U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

ORDER 1050.18A

National Policy

Effective date:
09/13/2022

SUBJ: Use of Ozone Depleting Substances and Regulated Greenhouse Gases at FAA Facilities

1. Ozone-depleting substances, including chlorofluorocarbons (CFCs), have been shown to deplete the Earth's stratospheric ozone layer resulting in adverse environmental damage and health effects by exposing the Earth to the sun's harmful ultraviolet radiation as well as contributing to global climate change. Concerns about the formation of an "ozone hole" over the Antarctic in the early 1980s led to the signing of an international agreement, the Montreal Protocol on Substances that Deplete the Ozone Layer, in 1987 (Montreal Protocol). The Kigali Amendment was adopted to phase down the production and consumption of hydrofluorocarbons (HFCs) worldwide, in addition to CFCs, in 2016. The Montreal Protocol and the national laws implementing it are working. Ozone-depleting substances in the atmosphere have begun to decrease, and Earth's protective ozone layer is showing signs of recovery. In recent years, new regulations have also expanded to tracking and mitigating fugitive emissions from greenhouse gases that are non-ozone-depleting substitutes as well.

2. Consistent with the Federal Aviation Administration's (FAA's) mission to provide the safest, most efficient air transportation system in the world and our vision to reach the next level of environmental responsibility and sustainability, this Order provides a comprehensive framework for ensuring that the FAA adheres to environmental requirements associated with ozone-depleting substances.

3. This Order establishes policy and assigns responsibility for ensuring agency compliance with all applicable regulations for the proper management of ozone-depleting substances and regulated greenhouse gases, including procedures to phase out their use in accordance with Title VI of the Clean Air Act Amendments of 1990 and the American Innovation and Manufacturing Act of 2020, section 103 in Division S of the Consolidated Appropriations Act, 2021. This Order also provides direction to personnel who use ozone-depleting substances, such as refrigerants, solvents, degreasers, and fire suppressants, for the procurement, use, management, and disposal of these substances.

4. If a Line of Business (LOB) or Staff Office (SO) needs to supplement this Order with specific guidelines, instructions, or protocols, they should be in a manner that is consistent with this Order.

5. Laws and environmental best practices change over time, and this Order will be updated and improved to reflect those changes. Users are encouraged to offer suggestions for revising this Order using FAA Form 1320-19, Directives Feedback Information.

Billy Nolen
Acting Administrator

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Chapter 1. General Requirements

1-1. Purpose of This Order. This Order establishes Federal Aviation Administration (FAA) policies, procedures, responsibilities, and guidelines for the procurement, use, management, and disposal of ozone-depleting substances (ODS) and other regulated greenhouse gases (GHGs) and implementation of their phase-out pursuant to Title VI of the Clean Air Act (CAA) Amendments of 1990, Environmental Protection Agency (EPA) regulations concerning Ozone protection promulgated under Section 612 of the CAA, and the American Innovation and Manufacturing (AIM) Act of 2020 (40 Code of Federal Regulations (CFR) Part 82). Where relevant, this Order will include requirements for non-ODS substitute refrigerants, which are covered under the Significant New Alternatives Policy (SNAP) program, as regulated under Section 612 of the CAA (40 CFR Part 82)[1].

1-2. Audience. FAA employees and contractors with responsibilities for the design, construction, or management of facilities or equipment using ODSs and regulated GHGs, such as refrigerants, solvents, degreasers, and fire suppressants; and personnel who handle refrigerants and equipment containing refrigerants.

1-3. Where Can I Find This Order? This Order is available on the MyFAA employee website at https://employees.faa.gov/tools_resources/orders_notices and on the public website at http://www.faa.gov/regulations_policies/orders_notices/.

1-4. Cancellation. Order 1050.18, *Chlorofluorocarbons and Halon Use at FAA Facilities*, dated April 25, 1994, is canceled.

1-5. What this Order Changes. This Order reflects changes in EPA regulations, other federal requirements, and industry standards since 1994. The discussion of ODS procurement has been updated to take into account the accelerated phase-out schedules for certain Class II ODSs and EPA's identification of acceptable ODS substitutes and reflects the requirement to maximize substitution of alternatives to ozone-depleting substances to encourage safer alternative policies (42 U.S.C. § 7671K and 7671L). The phasedown of certain HFCs has also been included (40 CFR Part 84). Maintenance procedures have been updated to be consistent with the most current regulations and industry standards. The discussion of reporting requirements and safety has been revised to ensure consistency and avoid duplication with other applicable FAA Orders.

1-6. Policy and Scope. FAA will comply with all requirements of the EPA regulations concerning ODSs and regulated GHGs (40 CFR Part 82, 40 CFR Part 84). FAA will also comply with all applicable state, interstate, and local requirements, administrative authorities, processes, and sanctions in the same manner and to the same extent as any nongovernmental entity. This Order applies to FAA-owned and/or FAA-managed facilities and equipment; it does not cover FAA-leased facilities or

[1] Effective April 10, 2020, EPA issued a rule to rescind the November 18, 2016, extension of the leak repair provisions to appliances using non-ODS substitute refrigerants (i.e., the Protection of Stratospheric Ozone: Revisions to the Refrigerant Management Program's Extension to Substitutes regulation). However certain non-ODS substitute refrigerants are still regulated. Requirements include sales restriction and technician certification requirement, safe disposal requirements, evacuation requirements, reclamation standards, and requirement to use certified recovery equipment.

equipment where another entity is responsible for maintenance and environmental compliance. This Order should be used in conjunction with FAA's Acquisition Management System, JO 6470.5, *Maintenance of Air Route Traffic Control Center Environmental Systems*, JO 6970.3, *Maintenance of Environmental Systems*, and JO 1050.17, *Environmental Compliance for Air Traffic Organization,* where applicable.

1-7. Roles and Responsibilities.

a. Lines of Business, Staff Offices, Regions, and Centers are responsible for ensuring compliance with the requirements of this Order in their respective organizations, and for any facilities they manage, including but not limited to:

(1) Considering the requirements of this Order and EPA's ODS and regulated GHGs phase-out provisions in the retirement of old equipment and the procurement of new equipment.

(2) Recapturing, reusing, storing, transporting, and disposing of refrigerant and equipment containing ODSs and regulated GHGs in compliance with all applicable regulations.

(3) Incorporating the requirements of this Order into all new and existing maintenance directives, technical instructions, training orders, and instructions, or any other guidance documents affecting the acquisition, use, or disposal of refrigerant and equipment containing ODSs and regulated GHGs.

(4) Ensuring personnel who handle refrigerants and equipment containing ODSs and regulated GHGs receive the appropriate training in the safe and compliant handling of refrigerants, including mandatory EPA training, and possess an EPA 608 Universal Certification.

(5) Ensuring appropriate emergency response planning is implemented to handle unexpected releases of ODSs.

(6) Ensuring individual facilities maintain records in accordance with requirements.

(7) Ensuring budget submissions account for the resources necessary to implement the requirements of this Order.

(8) Providing any supplemental directives or national guidance on ODSs and regulated GHGs to the Office of Environment and Energy (AEE) for review to ensure consistency with this Order.

b. Acquisition Policy & Oversight (AAP) must ensure that the FAA's Acquisition Management System and any other agency-wide procurement policy, guidance, and tools are consistent with this Order.

c. FAA Logistics Center (AJW-L) must incorporate the directives of this Order in the procurement and storage of refrigerants and equipment containing ODS and regulated GHG refrigerants and make every effort to procure and supply alternatives to ODS products.

d. Air Traffic Organization (ATO) Technical Training (AJI-2) must ensure that all existing courses designed for training technicians in the installation and maintenance of chillers, refrigeration units, and fire extinguishing systems incorporate the requirements of this Order. The **FAA Academy (AMA-1)** at the Aeronautical Center is responsible for delivering this training for technicians.

e. The Office of Environment and Energy (AEE) is responsible for the development of policies and guidance on agency-wide compliance with Title VI of the CAA, 40 CFR Part 82, and the AIM Act of 2020, 40 CFR Part 84, and other applicable environmental laws, regulations, Executive Orders and standards; provision of assistance to LOB/SO in development of guidelines and procedures for their program areas and review for consistency with agency policy; interpretation of policies established in this Order and updating this Order to reflect changes in applicable law and practices related to ODSs and regulated GHG refrigerants.

