.* The test sample paper shall not emit a residual sulfur odor as shown in Tables 1B and 2B.

Section 6. Reporting Procedure

6.1 *Reporting Procedure.* The source (manufacturer, reclaimer, or repackager) of the packaged refrigerant shall be identified. The refrigerant shall be identified by its accepted refrigerant number and/or its chemical name. Maximum allowable levels of contaminants are shown in Tables 1A, 1B, 1C, 2A, 2B, and 3. Test results shall be tabulated in a similar manner.

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Table 1A. Single Component Fluorocarbon Refrigerants and their Allowable Levels of Contaminants

	Reporting Units	Reference Section	**R-11**	**R-12**	**R-13**	**R-22**	**R-23**	**R-32**	**R-113**	**R-114**
CHARACTERISTICS:										
Boiling Point[1]	°C @ 101.3 kPa°	N/A	23.7	-29.8	-81.5	-40.8	-82	-51.7	47.6	3.6
Boiling Point Range[1]	K	N/A	± 0.3	± 0.3	± 0.5	± 0.3	± 0.5	± 0.3	± 0.3	± 0.3
Critical Temperature[1]	°C	N/A	198	112	28.9	96.2	26.1	78.1	214.1	145.7
Isomer Content	% by weight	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0-1 R-133a	0-30 R-144a
VAPOR PHASE CONTAMINANTS:										
Air and Other Non-condensables, Maximum	% by volume @ 25.0 °C	5.10	N/A[2]	1.5	1.5	1.5	1.5	1.5	N/A[2]	1.5
LIQUID PHASE CONTAMINANTS:										
Water, Maximum	ppm by weight	5.4	20	10	10	10	10	10	20	10
All Other Volatile Impurities, Maximum	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Maximum	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Maximum	ppm by weight (as HCl)	5.7	1	1	1	1	1	1	1	1
Chloride[3]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

Table 1A. Single Component Fluorocarbon Refrigerants and their Allowable Levels of Contaminants (continued)									
	Reporting Units	Reference Section	**R-115**	**R-116**	**R-123**	**R-124**	**R-125**	**R-134a**	**R-141b**
CHARACTERISTICS:									
Boiling Point[1]	°C @ 101.3 kPa	N/A	-38.9	-78.2	27.8	-12	-48.1	-26.1	32
Boiling Point Range[1]	K	N/A	± 0.3	± 0.3	± 0.3	± 0.3	± 0.3	± 0.3	± 0.3
Critical Temperature[1]	°C	N/A	80	19.9	183.7	122.3	66	101.1	206.8
Isomer Content	% by weight	N/A	N/A	N/A	0-8 R-123a+ R-123b	0-5 R-124a	N/A	0-0.5 R-134	0-0.1ea R-141, R-141a
VAPOR PHASE CONTAMINANTS:									
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	N/A[2]	1.5	1.5	1.5	N/A[2]
LIQUID PHASE CONTAMINANTS:									
Water, Max.	ppm by weight	5.4	10	10	20	10	10	10	100
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.9
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HCl)	5.7	1	1	1	1	1	1	1
Chloride[3]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

Table 1A. Single Component Fluorocarbon Refrigerants and their Allowable Levels of Contaminants (continued)

	Reporting Units	Reference Section	R-142b	R-143a	R-152a	R-218	R-227ea	R-236fa	R-245fa	R-1233zd(E)	R-1234yf	R-1234ze(E)	R-1336mzz(Z)
CHARACTERISTICS:													
Boiling Point[1]	°C @ 101.3 kPa	N/A	-9.2	-47.2	-24	-36.8	-16.5	-1.4	14.9	18.3	-29.4	-19	33.4
Boiling Point Range[1]	K	N/A	--	± 0.3	± 0.3	± 0.3	--	± 0.3	± 0.3	--	N/A	N/A	N/A
Critical Temperature[1]	°C	N/A	137.1	72.7	113.3	72	101.7	124.9	154.1	165.6	94.8	109.4	171.3
Isomer Content	% by weight	N/A	0-0.1ea R-142, R-142a	0-0.01 R-143	N/A	--	--	--	0-0.1ea R-245ca, R-245cb, R-245ea, R-245eb	--	N/A	0.3 R-1234ze(Z)	0 - 0.1 R-1336mzz(E)
VAPOR PHASE CONTAMINANTS:													
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	2	1.5	1.5	1.5	1.5	1.5	N/A[2]	N/A[2]	1.5	1.5	N/A[2]
LIQUID PHASE CONTAMINANTS:													
Water, Maximum	ppm by weight	5.4	15	10	10	10	10	10	20	20	10	10	20
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HCl)	5.7	3	1	1	1	1	1	1	1	1	1	1
Chloride[3]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

1. Boiling points, boiling point ranges, and critical temperatures, although not required, are provided for informational purposes. Refrigerant data compiled from Refprop 9.1.
2. Since R-11, R-113, R-123, R-141b, R-245fa, R-1233zd(E), and R-1336mzz(Z) have normal boiling points near or above room temperature, non-condensable determinations are not required for these refrigerants.
3. Recognized chloride level for pass/fail is about 3 ppm.
-- Data Not Available

Table 1B. Single Component Hydrocarbon Refrigerants and their Allowable Levels of Contaminants

	Reporting Units	R-50	R-170	R-E170	R-290	R-600	R-600a	R-601	R-601a	R-610	R-1150	R-1270
CHARACTERISTICS:												
Boiling Point[1]	°C at 101.3 kPa	-161.5	-88.6	-24.8	-42.1	-0.5	-11.8	36.1	27.8	34.6	-103.8	-47.6
Boiling Point Range[1]	K	± 0.5	± 0.5	± 0.5	± 0.5	± 0.5	± 0.5	± 0.5	± 0.5	± 0.5	± 0.5	± 0.5
Minimum Nominal Composition	% weight	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5
Other Allowable Impurities	% weight	N/A	N/A	N/A	2 (see footnote[2])	2 (see footnote[2])	2 (see footnote[2])	0-1 R-601a	0-1 R-601	N/A	N/A	0-1 R-290
VAPOR PHASE CONTAMINANTS[3]:												
Air and Other Non-condensables, Maximum	% by volume @ 25.0 °C	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS[4]:												
Sulfur Odor	Pass or Fail	No sulfur odor	No sulfur odor	No sulfur odor	No sulfur odor	No sulfur odor	No sulfur odor	No sulfur odor	No sulfur odor	No sulfur odor	No sulfur odor	No sulfur odor
High Boiling Residue, Max.	% weight	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HCl)	1	1	1	1	1	1	1	1	1	1	1
Water, Max.	mg kg^{-1}	10	10	10	10	10	10	10	10	10	10	10
All Other Volatile Impurities, Max.	% weight	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total C3, C4 and C5 Polyolefins, Max.	% weight	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

1. Boiling points, boiling point ranges, although not required, are provided for informational purposes.
2. 2% of other C3 and C4 saturated hydrocarbons are allowed
3.Taken from vapor phase
4. Vaporized from liquid phase

Table 2A. Zeotropic Blends (400 Series Refrigerants) and their Allowable Levels of Contaminants										
	Reporting Units	Reference Section	**R-401A**	**R-401B**	**R-402A**	**R-402B**	**R-403A**	**R-403B**	**R-404A**	**R-405**
CHARACTERISTICS:										
Refrigerant Components	N/A	N/A	R-22/ 152a/124	R-22/ 152a/124	R-125/ 290/22	R-125/ 290/22	R-290/ 22/218	R-290/ 22/218	R-125/ 143a/134a	R-22/152a/ 142b/C318
Nominal Composition	% by weight	N/A	53.0/13.0/ 34.0	61.0/11.0/ 28.0	60.0/2.0/ 38.0	38.0/2.0/60.0	5.0/75.0/ 20.0	5.0/56.0/ 39.0	44.0/52.0/ 4.0	45.0/7.0/5.5/42.5
Allowable Composition	% by weight	N/A	51.0-55.0/ 11.5-13.5/ 33.0-35.0	59.0-63.0/ 9.5-11.5/ 27.0-29.0	58.0-62.0/ 1.0-2.1/ 36.0-40.0	36.0-40.0/ 1.0-2.1/ 58.0-62.0	3.0-5.2/ 73.0-77.0/ 18.0-22.0	3.0-5.2/ 54.0-58.0/ 37.0-41.0	42.0-46.0/ 51.0-53.0/ 2.0-6.0	43.0-47.0/ 6.0-8.0/ 4.5-6.5/ 40.5-44.5
Bubble Point[1]	°C @ 101.3 kPa	N/A	-33.3	-34.9	-49	-47	-47.8	-49.2	-46.2	-32.9
Dew Point[1]	°C @ 101.3 kPa	N/A	-26.4	-28.8	-46.9	-44.7	-44.3	-46.8	-45.5	-24.5
Critical Temperature[1]	°C	N/A	105.3	103.5	76	83	87	79.7	72.1	106
VAPOR PHASE CONTAMINANTS:										
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:										
Water, Max.	ppm by weight	5.4	10	10	10	10	10	10	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HC1)	5.7	1	1	1	1	1	1	1	1
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

Table 2A. Zeotropic Blends (400 Series Refrigerants) and their Allowable Levels of Contaminants (continued)											
	Reporting Units	Reference Section	**R-406A**	**R-407A**	**R-407B**	**R-407C**	**R-407D**	**R-407E**	**R-407F**	**R-407G**	**R-408A**
CHARACTERISTICS:											
Refrigerant Components	N/A	N/A	R-22/600a/142b	R-32/125/134a	R-32/125/134a	R-32/125/134a	R-32/125/134a	R-32/125/134a	R-32/125/134a	R-32/125/134a	R-125/143a/22
Nominal Composition	% by weight	N/A	55.0/4.0/41.0	20.0/40.0/40.0	10.0/70.0/20.0	23.0/25.0/52.0	15.0/15.0/70.0	25.0/15.0/60.0	30.0/30.0/40.0	2.5/2.5/95.0	7.0/46.0/47.0
Allowable Composition	% by weight	N/A	53.0-57.0/3.0-5.0/40.0-42.0	18.0-22.0/38.0-42.0/38.0-42.0	8.0-12.0/68.0-72.0/18.0-22.0	21.0-25.0/23.0-27.0/50.0-54.0	13.0-17.0/13.0-17.0/68.0-72.0	23.0-27.0/13.0-17.0/58.0-62.0	28.0-32.0/28.0-32.0/38.0-42.0	2.0-3.0/2.0-3.0/94.0-96.0	5.0-9.0/45.0-47.0/45.0-49.0
Bubble Point[1]	°C @ 101.3 kPa	N/A	-32.7	-45.3	-46.8	-43.6	-39.5	-42.9	-46.1	-29.2	-44.6
Dew Point[1]	°C @ 101.3 kPa	N/A	-23.5	-38.9	-42.5	-36.6	-32.9	-35.8	-39.7	-27.2	-44.1
Critical Temperature[1]	°C	N/A	116.5	82.3	75	86	91.4	88.5	83	99.5	83.1
VAPOR PHASE CONTAMINANTS:											
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:											
Water, Max.	ppm by weight	5.4	10	10	10	10	10	10	10	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight	5.7	1	1	1	1	1	1	1	1	1
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

Table 2A. Zeotropic Blends (400 Series Refrigerants) and their Allowable Levels of Contaminants (continued)										
	Reporting Units	Reference Section	**R-409A**	**R-409B**	**R-410A**	**R-410B**	**R-411A**	**R-411B**	**R-412A**	**R-413A**
CHARACTERISTICS:										
Refrigerant Components	N/A	N/A	R-22/ 124/142b	R-22/ 124/142b	R-32/125	R-32/125	R-1270/ 22/152a	R-1270/ 22/152a	R-22/218/ 142b	R-218/ 134a/600a
Nominal Composition	% by weight	N/A	60.0/25.0/ 15.0	65.0/25.0/ 10.0	50.0/50.0	45.0/55.0	1.5/87.5 /11.0	3.0/94.0/ 3.0	70.0/5.0/ 25.0	9.0/88.0/3.0
Allowable Composition	% by weight	N/A	58.0-62.0/ 23.0-27.0/ 14.0-16.0	63.0-67.0/ 23.0-27.0/ 9.0-11.0	48.5-50.5/ 49.5-51.5	44.0-46.0/ 54.0-56.0	0.5-1.5/ 87.5-89.5/ 10.0-11.0	2.0-3.0/ 94.0-96.0/ 2.0-3.0	68.0-72.0/ 3.0-7.0/ 24.0-26.0	8.0-10.0/ 86.0-90.0/ 2.0-3.0
Bubble Point[1]	°C @ 101.3 kPa	N/A	-34.7	-35.6	-51.4	-51.3	-39.5	-41.6	-38	-30.6
Dew Point[1]	°C @ 101.3 kPa	N/A	-26.4	-27.9	-51.4	-51.6	-36.6	-40	-28.7	-27.9
Critical Temperature[1]	°C	N/A	106.9	106.9	71.4	70.8	99.1	96	107.2	98.5
VAPOR PHASE CONTAMINANTS:										
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:										
Water, Maximum	ppm by weight	5.4	10	10	10	10	10	10	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HCl)	5.7	1	1	1	1	1	1	1	1
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

