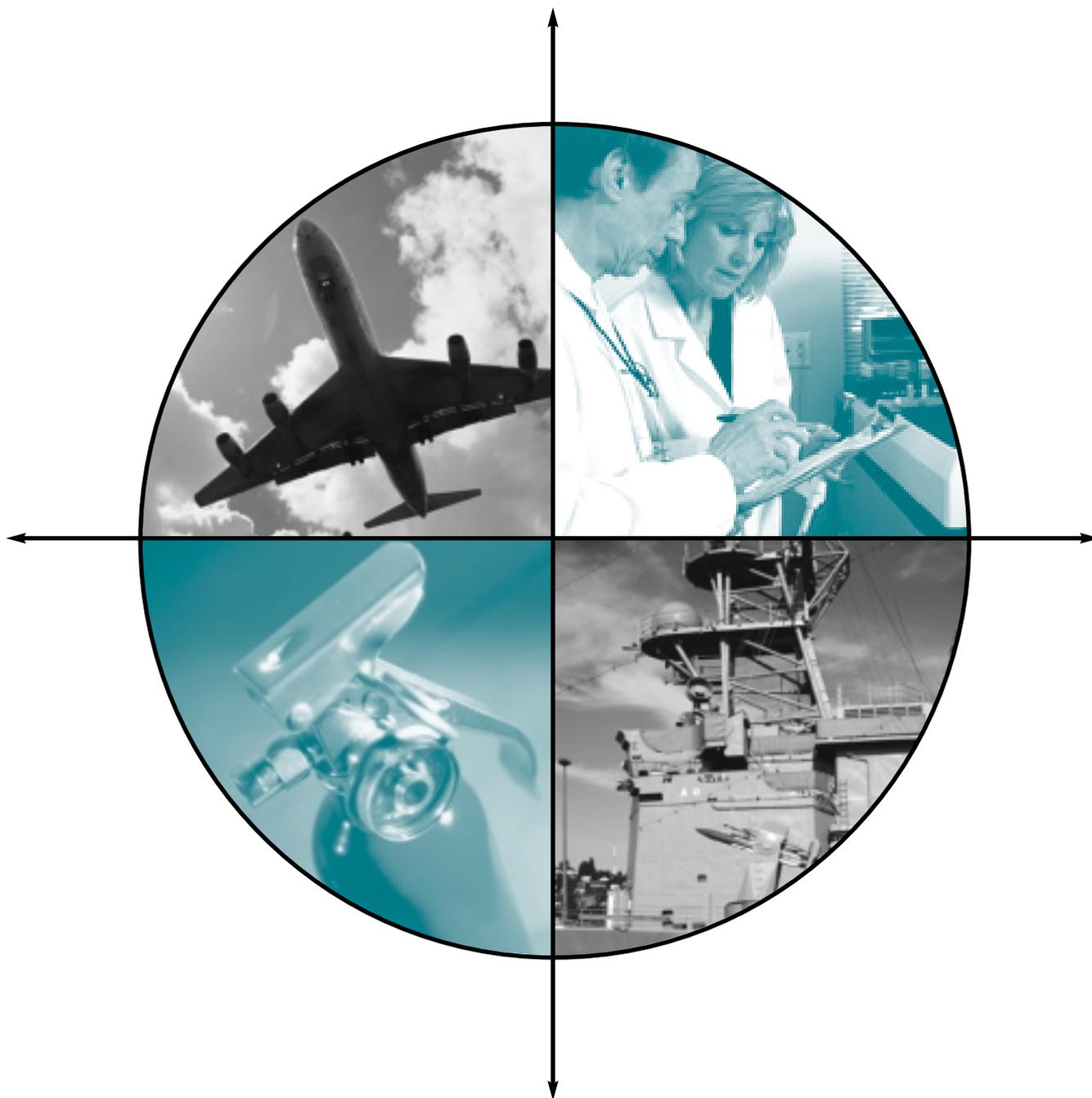




Guidance for the EPA Halon Emission Reduction Rule (40 CFR Part 82, Subpart H)



Guidance for the EPA Halon Emission Reduction Rule (40 CFR Part 82, Subpart H)