1-8. Recordkeeping. Individual facilities that use ozone-depleting substances or greenhouse gases will be responsible for keeping records on-site according to regulations. Records must be maintained for at least three (3) years unless otherwise specified. Further guidance on recordkeeping requirements is included throughout the other chapters when applicable.

Chapter 2. Use of Ozone Depleting Substances and Regulated Greenhouse Gases in FAA Facilities and Equipment

2-1. General. FAA-owned and operated facilities and equipment use a variety of ODSs and regulated GHGs for various applications, including refrigeration and air conditioning, fire protection equipment/systems, and motor vehicles and aircraft. The following practices and procedures must be followed by FAA employees and contractors to eliminate voluntary and prevent the involuntary release of ODS and regulated GHG refrigerants during installation, operation, and maintenance.

2-2. ODS and Regulated GHG Procurement.

a. Existing equipment using ODSs should be scheduled to be retrofitted to use non-ODS substances or replaced with non-ODS equipment as budget and facility requirements permit. When a major equipment failure occurs or is imminent, it should be replaced with equipment that uses alternatives to ODSs whenever those products meet performance criteria and are determined to be lifecycle cost-effective.

b. New equipment at FAA owned and/or managed facilities must not contain Class I ODSs (e.g., CFCs and halons), except in the limited case of halon fire suppressants for which no acceptable alternatives have been identified, because Class I ODSs are no longer produced anywhere in the world. The phase-out schedule of Class II ODSs as well as the phasedown of HFCs listed in the table in the appendix, must also be considered when purchasing new equipment. Production and importation of all Class II ODSs will be phased out by 2030, but some Class II ODSs have been placed on an accelerated schedule by EPA. Hydrochlorofluorocarbon (HCFC)-141b was phased out of production in 2004. HCFC-22 and HCFC-142b can only be produced or imported for equipment manufactured before 2010, and production/importation was cut off on January 1, 2020. Therefore, new equipment containing HCFC-22 (R-22), HCFC-141b, and HCFC-142b must not be installed at FAA facilities unless no acceptable alternatives are available. All remaining HCFCs are only allowed to be produced or imported for equipment manufactured before 2020 and will be phased out by 2030. The HFC phasedown sets a graduated reduction to 15 percent of their production and consumption baseline established by the EPA by the year 2036.

c. EPA's SNAP program publishes lists of acceptable and unacceptable substitutes for ODSs based on the end use (e.g., refrigeration and air conditioning, fire suppression, solvents). The SNAP program evaluates substitutes for ODSs to reduce the overall risk to human health and the environment. Substitutes are reviewed on the basis of ozone depletion potential, global warming potential, toxicity, flammability, and exposure potential. To the maximum extent practicable, LOB/SOs must purchase SNAP alternatives to all Class I and Class II ODSs where feasible. The SNAP list of substitutes can be found at: https://www.epa.gov/snap/snap-substitutes-sector.

2-3. Refrigeration and Air Conditioning.

a. General. FAA-owned and operated facilities and equipment use a variety of Class II ODSs for refrigeration, including but not limited to HCFC-123 (often used in chillers) and HCFC-22 (also known as R-22, often used in air conditioners). Some Class I ODSs also might remain in use, including R-12, a CFC usually sold under the brand name Freon-12 (found in drinking fountains,

refrigerators, air driers for pneumatic control systems, freezers, coolers, and ice machines). Some HFC refrigerants are also used in FAA facilities as well.

b. Maintenance Practices.

(1) Facilities must use good installation and maintenance practices that also maximize the recapture and recycling of ODS (e.g., take extra care to vacuum check new systems, make quality brazed joints, and operate good quality approved leak detecting equipment). Facilities must follow the maintenance requirements in 40 CFR Part 82, Subpart F, Recycling and Emission Reduction.

(2) Annual visual inspections of equipment and monthly inspections of seals and gaskets must be performed to minimize potential releases of refrigerants. The refrigerant purge unit counter shall also be regularly checked to be able to recognize an increase in purge unit operation, which is an early indication of a leak.

(3) Personnel must identify and repair system leaks rather than only topping off the refrigerant charge. When a leak is detected, that part of the system must be isolated to minimize the loss of refrigerant. EPA requires the repair of leaks above a certain size in large equipment (see Chapter 3).

(4) All refrigerants must be recovered and recycled by Section 608 Universal-certified technicians using approved equipment, as described in Chapter 4. If total recovery of refrigerant is not possible for future use, disposal of used contaminated refrigerant must be conducted through approved disposal procedures listed in Chapter 5.

c. Venting Prohibition. It is unlawful to vent or purge ODSs and non-ODS substitute refrigerants into the atmosphere while maintaining, servicing, repairing, or disposing of air-conditioning and refrigeration equipment or appliances (40 CFR Part 82, Subpart F). Only three types of releases are permitted:

(1) "De minimis" quantities of refrigerant are released in the course of making good faith attempts to recapture and recycle or safely dispose of refrigerant when connecting or disconnecting equipment to charge or service appliances.

(2) Refrigerants emitted in the course of the normal operation of air-conditioning and refrigeration equipment (as opposed to during the maintenance, servicing, repair, or disposal of this equipment), such as from mechanical purging and minor leaks. However, EPA requires that leaks above a certain leak rate be repaired in equipment that contains 50 pounds of refrigerant or more.

(3) Releases of substitute refrigerants that EPA has determined do not pose a threat to the environment.

d. Design of Refrigeration Mechanical Rooms. All refrigeration mechanical rooms at FAA owned and/or managed facilities must follow the American Society of Heating, Air Conditioning, and Refrigeration Engineering (ASHRAE) 15, Safety Standard for Refrigeration Systems. Design requirements for these mechanical rooms include but are not limited to:

(1) Doors connecting with an occupied building must be self-closing, tight-fitting fire doors. Additionally, ASHRAE requires rooms with larger refrigeration equipment to be 1-hour-rated construction with smoke- and fire-stopped penetrations.

(2) All pipes piercing the interior walls, ceiling, or floor of these rooms must be tightly sealed to the walls, ceiling, or floor through which they pass.

(3) The room must vent to the outdoors.

(4) Refrigerant storage inside the room must not exceed 330 pounds, in addition to the charge (not holding limit) in the unit, plus the refrigerant stored in a permanently attached receiving vessel.

(5) Conversion of equipment to use substitute refrigerants may require modification of mechanical room ventilation.

e. Alarms and Monitors.

(1) Refrigerant monitoring equipment must be installed and operational to identify refrigerant leaks and activate an alarm whenever the established acceptable exposure limit is detected and exceeded.

(2) All refrigerant monitoring equipment must be maintained and tested in accordance with the monitor manufacturer's instructions.