Table 2A. Zeotropic Blends (400 Series Refrigerants) and their Allowable Levels of Contaminants (continued)									
	Reporting Units	Reference Section	**R-414A**	**R-414B**	**R-415A**	**R-415B**	**R-416A**	**R-417A**	**R-417B**
CHARACTERISTICS:									
Refrigerant Components	N/A	N/A	R-22/124/ 600a/142b	R-22/124/ 600a/142b	R-22/152a	R-22/152a	R-134a/ 124/600	R-125/ 134a/600	R-125/ 134a/600
Nominal Composition	% by weight	N/A	51.0/28.5/ 4.0/16.5	50.0/39.0/ 1.5/9.5	82.0/18.0	25.0/75.0	59.0/39.5/1.5	46.6/50.0/3.4	79.0/18.3/2.7
Allowable Composition	% by weight	N/A	49.0-53.0/ 26.5-30.5/ 3.5-4.5/ 15.5-17.0	48.0-52.0/ 37.0-41.0/ 1.0-2.0/ 8.5-10.0	81.0-83.0/ 17.0-19.0	24.0-26.0/ 74.0-76.0	58.0-59.5/ 39.0-40.5/ 1.3-1.6	45.5-47.7/ 49.0-51.0/ 3.0-3.5	78.0-80.0/ 17.3-19.3/ 2.2-2.8
Bubble Point[1]	°C @ 101.3 kPa	N/A	-34	-32.9	-37.5	-27.7	-23.4	-38	-44
Dew Point[1]	°C @ 101.3 kPa	N/A	-25.8	-24.3	-34.7	-26.2	-21.8	-32.9	-41.5
Critical Temperature[1]	°C	N/A	110.7	111	100	111.3	108.2	89.9	75.2
VAPOR PHASE CONTAMINANTS:									
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:									
Water, Max.	ppm by weight	5.4	10	10	10	10	10	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HC1)	5.7	1	1	1	1	1	1	1
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

Table 2A. Zeotropic Blends (400 Series Refrigerants) and their Allowable Levels of Contaminants (continued)											
	Reporting Units	Reference Section	**R-417C**	**R-418A**	**R-419A**	**R-419B**	**R-420A**	**R-421A**	**R-421B**	**R-422A**	**R-422B**
CHARACTERISTICS:											
Refrigerant Components	N/A	N/A	R-125/ 134a/600	R-290/ 22/152a	R-125/ 134a/ E170	R-125/ 134a/E17 0	R-134a/ 142b	R-125/ 134a	R-125/ 134a	R-125/ 134a/600a	R-125/ 134a/600a
Nominal Composition	% by weight	N/A	19.5/78.8/ 1.7	1.5/96.0/ 2.5	77.0/19.0/ 4.0	48.5/48.0/ 3.5	88.0/12.0	58.0/42.0	85.0/15.0	85.1/11.5/ 3.4	55.0/42.0/ 3.0
Allowable Composition	% by weight	N/A	18.5-20.5/ 77.8-79.8/ 1.2-1.8	1.0-2.0/ 95.0-97.0/ 2.0-3.0	76.0-78.0/ 18.0-20.0/ 3.0-5.0	47.5-49.5/ 47.0-49.0/ 3.0-4.0	88.0-89.0/ 11.0-12.0	57.0-59.0/ 41.0-43.0	84.0-86.0/ 14.0-16.0	84.1-86.1/ 10.5-12.5/ 3.0-3.5	54.0-56.0/ 41.0-43.0/ 2.5-3.1
Bubble Point[1]	°C @ 101.3 kPa	N/A	-32.7	-41.2	-42.6	-37.4	-25	-40.8	-45.7	-46.5	-40.5
Dew Point[1]	°C @ 101.3 kPa	N/A	-29.2	-40.1	-36	-31.5	-24.2	-35.5	-42.6	-44.1	-35.6
Critical Temperature[1]	°C	N/A	95.4	96.7	79.1	90.4	105.4	78.5	69	71.7	85.7
VAPOR PHASE CONTAMINANTS:											
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:											
Water, Max.	ppm by weight	5.4	10	10	10	10	20	10	10	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually Clean	Visually clean	Visually clean	Visually Clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HC1)	5.7	1	1	1	1	1	1	1	1	1
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

Table 2A. Zeotropic Blends (400 Series Refrigerants) and their Allowable Levels of Contaminants (continued)											
	Reporting Units	Reference Section	**R-422C**	**R-422D**	**R-422E**	**R-423A**	**R-424A**	**R-425A**	**R-426A**	**R-427A**	**R-428A**
CHARACTERISTICS:											
Refrigerant Components	N/A	N/A	R-125/ 134a/600a	R-125/ 134a/600a	R-125/ 134a/600a	R-134a/ 227ea	R-125/ 134a/600a/ 600/601a	R-32/134a/ 227ea	R-125/134a/ 600/601a	R-32/125/ 143a/134a	R-125/143a/ 290/600a
Nominal Composition	% by weight	N/A	82.0/15.0/ 3.0	65.1/30.5/ 3.4	58.0/39.3/ 2.7	52.5/47.5	50.5/47.0/ 0.9/1.0/0.6	18.5/69.5/ 12.0	5.1/93.0/ 1.3/0.6	15.0/25.0/ 10.0/50.0	77.5/20.0/ 0.6/1.9
Allowable Composition	% by weight	N/A	81.0-83.0/ 14.0-16.0/ 2.5-3.1	64.0-66.0/ 30.5-32.5/ 3.0-3.5	57.0-59.0/ 38.0-41.0/ 2.5-3.0	51.5-53.5/ 46.5-48.5	49.5-51.5/ 46.0-48.0/ 0.7-1.0/ 0.8-1.1/ 0.4-0.7	18.0-19.0/ 69.0-70.0/ 11.5-12.5	4.1-6.1/ 92.0-94.0/ 1.1-1.4/ 0.4-0.7	13.0-17.0/ 23.0-27.0/ 8.0-12.0/ 48.0-52.0	76.5-78.5/ 19.0-21.0/ 0.4-0.7/ 1.7-2.0
Bubble Point[1]	°C @ 101.3 kPa	N/A	-45.3	-43.2	-41.8	-24.2	-39.1	-38.1	-28.5	-43	-48.3
Dew Point[1]	°C @ 101.3 kPa	N/A	-42.3	-38.4	-36.4	-23.5	-33.3	-31.3	-26.7	-36.3	-47.5
Critical Temperature[1]	°C	N/A	76.1	79.6	82.2	99	87.5	93.9	100.2	85.3	69
VAPOR PHASE CONTAMINANTS:											
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:											
Water, Max.	ppm by weight	5.4	10	10	20	10	10	10	10	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

Table 2A. Zeotropic Blends (400 Series Refrigerants) and their Allowable Levels of Contaminants (continued)											
	Reporting Units	Reference Section	**R-429A**	**R-430A**	**R-431A**	**R-434A**	**R-435A**	**R-437A**	**R-438A**	**R-439A**	**R-440A**
CHARACTERISTICS:											
Refrigerant Components	N/A	N/A	R-E170/ 152a/600a	R-152a/ 600a	R290/152a	R-125/ 143a/134a/ 600a	R-E170/ 152a	R-125/ 134a/600 /601	R-32/125/ 134a/600 /601a	R-32/125/ 600a	R-290/ 134a/152a
Nominal Composition	% by weight	N/A	60.0/10.0/ 30.0	76.0/24.0	71.0/29.0	63.2/18.0/ 16.0/2.8	80.0/20.0	19.5/78.5/ 1.4/0.6	8.5/45.0/ 44.2/1.7/ 0.6	50/47.0/ 3.0	0.6/1.6/97.8
Allowable Composition	% by weight	N/A	59.0-61.0/ 9.0-11.0/ 29.0-31.0	75.0-77.0/ 23.0-25.0	70.0-72.0/ 28.0-30.0	62.2-64.2/ 17.0-19.0/ 15.0-17.0/ 2.6-2.9	79.0-81.0/ 19.0-21.0	17.7-20.0/ 77.8-80.0/ 1.2-1.5/ 0.4-0.7	7.0-9.0/ 43.5-46.5/ 42.7-45.7/ 1.5-1.8/ 0.4-0.7	49.0-51.0/ 46.0-48.0/ 2.5-3.5	0.5-0.7/ 1.0-2.2/ 97.3-98.3
Bubble Point[1]	°C @ 101.3 kPa	N/A	-25.5	-27.6	-43.2	-45.1	-26	-32.9	-43	-52	-25.5
Dew Point[1]	°C @ 101.3 kPa	N/A	-24.9	-27.4	-43.2	-42.4	-25.8	-29.2	-36.4	-51.7	-24.3
Critical Temperature[1]	°C	N/A	123.5	107	100.3	75.6	125.2	95.3	84.2	72	112.9
VAPOR PHASE CONTAMINANTS:											
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:											
Water, Maximum	ppm by weight	5.4	10	10	20	20	10	10	20	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HC1)	5.7	1	1	1	1	1	1	1	1	1
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

Table 2A. Zeotropic Blends (400 Series Refrigerants) and their Allowable Levels of Contaminants (continued)											
	Reporting Units	Reference Section	**R-442A**	**R-444A**	**R-444B**	**R-445A**	**R-446A**	**R-447A**	**R-448A**	**R-449A**	**R-449B**
CHARACTERISTICS:											
Refrigerant Components	N/A	N/A	R-32/125/ 134a/152a/ 227ea	R-32/152a/ 1234ze(E)	R-32/152a/ 1234ze(E)	R-744/ 134a/ 1234ze(E)	R-32/ 1234ze(E)/ 600	R-32/ 125/ 1234ze (E)	R-32/125/ 1234yf/ 134a/ 1234ze(E)	R-32/125/ 1234yf/ 134a	R-32/125/ 1234yf/134a
Nominal Composition	% by weight	N/A	31.0/31.0/ 30.0/3.0/ 5.0	12.0/5.0/ 83.0	41.5/10.0/ 48.5	6.0/9.0/ 85.0	68.0/29.0/ 3.0	68.0/3.5/ 28.5	26.0/26.0/ 20.0/21.0/ 7.0	24.3/24.7/ 25.3/25.7	25.2/24.3/ 23.2/27.3
Allowable Composition	% by weight	N/A	30.0-32.0/ 30.0-32.0/ 29.0-31.0/ 2.5-3.5/ 4.0- 6.0	11.0-13.0/ 4.0-6.0/ 81.0-85.0	40.5-42.5/ 9.0-11.0/ 47.5-49.5	5.0-7.0/ 8.0-10.0/ 83.0-87.0	67.0-68.5/ 28.4-31.0/ 2.0-3.1	67.5-69.5/ 3.0-5.0/ 27.5-29.5	24.0-26.5/ 25.5-28.0/ 18.0-20.5/ 20.0-23.0/ 5.0-7.5	23.3-24.5/ 24.5-25.7/ 24.3-25.5/ 25.5-26.7	23.7-25.5/ 24.0-25.8/ 21.7-23.5/ 27.0-28.8
Bubble Point[1]	°C @ 101.3 kPa	N/A	-46.5	-34.3	-44.6	-50.3	-49.4	-49.3	-45.9	-46	-46.1
Dew Point[1]	°C @ 101.3 kPa	N/A	-39.9	-24.3	-34.9	-23.5	-42.1	-44.2	-39.8	-39.9	-40.2
Critical Temperature[1]	°C	N/A	82.4	103.2	91.5	98	84.2	82.6	81.6	81.5	84.2
VAPOR PHASE CONTAMINANTS:											
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:											
Water, Maximum	ppm by weight	5.4	10	10	10	10	10	10	10	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HC1)	5.7	1	1	1	1	N/A	1	1	1	1
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

1. Bubble points, dew points, and critical temperatures, although not required, are provided for informational purposes. Refrigerant data compiled from Refprop 9.1.
2. Recognized chloride level for pass/fail is about 3 ppm.

Table 2A. Zeotropic Blends (400 Series Refrigerants) and their Allowable Levels of Contaminants (continued)

	Reporting Units	Reference Section	R-450A	R-451A	R-451B	R-452A	R-453A	R-454A	R-454B	R-455A
CHARACTERISTICS:										
Refrigerant Components	N/A	N/A	R-134a/ 1234ze(E)	R-1234yf/ 134a	R-1234yf/ 134a	R-32/125/ 1234yf	R-32/125/ 134a/227e/600/601a	R-32/ 1234yf	R-32/ 1234yf	R-744/32/ 1234yf
Nominal Composition	% by weight	N/A	42.0/58.0	89.8/10.2	88.8/11.2	11.0/59.0/ 30.0	20.0/20.0/53.8/ 5.0/0.6/0.6	35.0/65.0	68.9/31.1	3.0/21.5/ 75.5
Allowable Composition	% by weight	N/A	40.0-44.0/ 56.0-60.0	89.6-90.0/ 10.0-10.4	88.6-89.0/ 11.0-11.4	9.3-12.7/ 57.2-60.8/ 29.0-30.1	19.0-21.0/19.0-21.0/ 52.8-54.8/4.5-5.5/ 0.4-0.7/0.4-0.7	33.0-37.0/ 63.0-67.0	67.9-69.9/ 30.1-32.1	2.0-5.0/ 19.5-22.5/ 73.5-77.5
Bubble Point[1]	°C @ 101.3 kPa	N/A	-23.4	-30.8	-31	-47.0	-42.2	-48.4	-50.9	-51.6
Dew Point[1]	°C @ 101.3 kPa	N/A	-22.8	-30.5	-30.6	-43.2	-35	-41.6	-50.0	-39.1
Critical Temperature[1]	°C	N/A	104.4	95.4	95.5	74.9	88	86.2	76.5	82.8
VAPOR PHASE CONTAMINANTS:										
Air and Other Non-condensables, Max.	% by volume @ 25.0 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:										
Water, Maximum	ppm by weight	5.4	10	10	10	10	10	10	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight (as HCl)	5.7	1	1	1	1	N/A	1	1	1
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

1. Bubble points, dew points, and critical temperatures, although not required, are provided for informational purposes. Refrigerant data compiled from Refprop 9.1.
2. Recognized chloride level for pass/fail is about 3 ppm.