Covering compliance with technician training and proper disposal requirements

Overview of guidance

I. Introduction	1
What does this guidance cover?	
• The training and disposal provisions of EPA’s halon regulation	
Why is this guidance being offered?	
• To respond to questions raised by the regulated community	
Who should read this guidance?	
• Entities subject to the training and disposal requirements of the regulation	
• Other entities interested in the use or handling of halon	
II. Complying with the Technician Training Requirement	2
What should halon technician training cover?	
• Explanation of why training is required	
• Overview of halons and environmental concerns with halons	
• Review of relevant regulations concerning halons	
• Specific technical instruction relevant to each individual facility	
III. Proper Disposal and Recycling Guidance	6
What are the requirements for disposing of halon and halon-containing equipment?	
• Non-emergency venting of halon is prohibited	
• Halon in equipment must be recovered	
What can be done to minimize losses of halon during recycling?	
Appendix A. Definitions	9
Appendix B. Resources	10
Appendix C. Other Relevant Regulations, Codes, and Standards	13

Acknowledgements

This guidance was prepared by the Global Programs Division (GPD) of the U.S. Environmental Protection Agency with the support of GPD’s contractor, ICF Consulting, Inc. GPD gratefully acknowledges the comments of two technical experts who reviewed a draft of this guidance. In addition, GPD gratefully acknowledges the assistance of the Halon Recycling Corporation (HRC) in coordinating a stakeholder review in which members of the fire protection and halon recycling community provided comments. Comments from both the technical review and stakeholder review were incorporated as appropriate.

I. Introduction

This section describes the origin and intended audience for this guidance.

What does this guidance cover?

- **The training and disposal provisions of EPA's halon regulation**

A U.S. Environmental Protection Agency (EPA) regulation published in the *Federal Register* on March 5, 1998, (63 FR 11084) and codified in the Code of Federal Regulations (CFR) at 40 CFR Part 82, Subpart H – Halon Emissions Reduction – regulated certain practices involving halons with the purpose of minimizing their unnecessary release and maximizing their recovery and recycling. See the information under references 9 and 12 in Appendix B of this guidance on how to get a copy of the EPA regulation and an EPA summary of the regulation. This guidance addresses two of the regulation's requirements: the technician training requirement (40 CFR 82.270(c)) and the proper disposal requirement (40 CFR 82.270(d) and (e)).

EPA recognizes that technicians may perform multiple functions and may undergo training for other purposes or requirements. The aim of EPA's technician training requirement is to ensure that technicians who service halon systems are trained to minimize unnecessary releases of halons, and to maximize their recovery and recycling. The aim of this guidance is to identify elements and topics that could be covered in such training. This training may take the form of a stand-alone course, or may take the form of a unit or session of existing training requirements. This document suggests an outline for training but should not be considered the training itself. Each facility or organization, working with this guidance, should develop training suitable to its particular situation.



Why is this guidance being offered?

- **To respond to questions raised by the regulated community**

Following publication of the March 5, 1998, EPA rule, EPA received requests for clarification of the training and disposal provisions of the regulation. This document, developed with input from stakeholders, responds to these requests.

EPA intends for this document to be used solely as guidance. It does not substitute for EPA's regulations or those of any other agency, nor is it a regulation itself. Thus, it does not impose legally binding requirements, and may not apply to a particular situation based upon the circumstances. In addition, EPA may change this guidance in the future, as appropriate.

Who should read this guidance?

- **Entities subject to the training and disposal requirements of the regulation**
- **Other entities interested in the use or handling of halon**

Such entities include those that employ technicians who test, maintain, service, repair, or dispose of halon-containing equipment, but may also include owners of halon-containing equipment as well as others. For the purposes of this guidance, the definitions of *halon*, *halon-containing equipment*, *disposal of halon*, *disposal of halon-containing equipment*, and *technician* are as stated in 40 CFR 82.260. Those definitions are reproduced in Appendix A for reference.

II. Complying with the Technician Training Requirement

Section II identifies key areas that EPA recommends be covered in the halon technician training required under 40 CFR 82.270(c). EPA recommends that technician training be designed so that general and environmental issues, including topics covered in the first three subsections below, cover a time period of 1-3 hours. In addition, each facility should determine a suitable time period for covering any additional technical instruction relevant to its particular situation, such as topics covered in the fourth subsection below. EPA also recommends that facilities document that personnel have undergone this training. For example, local personnel records can be annotated, indicating where and when the training occurred. Finally, EPA recommends that facilities provide periodic refresher training at least every 2 years.