(3) Alarm and monitoring systems may need to be updated or modified if the equipment is converted to a substitute refrigerant.

f. Pressure-Relief Protection. An approved pressure-relieving device must be installed on the units located in Refrigeration Mechanical Rooms to safely release a sudden, unexpected buildup of pressure and vent refrigerant to an outdoor location away from personnel and the building's heating, ventilation, and air conditioning (HVAC) fresh air intake.

g. Equipment Modification. High-efficiency purge units must be installed on existing equipment to mitigate potential losses of refrigerant vapor to the atmosphere. Follow the manufacturer's recommended refrigerant management enhancements for existing low-pressure (vacuum) operating chillers and equipment.

2-4. Fire Protection.

a. General. Halons are used to extinguish the fire by chemically interrupting the combustion chain reaction. Halons are a Class I ODS, and a ban on halon production took effect on January 1, 1994. Because no new halon is being produced and supplies are finite, FAA LOBs/SOs should take steps to reduce the need to use halon in fire protection systems and equipment by replacing or converting them as soon as feasible. Halon-containing equipment must be maintained to relevant industry standards; halon releases that result from failure to maintain equipment are prohibited by EPA regulations.

b. Venting Prohibition. The venting or other release into the environment of any halons used for fire extinguishing is prohibited, except for *de minimis* releases or the emergency release of halons for the legitimate purpose of fire extinguishing. Release of halons during testing of fire extinguishing systems or equipment is also prohibited except when:

(1) Systems or equipment employing suitable alternative agents are not available;

(2) System or equipment testing requiring the release of the agent is essential to demonstrate system or equipment functionality;

(3) Failure of the system would pose a great risk to human safety or the environment, and

(4) A simulant agent cannot be used for testing purposes.

c. Halon Total Flooding Systems. Halon 1301 may be in use in total fire protection systems in some FAA-owned or managed facilities as a "flooding agent" that discharges mostly as a gas. Current Halon 1301 total flooding systems may remain in place at FAA facilities, but as it becomes economically and technically feasible, LOBs/SOs must schedule the conversion of these systems to SNAP substitutes or replacement with another equivalent means of fire protection. Halon total flooding systems must be properly maintained in accordance with the National Fire Protection Association (NFPA) 12A: Standard on Halon 1301 Fire Extinguishing Systems.

d. Halon Portable Fire Extinguishers. Halon 1211 has been used in portable fire extinguishing units at FAA facilities. Portable Halon 1211 fire extinguishers at FAA facilities must be scheduled for replacement with appropriate substitute extinguishers or converted to a substitute chemical that has a lower ozone depletion rating as soon as feasible. Because fire extinguishers are designed for specific applications, they should only be replaced with a substitute that fulfills the same function and provides the same level of fire suppression.

2-5. Motor Vehicle Air Conditioners (MVAC).

a. General. MVAC is mechanical vapor compression refrigeration equipment used to cool the driver's or passenger's compartments of any motor vehicle. MVAC-like appliances are used to cool the driver's or passenger's compartments of off-road vehicles, including agricultural and construction vehicles.

b. Maintenance Requirements. FAA employees and contractors servicing MVAC must comply with the requirements of CAA Section 609, as amended, which prohibits intentionally releasing or venting ODS refrigerants and most alternatives while maintaining, servicing, repairing, or disposing of MVACs and MVAC-like equipment and requires recycling of refrigerant in MVACs whenever service is being performed. Section 609 also requires persons who repair or service MVACs to be certified in refrigerant recovery and recycling (see Chapter 3) and to properly use certified equipment when performing service (see Chapter 4).

c. Recordkeeping Requirements. Facilities that perform motor vehicle maintenance must maintain records of all recovered refrigerants sent off-site, which include the name and address of the reclamation facility, the quantity and type of refrigerant, and the shipment date. Facilities are also required to maintain records (on-site) showing that all service technicians are properly certified.

2-6. Aircraft.

a. General. Halons are the principal fire-extinguishing agent used onboard aircraft because of their unique fire extinguishing properties, and are used in hand-held extinguishers, lavatory bottles, engine nacelles and auxiliary power units (APUs), and cargo compartments. Federal aviation regulations require the use of halon or an equivalent that meets the Minimum Performance Standards (MPS). FAA Advisory Circular 20-42D, Hand Fire Extinguishers for Use in Aircraft (2011), provides guidance to aircraft owners and operators on the use of replacements for halon hand-held fire extinguishers and encourages their use where practical. A predetermined allocation made by EPA of HFCs may be produced, purchased, and used until 2025 for certain essential uses, including onboard aerospace fire suppression, provided no safe or technically achievable substitute is available, and there is an available supply (40 CFR Part 84).

b. Aircraft do not meet the definition of "motor vehicle" in section 609; therefore, maintenance practices on aircraft air conditioning systems are regulated under section 608 of the CAA, which prohibits intentional release or venting of ODSs and ODS-substitutes. Specifically, halon used in aircraft fire suppression systems is subject to the prohibition on venting or other release into the environment, except for *de minimis* releases or the emergency release for the legitimate purpose of fire extinguishing.

2-7. Cleaning Solvents and Degreasers. Methyl chloroform (1, 1, 1-trichloroethane) and carbon tetrachloride are Class I ODSs that were commonly used as solvents. Their production was phased out in 1995. Substitutes include terpene products, semi-aqueous hydrocarbons, and HCFC blends, which pose less harm to the ozone layer. LOBs/SOs must take steps to eliminate the use of non-aerosol cleaning solvents and degreasers containing CFCs, carbon tetrachloride, and methyl chloroform from FAA facilities and operations to reduce the inventory of Class I ODSs. Spray cans containing ODS solvents or propellants must be replaced with SNAP substitutes as inventories are diminished.

Chapter 3. Management of Ozone Depleting Substances and Regulated Greenhouse Gases

3-1. Health and Safety.

a. ODSs are typically stored in compressed gas cylinders. Handling and storage of compressed gases must follow the requirements of FAA Order 3900.19C, *Occupational Safety and Health Policy*, including but not limited to inspections of compressed cylinders, storage of compressed cylinders, safety relief devices for compressed cylinders, labeling requirements, and the use of personal protective equipment. All FAA employees and contractors handling ODSs must comply with the health, safety, and handling procedures on the manufacturer's Safety Data Sheets (SDS).

b. ODSs generally have low inhalation toxicity under normal use. However, ODSs are heavier than air and may settle into low areas, replacing the oxygen in an enclosed area and thereby potentially causing loss of consciousness or asphyxiation. There is also the risk of injury from the high pressurization under which some of these substances are used. Due to these health and safety risks, ODSs must be carefully handled and monitored.

c. ODSs must be transferred only to a container that is suitable for the specific refrigerant involved. The container should be a color of light green gray (RAL 7044) for all refrigerants, as identified by the Air Conditioning, Heating, and Refrigeration Institute (AHRI) Guideline N Assignment of Refrigerant Container Colors and must comply with the appropriate Department of Transportation (DOT) regulations for refillable containers. FAA employees and contractors must always verify contents by means other than color and should never reuse a non-refillable container or cylinder.

d. ODS containers must not be overfilled. The design maximum working pressure of the container must not be exceeded, even temporarily, during any filling operation. The maximum working pressure of the container is stamped in the neck area of the cylinder/container. Refrigerant-oil mixtures have a lower density than refrigerants alone; the container capacity will therefore be reduced for a refrigerant-oil mixture.

e. In filling ODS containers, the maximum carrying capacity must not be exceeded (approximately 80 percent liquid fill at 70 degrees Fahrenheit or 21 degrees Centigrade). The carrying capacity is a function of the internal volume of the container and the liquid density of the ODS at a reference temperature.