Table 2B. Hydrocarbon Blends (400 & 500 Series Refrigerants) and their Allowable Levels of Contaminants

	Reporting Units	Reference Section	**R-432A**	**R-433A**	**R-433B**	**R-433C**	**R-436A**	**R-436B**	**R-441A**	**R-443A**
CHARACTERISTICS:										
Refrigerant Components	N/A	N/A	R-1279/E170	R-1270/290	R-1270/290	R-1270/290	R-290/600a	R-290/600a	R-170/ 290/600a/600	R-1270/ 290/600a
Nominal Composition	% by weight	N/A	80.0/20.0	30.0/70.0	5.0/95.0	25.0/75.0	56.0/44.0	52.0/48.0	3.1/54.8/6.0/36.1	55.0/40.0/5.0
Allowable Composition	% by weight	N/A	79.0-81.0/ 19.0-21.0	29.0-31.0/ 69.0-71.0	4.0-6.0/ 94.0- 96.0	24.0-26.0/ 74.0-76.0	55.0-57.0/ 43.0-45.0	51.0-53.0/ 47.0- 49.0	2.8-2.4/52.8-56.8/ 5.4-6.6/34.1-38.1	53.0-57.0/ 38.0-42.0/ 3.8-6.2
Bubble Point[1]	°C @ 101.3 kPa	N/A	-45.2	-44.4	-42.5	-44.1	-34.3	-33.3	-41.5	-45.2
Dew Point[1]	°C @ 101.3 kPa	N/A	-42.4	-44	-42.4	-43.7	-26.1	-25	-20.3	-42.1
Critical Temperature[1]	°C	N/A	97.3	94.4	96.3	94.8	115.9	117.4	117.3	95.1
VAPOR PHASE CONTAMINANTS[2]:										
Air and Other Non-condensables, Max.	% by volume @ 25.0°C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS[3]:										
Sulfur Odor[4]	No odor to pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight	5.7	1	1	1	1	1	1	1	N/A
Water, Max.	ppm by weight	5.4	20	10	10	10	10	10	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Total C3, C4 and C5 Polyolefins, Max.	% by weight	5.12	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	N/A	N/A

1. Bubble points, dew points, and critical temperatures, although not required, are provided for informational purposes. Refrigerant data compiled from Refprop 9.1.
2. Taken from vapor phase
3. Vaporized from liquid phase
4. Including hydrogen sulphide and mercaptans

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Table 3. Azeotropic Blends (500 Series Refrigerants) and their Allowable Levels of Contaminants

	Reporting Units	Reference Section	**R-500**	**R-502**	**R-503**	**R-507A**	**R-508A**	**R-508B**	**R-509A**	**R-510A**	**R-511A**	**R-512A**	**R-513A**
CHARACTERISTICS:													
Refrigerant Components	N/A	N/A	R-12/152a	R-22/115	R-23/13	R-125/143a	R-23/116	R-23/116	R-22/218	R-E170/600a	R-290/E170	R-134a/152a	R-1234yf/134a
Nominal Composition	% by weight	N/A	73.8/26.2	48.8/51.2	40.1/59.9	50.0/50.0	39.0/61.0	46.0/54.0	44.0/56.0	88.0/12.0	95.0/5.0	5.0/95.0	56.0/44.0
Allowable Composition	% by weight	N/A	72.8-74.8/25.2-27.2	44.8-52.8/47.2-55.2	39.0-41.0/59.0-61.0	49.5-51.5/48.5-50.5	37.0-41.0/59.0-63.0	44.0-48.0/52.0-56.0	42.0-46.0/56.0-60.0	87.5-88.5/11.5-12.5	94.0-96.0/4.0-6.0	4.0-6.0/94.0-96.0	55.0-57.0/43.0-45.0
Bubble Point[1]	°C @ 101.3 kPa	N/A	-33.6	-45.2	-87.8	-46.7	-87.4	-87	-49.8	-24.9	-42	-24	-29.2
Dew Point[1]	°C @ 101.3 kPa	N/A	-33.6	-45	-87.8	-46.7	-87.4	-87	-48.1	-24.9	-42	-24	-29.1
Critical Temperature[1]	°C	N/A	102.1	80.2	18.4	70.6	10.8	11.8	68.6	125.7	97	112.9	96.5
VAPOR PHASE CONTAMINANTS:													
Air and Other Non-condensables, Max.	% by volume @ 25 °C	5.10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
LIQUID PHASE CONTAMINANTS:													
Water, Maximum	ppm by weight	5.4	10	10	10	10	10	10	10	20	20	10	10
All Other Volatile Impurities, Max.	% by weight	5.11	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
High Boiling Residue, Max.	% by volume or % by weight	5.8	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Particulates/Solids	Pass or Fail	5.9	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean	Visually clean
Acidity, Max.	ppm by weight	5.7	1	1	1	1	1	1	1	1	1	1	1
Chloride[2]	Pass or Fail	5.6	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity	No visible turbidity

1. Bubble points, dew points, and critical temperatures, although not required, are provided for informational purposes. Refrigerant data compiled from Refprop 9.1.
2. Recognized chloride level for pass/fail is about 3 ppm.

Section 7.0 References—Normative

Listed here are all standards, handbooks, and other publications essential to the formation and implementation of the standard. All references in this appendix are considered as part of this standard.

ANSI/ASHRAE Standard 34–2013, *Designation and Safety Classification of Refrigerants,* with Addenda, American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

2008 Appendix C to AHRI Standard 700–2014, *2008 Appendix C for Analytical Procedures for AHRI Standard 700–2014—Normative,* copyright 2008 (incorporated by reference, see § 82.168).

ASTM D1296–01 (Reapproved 2012), *Standard Test Method for Odor of Volatile Solvents and Diluents,* approved July 1, 2012, (incorporated by reference, see § 82.168).

BB–F–1421B, Federal Specification for ''Fluorocarbon Refrigerants,'' dated March 5, 1982, (incorporated by reference, see § 82.168).

GPA Standard 2177–13, *Analysis of Natural Gas Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography, Revised,* copyright 2013, (incorporated by reference, see § 82.168).

REFPROP Reference Fluid Thermodynamic and Transport Properties *NIST Standard Reference Database 23 version 9.1,* 2013, U.S. Department of Commerce, Technology Administration, National Institute of Standards and Technology.

Section 8.0 References—Informative

Listed here are standards, handbooks, and other publications which may provide useful information and background but are not considered essential.

2012 Appendix D to AHRI Standard 700–2014, *2012 Appendix D for Gas Chromatograms for AHRI Standard 700–2014—Informative,* copyright 2012, (incorporated by reference, see § 82.168).

■ 16. Amend subpart F by adding appendix B3 to read as follows:

Appendix B3 to Subpart F of Part 82—Performance of Refrigerant Recovery, Recycling, and/or Reclaim Equipment

This appendix is based on the Air-Conditioning, Heating, and Refrigeration Institute Standard 740–2016, *Performance Rating of Refrigerant Recovery Equipment and Recovery/Recycling Equipment.*

Section 1. Purpose

1.1 The purpose of this standard is to establish methods of testing for rating and evaluating the performance of refrigerant recovery, and/or recycling equipment and general equipment requirements (herein referred to as ''equipment'') for contaminant or purity levels, capacity, speed and purge loss to minimize emission into the atmosphere of designated refrigerants.

Section 2. Scope

2.1 This standard applies to equipment for recovering and/or recycling single refrigerants, azeotropes, zeotropic blends, and their normal contaminants from refrigerant systems. This standard defines the test apparatus, test gas mixtures, sampling procedures and analytical techniques that will be used to determine the performance of refrigerant recovery and/or recycling equipment (hereinafter, ''equipment''). Appendix B4 of this subpart establishes standards for recovery/recycling equipment used with flammable refrigerants.

Section 3. Definitions

3.1 *Definitions.* All terms in this appendix will follow the definitions in § 82.152 unless otherwise defined in this appendix.

3.2 *Clearing Refrigerant.* Procedures used to remove trapped refrigerant(s) from equipment before switching from one refrigerant to another.

3.3 *High Temperature Vapor Recovery Rate.* For equipment having at least one designated refrigerant (see Section 11.2 of this appendix) with a boiling point in the range of −50 to +10 °C, the rate will be measured for R–22, or the lowest boiling point refrigerant if R–22 is not a designated refrigerant.

3.4 *Published Ratings.* A statement of the assigned values of those performance characteristics, under stated rating conditions, by which a unit may be chosen to fit its application. These values apply to all units of like nominal size and type (identification) produced by the same manufacturer. As used herein, the term ''published rating'' includes the rating of all performance characteristics shown on the unit or published in specifications, advertising, or other literature controlled by the manufacturer, at stated rating conditions.

3.5 *Push/Pull Liquid Recovery.* The push/pull refrigerant recovery method is defined as the process of transferring liquid refrigerant from a refrigeration system to a receiving vessel by lowering the pressure in the vessel and raising the pressure in the system, and by connecting a separate line between the system liquid port and the receiving vessel.

3.6 *Recycle Flow Rate.* The amount of refrigerant processed divided by the time elapsed in the recycling mode. For equipment which uses a separate recycling sequence, the recycle rate does not include the recovery rate (or elapsed time). For equipment which does not use a separate recycling sequence, the recycle rate is a rate based solely on the higher of the liquid or vapor recovery rate, by which the contaminant levels were measured.

3.7 *Residual Trapped Refrigerant.* Refrigerant remaining in equipment after clearing refrigerant.

3.8 *Shall, Should, Recommended* or *It Is Recommended* shall be interpreted as follows:

3.8.1 *Shall.* Where ''shall'' or ''shall not'' is used for a provision specified, that provision is mandatory if compliance with this appendix is claimed.

3.8.2 *Should, Recommended* or *It Is Recommended* is used to indicate provisions which are not mandatory but which are desirable as good practice.

3.9 *Standard Contaminated Refrigerant Sample.* A mixture of new or reclaimed refrigerant and specified quantities of identified contaminants which constitute the mixture to be processed by the equipment under test. These contaminant levels are expected only from severe service conditions.

3.10 *Trapped Refrigerant.* The amount of refrigerant remaining in the equipment after the recovery or recovery/recycling operation but before clearing refrigerant.

3.11 *Vapor Recovery Rate.* The average rate that refrigerant is withdrawn from the mixing chamber between two pressures as vapor recovery rate is changing depending on the pressure. The initial condition is vapor only at saturation pressure and temperature at either 24 °C or at the boiling point at 100 kPa, whichever is higher. The final pressure condition is 10 percent of the initial pressure, but not lower than the equipment final recovery vacuum and not higher than 100 kPa.

Section 4. General Equipment Requirements

4.1 *Equipment Information.* The equipment manufacturer shall provide operating instructions, necessary maintenance procedures, and source information for replacement parts and repair.

4.2 *Filter Replacement.* The equipment shall indicate when any filter/drier(s) needs replacement. This requirement can be met by use of a moisture transducer and indicator light, by use of a sight glass/moisture indicator, or by some measurement of the amount of refrigerant processed such as a flow meter or hour meter. The equipment manufacturer must provide maximum quantity recycled or filter change interval in its written instructions.

4.3 *Purge of Non-Condensable.* If non-condensables are purged, the equipment shall either automatically purge non-condensables or provide an indicating means to guide the purge process. Recycling equipment must provide purge means.

4.4 *Purge Loss.* The total refrigerant loss due to purging non-condensables, draining oil, and clearing refrigerant (see Section 9.5) shall be less than 3 percent (by weight) of total processed refrigerant.

4.5 *Permeation Rate.* High pressure hose assemblies ⅝ in. (16 mm) nominal and smaller shall not exceed a permeation rate of 3.9 g/cm^2/yr (internal surface) at a temperature of 48.8 °C. Hose assemblies that UL recognized as having passed UL 1963, 2011 requirements shall be accepted without testing. See Section 7.1.4 of this appendix.

4.6 *Clearing Trapped Refrigerant.* For equipment rated for more than one refrigerant, the manufacturer shall provide a method and instructions which will accomplish connections and clearing within 15 minutes. Special equipment, other than a vacuum pump or manifold gauge set, shall be furnished. The clearing procedure shall not rely upon the storage cylinder below saturated pressure conditions at ambient temperature.

4.7 *Temperature.* The equipment shall be evaluated at 24 °C with additional limited evaluation at 40 °C. Normal operating conditions range from 10 °C to 40 °C.

4.8 *Exemptions.* Equipment intended for recovery only shall be exempt from Sections 4.2 and 4.3.

Section 5. Contaminated Refrigerants

5.1 *Sample Characteristics.* The standard contaminated refrigerant sample shall have the characteristics specified in Table 1, except as provided in Section 5.2 of this appendix. Testing shall be conducted at an ambient temperature of 24 °C ± 1 °C except high temperature vapor recovery shall be 40 °C ± 1 °C.

5.2 *Recovery-only Testing.* Recovery equipment not rated for removal of contaminants shall be tested with new or reclaimed refrigerant.