What should halon technician training cover?

- Explanation of why training is required
- Overview of halons and environmental concerns with halons
- Review of relevant regulations concerning halons
- Specific technical instruction relevant to each individual facility

The remainder of Section II discusses each of these areas. In each of the following boxes, we describe in general terms the material that can be covered in a training program. For each topic, we also identify references and resources that are available to the public. This information should help you comply with the technician training requirement of the March 5, 1998, rule by indicating appropriate topics and material you may find helpful in developing your training materials.

Explanation of why training is required

Trained technicians can better prevent halon emissions

Technicians are a key element in any effort to control unnecessary emissions of ozone-destroying chemicals. Training technicians in the significance of, and procedures for, minimizing unintentional halon releases is a vital part of EPA's effort to reduce emissions.

It is federal law

EPA's regulation published on March 5, 1998, requires that organizations that employ technicians who test, maintain, service, repair, or dispose of halon-containing equipment must ensure that these technicians are trained regarding halon emissions reduction (40 CFR 82.270(c)). Technicians should be trained regarding control of the process to ensure minimum losses of halon to the atmosphere.

Overview of halons and environmental concerns with halons

Technicians should be aware of the broad environmental and regulatory concerns that give rise to halon control. Technician training should include an overview of these concerns, including the following key points:

Halons are effective fire protection agents

Halons are very effective fire and explosion suppression agents that are electrically non-conductive and leave no residue. As such, they are extremely valuable for certain applications. The halons covered by 40 CFR Part 82, Subpart H are Halon 1211 (CF_2ClBr), Halon 1301 (CF_3Br), and Halon 2402 ($\text{C}_2\text{F}_4\text{Br}_2$). Sources of background information include references 17 and 18 in Appendix B.



Halons play an important role in stratospheric ozone (O_3) depletion

The halons covered by 40 CFR Part 82, Subpart H contain the chemical element bromine (Br) and also, in the case of Halon 1211, chlorine (Cl). Br and Cl both contribute to stratospheric ozone destruction. The earth's stratosphere is a layer of the atmosphere that begins between 5 and 11 miles above the earth's surface and extends up to about 30 miles above the earth's surface. Ninety percent of the ozone in the earth's atmosphere is found in the stratosphere. The characteristics of halon and other human-made chemicals that can deplete ozone (e.g., chlorofluorocarbons, or CFCs) enable them to reach the stratosphere, where they break down and the Cl and Br from them can destroy ozone. Halons are a major source of bromine in the stratosphere. General information on stratospheric ozone depletion can be found in references 6, 19, 32, and Web site 1 in Appendix B.

Stratospheric ozone destruction is a human health risk

Ozone in the earth's stratosphere protects the earth from the penetration of harmful ultraviolet (primarily UV-B) solar radiation by absorbing most of this harmful UV-B, allowing only a small amount to reach the earth's surface. Without the filtering action of the ozone layer, more of the Sun's UV-B radiation would penetrate the atmosphere and reach the earth's surface. Increased UV-B radiation can lead to increased incidence of certain skin cancers and cataracts, as well as other human health and environmental consequences. Further information on these subjects can be found in references 6, 7, 30, and Web site 1 in Appendix B.

There is a limited supply of halon

Due to concerns about stratospheric ozone layer destruction, many countries have, under the landmark international agreement known as the "Montreal Protocol on Substances that Deplete the Ozone Layer," ended or plan to end production of ozone-depleting substances. The Montreal Protocol was first negotiated in 1987 and now involves more than 162 countries. In the United States, halon production ended in 1994, and recycled halon and inventories produced before January 1, 1994, are now the only sources of supply. References 5 and 8 in Appendix B describe U.S. government and industry programs that were developed in response to the ban on halon production to store ("bank") and trade halon.



Halon 1301 total flooding system cylinders held in storage. Cylinders such as these are collected from decommissioned systems, and the halon is recycled and banked for critical government and industry programs. Photo courtesy of U.S. Department of Defense (DOD), Defense Logistics Agency (DLA), Ozone Depleting Substance (ODS) Reserve.