3-2. Leak Detection, Reporting, and Repair of Refrigeration Units.

a. FAA employees and contractors servicing refrigeration equipment at FAA facilities must perform leak detection inspections on refrigeration units on a regular basis in accordance with manufacturer recommendations and FAA maintenance orders (typically annually). There are no federal requirements for physical leak detection inspections on refrigeration and air conditioning equipment.

b. The leak rate must be calculated each time refrigerant is added to a system or any time there is an indication that the system may be leaking. To track leak rates, FAA-owned or operated facilities with air-conditioning and refrigeration equipment containing more than 50 pounds of ODSs must keep servicing records documenting the date and type of service, as well as the quantity of refrigerant added. For ATO facilities, these records must be kept in accordance with JO 6000.206, *Refrigerant Inventory Log* using the Refrigerant Inventory Control Log (FAA Form 6000-27). JO 6000.206 contains information on how to calculate the leak rate.

c. FAA-owned and operated facilities with ODS refrigerant equipment having charges greater than 50 pounds must repair leaks within 30 days of discovering the leak if the loss of refrigerant is greater than 10 percent of the charge over a year. The trigger for repair requirements is the current leak rate projected over a consecutive 12-month period rather than the total quantity of refrigerant lost. For instance, owners or operators of a commercial refrigeration system containing 100 pounds of charge must repair leaks if they find that the system has lost 5 pounds of charge over the past month; although 5 pounds represents only 5 percent of the system charge in this case, a leak rate of 5 pounds per month would result in the release of over 50 percent of the charge over the year.

d. Initial and follow-up verification tests must be conducted at the conclusion of all repair efforts. These tests are essential to ensure that the repairs have been successful. Initial leak tests must be conducted as soon as practical after the repair is completed to verify the leak was addressed. After the unit has returned to normal operating conditions, a follow-up verification leak test must be performed, and there is no minimum timeframe. Facilities may use any method that meets sound professional judgment for the follow-up verification (e.g., pressure test, bubble test, etc.).

e. This 30-day requirement may be waived if, within 30 days of discovery, owners develop a one-year retrofit or retirement plan for the leaking equipment. A copy of the plan must be kept on-site and must be made available to EPA upon request. The retrofit/retirement of the unit must be completed within one year from the retrofit/retirement plan's date.

f. FAA-owned or operated facilities with refrigerant equipment having charges greater than 50 pounds, who have a leak rate of 125% or more of the full charge in a calendar year must submit a report to the EPA. The report must be submitted no later than March 1 following the calendar year of the 125% or greater leak and describe efforts to identify leaks and repair the system or equipment.

g. The leak repair regulations do not apply to refrigeration, and air-conditioning equipment with refrigerant charge sizes less than 50 pounds (such as residential split air-conditioning systems). However, smaller equipment is not exempt from the refrigerant venting prohibition. EPA regulations prohibit the intentional release of all refrigerants during the maintenance, service, repair, or disposal of air-conditioning and refrigeration equipment.

3-3. ODS Training Requirements.

a. Section 608 Training. CAA Section 608 requires that all employees who service, purchase, or maintain refrigerant-containing equipment be certified in accordance with the EPA's training requirements. Section 608 training must be conducted by an EPA-approved instructor. Employees servicing or disposing of ODS refrigerant units must have the proper type of certification for all units

they are authorized to service and must maintain a personal copy while also storing a local copy of their certificate available at their place of business in accordance with 40 CFR Part 82, Subpart F. As a result of the diversity of equipment FAA employees maintain, the FAA requires all FAA technicians to hold an EPA 608 Universal Certification. Equivalency requests for approved external training will be evaluated by the National Technical Training and Safety Directorate (AJI-23) on a case-by-case basis. The request must include an official transcript and a valid EPA 608 Universal Certification for consideration.

FAA employees are required to pass an EPA-approved test to earn Section 608 Technician Certification. The tests are specific to the type of equipment the technician seeks to work on. Tests must be administered by an EPA-approved certifying organization. Section 608 Technician Certification credentials do not expire. Core tests taken as an open book exam cannot be used to get your Universal Certification. The core test must be taken as a proctored exam in order to attain Universal Certification.

EPA has developed four types of technician certification training:

1) Type I – For servicing small "appliances" that contain 5 pounds or less of refrigerants such as water coolers, domestic refrigerators, room air conditioners, packaged terminal air conditioners, packaged thermal heat pumps, dehumidifiers, under-the-counter icemakers, and vending machines.

2) Type II – For servicing or disposing of high- or very high-pressure units, except small "appliances" and motor vehicle air conditioning.

3) Type III – For servicing or disposing of low-pressure units.

4) Universal – For servicing all types (Types I–III).

b. Section 609 Training. FAA employees and contractors servicing MVAC systems must be certified and trained under an EPA-approved MVAC technician training and certification program, regardless of the refrigerant type. This includes all persons who are paid to perform service on MVAC. (Although "do-it-yourself" repair of MVAC is not prohibited by the CAA, it is discouraged through the small container limitations.) MVAC certification is different from the EPA certification for stationary, non-MVAC refrigerant systems under Section 608. A current list of all EPA-authorized Section 609 Technician Training and Certification organizations is available at: https://www.epa.gov/mvac/section-609-technician-training-and-certification-programs.

c. Training for Halon Use. Technicians who test, maintain, service, repair, or dispose of halon-containing equipment must be trained within 30 days of hire. EPA does not approve or authorize halon training programs but recommends that technician training be designed to cover general and environmental issues pertaining to halons, review relevant regulations pertaining to halons, and be specific to each facility or type of equipment used (40 CFR 82.270(c)). EPA suggests that employers consult NFPA, International Organization for Standardization (ISO), and American Society for Testing and Materials (ASTM) International publications during the development of training programs and materials.

d. Frequency of Training. Section 608 and 609 training must be provided to all personnel who perform maintenance, service, repair, or disposal that could be reasonably expected to release refrigerants into the atmosphere before they initiate such activities. EPA does not require recurrent training; however, recurrent training may be provided if an employee is relocated and the new workplace requires an update in training, if a program evaluation determines inadequacies in the employee's knowledge, or if additional continuing education is required by AJI-23.

e. Hazardous Materials Transportation Training. Employees who are involved in the transportation of hazardous materials, including refrigerant cylinders containing ODS refrigerants, must receive hazardous materials transportation training in accordance with 49 CFR 172, Subpart H.

f. Hazardous Waste Generator Training. Employees who manage hazardous waste, including ODS refrigerants that are classified as hazardous waste (see Chapter 5), will need to receive training on proper waste handling and emergency procedures, relevant to their responsibilities, in accordance with 40 CFR Part 262. Hazardous waste generator training is required for employees at facilities that are "small quantity generators" (generating between 100 kg but less than 1,000 kg per month) and "large quantity generators" (generating greater than or equal to 1,000 kg per month) of hazardous waste, as defined at 40 CFR 260.10.

Chapter 4. Recovery, Recycling, and Reuse of Ozone Depleting Substances and Regulated Greenhouse Gases

4-1. General. Recovery, recycling, and reuse of ODS refrigerants must be practiced during routine and corrective maintenance of all FAA equipment containing these chemicals. The recovery of ODS refrigerants must be performed in accordance with EPA regulations.