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Table 1– Standard Contaminated Refrigerant Samples

	R-11	R-12	R-13	R-22	R-23	R-113	R-114	R-123	R-124	R-134a	R-500	R-502	R-503	R-401A	R-401B	R-402A
Moisture Content: ppm by Weight of Pure Refrigerant	100	80	30	200	30	100	85	200	200	200	200	200	30	200	200	200
Particulate Content: ppm by Weight of Pure Refrigerant[1]	80	80	N/A	80	N/A	80	80	80	80	80	80	80	N/A	80	80	80
Acid Content: ppm by Weight of Pure Refrigerant[2]	100	200	N/A	100	N/A	100	100	100	100	100	200	100	N/A	100	100	100
Oil (HBR) Content: % by Weight of Pure Refrigerant	20	5	N/A	5	N/A	20	20	20	5	5	5	5	N/A	5	5	5
Viscosity/Type[3]	300/MO	150/MO	N/A	300/MO	N/A	300/MO	300/MO	300/MO	150/MO	150/MO	150/MO	150/MO	N/A	150/AB	150/AB	150/AB
Non-Condensable Gases (Air Content): % by Volume	N/A	3	3	3	3	N/A	3	N/A	3	3	3	3	3	3	3	3

Table 1 (continued) – Standard Contaminated Refrigerant Samples

	R-402B	R-404A	R-406A	R-407A	R-407B	R-407C	R-407D	R-408A	R-409A	R-410A	R-410B	R-411A	R-411B	R-417C	R-419B	R-422E	R-445A	R-507	R-508A	R-508B
Moisture Content: ppm by Weight of Pure Refrigerant	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	20	20
Particulate Content: ppm by Weight of Pure Refrigerant[1]	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80	NA	NA
Acid Content: ppm by Weight of Pure Refrigerant [2]	100	100	200	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	NA	NA
Oil (HBR) Content: % by Weight of Pure Refrigerant	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	NA	NA
Viscosity/Type[3]	150/AB	150/POE	150/AB	150/POE	150/POE	150/POE	150/POE	150/MO	150/MO	150/POE	150/POE	150/MO	150/MO	150/POE	150/POE	150/POE	150/POE	150/POE	NA	NA
Non-Condensable Gases (Air Content): % by Volume	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

[1] Particulate content shall consist of inert materials and shall comply with particulate requirements in Appendix B.
[2] Acid consists of 60% oleic acid and 40% hydrochloric acid on a total number basis.
[3] POE = Polyoester, AB = Alkylbenzene, MO = Mineral Oil.
[4] N/A means not applicable.

BILLING CODE 6560–50–C

Section 6. Test Apparatus

6.1 *General Recommendations.* The recommended test apparatus is described in the following paragraphs. If alternate test apparatus are employed, the user shall be able to demonstrate that they produce results equivalent to the specified reference apparatus.

6.2 *Self-Contained Equipment Test Apparatus.* The apparatus, shown in Figure 1, shall consist of:

6.2.1 *Mixing Chamber.* A mixing chamber consisting of a tank with a conical-shaped bottom, a bottom port and piping for delivering refrigerant to the equipment, various ports and valves for adding refrigerant to the chamber, and stirring means for mixing.

6.2.2 *Filling Storage Cylinder.* The storage cylinder to be filled by the refrigerant transferred shall be cleaned and at the pressure of the recovered refrigerant at the beginning of the test. It will not be filled over 80 percent, by volume.

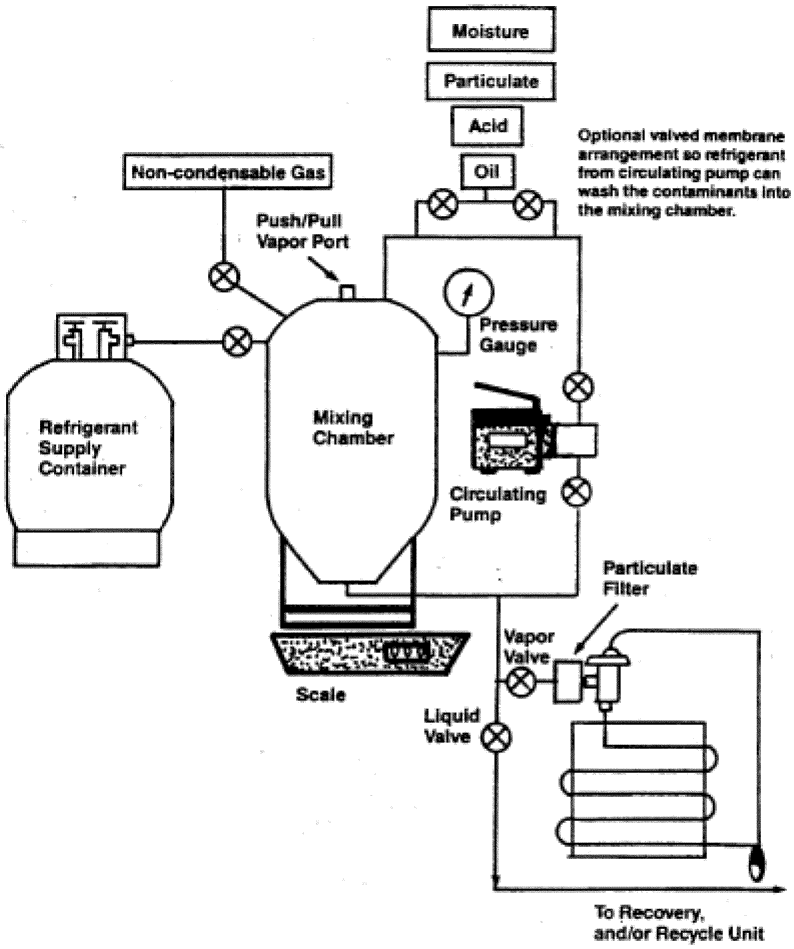
6.2.3 *Vapor Feed.* Vapor refrigerant feed consisting of evaporator, control valves and piping to create a 3.0 °C superheat condition at an evaporating temperature of 21 °C ± 2 °C.

6.2.4 *Alternative Vapor Feed.* An alternative method for vapor feed shall be to pass the refrigerant through a boiler and then through an automatic pressure regulating valve set at different saturation pressures, moving from saturated pressure at 24 °C to final pressure of recovery.

6.2.5 *Liquid Feed.* Liquid refrigerant feed consisting of control valves, sampling port, and piping.

6.2.6 *Instrumentation.* Instrumentation capable of measuring weight, temperature, pressure, and refrigerant loss, as required.

Figure 1. Test Apparatus for Self-Contained Equipment



6.3 *Size.* The size of the mixing chamber and filling storage cylinder used during testing shall correspond to the size of the equipment being tested per Section 6.3.1 or 6.3.2:

6.3.1 For equipment utilizing nominal ¼″ or ⅜″ flare ports and hoses, the mixing chamber shall be 0.09 m^3 and all ports, valves, mixing valves, and piping shall be ½″ or larger, reduced down to the port size of the equipment by fittings at the connection ports of the mixing chamber. The filling storage cylinder used during testing shall be a nominal 50-pound water capacity DOT 4Bx cylinder with ¼″ flare liquid and vapor ports.

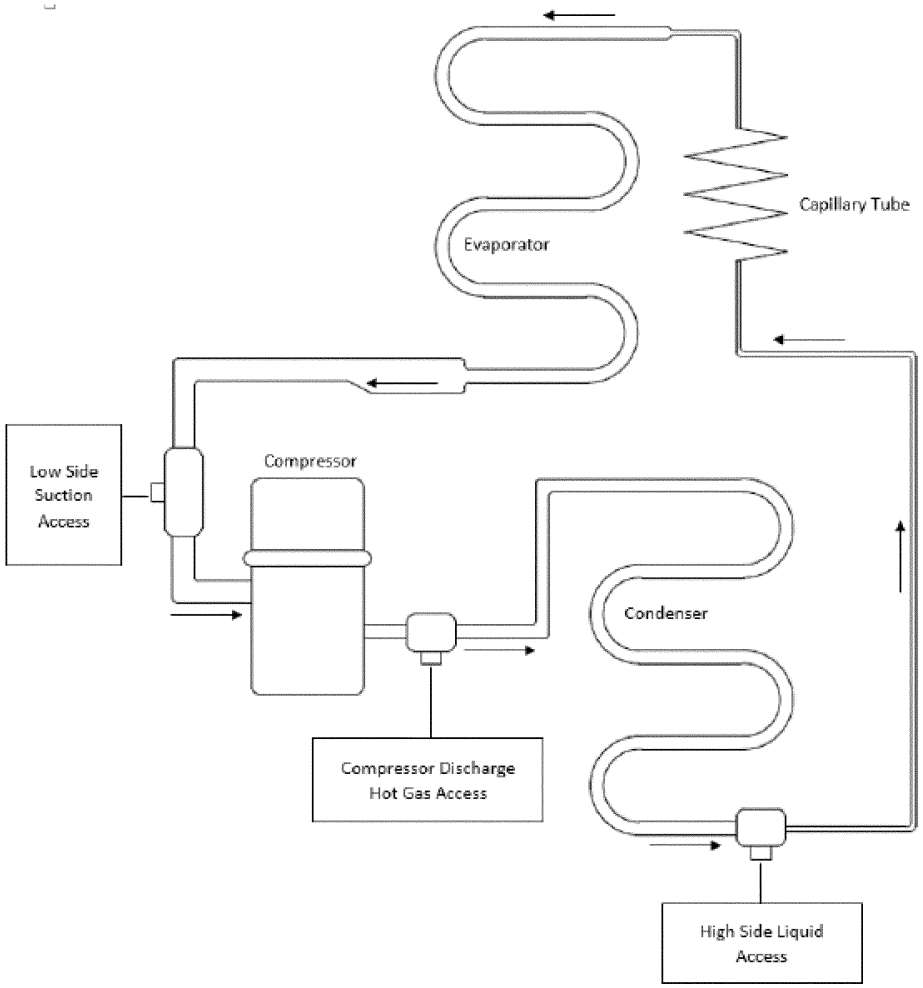
6.3.2 For equipment utilizing ½″ or larger flare ports and hoses, the mixing chamber shall be 0.45 m^3 (or nominal 1000-pound water capacity DOT 4Bx cylinder) and all ports, valves, mixing valves, and piping shall be 1½″ or larger, reduced down to the port size of the equipment by fittings at the connection ports of the mixing chamber. The filling storage cylinder used during testing shall be a nominal 1000-pound water capacity DOT 4Bx cylinder with liquid and vapor ports, valves and piping sized ¾″ NPT and reduced or increased to the port size of the equipment by fittings at the connection ports of the filling storage cylinder.

6.4 *System Dependent Equipment Test Apparatus.* This test apparatus is to be used for final recovery vacuum rating of all system dependent equipment.

6.4.1 *Test Setup.* The test apparatus shown in Figure 2 consists of a complete refrigeration system. The manufacturer shall identify the refrigerants to be tested. The test apparatus can be modified to facilitate operation or testing of the system dependent equipment if the modifications to the

apparatus are specifically described within the manufacturer's literature. A 6.3 mm balance line shall be connected across the test apparatus between the high- and low-pressure sides, with an isolation valve located at the connection to the compressor high side. A 6.3 mm access port with a valve core shall be located in the balance line for the purpose of measuring final recovery vacuum at the conclusion of the test.

Figure 2. System Dependent Equipment Test Apparatus



Section 7. Performance Testing Procedures

7.1 *General Testing.*

7.1.1 *Temperatures.* Testing shall be conducted at an ambient temperature of 24 °C ± 1 °C except high temperature vapor recovery shall be at 40 °C ± 1 °C. The evaporator conditions of Section 6.2.3 shall be maintained as long as liquid refrigerant remains in the mixing chamber.

7.1.2 *Refrigerants.* The equipment shall be tested for all designated refrigerants (see Section 11.2). All tests in Section 7 shall be completed for each refrigerant before starting tests with the next refrigerant.

7.1.3 *Selected Tests.* Tests shall be as appropriate for the equipment type and ratings parameters selected (see Sections 9.9, 11.1 and 11.2).

7.1.4 *Hose Assemblies.* For the purpose of limiting refrigerant emissions to the atmosphere, hose assemblies shall be tested for permeation according to UL Standard 1963 (incorporated by reference, see § 82.168).

7.2 *Equipment Preparation and Operation.* The equipment shall be prepared and operated per the operating instructions.

7.3 *Test Batch.* The test batch consisting of refrigerant sample (*see* Section 5) of the test refrigerant shall be prepared and thoroughly mixed. Continued mixing or stirring shall be required during the test while liquid refrigerant remains in the mixing chamber. The mixing chamber shall be filled to 80 percent level by volume.

7.3.1 *Control Test Batch.* Prior to starting the test for the first batch for each refrigerant, a liquid sample will be drawn from the mixing chamber and analyzed per Section 8 to assure that contaminant levels match Table 1 within ±10 ppm for moisture, ±20 ppm for oleic acid and ±0.5 percent for oil.

7.4 *Recovery Tests (Recovery and Recovery/Recycling Equipment)*

7.4.1 *Determining Recovery Rates.* The liquid and vapor refrigerant recovery rates shall be measured during the first test batch for each refrigerant (*see* Sections 9.1, 9.2 and 9.4). Equipment preparation and recovery cylinder changeover shall not be included in elapsed time measurements for determining vapor recovery rate and liquid refrigerant recovery rate. Operations such as subcooling the recovery cylinder shall be included. The recovery cylinder shall be the same size as per Section 6.3 or as furnished by the equipment manufacturer. Oversized tanks shall not be permitted.

7.4.1.1 *Liquid Refrigerant Recovery Rate.* If elected, the recovery rate using the liquid refrigerant feed means (*see* Section 6.2.5) shall be determined. After the equipment reaches stabilized conditions of condensing temperature and/or recovery cylinder pressure, the recovery process shall be stopped and an initial weight shall be taken of the mixing chamber (*see* Section 9.2). The recovery process shall be continued for a period of time sufficient to achieve the accuracy in Section 9.4. The recovery process shall be stopped and a final weight of the mixing chamber shall be taken.