There are alternative agents for most current halon applications

EPA has, under its Significant New Alternatives Policy (SNAP) program, listed several acceptable alternative agents and technologies for halon total-flooding and streaming applications. The SNAP program goal is to ensure that industry and consumers have ample alternatives to applications for which ozone-depleting substances, including halons, are currently used; and that these alternatives reduce the overall risk to human health and the environment. References 14, 15, 18, 26 and 27, and Web site 1 in Appendix B describe halon alternatives and EPA's SNAP program.

Review of relevant regulations concerning halons

EPA's regulation published March 5, 1998 (40 CFR Part 82, Subpart H):



One example of halon-containing equipment. This is a hand-held Halon 1211 fire extinguisher containing a 20 lb charge. See Appendix A for a definition of halon-containing equipment. Photo courtesy of U.S. DOD/DLA ODS Reserve.



This "Non-Flammable Gas" label is one of the requirements when shipping halon. U.S. Department of Transportation (DOT) regulations for shipment of hazardous materials apply to halon shipments. Photo courtesy of U.S. DOD/DLA ODS Reserve.

In addition to requiring technician training, this regulation makes it unlawful to:

- Vent halons during testing, maintaining, servicing, repairing, or disposing of halon-containing equipment.
- Vent halons during the use of halon-containing equipment for technician training purposes.
- Allow halon releases from halon-containing equipment to occur as a result of failure to maintain equipment.
- Dispose of halon-containing equipment except by sending it for halon recovery to facilities operating in accordance with National Fire Protection Association (NFPA) 10 and NFPA 12A standards.
- Dispose of halon except by sending it for recycling to a recycling facility operating in accordance with NFPA 10 and NFPA 12A standards or by arranging for its destruction by an EPA-approved process.
- Manufacture halon blends, due to the inability to economically recycle and reuse such blends.

The prohibitions on venting do not apply to the emergency release of halons for the legitimate purpose of fire extinguishing, explosion inertion, or other emergency applications for which the equipment or systems were designed.

Certain limited exemptions are identified in the regulation. Please refer to the text of the regulation for more detail on specific provisions and exceptions.

Other regulations that currently cover halons in the U.S.

Technicians should be aware that other federal, state, and local regulations, and industry and professional codes may exist that might affect work on halon systems. These may include, but are not limited to, other EPA regulations, U.S. Department of Transportation (DOT) regulations, Occupational Safety and Health Administration (OSHA) regulations, codes and standards of NFPA, and other federal, state, or local fire, building, safety, and environmental codes and standards. Appendix C contains a discussion of some of these other regulations and codes.

Specific technical instruction relevant to each individual facility

Losses of halon may occur if halon-containing equipment is handled improperly. Thus, to prevent unnecessary losses of halon, technicians should receive training on equipment that they use daily. Key resources in this section of your training program might include:

Manufacturer manuals and training materials

EPA Safety Guide for Decommissioning Halon Systems

Unnecessary losses of halon can occur if halon systems are improperly decommissioned (removed from service). The EPA Safety Guide for Decommissioning Halon Systems (reference 13 in Appendix B) was prepared to assist personnel involved in decommissioning halon cylinders with the identification and safe handling procedures for the most readily available cylinders. It contains manufacturer's specifications and instructions for handling specific equipment, as well as generic instructions for safe decommissioning of halon systems. It contains diagrams of cylinder and/or valve configurations from the following halon system manufacturers: Ansul, Chemetron, Fenwal, Kidde, Fike, Ginge Kerr, Pyrotronics, and Wormald.

Demonstration equipment

Cut-away valves, cylinders, and connections can further assist technicians in their understanding of the causes of halon emission.

Coverage of key issues

- Risks associated with high pressure cylinders. Unintended losses of halon may occur when high pressure cylinders are not handled properly. In addition, *for safety reasons, experts stress that any decommissioning of high-pressure cylinders, such as those containing halon, must be performed only by properly trained personnel. Serious injury or death can occur from improper handling of high-pressure cylinders.*
- Use of manufacturer manuals for all procedures including arming/disarming, power up/down, decommissioning.
- Equipment field inspections to detect leaks and loss of agent.
- Procedures for the safe and legal transport and storage of halon cylinders (e.g., properly securing containers, protection of container fittings).
- Safeguards for injury and leak prevention during recharging operations.
- Use of appropriate equipment during recharging.