4-2. Recovery, Recycling and Reuse of Refrigerants.

a. Recovery and Reuse. Recovery is a term that describes the removal of refrigerant from a refrigerant system when necessary for routine and corrective maintenance and prior to disposal of old equipment, whether or not the system is operational. The refrigerant that has been recovered may be returned to the same system or other systems owned by the same person without reprocessing. Recovery must be performed by EPA-certified technicians using EPA-certified refrigerant recovery equipment. Proper evacuation and charging procedures (as outlined in the latest versions of the American National Standards Institute (ANSI)/ASHRAE Standard 147, "Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems" and ASHRAE Handbook - Refrigeration), must be followed when returning the refrigerant to the system.

b. Recycling. Refrigerants evacuated from a system may need to be recycled if there is a question about the quality of the refrigerant that would cause it to be a characteristic hazardous waste if disposed of (e.g., if the refrigerant was recovered from a system taken out of service because of motor burnout). Recycling evacuated refrigerants from systems could prevent the further release of harmful greenhouse gas emissions and other hazardous contaminants. In such cases, pursuant to 40 CFR Part 82, Subpart F (§ 82.156), the refrigerant must be analyzed for contaminants (e.g., acids, moisture, high boiling point, residue, and other contaminants) and recycled if necessary prior to reuse. Recycling is limited to filtering and drying the refrigerant to remove physical and chemical contaminants. Distillation is not normally done with recycling equipment used for maintenance. Therefore, it may be necessary to use an approved reclamation company.

c. Recovery and Recycling Equipment.

1) Refrigerant recovery or recycling equipment in use at FAA facilities must be certified by an EPA-approved testing organization to ensure that the equipment meets EPA standards based on the test method established by AHRI Standard 740. The EPA has approved both AHRI and Underwriter Laboratories (UL) to certify recycling and recovery equipment. Certified equipment may be identified by a label reading: "This equipment has been certified by AHRI/UL to meet EPA's minimum requirements for recycling and/or recovery equipment intended for use with [appropriate category of the appliance, e.g., small appliances, HCFC appliances containing less than 200 pounds of refrigerant, all high-pressure appliances, etc.]."

2) Recycling equipment and filters must be maintained to the specifications of the recycling equipment manufacturer.

d. Reclamation. If a used refrigerant requires purification, or if the used refrigerant changes ownership, it must be reclaimed by an EPA-certified refrigerant reclaimer prior to resale. Contractors

and technicians involved in the service, repair, or disposal of refrigeration and air-conditioning systems (i.e., appliances) have the option of returning their recovered refrigerant to a consolidator (such as a refrigerant manufacturer, supplier, wholesale distributor, or refrigerant recovery company) for packaging and preparation for reclamation, or in some cases directly to an EPA-certified refrigerant reclaimer. No FAA facilities are approved EPA-certified refrigerant reclaimers.

4-3. Recycling and Recovery of MVAC Refrigerant.

a. Recycling of refrigerant in MVAC is required whenever service is being performed that may release refrigerant into the atmosphere.

b. All MVAC refrigerant equipment must be certified by the EPA or an independent standards testing organization approved by the EPA to meet standards at least as stringent as those developed by the Society of Automotive Engineers (SAE) in effect as of November 1990.

c. Intertek (formerly ETL Testing Laboratories, Inc.) and Underwriters Laboratory have approved testing organizations for equipment used for refrigerant recovery and recycling in mobile units.

d. Facilities possessing refrigerant recovery equipment must certify to EPA that they have acquired and are properly using approved equipment and that each person using the equipment has been properly trained and certified. A certification form must be submitted to the appropriate EPA Regional Office. Note that this certification is a one-time requirement, and there are no requirements to resend notifications when a certified person acquires new equipment.

e. Any refrigerant sent off-site must be reclaimed to a higher level of purity in order to ensure it does not contain any contaminants that could be introduced from equipment other than MVAC (e.g., refrigerant from a home refrigerator, which may contain acids, may not be introduced into an automobile until it has been reclaimed to the AHRI-700 standard, Specifications for Refrigerants). This is required even if the refrigerant is being returned to the system from which it was removed. Refrigerant must be cleaned to the SAE J1991 Standard of Purity for Use in Mobile Air-Conditioning Systems and SAE J2099 Standard of Purity for Recycled R-134a (HFC-134a) and R-1234yf (HFO-1234yf) for Use in Mobile Air-Conditioning Systems.

4-4. Halon Recovery and Recycling.

a. Due to the ban on the production of new halon and the continuing need for halon in aircraft fire protection, the aviation industry now relies on recycled halon. Recycled halon must meet certified standards for halon quality.

b. Used halon typically becomes available when a fire suppression system or extinguisher is decommissioned. When a halon system or extinguisher is ready for decommissioning, the halon should be recovered by a fire equipment manufacturer or dealer, a recycler, or an in-house recovery or recycling operation in accordance with NFPA 10: Standard for Portable Fire Extinguishers and NFPA 12A: Standard on Halon 1301 Fire Extinguishing Systems.

c. Halon recyclers are responsible for transporting the halon; sampling and testing the halon for any impurities; consolidating the halon into larger storage cylinders; recycling the halon through equipment designed to remove impurities and return the halon to commercial aviation standards; re-sampling the finished product to determine if it meets the above specifications, and shipping the recycled halon to the commercial aviation customer.

d. A small number of US-based halon recyclers handle the supply of recovered halon. Halon sourced from outside of the U.S. must first be granted EPA approval prior to importation, which is obtained by providing EPA with documentation that will allow the Agency to independently verify that the halon is truly recycled (i.e., recovered from an existing fire suppression system).

Chapter 5. Disposal of Ozone Depleting Substances and Regulated Greenhouse Gases

5-1. General Disposal Requirements.

a. FAA personnel engaged in the disposal of ODSs must follow Resource Conservation and Recovery Act (RCRA) regulations contained in 40 CFR Parts 260-268. If the ODSs are classified as hazardous waste, then stricter disposal regulations apply, and the ODSs must be assigned an EPA waste code before they can be transported off-site (40 CFR 262.11).

b. RCRA regulations list more than 400 wastes as hazardous (40 CFR 261, Subpart D) in addition to characteristically hazardous wastes (i.e., ignitability, corrosivity, reactivity, or toxicity). These listed wastes are broken down into four lists: U, P, K, and F (40 CFR 261.33(f), .33(e), .32, and .31). Whenever waste is generated, the operator must review the lists to determine whether the waste is listed as hazardous.

c. Disposal must only be considered as a final option when the recovery and reclamation/ recycling/reuse of the ODS, or the trading and selling of ODS refrigerant, is not a viable alternative. Given the increasing scarcity of ODSs and some non-ODS substitute refrigerants, one option will be to sell or trade refrigerants in the waste exchange market or to sell them to users who have a demand for them. Records of sales of ODS refrigerants must be kept on file indefinitely.

5-2. Disposal of ODS Used as Solvents.

a. Under the current hazardous waste identification regulations (40 CFR 261), a CFC solvent waste is hazardous only under the following circumstances:

(1) When dichlorodifluoromethane (CFC-12) or trichloromonofluoromethane (CFC-11) is an unused commercial chemical product or an off-specification commercial chemical product (including inner liners, containing residues, or spill residues), the material is considered hazardous waste when discarded, except when sent off-site for recycling. For the purposes of this subsection, the term "unused" means not introduced into a process, activity, or piece of equipment for use. The term "off-specification" must mean not meeting the physical or chemical standards set by the product manufacturer. The EPA RCRA hazardous waste code for CFC-12 is U075; the code for CFC-11 is U121.

(2) When CFC waste is covered by a spent solvent listing (F001-F005), the waste is considered hazardous. Any CFC solvent used for degreasing would be considered hazardous waste. CFC-11 and 1, 1, 2-trichloro-1,2,2 tri-fluoromethane used as solvents are considered hazardous wastes. Furthermore, any spent solvent mixture containing CFCs and meeting one of the F001-F005 solvent listings is considered hazardous waste. For example, a spent solvent mixture containing 10 percent trichloro-fluoromethane, 5 percent ethyl ether, and 5 percent acetone before use would meet the F002 and F003 listings.