7.4.1.2 *Vapor Refrigerant Recovery Rate.* If elected, the average vapor flow rate shall be measured to accuracy requirements in Section 9.4 under conditions with no liquid

refrigerant in the mixing chamber. The liquid recovery feed means shall be used. At initial conditions of saturated vapor at the higher of 24 °C or the boiling temperature (100 kPa), the weight of the mixing chamber and the pressure shall be recorded. At final conditions representing pressure in the mixing chamber of 10 percent of the initial condition, but not less than the final recovery vacuum (*see* Section 9.6) nor more than 100 kPa, measure the weight of the mixing chamber and the elapsed time. At initial conditions, the recovery cylinder shall be at saturation pressure at ambient conditions.

7.4.1.3 *High Temperature Vapor Recovery Rate.* This is applicable for equipment having at least one designated refrigerant (*see* Section 11.2) with a boiling point between −50 °C and +10 °C. Measure the rate for R–22, or the refrigerant with the lowest boiling point if R–22 is not a designated refrigerant. Repeat the test in Section 7.4.1.2 at saturated conditions at 40 °C and continue to operate equipment to assure it will operate at this condition (see Section 7.4.3). At initial conditions, the recovery cylinder shall be at saturated pressure at 40 °C.

7.4.1.4 *Push/Pull Liquid Refrigerant Recovery Rate.* If elected, the average liquid push/pull flow rate shall be measured to accuracy requirements in Section 9.4. The mixing chamber and filling storage cylinder shall be filled with refrigerant vapor at initial conditions of saturated vapor at the higher of 24 °C or the boiling temperature at 100 kPa. An amount of liquid refrigerant shall be added to the mixing chamber equivalent to 80 percent by weight of the capacity of the filling storage cylinder. The pressure between the mixing chamber and filling storage cylinder shall be equalized and stabilized at initial conditions of saturated vapor at the higher of 24 °C or the boiling temperature at 100 kPa. The initial weight of the mixing chamber and the pressure shall be recorded. The equipment is then operated in push/pull liquid recovery mode and the weight change of the mixing chamber is recorded over time until all of the liquid has been transferred.

7.4.2 *Recovery Operation.* This test is for determining the final recovery vacuum and the ability to remove contaminants as appropriate. If equipment is rated for liquid recovery (*see* Section 7.4.1.3), liquid recovery feed means described in Section 6.2.5 shall be used. If not, vapor recovery means described in Sections 6.2.3 or 6.2.4 shall be used. Continue recovery operation until all liquid is removed from the test apparatus and vapor is removed to the point where equipment shuts down by automatic means or is manually shut off per operating instructions.

7.4.2.1 *Oil Draining.* Capture oil from the equipment at intervals as required in the instructions. Record the weight of the container. Completely remove refrigerant from oil by evacuation or other appropriate means. The weight difference shall be used in Section 7.5.2.

7.4.3 *Final Recovery Vacuum.* At the end of the first test batch for each refrigerant, the liquid valve and vapor valve of the apparatus shall be closed. After waiting 1 minute, the mixing chamber pressure shall be recorded (*see* Section 9.6).

7.4.4 *Residual Refrigerant.* This test will measure the mass of remaining refrigerant in the equipment after clearing and therefore the extent of mixing different refrigerants (*see* Section 9.6).

7.4.4.1 *Initial Conditions.* At the end of the last test for each batch for each refrigerant, the equipment shall be disconnected from the test apparatus (Figure 1). Recycle per Section 7.5, if appropriate. Perform refrigerant clearing operations as called for in the instruction manual. Capture and record the weight of any refrigerant which would have been emitted to the atmosphere during the clearing process for use in Section 9.5. If two loops are used for recycling, trapped refrigerant shall be measured for both.

7.4.4.2 *Residual Trapped Refrigerant.* Evacuate an empty test cylinder to 1.0 kPa. Record the empty weight of the test cylinder. Open all valves to the equipment so as to provide access to all trapped refrigerant. Connect the equipment to the test cylinder and operate valves to recover the residual refrigerant. Record the weight of the test cylinder using a recovery cylinder pressure no less than specified in Section 6.2.2. Place the test cylinder in liquid nitrogen for a period of 30 minutes or until a vacuum of 1000 microns is reached, whichever occurs first.

7.5 *Recycling Tests (Recovery/Recycling Equipment).*

7.5.1 *Recycling Operation.* As each recovery cylinder is filled in Section 7.4.2, recycle according to operating instructions. There will not necessarily be a separate recycling sequence. Note non-condensable purge measurement in Section 9.5.

7.5.1.1 *Recycle Flow Rate.* While recycling the first recovery cylinder for each refrigerant, determine the recycling flow rate by appropriate means (*see* Section 9.3) to achieve the accuracy required in Section 9.4.

7.5.2 *Non-Condensable Sample.* After completing Section 7.4.3, prepare a second test batch (*see* Section 7.3). Recover per Section 7.4.2 until the current recovery cylinder is filled to 80 percent level by volume. Recycle per Section 7.5.1. Mark this cylinder and set aside for taking the vapor sample. For equipment having both an internal tank of at least 3 kg refrigerant capacity and an external recovery cylinder, two recovery cylinders shall be marked and set aside. The first is the cylinder described above. The second cylinder is the final recovery cylinder after filling it to 80 percent level by volume and recycling.

7.5.2.1 *Push/Pull Liquid Refrigerant Recovery Rate.* This rate shall be measured by weight change of the mixing chamber divided by elapsed time (*see* Section 7.4.1.4). The units shall be kg/min and the accuracy shall be per Section 9.4.

7.5.3 *Liquid Sample for Analysis.* Repeat steps in Sections 7.3, 7.4.2 and 7.5.1 with further test batches until indication means in Section 4.2 show the filter/drier(s) need replacing.

7.5.3.1 *Multiple Pass.* For equipment with a separate recycling circuit (multiple pass), set aside the current cylinder and draw the liquid sample (*see* Section 7.4) from the previous cylinder.

7.5.3.2 *Single Pass.* For equipment with the single pass recycling circuit, draw the liquid sample (*see* Section 7.4) from the current cylinder.

7.6 *Measuring Refrigerant Loss.* Refrigerant loss due to non-condensables shall be determined by appropriate means (*see* Section 9.5.1). The loss could occur in Sections 7.4.1, 7.4.2 and 7.5.1.

Section 8. Sampling and Chemical Analysis Methods

8.1 *Chemical Analysis.* Chemical analysis methods shall be specified in appropriate standards such as AHRI Standard 700, *2008 Appendix C for Analytical Procedures for AHRI Standard 700–2014- Normative*, and Addendum 700–1 to Appendix C. If alternate test methods are employed, the laboratory must be able to demonstrate that they produce results equivalent to the specified referee method.

8.2 *Refrigerant Sampling.*

8.2.1 *Moisture Content.* The water content in refrigerant shall be measured by the Karl Fischer Coulometric Titration technique. Report the moisture level in parts per million by weight.

8.2.2 *Chloride Ions.* Chloride ions shall be measured by turbidity tests. At this time, quantitative results have not been defined. Report chloride content as ''pass'' or ''fail.'' In the future, when quantitative results are possible, report chloride content as parts per million by weight.

8.2.3 *Acid Content.* The acidity test uses the titration principle. Report the acidity in parts per million by weight (mg KOH/kg) of sample.

8.2.4 *High Boiling Residue.* High boiling residues shall use measurement of the volume of residue after evaporating a standard volume of refrigerant. Using weight measurement and converting to volumetric units is acceptable. Report high boiling residues as percent by volume.

8.2.5 *Particulates/Solids.* The particulates/solids measurement employs visual examination. Report results as ''pass'' or ''fail.''

8.2.6 *Non-condensables.* The level of contamination by non-condensable gases in the base refrigerant being recycled shall be determined by gas chromatography. Report results as percent by volume.

Section 9. Performance Calculations for Ratings

9.1 *Vapor Refrigerant Recovery Rate.* This rate shall be measured by weight change of the mixing chamber divided by elapsed time (*see* 7.4.1.2). The units shall be kg/min and the accuracy shall be per Section 9.4.

9.1.1 *High Temperature Vapor Recovery Rate.* This rate shall be measured by measured weight change of the mixing chamber divided by elapsed time (see Section 7.4.1.3). The units shall be kg/min and the accuracy shall be per Section 9.4.

9.2 *Liquid Refrigerant Recovery Rate.* This rate shall be measured by weight change of the mixing chamber divided by elapsed time (*see* 7.4.1.3). The units shall be kg/min and the accuracy shall be per Section 9.4.

9.3 *Recycle Flow Rate.* The recycle flow rate shall be as defined in Section 3.12,

expressed in kg/min, and the accuracy shall be per Section 9.4.

9.3.1 For equipment using multi-pass recycling or a separate sequence, the recycle rate shall be determined by dividing the net weight, W, of the refrigerant to be recycled by the actual time T required to recycle. Any set-up or operator interruptions shall not be included in the time T.

9.3.2 If no separate recycling sequence is used, the recycle rate shall be the higher of the vapor refrigerant recovery rate or the liquid refrigerant recovery rate. The recycle rate shall match a process which leads to contaminant levels in Section 9.9. Specifically, a recovery rate determined from bypassing a contaminant removal device cannot be used as a recycle rate when the contaminant levels in Section 9.9 are determined by passing the refrigerant through the contaminant removal device.

9.4 *Accuracy of Flow Rates.* The accuracy of test measurements in Sections 9.1, 9.2 and 9.3 shall be ±008 kg/min for flow rates up to 0.42 kg/min and ±2.0 percent for flow rates larger than 0.42 kg/min. Ratings shall be expressed to the nearest 0.02 kg/min.

9.5 *Refrigerant Loss.* This calculation will be based upon the net loss of refrigerant which would have been eliminated in the non-condensable purge process (*see* Section 7.5.1), the oil draining process (*see* Section 7.4.2.1) and the refrigerant clearing process (*see* Section 7.4.4.1), all divided by the net refrigerant content of the test batches. The refrigerant loss shall not exceed 3 percent by weight.

9.5.1 *Non-Condensable Purge.* Evacuate an empty container to 2 kPa. Record the empty weight of the container. Place the container in a dry ice bath. Connect the equipment purge connection to the container and operate purge according to operating instructions so as to capture the non-condensables and lost refrigerant. Weigh the cylinder after the recycling is complete. Equivalent means are permissible.

For units which either recycle or publish (list) non-condensable removal, non-condensable gases are purged, operating the recycle device per the manufacturer's instructions through an evaporator pressure regulator (EPR) valve into a liquid nitrogen-chilled cylinder. This combination will simulate the atmosphere while allowing the capture of purge gases. The cylinder is weighed before and after the purge procedure.

9.5.2 *Oil Draining.* Refrigerant removed from the oil after draining shall be collected and measured in accordance with Section 7.4.2.1.

9.5.3 *Clearing Unit.* Refrigerant captured during the clearing process shall be measured in accordance with Section 7.4.4.1.

9.6 *Final Recovery Vacuum.* The final recovery vacuum shall be the mixing chamber pressure in Section 7.4.3 expressed in kPa at 24 °C. The accuracy of the measurement shall be within 0.33 kPa.

9.7 *Residual Trapped Refrigerant.* The amount of residual trapped refrigerant shall be the final weight minus the initial weight of the test cylinder in Section 7.4.4.2, expressed in kg. The accuracy shall be ±0.02 kg and reported to the nearest 0.05 kg.

9.8 *Refrigerant Processed.* The amount of refrigerant processed before changing filters (*see* Section 7.5.3) shall be expressed in kg to an accuracy of ±1 percent.

9.9 *Contaminant Levels.* The contaminant levels remaining after testing shall be published as follows:

Moisture content, ppm by weight
Chloride ions, pass/fail
Acid Content, ppm by weight
High boiling residue, percent (by volume)
Particulates/solids, pass/fail (visual examination)
Non-condensables, percent (by volume)

9.10 *Minimum Data Requirements for Published Ratings.* Published ratings shall include all of the parameters as shown in Tables 2 and 3 for each refrigerant designated by the manufacturer.

Section 10. Tolerances

10.1 *Tolerances.* Performance related parameters shall be equal to or better than the published ratings.

Section 11. Marking and Nameplate Data

11.1 *Marking and Nameplate Data.* The nameplate shall display the manufacturer's name, model designation, type of equipment (Recovery or Recovery/Recycling and Self-Contained or System Dependent), designated refrigerant(s), capacities, and electrical characteristics where applicable. The nameplate shall also conform to the labeling requirements established for certified recycling and recovery equipment established at 40 CFR 82.158(h).

Recommended nameplate voltages for 60 Hertz systems shall include one or more of the equipment nameplate voltages shown in Table 1 of AHRI 110–2016 (incorporated by reference, see § 82.168). Recommended nameplate voltages for 50 Hertz systems shall include one or more of the utilization voltages shown in Table 1 of IEC 60038 (English version) (incorporated by reference, see § 82.168).