Cut-away of the valve from a halon 1301 total flooding system cylinder. Training aids such as this can be used in technician training courses to provide an understanding of how the systems work. Photo courtesy of U.S. DOD/DLA ODS Reserve.

List of documentation and resources available to technicians

Technicians should know where to find key references concerning halons and halon-containing equipment at your facility. These may include copies of NFPA, American Society for Testing and Materials (ASTM), International Organization for Standardization, EPA, DOT, and military specifications (if relevant); OSHA regulations, codes, or standards; copies of manufacturers' equipment and/or servicing manuals; and copies of materials used or referenced during training. These may also include log books for maintenance and service, contact information for repair contractors, information referenced in this guidance, and log books for halon recovery and recycling jobs.

III. Proper Disposal and Recycling Guidance

Section III reviews the halon and halon-containing equipment disposal requirements (82.270(d) and (e)) of the March 5, 1998, rule. This Section also discusses recommended practices affecting halon recycling and reclamation equipment.



Technician connecting hose to a halon storage cylinder from a halon recycling unit operated in accordance with NFPA standards. EPA regulations prohibit disposal of halon except by sending it for recycling to a recycler operating in accordance with NFPA standards – or by arranging for its destruction via approved processes. Photo courtesy of U.S. DOD/DLA ODS Reserve.

What are the requirements for disposing of halon and halon-containing equipment?

- Non-emergency venting of halon is prohibited

See discussion under “Review of relevant regulations concerning halons,” page 4.

- Halon in equipment must be recovered

The EPA regulation published on March 5, 1998, requires that when you dispose¹ of any equipment containing halon, you must arrange for recovery of the halon by sending the equipment to a facility that operates in accordance with NFPA standards 10 and 12A (references 23 and 24 in Appendix B, and Appendix C) (82.270(d)).

The EPA regulation further requires that halon itself can only be disposed of by:

- Sending the halon for recycling to a facility operating in accordance with the NFPA standards mentioned above, or
- Arranging for its destruction by a destruction process that meets relevant regulations (82.270(e)).

There are six processes that have been identified as suitable for destruction by the Parties to the Montreal Protocol. These are (1) liquid injection incineration, (2) reactor cracking, (3) gaseous/fume oxidation, (4) rotary kiln incineration, (5) cement kiln, and (6) radiofrequency plasma destruction. In addition, destruction technologies that achieve destruction efficiencies of 98 percent or greater may be approved by EPA.

In the United States, very few destruction facilities for ozone-depleting substances (ODSs) such as halons currently exist. This is due in part to technical difficulties in destroying halons and other ODSs, and the costs of doing so. EPA continues to monitor technological developments in the

¹ The definition of “disposal” as originally provided in 40 CFR Part 82, Subpart H, is reproduced in Appendix A.

United States and other countries for the destruction of ozone-depleting substances.

What can be done to minimize losses of halons during recycling?

EPA does not impose specific performance requirements for equipment used to recycle halon (see references 10 and 11 in Appendix B). Our research shows that all such commercially available equipment already meets certain targets for recovery and overall process efficiency, and is capable of restoring halon to high industry standards for chemical purity. For the purposes of the discussion in this subsection, “What can be done to minimize losses of halons during recycling?” the definition of the terms in the box may be useful.

To ensure that halon recycling continues to occur with minimal losses of halon to the atmosphere, you should:

- Operate and maintain recovery and recycling equipment in strict accordance with manufacturer specifications to ensure that it performs as specified
- Ensure that cross-contamination does not occur through the mixing of halons and/or refrigerants that may be contained in similar cylinders.

When a given halon is recycled, it is essential that the recovery and recycling equipment be purged of other halons and/or refrigerants that may have been previously recycled using the same equipment. It is expensive to purify a halon that has been contaminated with other halons or CFCs, and such contaminated mixtures typically have to be destroyed. The principal objective of recycling equipment is to remove contaminants of residue, suspended matter, water, oils, etc., and to return the halon to one of the purity standards listed in the box on page 8. Either at time of resale, or on a periodic basis, a sample of recycled halon should be tested by gas chromatography to ensure that the purity standard is being maintained.