(3) If CFC waste exhibits a characteristic of hazardous waste (i.e., ignitability, corrosivity, reactivity, or toxicity, see 40 CFR 261.21-261.24), the waste would be considered hazardous. However, if CFC waste is hazardous by virtue of the toxicity characteristic and is destined for recycling, it is exempt from RCRA regulations (40 CFR 261.4 (b) (10-12)). A non-RCRA-designated CFC waste may still be state regulated as a dangerous waste.

(4) If CFC waste is co-mingled in a container with hazardous waste, the entire volume of waste in the container would be hazardous.

b. Filters that are used in the recycling process for CFC solvents must be considered hazardous waste upon removal from the recycling unit. In order to determine the level and type of contamination of recycling filters, an initial laboratory test must be performed on a sample filter or filters. This need not be conducted on each and every filter used over the life of the equipment: once an initial baseline test has been performed to determine filter contamination levels, extrapolation from these results may be conducted to estimate future filter contamination levels. This approach can only be followed if system filters are replaced in a consistent and routine fashion. These results can only apply to a specific system in a given geographic area. If filters are not replaced on a regular basis, then the results of the baseline test will not be valid for future filter replacements. A log of filter replacement must be kept in order to document this approach for regulatory agencies, such as the EPA, should any questions or concerns arise.

c. When a used CFC solvent is determined to be a hazardous waste, the owner of the system from which it was removed would be considered the generator. In addition, the service person or company that removed the ODS from the system would be considered a co-generator. Although both parties are subject to RCRA hazardous waste regulations, EPA prefers that the generator's responsibility lie with one party, preferably specified in a contract or written agreement.

5-3. Disposal of Halons. Halon removed from FAA facilities, such as halon fire extinguishers or decommissioned halon total flooding systems, may be disposed of by (1) making it available to critical users through the Halon Recycling Corporation (HRC); (2) donating it to the Department of Defense Ozone Depleting Substances Reserve (DoD bank); (3) returning it to your distributor for resale; or (4) sending it to a halon recycler.

5-4. Disposal of Appliances Containing ODS Refrigerants.

a. Appliances containing refrigerants, including but not limited to household refrigerators and freezers, window air conditioners, water coolers, vending machines, ice makers, and dehumidifiers, are subject to EPA's safe disposal requirements. Under these requirements, the final person in the disposal chain (e.g., a scrap metal recycler or landfill owner) is responsible for ensuring that refrigerant is recovered from equipment before the final disposal of the equipment. Persons disposing of small appliances must require a signed statement from the appliance supplier (e.g., the original owner or disposal contractor) if the supplier indicates that he has removed the refrigerant from the appliance. The signed statement must include the name and address of the technician and the date of recovery. A contract with this information is acceptable.

b. When an appliance is evacuated by personnel at an FAA facility in preparation for disposal, the equipment used to recover refrigerant from appliances prior to their final disposal must meet the same performance standards as refrigerant recovery equipment used prior to service. However, technician certification is not required for individuals removing refrigerant from small appliances, motor vehicle air conditioners, and motor vehicle-like air conditioners, when preparing them for disposal.

c. When disposing of appliances containing at least 5 pounds and less than 50 pounds of refrigerant, records of the disposal must be kept. This requirement applies to appliances containing ODS refrigerants. The records should include, but are not limited to, location and date of recovery, type of refrigerant recovered, monthly totals of the amounts of refrigerant recovered, and amount of refrigerant sent for reclamation.

d. While the appliance with a refrigerant charge is at an FAA facility awaiting disposal, care must be taken to ensure that refrigerants are not accidentally vented to the atmosphere, which may include keeping the appliances sheltered from the elements to prevent degradation.

e. Refrigeration and air-conditioning equipment that is typically dismantled on-site before disposal (e.g., central residential air conditioning, chillers, and industrial process refrigeration) must have the refrigerant recovered in accordance with EPA requirements for servicing prior to their disposal.

Chapter 6. Administrative Information

6-1. Distribution. This Order is distributed electronically to all LOBs and SOs, regional offices, and centers.

6-2. Authority to Change this Order.

a. FAA Administrator. The Administrator reserves the authority to approve changes that establish policy, delegate authority, or assign responsibility.

b. Executive Director of the Office of Environment and Energy (AEE-1). AEE-1 has the authority to add new chapters or appendices, or change existing chapters or appendices, after appropriate coordination with internal stakeholder organizations.

c. Organizational elements. Changes proposed by an organizational element within FAA must be submitted to AEE-1, who will evaluate or assign a designee to evaluate the changes for incorporation.

6-3. Related Publications.

AHRI Standard 700, *Specifications for Refrigerants*

AHRI Standard 740, *Performance Rating of Refrigerant Recovery Equipment and Recovery/ Recycling Equipment*

ANSI/ASHRAE Standard 147, *Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems*

ASHRAE 15, *Safety Standard for Refrigeration Systems*

FAA Advisory Circular 20-42D, *Hand Fire Extinguishers for Use in Aircraft*

FAA JO 1050.17A, *Environmental Compliance for Air Traffic Organization*

FAA JO 6000.206, *Refrigerant Inventory Log*

FAA JO 6470.5A, *Maintenance of Air Route Traffic Control Center Environmental Systems*

FAA JO 6970.3A, *Maintenance of Environmental Systems*

FAA Order 3900.19C, *FAA Occupational Safety and Health (OSH) Policy*

NFPA 10: Standard for Portable Fire Extinguishers

NFPA 12A: Standard on Halon 1301 Fire Extinguishing Systems

SAE J1991: Standard of Purity for Use in Mobile Air-Conditioning Systems

SAE J2099: Standard of Purity for Recycled R-134a (HFC-134a) and R-1234yf (HFO-1234yf) for Use in Mobile Air-conditioning Systems

Appendix A. Acronyms List

AAP	Acquisitions Policy & Oversight
AEE	Office of Environment and Energy
AEE-1	Executive Director of the Office of Environment and Energy
AHRI	Air Conditioning, Heating and Refrigeration Institute
AIM Act	American Innovation and Manufacturing Act
AJI-2	Air Traffic Organization Technical Training
AJI-23	National Technical Training and Safety Directorate
AJW-L	FAA Logistics Center
AMA	FAA Academy
APU	Auxiliary power unit
ASHRAE	American Society of Heating, Refrigerating & Air Conditioning Engineers
ASTM	American Society for Testing Materials
ATO	Air Traffic Organization
CAA	Clean Air Act
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
DoD bank	Department of Defense Ozone Depleting Substances Reserve
DOT	Department of Transportation
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
GHG	Greenhouse Gas
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HRC	Halon Recycling Corporation
HVAC	Heating, ventilation, and air conditioning
ICAO	International Civil Aviation Organization
ISO	International Organization for Standardization
JO	Joint Order
LOB	Line of Business
MPS	Minimum performance standard
MVAC	Motor Vehicle Air Conditioners
NFPA	National Fire Protection Association
ODP	Ozone depletion potential
ODS	Ozone Depleting Substance
PFC	Perfluorocarbons
RCRA	Resource Conservation and Recovery Act
SAE	Society of Automotive Engineers
SDS	Safety Data Sheet
SNAP	Significant New Alternatives Policy
SO	Staff Office
UL	Underwriter Laboratories

Appendix B. Definitions

This list of definitions pertains to this Order and has been abstracted from Federal and private sources where appropriate. It should not be construed as comprehensive and is only for the purpose of clarifying terminology used in this Order.

a. Appliance is any device that contains and uses a Class I or Class II ODS as a refrigerant and which is used for household or commercial purposes, including any air conditioner, refrigerator, chiller, or freezer.

b. Brazed Joint is a gas-tight joint obtained by joining metal parts with alloys that melt at temperatures higher than 800 degrees F (430 degrees C) but less than the melting temperatures of the joined parts.