11.2 *Data for Designated Refrigerants.* For each refrigerant designated, the manufacturer shall include all the following that are applicable per Table 2:

a. Liquid Recovery Rate, kg/min
b. Vapor Recovery Rate, kg/min
c. High Temperature Vapor Recovery Rate, kg/min
d. Push/Pull Liquid Recovery Rate, kg/min
e. Final Recovery Vacuum Level, kPa
f. Recycle Flow Rate, kg/min
g. Refrigerant Loss, kg
h. Residual Trapped Refrigerant, kg
i. Quantity of Refrigerant Processed at Rated Conditions, kg

TABLE 2—PERFORMANCE RATINGS FOR REFRIGERANT RECOVERY AND RECOVERY/RECYCLING EQUIPMENT [4] [5]

Parameter	Type of equipment			
	Recovery	Recovery/ recycling	Recycling	System dependent equipment
Liquid Refrigerant Recovery Rate, kg/min	X [1] [4]	X [1]	N/A [5]	N/A
Vapor Refrigerant Recovery Rate, kg/min	X [1]	X [1]	N/A	N/A
High Temperature Vapor Recovery Rate, kg/min	X [1]	X [1]	N/A	N/A
Push/Pull Liquid Recovery Rate, kg/min	X [1]	X [1]	N/A	N/A
Final Recovery Vacuum Level, kPa	X	X	N/A	X
Recycle Flow Rate, kg/min	N/A	X	X	N/A
Refrigerant Loss, kg	X [2]	X	X	X [3]
Residual Trapped Refrigerant, kg	X [3]	X [2]	X [2]	X [2]
Quantity of Refrigerant Processed at Rated Conditions, kg	N/A	X	X	N/A

[1] For a recovery or recovery/recycle unit, one must rate either liquid refrigerant recovery rate or vapor refrigerant recovery rate or one can rate for both. If rating only one, the other shall be indicated by N/A, ''not applicable.''

[2] Mandatory rating if multiple refrigerants, oil separation or non-condensable purge are rated.

[3] Mandatory rating for equipment tested for multiple refrigerants.

[4] ''X'' denotes mandatory rating or equipment requirements.

[5] ''N/A'' indicates ''Not Applicable'' for a parameter that does not have a rating.

TABLE 3—CONTAMINANT REMOVAL RATINGS FOR REFRIGERANT RECOVERY AND RECOVERY/RECYCLING EQUIPMENT [1] [2]

Contaminant	Type of equipment			
	Recovery	Recovery/ recycling	Recycling	System dependent equipment
Moisture Content, ppm by weight	N/A [2]	X [1]	X	N/A
Chloride Ions, pass/fail	N/A	X	X	N/A
Acid Content, ppm by weight	N/A	X	X	N/A
High Boiling Residue, % by volume	N/A	X	X	N/A
Particulates/solids, pass/fail	N/A	X	X	N/A
Non-condensables, % by volume	N/A	X	X	N/A

[1] "X" denotes mandatory rating.
[2] "N/A" indicates "Not Applicable" for a parameter that does not have a rating.

Section 12. References

Listed here are all standards, handbooks, and other publications essential to the formation and implementation of the standard. All references in this appendix are considered as part of this standard.

- UL 1963, *Standard for Safety Refrigerant Recovery/Recycling Equipment*, Fourth Edition (with revisions through October 13, 2013), dated June 1, 2011, (incorporated by reference, see § 82.168).
- AHRI 110–2016, *2016 Standard for Air-Conditioning, Heating and Refrigerating Equipment Nameplate Voltages*, copyright 2016 (incorporated by reference, see § 82.168).
- AHRI Standard 700–2015, *Specifications for Refrigerants*, Air-Conditioning, Heating, and Refrigeration Institute
- IEC 60038 *IEC Standard Voltages*, Edition 7.0, 2009–06 (English version) (incorporated by reference, see § 82.168).

Section 13.0. Particulate Used in Standard Contaminated Refrigerant Sample

13.1 *Particulate Specification*

13.1.1 The particulate material (pm) will be a blend of 50 percent coarse air cleaner dust as received, and 50 percent retained on a 200-mesh screen. The coarse air cleaner dust is available from: AC Spark Plug Division; General Motors Corporation; Flint, Michigan.

13.1.2 *Preparation of Particulate Materials.* To prepare the blend of contaminant per ANSI/ASHRAE Standard 63.2–1996 (RA 2010), first wet screen a quantity of coarse air cleaner dust on a 200-mesh screen (particle retention 74 μm). This is done by placing a portion of the dust on a 200-mesh screen and running water through the screen while stirring the dust with the fingers. The fine contaminant particles passing through the screen are discarded. The larger than 200-mesh particles collected on the screen are removed and dried for one hour at 110 °C. The blend of standard contaminant is prepared by mixing 50 percent by weight of coarse air cleaner dust as received (after drying for one hour at 110 °C) with 50 percent by weight of the larger than 200-mesh screened dust.

13.1.3 *Particle Size Analysis.* The coarse air cleaner dust as received and the blend used as the standard contaminant have the following approximate particle size analysis:

TABLE B1—WEIGHT PERCENTAGE IN VARIOUS μm SIZE RANGES FOR PARTICLE SIZE ANALYSIS

Size range (μm)	As received (wt %)	Blend (wt %)
0–5	12	6
5–10	12	6
10–20	14	7
20–40	23	11
40–80	30	32
80–200	9	38

■ 17. Amend subpart F by adding appendix B4 to read as follows:

Appendix B4 to Subpart F of Part 82—Performance and Safety of Flammable Refrigerant Recovery and/or Recycling Equipment

This appendix is based on the Air-Conditioning, Heating, and Refrigeration Institute Standard 740–2016, *Performance Rating of Refrigerant Recovery Equipment and Recovery/Recycling Equipment*, and Underwriters Laboratories Standard 1963–2011 (Fourth Edition), *Standard for Safety: Refrigerant Recovery/Recycling Equipment*, including Supplement SB (added October 11, 2013), *Requirements for Refrigerant Recovery/Recycling Equipment Intended for Use with a Flammable Refrigerant.*

Section 1. Purpose

1.1 The purpose of this standard is to establish methods of testing for rating and evaluating the performance and safety of refrigerant recovery and/or recycling equipment and general equipment requirements (herein referred to as "equipment") for contaminant or purity levels, capacity, speed and purge loss to minimize emission into the atmosphere of designated refrigerants, as well as safety for use with flammable refrigerants.

Section 2. Scope

2.1 This standard applies to equipment for recovering and/or recycling flammable single refrigerants, azeotropes, zeotropic blends, and their normal contaminants from refrigerant systems. This standard defines the test apparatus, test gas mixtures, sampling procedures, analytical techniques, and equipment construction that will be used to determine the performance and safety of refrigerant recovery and/or recycling equipment (hereinafter, "equipment").

Section 3. Definitions

3.1 All terms in this appendix will follow the definitions in § 82.152 and Appendix B3 to Subpart F of Part 82 unless otherwise defined in this appendix.

3.2 All definitions used in UL 1963, including the definitions in Supplement SB, as applicable, are incorporated by reference, see § 82.168.

Section 4. Evaluation of Performance

4.1 *Performance Ratings.* All recovery and/or recycling equipment to be tested under this appendix must follow the procedures and meet all requirements established in Appendix B3 to Subpart F of Part 82 to determine the performance ratings in addition to the safety evaluation conducted under the rest of this appendix.

4.2 *Safety.* All recovery and/or recycling equipment to be tested under this appendix must follow the procedures and meet all requirements in Supplement SB (added October 11, 2013), *Requirements for Refrigerant Recovery/Recycling Equipment Intended for Use with a Flammable Refrigerant* in Underwriters Laboratories Standard 1963–2011 (Fourth Edition), *Standard for Safety: Refrigerant Recovery/Recycling Equipment* (incorporated by reference, see § 82.168).

■ 18. Amend subpart F by revising appendix D to read as follows:

Appendix D to Subpart F of Part 82—Standards for Becoming a Certifying Program for Technicians

a. Test Preparation. Technicians must pass an EPA-approved test, provided by an EPA-approved certifying program to be certified as a Type I technician. Organizations providing Type I certification only may choose either an on-site format or a mail-in format similar to what is permitted under the MVACs program.

Technicians must pass a closed-book, proctored test, administered in a secure environment, by an EPA-approved certifying program to be certified as a Type II or Type III technician.

Technicians must pass a closed-book, proctored test (or series of tests), administered in a secure environment, by an

EPA-approved certifying program to be certified as a Universal technician. Mail-in format Type I tests cannot be used toward a Universal certification.

Each certifying program must assemble tests by choosing a prescribed subset from the EPA test bank. EPA will have a test bank with more questions than are needed for an individual test, which will enable the certifying program to generate multiple tests in order to discourage cheating. Each test must include 25 questions drawn from Group 1 and 25 questions drawn from each relevant technical Group. Tests for Universal technicians will include 100 questions (25 from Group 1 and 25 from each relevant technical Group). Universal tests may be taken all at once, or by combining passing scores on separate Type I, Type II, and Type III tests. Questions should be divided in order to sufficiently cover each topic within the Group.

Certifying programs must provide a paper hand-out or electronic form of communication to technicians after they have completed their certification test that contains the following information:

—Which certifying program is providing the testing;
—Contact information for the certifying program;
—The name and contact information of the proctor; and
—When they should expect to receive their score and, if they passed, their certification card.

Each certifying program must show a method of randomly choosing which questions will be on the tests. Multiple versions of the test must be used during each testing event. Test answer sheets must include the name and address of the applicant, the name and address of the certifying program, and the date and location at which the test was administered.

Training material accompanying mail-in Type I tests must not include sample test questions mimicking the language of the certification test. All mail-in material will be subject to review by EPA.

Certifying programs may charge individuals reasonable fees for the administration of the tests. EPA will publish a list of all approved certifying programs.

b. Proctoring. A certifying program for Type I (if in-person), Type II, Type III, and Universal technicians must designate at least one proctor registered for every 50 people taking tests at the same time at a given site.

The certification test for Type I (if taken as part of a Universal certification), Type II, Type III, and Universal technicians is a closed-book exam. The proctors must ensure that the applicants for certification do not use any notes or training materials during testing. Desks or work space must be placed in a way that discourages cheating. The space and physical facilities are to be conducive to continuous surveillance by the proctors and monitors during testing.

The proctor may not receive any benefit from the outcome of the testing other than a fee for proctoring. Proctors cannot know in advance which questions are on the tests they are proctoring.

Proctors are required to verify the identity of individuals taking the test by examining photo identification. Acceptable forms of identification include but are not limited to drivers' licenses, government identification cards, passports, and military identification.

Certifying programs for Type I technicians using the mail-in format, must take sufficient measures at the test site to ensure that tests are completed honestly by each technician. Each test for Type I certification must provide a means of verifying the identification of the individual taking the test. Acceptable forms of identification include but are not limited to drivers' licenses and passports.

c. Test Security. A certifying program must demonstrate the ability to ensure the confidentiality and security of the test questions and answer keys through strict accountability procedures. An organization interested in developing a technician certification program will be required to describe these test security procedures to EPA.

After the completion of a test, proctors must collect all test forms, answer sheets, scratch paper and notes. These items are to be placed in a sealed envelope.

d. Test Content. All Type I, Type II and Type III, certification tests will include 25 questions from Group I and 25 questions from Group II. Universal certification tests will include 25 questions from Group I and 75 questions from Group II (with 25 from each of the three sector-specific areas).

Group I will ask questions in the following areas:

1. Environmental impact of CFCs, HCFCs, and substitute refrigerants
2. Laws and regulations
3. Changing industry outlook

Group II will ask questions covering sector-specific (*i.e.,* Type I, Type II, Type III) issues in the following areas:

4. Leak detection
5. Recovery Techniques
6. Safety
7. Shipping
8. Disposal

e. Grading. Tests must be graded objectively. Certifying programs must inform the applicant of their test results no later than 30 days from the date of the test. Type I certifying programs using the mail-in format must notify the applicants of their test results no later than 30 days from the date the certifying programs received the completed test and any required documentation.

The passing score for the closed-book Type I, Type II, Type III and Universal certification test is 70 percent. The passing score for Type I certification tests using the mail-in format is 84 percent.

f. Proof of Certification. Certifying programs must issue a standard wallet-sized identification card no later than 30 days from the date of the test. Type I certifying programs using mail-in formats must issue cards to certified technicians no later than 30 days from the date the certifying program receives the completed test and any required documentation.

Each wallet-sized identification card must include, at a minimum, the name of the certifying program including the date the certifying program received EPA approval, the name of the person certified, the type of certification, a unique number for the certified person that does not include a technician's social security number, and the following text:

[name of person] has successfully passed a [Type I, Type II, Type III and/or Universal—as appropriate] exam on how to responsibly handle refrigerants as required by EPA's National Recycling and Emissions Reduction Program.

g. Recordkeeping and Reporting Requirements. Certifying programs must maintain records of the names and addresses of all individuals taking the tests, the scores of all certification tests administered, and the dates and locations of all tests administered. These records must be maintained indefinitely, unless transferred to another certifying program or EPA.

EPA must receive an activity report from all approved certifying programs by every January 30 and July 30, which covers the previous six months of certifications. The first report must be submitted following the first full six-month period for which the program has been approved by EPA. This report includes the pass/fail rate. If the certifying program believes a test bank question needs to be modified, information about that question should also be included.

Approved certifying programs will receive a letter of approval from EPA. Each testing center must display a copy of that letter at their place of business.

Approved technician certification programs that voluntarily plan to stop providing the certification test must forward all records required by this appendix and § 82.161 to another program currently approved by EPA in accordance with this appendix and with § 82.161. Approved technician certification programs that receive records of certified technicians from a program that no longer offers the certification test, and the program that is voluntarily withdrawing from being a technician certification program must inform EPA at the address listed in § 82.160 within 30 days of receiving or transferring these records. The notification must include the name and address of the program to which the records have been transferred. If another currently approved program willing to accept the records cannot be located, these records must be submitted to EPA at the address listed at § 82.160.

Technician certification programs that have had their certification revoked in accordance with § 82.169 must forward all records required by this appendix and § 82.161 to EPA at the address listed in § 82.160. Failure to do so is a violation of 40 CFR part 82, subpart F.

h. Additional Requirements. EPA may periodically inspect testing sites to ensure compliance with EPA regulations. If testing center discrepancies are found, they must be corrected within a specified time period. If discrepancies are not corrected, EPA may suspend or revoke the certifying program's approval. The inspections will include but are not limited to a review of the certifying program's provisions for test security, the availability of space and facilities to conduct the administrative requirements and ensure

the security of the tests, the availability of adequate testing facilities and spacing of the applicants during testing, a review of the proper procedures regarding accountability, and that there is no evidence of misconduct on the part of the certifying programs, their representatives and proctors, or the applicants for certification.

If the certifying programs offer training or provide review materials to the applicants, these endeavors are to be considered completely separate from the administration of the certification test.

■ 19. Amend subpart F by adding appendix E to read as follows:

Appendix E to Subpart F of Part 82—Test Procedure for Leaks From Containers Holding Two Pounds or Less of Refrigerant for Use in an MVAC

This appendix is based on the California Air Resources Board (CARB) standard *TP–503: Test Procedure for Leaks from Small Cans of Automotive Refrigerant,* as amended on January 5, 2010; and CARB standard *BP–A1: Balance Protocol for Gravimetric Determination of Sample Weights using a Precision Balance,* as amended January 5, 2010.

Section 1. Applicability

This test procedure is used by manufacturers of containers holding two pounds or less of refrigerant for use in a motor vehicle air conditioner (MVAC) to determine the leakage rate of small containers of automotive refrigerant that are subject to the requirements of 40 CFR part 82, subpart F. Specifically, this test procedure will specify the equipment, procedures, and calculations to determine if a container holding two pounds or less of refrigerant for use in an MVAC complies with the leakage rate specified in § 82.154(c)(2)(ii). All terms in this appendix will follow the definitions in § 82.152 unless otherwise defined in this appendix.

All containers holding two pounds or less of refrigerant for use in an MVAC must comply with other applicable codes and regulations such as local, state, or Federal safety codes and regulations.

This test procedure involves the use of materials under pressure and operations and should only be used by or under the supervision of those familiar and experienced in the use of such materials and operations. Appropriate safety precautions should be observed at all times while performing this test procedure.

Section 2. Principle and Summary of Test Procedure

This procedure is used to determine the leakage rate of containers holding two pounds or less of refrigerant for use in an MVAC (small cans). Testing will involve subjecting both full and partially empty cans in both upright and inverted positions at two temperatures: 73 °F and 130 °F.

Thirty small cans are tested under each condition for a total of 240 small cans tested. Small cans are brought to temperature stability, weighed, then stored for 30 days under specified conditions of temperature, orientation, and state of fill, then re-weighed. Leakage rate (grams/year) is estimated by (weight loss in grams) x 365/(days duration). The leakage rate is then compared to a standard of 3.00 grams/year to determine if a given small can complies with the leakage rate specified in § 82.154(c)(2)(ii).

Section 3. Biases and Interferences

3.1 Contaminants on the operator's hands can affect the weight of the small can and the ability of the small can to absorb moisture. To avoid contamination of the small can, the balance operator should wear gloves while handling the small cans.

3.2 Weight determinations can be interfered with by moisture condensing on the small can and by thermal currents generated by temperature differences between the small can and the room temperature. The small cans cool during discharge and could cause condensation. For these reasons, small cans must be equilibrated to balance room temperature for at least four hours before weighing.

3.3 Variations in the temperature, pressure, and humidity of the ambient air will cause variations in the buoyancy of the small can. These variations should typically be less than 25 mg for a small can. If the small can is not leaking at all, then the uncorrected weight changes will be within the range of 0 ± 25 mg, which is about ten percent of the 247 mg loss expected after thirty days for a can leaking at 3 g/yr. In that case buoyancy corrections can be omitted. If the absolute value of the uncorrected weight change exceeds 25 mg, then all calculations must be made using weights corrected for buoyancy based on the temperature, pressure, and humidity of the weighing room.

3.4 Some electronic balances are sensitive to the effects of small static charges. The small can should be placed directly on the balance pan, ensuring metal to metal contact. If the balance pan is not grounded, the small can and balance pan should be statically discharged before weighing.

Section 4. Sensitivity and Range

The mass of a full small can could range from roughly 50 g to 1000 g depending on the container capacity. A top loading balance, capable of a maximum weight measurement of not less than 1,000 g and having a minimum readability of 0.001 g, reproducibility and linearity of ± 0.002 g, must be used to perform mass measurements.

Section 5. Equipment

5.1 A top loading balance that meets the requirements of Section 4 above.

5.2 A NIST traceable working standard mass for balance calibration. A NIST traceable working standard mass for a balance linearity check. A reference mass to serve as a ''blank'' small can.

5.3 An enclosure capable of controlling the internal air temperature from 73 °F ± 5 °F, and an enclosure capable of controlling the internal air temperature to 130 °F ± 5 °F.

5.4 A temperature instrument capable of measuring the internal temperature of the temperature conditioning enclosures and the balance room with a sensitivity of ± 2 °F.

5.5 A barometric pressure instrument capable of measuring atmospheric pressure at the location of the balance to within ± 0.02 inches of mercury.

5.6 A relative humidity measuring instrument capable of measuring the relative humidity (RH) at the location of the balance with a sensitivity of ± 2 percent RH.

5.7 A hose with appropriate fitting for dispensing refrigerant from the small can to a recovery machine.

5.8 A refrigerant recovery machine to collect the discharged refrigerant from small cans being tested.

Section 6. Calibration Procedures

6.1 Calibrations are applied to the balance and to the support equipment such as temperature, humidity, and pressure monitoring equipment. Procedures for calibration are not spelled out here. General calibration principals for the support equipment and the balance are described in Section 11, Quality Assurance/Quality Control. Detailed calibration procedures for measurements made using the balance are contained in Attachment A: ''Balance Protocol for Gravimetric Determination of Sample Weights using a Precision Balance.''

Section 7. Small Can Preparation

7.1 Receive a batch of 240 small cans of one design to be tested. These may include several SKUs from different manufacturers if the container and valve combination are the same.

7.2 Clean small cans with Alkanox solution or equivalent and dry with a lint free towel.

7.3 Confirm that the sample ID sticker on the small can matches the sample ID on the chain of custody forms.

7.4 Select a reference mass similar to the weight of a full small can. If multiple sets of similar sized small cans are being tested, only one reference mass is needed; it can be used with all sets. Store the reference mass in the balance area.

7.5 Evacuate the contents of one half of the small cans (120 cans) into the refrigerant recovery machine using normal DIY dispensing procedures until each small can is approximately half full.

7.6 Select a reference mass similar to the weight of the half-full small can. If multiple sets of similar size small cans are being tested, only one reference mass is needed; it can be used with all sets. Store the reference mass in the balance area.

Section 8. Small Can Weighing

Weighing cans on the balance is done in accordance with Attachment A to this appendix. Attachment A describes how to conduct weight determinations including appropriate calibration and QC data. This section, ''Small Can Weighing,'' describes the overall process, not the details of how to use the balance.

Initial Weights

8.1 Put on gloves. Check the small cans for contamination.

8.2 Place the 240 small cans into a location where they can equilibrate to balance room temperature. Record the small can test IDs and the equilibration start time

on the Small Can Test Data Forms available on EPA's Web site in sets of thirty, one form for each of the eight test conditions.

8.3 Let cans equilibrate for at least four hours.

8.4 Weigh the set of 240 small cans and the reference weights using Attachment A and log the results to the Balance Weighing Log Form available on EPA's Web site.

8.5 Transfer data from the Balance Weighing Log Form to the Small Can Test Data Form in sets of 30, one set for each of the eight conditions to be tested.

Thirty-Day Soak

8.6 Place each set of 30 small cans into the appropriate orientation and temperature for soaking:

30 full small cans—73 °F, upright
30 full small cans—73 °F, inverted
30 full small cans—130 °F, upright
30 full small cans—130 °F, inverted
30 half-full small cans—73 °F, upright
30 half-full small cans—73 °F, inverted
30 half-full small cans—130 °F, upright
30 half-full small cans—130 °F, inverted

8.7 Soak the small cans for 30 days undisturbed.

Final Weighing

8.8 Place the 240 small cans into a location where they can equilibrate to balance room temperature.

8.9 Let the small cans equilibrate for at least four hours.

8.10 Weigh the set of 240 small cans, the reference weights, and any additional sets of small cans using Attachment A.

8.11 Transfer data from the Balance Weighing Log Form to the corresponding Small Can Test Data Forms.

Section 9. Calculations

Corrections for Buoyancy

The calculations in this section are described in terms of ''weight.'' Mass is a property of the small can, whereas weight is a force due to the effects of buoyancy and gravity. Procedures for correcting the effect of buoyancy are given in Attachment B of this appendix. Ignoring buoyancy, *i.e.,* using weight data uncorrected for buoyancy effects, is acceptable for a thirty day test if the absolute magnitude of the weight change is less than 25 mg. If the uncorrected weight change exceeds 25 mg for any small can, then correct all small can weights for buoyancy using the procedures in Attachment B before performing the calculations described below.

Calculation of Leak Rate

The emission rate in grams/day for each small can is calculated by subtracting the final weight from the initial weight and then dividing the weight difference by the time difference measured in days to the nearest hour (nearest 1/24 of a day). The emission rate in g/day is multiplied by 365 to determine emission rate in grams/yr. If the annual emission rate for any small can exceeds the entire small can contents, then the annual emission rate for that small can is adjusted to equal the entire small can contents/year (*e.g.,* about 350 g/yr for a 12 ounce small can). The annual emission rate for the purpose of the test is calculated by averaging the 240 individual adjusted annual emission rates and rounding to two decimal places. The cans fail the test if the adjusted annual emission rate averaged over 240 cans is greater than 3.00 g/yr. The calculations are described below.

Loss rate for each small can

$$Ei_{daily} = (Wi_{final} - Wi_{initial})/(Di_{final} - Di_{initial}) \quad g/day$$

$$Ei_{annual} = 365 \times Ei_{daily} \quad g/year$$

$$Ei_{adjusted} = \text{Minimum of } (Ei_{adjusted}, Ci/year) \quad g/yr$$

Where,

Ei = emission rate
Wi_{final} = weight of can i after soaking (grams)
$Wi_{initial}$ = weight of can I before soaking (grams)
Di_{final} = date/time of final weight measurements (days)
$Di_{initial}$ = date/time of initial weight measurements (days)
Ci = original factory mass of refrigerant in can i

Note: Date/Times are measured in days. Microsoft Excel stores dates and times in days, and the calculations can be made directly in Excel. If calculations are made manually, calculate serial days to the nearest hour for each date and time as follows:

D = Julday + Hour/24

Where,

Julday = serial day of the year: Jan 1 = 1, Jan 31 = 31, Feb 1 = 32, etc.
Hour = hour of day using 24-hour clock, 0 to 23

Calculate the average loss rate for the 240 small cans as follows:

$$E_{mean} = [\text{Sum } (E_{adjusted}i), i = 1 \text{ to } 240]/240$$

Section 10. Recordkeeping

During small can weighing, record the small can weights and date/times on the Balance Weighing Log Form. After each weighing session, transfer the measured weights and date/times from the Balance Weighing Log Form to the Small Can Test Data Form.

At the end of the test, complete the calculations described in Section 9, Calculations, and record the results on the Small Can Test Data Form.

Section 11. Quality Assurance/Quality Control

11.1 All temperature, pressure, and humidity instruments should be calibrated annually against NIST traceable laboratory standards. The main purpose of the NIST traceable calibration is to establish the absolute accuracy of the device. The instruments should also be checked periodically such as weekly, monthly, or quarterly against intermediate standards or against independent instruments. For example, a thermocouple can be checked weekly against a wall thermometer. A barometer or pressure gauge can be checked weekly by adjusting to sea level and comparing with local airport data. The main purpose of the frequent checks is to verify that the device has not failed in some way. This is especially important for electronic devices such as a digital thermometer, but even a liquid filled thermometer can develop a problem such as a bubble.

11.2 The balance should be serviced and calibrated annually by an independent balance service company or agency using NIST traceable reference masses. Servicing verifies accuracy and linearity, and the maintenance performed helps ensure that a malfunction does not develop.

11.3 The balance must also be calibrated and its linearity checked with working standards before and after each weighing session, or before and after each group of 24 small cans if more than 24 small cans are weighed in a session. Procedures for calibrating and using the balance, as well as recording balance data, are described in the accompanying balance weighing protocol. These procedures include zero checks, calibration checks, and reference mass checks. Procedures for calculating quality control data from those checks are described in Attachment A.

11.4 The small cans are cleaned then handled using gloves to prevent contamination. All equilibration and soaking must be done in a dust free area.

Section 12. Balance Protocol for Gravimetric Determination of Sample Weights Using a Precision Balance

12.1 *Scope and application*

This Protocol summarizes a set of procedures and tolerances for weighing objects in the range of 0 to 1,000 g with a resolution of 0.001 g. This protocol only addresses balance operations, it does not address project requirements for equilibration, sample hold time limits, sample collection etc.

12.2 *Summary of method*

The balance is zeroed and calibrated using procedures defined herein. Object weight determinations are conducted along with control object weight determinations, zero checks, calibration checks, sensitivity checks, and replicate weightings in a defined sequence designed to control and quantitatively characterize precision and accuracy.

12.3 *Definitions*

N/A.

12.4 *Interferences*

Object weights can be affected by temperature and relative humidity of their environment, air currents, static electricity, gain and loss of water vapor, gain or loss of and loss of volatile compounds directly from the sample or from contaminants such as finger prints, marker ink, and adhesive tape.