c. Carbon Tetrachloride was used extensively in the United States as a solvent and grain fumigant and is still used in this capacity in many parts of the world. Carbon tetrachloride is still used as a feedstock in the United States and, therefore, has been identified as a Class I substance under Title VI - Stratospheric Ozone Protection - of the Clean Air Act. However, its high toxicity led to a ban on its use in the United States in most dispersive applications.

d. Chillers are heavy-duty air-conditioning systems in commercial and industrial buildings (e.g., air route traffic control centers). There are three types of chillers (reciprocating, screw, and centrifugal) distinguished principally by their compressors. Reciprocating compressors use pistons and cylinders for compression. Screw compressors most commonly use two intermeshing "screws" for compression. As they turn, the volume between the screws is reduced, compressing the refrigerant. Centrifugal compressors rotate at high speed, compressing the refrigerant by centrifugal force.

e. Chlorofluorocarbons (CFC) are extremely stable, nontoxic, nonflammable, noncorrosive, and thermally efficient chemicals that are widely used as coolants for refrigeration and air conditioning systems, cleaning agents for electronic components, and foam blowing agents. CFCs are fully halogenated (no hydrogen remaining) halocarbons containing chlorine, fluorine, and carbon atoms.

f. Class I Substances are any CFC, halons, carbon tetrachloride, and methylchloroform deemed to fall in this category by the EPA Administrator based on current scientific data and pursuant to the Montreal Protocol, CAA, and EPA's implementing regulations. A list of Class I substances is contained in Appendix B; however, the EPA website should be reviewed to ensure no other refrigerants or blends have been added to the list, https://www.epa.gov/ods-phaseout/phaseout-class-i-ozone-depleting-substances.

g. Class II Substances are a wide variety of HCFCs considered by EPA to fall within this category based on current scientific data and in compliance with the Montreal Protocol, CAA, and EPA implementing regulations. A list of Class II substances is contained in Appendix B; however, it does not contain blended refrigerants that contain Class II substances. Common blends include R-401A, R-402A, R-408A, R-409A, R-414B, and R-502A. See the EPA website on Class II

Substances for additional information: https://www.epa.gov/ods-phaseout/phaseout-class-ii-ozone-depleting-substances.

h. Greenhouse Gases (GHG) are gases that trap heat in the atmosphere. This includes many replacements for ODS, such as HFCs.

i. Halons are fully halogenated compounds that are effective fire extinguishing chemicals. They are electrically nonconductive, dissipate quickly, leave no residue, are explosive suppressants, and are nontoxic.

j. Hazardous Waste is defined in 40 CFR Section 261.3. A waste is hazardous by virtue of being listed on EPA designated lists and/or having one or more of the following characteristics: ignitability, corrosivity, reactivity, or toxicity.

k. Hydrochlorofluorocarbons (HCFC) are types of CFCs that contain hydrogen atoms. Hydrogen reduces the stability of the CFC, allowing the CFC to break down more readily before reaching the stratosphere, where it can damage the ozone. HCFCs also contain fluorine, chlorine, and carbon atoms.

l. Hydrofluorocarbons (HFC) are halocarbons that contain only fluorine, carbon, and hydrogen. See the EPA website on HFC reduction for more information: https://www.epa.gov/climate-hfcs-reduction

m. Methylchloroform (1, 1, 1-trichloroethane) is widely used throughout the world as an industrial solvent. Unlike other Class I substances, it is only partially halogenated and correspondingly has a much lower ozone depletion potential (ODP). However, because of its high volume of use, it contributes significantly to total atmospheric chlorine levels.

n. Motor Vehicle is any self-propelled vehicle designed for transporting persons or property on a street or highway.

o. Non-ODS Substitute Refrigerants are any substitute refrigerants that the EPA has listed on their SNAP list, including hydrofluorocarbons (HFC), perfluorocarbons (PFC), and certain blends of other non-ODS refrigerants. Most of these refrigerants are relatively nonflammable, stable, and non-reactive.

p. Ozone Depleting Substances are extremely stable, nontoxic, nonflammable, noncorrosive, and thermally efficient chemicals that are widely used as coolants for refrigeration and air conditioning systems, cleaning agents for electronic components, foam blowing agents, and propellants for aerosol sprays. These substances have been shown to significantly deplete the 'Earth's ozone layer.

q. Ozone Depletion is the interruption of the naturally occurring ozone generation process. For instance, this occurs when ODSs are released and rise into the stratosphere. Sunlight breaks down the molecules, releasing a chlorine atom or a bromine atom in the case of halons. Instead of a single oxygen atom combining with the oxygen molecule, the more chemically aggressive chlorine or

bromine ions react with an oxygen atom to form chlorine monoxide or another compound that fails to block dangerous ultraviolet radiation. As this process continues, the ozone layer deteriorates, allowing more ultraviolet radiation to pass through and reach the 'Earth's surface.

r. Ozone Layer is located 11 miles above the 'Earth's surface and extends beyond 25 miles. Ozone molecules are continually generated as sunlight reacts with oxygen molecules to produce two single oxygen atoms. An oxygen molecule will then combine with a single oxygen atom to produce an ozone molecule. This process is balanced by a simultaneous reaction of ozone decomposing, due to sunlight, into an atom and molecule each of oxygen.

s. Purging is the removal of non-condensable gases and water vapor from the cooling system.

t. Purging Device is an automatic, semi-automatic, or hand-operated device which collects non-condensable gases and water vapor from the condenser or receiver, condenses some of the condensable refrigerants, and relieves the remainder to the atmosphere.

u. Reclaim means reprocessing refrigerant to at least the purity specified in the AHRI Standard 700-2019, Specifications for Refrigerants, and verifying this purity using the analytical methodology prescribed in the Standard. This term usually implies the use of processes or procedures available only at a reprocessing or manufacturing facility.

v. Recovery means removing refrigerant in any condition from a system and storing it in an external container without necessarily testing or processing it in any way.

w. Recovery Equipment is normally a mechanical system consisting of an evaporator, oil separator, compressor, and condenser, which draws refrigerant out of the refrigeration system and stores it in a storage container. The equipment may employ replaceable core filter driers to remove moisture, acid, particulates, and other contaminants.

x. Recycling means extracting refrigerant from an appliance and cleaning refrigerant for reuse without meeting all of the requirements for reclamation. In general, recycled refrigerant is refrigerant that 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.

y. Technician is any person who performs maintenance, service, or repair that could reasonably be expected to release refrigerants, including Class I or Class II ODS substances, from appliances, except for MVACs, into the atmosphere. Technician also means any person performing disposal of appliances, except for small appliances, MVACs, and MVAC-like appliances, which could be reasonably expected to release refrigerants, including Class I or Class II ODS refrigerants, from appliances into the atmosphere.