Contamination, transfer of material to or from the samples, is controlled by conducting operations inside a clean area dedicated to the purpose and having a filtered laminar air flow where possible; by wearing gloves while handling all samples and related balance equipment; by using forceps to handle small objects, and by keeping the balance and all related equipment inside the clean area.

Air currents are controlled by conducting weighing operations inside a closed chamber or glove box and by allowing the substrates to reach temperature and relative humidity equilibrium. The chamber is maintained at 40 percent relative humidity and 25 °C by a continuous humidity and temperature control system. The temperature and RH

conditions are recorded at least once per weighing sessions. Equilibration times for samples that are particularly sensitive to humidity or to loss of semi-volatiles species are specified by project requirements.

Static electric charges on the walls of the balance and the weighed objects, including samples, controls, and calibration weights, can significantly affect balance readings. Static is avoided by the operator ground himself and test objects as described in the balance manual.

12.5 *Personnel health and safety*

N/A

12.6 *Equipment and supplies*

- Filtered, temperature and humidity controlled weighing chamber.
- Precision Balance
- Plastic forceps
- Nylon fabric gloves.
- Working calibration weights: ANSI Class 2, 1000g and 500 g
- Working sensitivity weight: 50 mg
- Reference objects: references are one or more objects that are typical of the objects to be weighed during a project, but that are stored permanently inside the balance glove box. Reference objects are labeled Test1, Test2, Test3, etc.

12.7 *Reagents and standard*

N/A

12.8 *Sample collection, preservation, and storage*

N/A. See relevant project requirements and SOPs.

12.9 *Quality control*

Data quality is controlled by specifying frequencies and tolerances for Zero, Calibration, Linearity, and Sensitivity checks. If checks do not meet tolerance criteria, then samples must be re-weighed. In addition, the procedures specify frequencies for Control Object Checks.

Data quality is quantitatively characterized using Zero Check, Calibration Check, and Control Check data. These data are summarized monthly in statistics and QC charts.

12.10 *Calibration and standardization*

The absolute accuracy of the balance is established by calibration against an ANSI Class 2, stainless steel working weight: 1000.000 g ± 0.0025 g. Linearity is established checking the midpoint against an ANSI Class 2 stainless steel working weight: 500.000 ± 0.0012 g. Sensitivity is established using and ANSI Class 2 stainless steel or aluminum working weight: 50 mg. Precision is checked by periodically checking zero, calibration, and reference object weights.

12.11 *Procedure*

12.11.1 *Overview of Weighing Sequence*

Weighing a series of substrates consists of performing the following procedures in sequence, while observing the procedures for handling and the procedures for reading the balance:

1. Initial Adjustment
2. Weigh eight samples
3. Zero Check
4. Weigh eight samples
5. Zero Check
6. Weigh eight samples
7. Calibration Check
8. Return to step 2.
9. If less than 24 cans are weighed, perform a final Calibration Check at the end of weighing.

This sequence is interrupted and samples are reweighed if QC check tolerances are not met. Each of these procedures along with procedures for handling and reading the balance are described below. The QC tolerances referred to in these procedures are listed in Table 1.

12.11.2 *Handling*

1. Never touch samples, weights, balance pans, etc. with bare hands. Wear powder free gloves to handle the weights, controls, and samples.

12.11.3 *Reading the Balance*

1. Close the door. Wait for the balance stabilization light to come on, and note the reading.
2. Watch the balance reading for 30 sec (use a clock). If the reading has not changed by more than 0.001 g from the reading noted in step 1, then record the reading observed at the end of the 30 sec period.
3. If the reading has drifted more than 0.001 g note the new balance reading and go to step 2.
4. If the balance reading is flickering back and forth between two consecutive values choose the value that is displayed more often than the other.
5. If the balance reading is flickering equally back and forth between two consecutive values choose the higher value.

12.11.4 *Initial Adjustment*

1. Empty the sample pan Close the door. Select Range 1000 g
2. Wait for a stable reading
3. Record the reading with QC code IZC (initial zero check)
4. Press the Tare button
5. Record the reading in the logbook with QC code IZA (initial zero adjust)
6. Place the 1,000 g working calibration weight on the balance pan
7. Wait for a stable reading.
8. Record the reading with QC code ICC (initial cal check)
9. Press the Calibrate button
10. Record the reading with QC code ICA (initial cal adjust)
11. Remove the calibration weight.
12. Wait for a stable reading.
13. Record the reading with QC code IZC.
14. If the zero reading exceeds ± 0.002 g, go to step 4.
15. Place the 500 g calibration weight on the balance pan
16. After a stable reading, record the reading with QC code C500. Do not adjust the balance.
17. Add the 0.050 g weight to 500 g weight on the balance pan.
18. After a stable reading, record the reading with QC code C0.05. Do not adjust the balance.
19. Weigh reference object TEST1, record reading with QC code T1.
20. Weigh the reference object TEST2, TEST3, etc. that is similar in weight to the samples that you will be weighing. Record with QC code T2, T3, etc.

12.11.5 *Zero Check*

1. Empty the sample pan. Close the door.
2. Wait for a stable reading
3. Record the reading with QC code ZC
4. If the ZC reading is less than or equal to the zero adjustment tolerance shown in Table 1, return to weighing and *do not adjust the zero.* If the ZC reading exceeded the zero adjustment tolerance, proceed with steps 5 through 7.
5. Press the Tare button
6. Record the reading in the logbook with QC code ZA.
7. If the ZC reading exceeded the zero re-weigh tolerance, change the QC code recorded in step 3 from ZC to FZC. Then enter a QC code of FZ into the QC code column of all samples weights obtained after the last valid zero check. Re- weigh all of those samples, recording new data in new rows of the logbook.

12.11.6 *Calibration Check*

1. First, follow procedures for Zero Check. If the ZC was within tolerance, tare the balance anyway (*i.e.,* follow steps 5 and 6 of the Zero Check method)
2. Place the 1,000 g working calibration weight on the sample pan, wait for a stable reading.
3. Record the reading with QC code C1000
4. If the C1000 reading is less than or equal to the calibration adjustment tolerances, skip steps 5 through 8 and proceed to step 9. *Do not adjust the calibration.*
5. If the C100 reading exceeded the calibration adjust tolerance, press the Calibrate button.
6. Record the reading in the logbook with QC code CA
7. Perform a Zero Check (follow the Zero Check method)
8. If the C1000 reading exceeded the calibration re-weigh tolerance, change the code recorded in step 3 from C1000 to FC1000. Enter FC into the QC column for all sample weights obtained after the last valid calibration check. Re-weigh all of those samples, recording new data in new rows of the logbook.

12.11.7 *Replicate Weighing Check*

1. This protocol does not include reweigh samples to obtain replicates. The projects for which this protocol is intended already include procedures multiple weightings of each sample.

TABLE 1—QC TOLERANCES AND FREQUENCIES FOR BALANCE PROTOCOL

Reading Tolerance:	
0.001 g, stable for 30 sec.	
Adjustment Tolerances:	
Zero:	−0.003 to +0.003 g.
Calibration:	999.997 to 1000.003 g.
Controls:	none.
Replicates:	none.
Re-weigh Tolerances:	
Zero:	−0.005 to +0.005 g.
Calibration:	999.995 to 1000.005 g.
Controls:	none.
Replicates:	none.

TABLE 1—QC TOLERANCES AND FREQUENCIES FOR BALANCE PROTOCOL—Continued

Reference Objects:	
Test 1—A reference object weighing about 400 g.	
Test 2—A reference object weighing about 200 g.	
Test 3—A reference object weighing about 700 g.	
QC Frequencies:	
Zero Checks:	once per 8 samples.
Calibration Checks: ...	once per 24 samples.
Repeat weighings:	none (test method includes replicate determinations).
Control objects:	once per weighing session.

12.12 *Data analysis and calculations*

For Zero Checks, let Z equal the recorded Zero Check value. For control checks let T1, T2, etc. equal the recorded value for control object Test 1, Test 2, etc. For Calibration Checks, let C1000 equal C1000 reading minus 1000, M = C500—500, S = .C.050—C500—.050. For Replicate Checks, let D equal the loss that occurred between the first and second measurements. In summary:

T1 = T1
T2 = T2
T3 = T3
Z = ZC—0
C = C1000—1000
M = C500—500
G = C050—C500—.050

Tabulate the mean and standard deviation for each of the following: Z, C, M, G. T1, T2, T3. Depending on the number of operators using the balance and the number of protocols in use, analyze the data by subcategories to determine the effects of balance operator and protocol. Each of these standard deviations, S_Z, S_C, etc. is an estimate of the precision of single weight measurement.

For Z, C, M, and G, check the mean value for statistical difference from 0. If the means are statistically different than zero, troubleshooting to eliminate bias may be called for. For Z, C, M, G, T1, T2, T3, check that the standard deviations are all comparable. If there are systematic differences, then troubleshooting to eliminate the problem may be called for.

Note that the precision of a weight gain, involves two weight determinations, and therefore is larger than S by a factor of sqrt(2). On the other hand replicate weighings improves the precision of the determinations by a factor of sqrt(N). If N = 2, *i.e.,* duplicates, then the factors cancel each other.

To estimate the overall uncertainty in a weight determination, a conservative estimate might be to combine the imprecision contributed by the zero with the imprecision contributed by the calibration.

$U = Sqrt(S_Z^2 + S_C^2)$

The uncertainty in a weight gain from N replicates is then given by:

$U_{gain} = Sqrt(2) \times Sqrt(S_Z^2 + S_C^2)/Sqrt(N)$

But due to the balance adjustment and reweigh tolerances, we expect S_Z to approximately equal S_C, to approximately equal S_M, etc. tolerances, so that the equation above becomes:

$U_{gain} = 2 \times S/Sqrt(N)$

Where S is any individual standard deviation; or better, a pooled standard deviation.

12.13 *Method performance*

The data necessary to characterize the accuracy and precision of this method are still being collected. The method is used primarily to weigh objects before and after a period of soaking to determine weight loss by subtraction. Given the reweigh tolerances, we expect that the precision of weight gain determinations will be on the order of 0.006 g at the 1-sigma level. Bias in the weight gain determination, due to inaccuracy of the calibration weight and to fixed non-linearity of the balance response is on the order 0.005 percent of the gain.

12.14 *Pollution prevention*

When discharging half the can contents during can preparation, do not vent the contents of the small can to the atmosphere. Use an automotive recovery machine to transfer small can contest to a recovery cylinder.

12.15 *Waste management*

Dispose of the contents of the recycle cylinder through a service that consolidates waste for shipment to EPA certified facilities for reclaiming or destruction.

Section 13. Compensation of Weight Data for Buoyancy and Gravity Effects

13.1 *Gravity*

Variations in gravity are important only when weighing objects under different gravitational fields, *i.e.,* at different locations or at different heights. Since the balance procedures calibrate the balance against a known mass (the calibration ''weight'') at the same location where sample objects are weighed, there is no need to correct for location. Although both the sample and the calibration weight are used at the same location, there will be a difference in the height of the center of gravity of the sample object (small can) and the center of gravity of the reference mass (calibration weight). However, this difference in height is maintained during both the initial weights and final weights, affecting the initial and final weights by the same amount, and affecting the scale of the weight difference by only a few ppm. In any event, the magnitude of this correction is on the order of 0.3 ug per kg per mm of height difference. A difference on the order of 100 mm would thus yield a weight difference of about 0.03 mg, which is insignificant compared to our balance resolution which is 0.001 g or 1 mg.

Based on the discussion above, no corrections for gravity are necessary when determining weight changes in small cans.

13.2 *Buoyancy*

Within a weighing session, the difference in density between the sample object and the calibration weight will cause the sample object weight value to differ from its mass value due to buoyancy. For a 1-liter object in air at 20 °C and at 1 atm, the buoyant force is about 1.2 g. The volume of a 1 kg object with a density of 8 g/cm^3 (*e.g.,* a calibration weight), is about 0.125 liters, and the buoyancy force is about 0.15 g. Variations in air density will affect both of these values in proportion. The net value being affected by variations in air density is thus on the order of 1.2 − 0.15 = 1.05 g. Air density can vary up or down by 2 percent or more due to variations in barometric pressure, temperature, and humidity. The buoyancy force will then vary up or down by 0.02 g, or 20 mg. This is significant compared to the weight change expected after one week for a can leaking at 3 grams per year, which is 57 mg.

Based on the discussion above, buoyancy corrections must be made.

Variables measured or calculated:

V_{can} = volume of can (cm^3). Estimate to within 10 percent by measuring the can dimensions or by water displacement. Error in the can volume will cause an error in the absolute amount of the buoyancy force, but will have only a small effect on the change in buoyancy force from day to day.

W_{can} = nominal weight of a can (g), used to calculate the nominal density of the can.

ρ_{can} = nominal density of a small can (g/cm^3). The nominal values can be applied to corrections for all cans. It is not necessary to calculate a more exact density for each can. Calculate once for a full can and once for a half full can as follows:

ρ_{can} = Wcan /Vcan

T = Temperature in balance chamber (degrees Celsius).

RH = Relative humidity in balance chamber (expressed a number between 0 and 100).

P_{baro} = Barometric pressure in balance chamber (millibar). Use actual pressure, NOT pressure adjusted to sea level.

ρ_{air} = density of air in the balance chamber (g/cm^3). Calculate using the following approximation:

$\rho_{air} = 0.001*[0.348444*P_{baro} - (RH/100) \times (0.252 \times T - 2.0582)]/(T + 273.15)$

ρ_{ref} = the reference density of the calibration weight (g/cm^3). Should be 8.0 g/cm^3.

Equation to correct for buoyancy: $W_{corrected} = W_{reading} \times (1—\rho_{air}/\rho_{ref})/(1—\rho_{air}/\rho_{can})$

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