Appendix C. Regulation of Ozone Depleting Substances and Greenhouse Gases

Background.

a. Growing concern over the depletion of the Earth's ozone layer led to the signing of the Montreal Protocol in 1987, an international agreement that regulates the use of ODSs. This agreement has been ratified by 70 countries, including the United States, representing over 90 percent of the world's production capacity for ODSs. In support of the Montreal Protocol, the United States Congress passed the CAA Amendments of 1990 (Public Law 101-549), which strictly regulates the manufacture, sale, and use of ODSs.

b. EPA regulations issued under Sections 601-607 of the CAA phase out the production and import of ODSs, consistent with the schedules developed under the Montreal Protocol. The parties to the Montreal Protocol have changed the phase-out schedule over time, through adjustments and amendments, and EPA has also accelerated the phase-out under its CAA authority.

c. In the United States, ozone-depleting substances are regulated as Class I or Class II controlled substances. Class, I ODSs include CFCs, most commonly used in refrigeration, air conditioning, and heat pump systems; halogenated hydrocarbons (halon), used as fire suppression agents; and certain solvents such as methyl chloroform and carbon tetrachloride. Class I substances have higher ozone-depleting potential and have been completely phased out in the U.S., except for exemptions allowed under the Montreal Protocol. Class II ODSs are hydrochlorofluorocarbons (HCFC), which were developed as transitional substitutes for Class I substances. Class II production will be gradually phased out by 2030 as follows:

(1) Cut production 75 percent by January 1, 2010
(2) Cut production 90 percent by January 1, 2015
(3) Cut production 99.5 percent by January 1, 2020
(4) Complete phase out by January 1, 2030

d. Halons are gaseous or easily vaporized halocarbons used primarily for fire and explosion protection and are listed as Class I ODSs. Due to their effectiveness as a firefighting agent, halons are among the most ozone-depleting chemicals in use today. With 0.2 ozone-depleting potential (ODP) representing the threshold for classification as a Class I substance, Halon 1301 has an estimated ODP of 10, Halon 2402 has an estimated ODP of 6, and Halon 1211 has an estimated ODP of 3. A ban on halon production in the U.S. and other developed countries took effect on January 1, 1994, and in developing countries in 2010. The supply of previously produced halon is finite; residual supplies and recycled halon are being used or held for use in key areas, including civil aviation, military, oil and gas, and other critical fire protection applications. Since 2010, the International Civil Aviation Organization (ICAO) has adopted a series of resolutions directed at accelerating the replacement of halons in aircraft fire suppression systems.

e. On November 18, 2016, EPA updated the Section 608 CAA regulations to extend the ODS regulations to non-ODS substitute refrigerants, including HFCs and PFCs. However, on February 26, 2020, EPA issued a rule to rescind this extension of the leak repair provisions to appliances using non-ODS substitute refrigerants. The leak repair requirements and associated recordkeeping and reporting

will continue for Class I and Class II ODS refrigerants. This action does not rescind current regulations requirements for certain non-ODS substitute refrigerants, including sales restriction and technician certification requirements, safe disposal requirements, evacuation requirements, reclamation standards, and the requirement to use certified recovery equipment.

f. On December 27, 2020, the AIM Act was enacted as section 103 in Division S, Innovation for the Environment, of the Consolidated Appropriations Act, 2021. The AIM Act directs EPA to address HFCs by providing new authorities in three main areas: phasedown, the production, and consumption of listed HFCs, managing these HFCs and their substitutes, and facilitating the transition to next-generation technologies. The phasedown of HFC production and consumption from the baseline established by the EPA will occur following this schedule:

(1) Cut production and consumption to 90 percent of baseline by December 31, 2023
(2) Cut production and consumption to 60 percent of baseline by December 31, 2028
(3) Cut production and consumption to 30 percent of baseline by December 31, 2033
(4) Cut production and consumption to 20 percent of baseline by December 31, 2035
(5) Cut production and consumption to 15 percent of baseline from January 1, 2036, and thereafter

Classification of ODS (42 U.S. Code § 7671a)

Class I	Class II
CFC-11 (Trichlorofluoromethane)	HCFC-21 (Dichlorofluoromethane)
CFC-12 (Dichlorodifluoromethane)	HCFC-22 (Monochlorodifluoromethane)
CFC-13 (Chlorotrifluoromethane)	HCFC-31 (Monochlorofluoromethane)
CFC-111 (Pentachlorofluoroethane)	HCFC-121 (Tetrachlorofluoroethane)
CFC-112 (Tetrachlorodifluoroethane)	HCFC-122 (Trichlorodifluoroethane)
CFC-113 (1,1,2-Trichlorotrifluoroethane)	HCFC-123 (Dichlorotrifluoroethane)
CFC-114 (Dichlorotetrafluoroethane)	HCFC-124 (Monochlorotetrafluoroethane)
CFC-115 (Monochloropentafluoroethane)	HCFC-131 (Trichlorofluoroethane)
CFC-211 (Heptachlorofluoropropane)	HCFC-132b (Dichlorodifluoroethane)
CFC-212 (Hexachlorodifluoropropane)	HCFC-133a (Monochlorotrifluoroethane)
CFC-213 (Pentachlorotrifluoropropane)	HCFC-141b (Dichlorofluoroethane)
CFC-214 (Tetrachlorotetrafluoropropane)	HCFC-142b (Monochlorodifluoroethane)
CFC-215 (Trichloropentafluoropropane)	HCFC-221 (Hexachlorofluoropropane)
CFC-216 (Dichlorohexafluoropropane)	HCFC-222 (Pentachlorodifluoropropane)
CFC-217 (Chloroheptafluoropropane)	HCFC-223 (Tetrachlorotrifluoropropane)
Halon 1211 (Bromochlorodifluoromethane)	HCFC-224 (Trichlorotetrafluoropropane)
Halon 1301 (Bromotrifluoromethane)	HCFC-225ca (Dichloropentafluoropropane)
Halon 2402 (Dibromotetrafluoroethane)	HCFC-225cb (Dichloropentafluoropropane)
Halon 1011/CBM (Chlorobromomethane)	HCFC-226 (Monochlorohexafluoropropane)
Carbon Tetrachloride	HCFC-231 (Pentachlorofluoropropane)
Methyl Chloroform (1,1,1-trichloroethane)	HCFC-232 (Tetrachlorodifluoropropane)
Methyl Bromide	HCFC-233 (Trichlorotrifluoropropane)
Hydrobromofluorocarbons (HBFCs)	HCFC-234 (Dichlorotetrafluoropropane)
	HCFC-235 (Monochloropentafluoropropane)
	HCFC-241 (Tetrachlorofluoropropane)
	HCFC-242 (Trichlorodifluoropropane)
	HCFC-243 (Dichlorotrifluoropropane)
	HCFC-244 (Monochlorotetrafluoropropane)
	HCFC-251 (Trichlorofluoropropane)
	HCFC-252 (Dichlorodifluoropropane)
	HCFC-253 (Monochlorotrifluoropropane)
	HCFC-261 (Dichlorofluoropropane)
	HCFC-262 (Monochlorodifluoropropane)
	HCFC-271 (Monochlorofluoropropane)

*Note: This list does not include common refrigerant blends that contain Class II substances that will be subject to the Section 608 regulations, such as R-401A, R-402A, R-408A, R-409A, R-414B, and R-502A. It is important to verify the components of all refrigerants and solvents to ensure that no Class I or Class II ODS is included in the blend.

Regulated HFCs (40 CFR Part 84**)**

HFC-134 (1,1,2,2-Tetrafluoroethane)
HFC-134a (1,1,1,2-Tetrafluoroethane)
HFC-143 (1,1,2-Trifluoroethane)
HFC-245fa (1,1,1,3,3-Pentafluoropropane)

HFC-365mfc (1,1,1,3,3-Pentafluorobutane)
HFC-227ea (1,1,1,2,3,3,3-Heptafluoropropane)
HFC-236cb (1,1,1,2,2,3-Hexafluoropropane)
HFC-236ea (1, 1, 1, 2, 3, 3-Hexafluoropropane)
HFC-236fa (1,1,1,3,3,3-Hexafluoropropane)
HFC-245ca (1,1,2,2,3-Pentafluoropropane)
HFC-43-10mee (1,1,1,2,2,3,4,5,5,5-Decafluoropentane)
HFC-32 (Difluoromethane)
HFC-125 (Pentafluoroethane)
HFC-143a (1,1,1-Trifluoroethane)
HFC-41 (Fluoromethane)
HFC-152 (1,2-Difluoroethane)
HFC-152a (1,1-Difluoroethane)
HFC-23 (Trifluoromethane)