Recovery, recycling

The terms “recovery” and “recycling” in the context of halons have been defined in several ways. For the purposes of the discussion in this subsection, “What can be done to minimize losses of halons during recycling?” these terms can be understood as follows. The term “controlled substance” below includes halons.

Recovery

The collection and storage of controlled substances from machinery, equipment, containment vessels, etc., during servicing or prior to disposal.

Recycling

The application of a basic cleaning process such as filtering or drying to a controlled substance. For the purposes of the discussion following this box, “recycling” also includes what has also been termed “reclamation,” defined as the reprocessing and upgrading of a recovered controlled substance through such mechanisms as filtering, drying, distillation and chemical treatment, in order to restore the substance to a specified standard of performance.



Technician taking a sample of Halon 1301. Recycled halon should be tested by an independent laboratory to ensure product conformance to specifications. Photo courtesy of U.S. DOD/DLA ODS Reserve.

	Halon 1211	Halon 1301
Chemical purity standards	ISO 7201 ULC/ORD-C1058.5-1993 Mil-B-38741 UL 2006	ISO 7201 ULC/ORD-C1058.5-1993 ASTM D5632-95 NFPA 12A UL 2083
Guidance on test conditions	UL 2006 (§41) ULC/ORD-C1058.5-1993	UL 2083 (§42) ULC/ORD-C1058.5-1993
Sampling/laboratory methods	UL 2006 (§41) ULC/ORD-C1058.5-1993	UL 2083 (§42) ULC/ORD-C1058.5-1993 ASTM D5632-95
* These standards may be periodically revised.		

Acronyms and abbreviations:

ISO: International Organization for Standardization
 ASTM: American Society for Testing and Materials
 NFPA: National Fire Protection Association

UL: Underwriters' Laboratories
 ULC: Underwriters' Laboratories of Canada
 "Mil" signifies a U.S. military specification

For further information:

Appendix B – Resources – provides a list of references, information on how to obtain many of the references, and a list of Web sites for several organizations mentioned in this guidance, including EPA's Stratospheric Ozone Web site. For further copies of this guidance, as well as for answers to questions on EPA's stratospheric ozone protection programs and regulations, please contact:

**U.S. Environmental Protection Agency
 Stratospheric Protection Hotline
 800 296-1996**

Appendix A. Definitions

Reproduced from 40 CFR 82.260:

Halon means any of the Class I, Group II substances listed in subpart A, Appendix A of 40 CFR Part 82. This group consists of the three halogenated hydrocarbons known as Halon 1211, Halon 1301, and Halon 2402, and all isomers of these chemicals.

Halon-containing equipment means equipment used to store, transfer, and/or disperse halon.

Disposal of halon means the process leading to and including discarding of halon from halon-containing equipment.

Disposal of halon-containing equipment means the process leading to and including: (1) The discharge, deposit, dumping, or placing of any discarded halon-containing equipment into or on any land or water; (2) the disassembly of any halon-containing equipment for discharge, deposit, or dumping or placing of its discarded component parts into or on any land or water; or (3) the disassembly of any halon-containing equipment for reuse of its component parts.

Technician means any person who performs testing, maintenance, service, or repair that could reasonably be expected to release halons from equipment into the atmosphere. Technician also means any person who performs disposal of equipment that could reasonably be expected to release halons from the equipment into the atmosphere. Technician includes but is not limited to installers, contractor employees, in-house service personnel, and in some cases, owners.

Appendix B. Resources

References

- [1] ASTM, 1994. Standard Practice for Handling Transportation and Storage of Halon 1301 Bromotrifluoromethane (CF₃BR). ASTM standard designation D5631-94.
- [2] Andersen, S.O., Metchis, K.L., and Rubenstein, R., 1995. "The History of the Halon Phaseout and Regulation of Halon Alternatives," Chapter 2 IN: Halon Replacements: Technology and Science, American Chemical Society (ACS) Symposium Series 611, ACS, Washington, DC.
- [3] Cook, E. (Editor), 1996. Ozone protection in the United States - Elements of Success. World Resources Institute, Washington, D.C.
- [4] Environment Canada, 1996. Code of Practice on Halons. Code of Practice Environmental Protection Series (EPS) 1/RA/3E, July 1996.
- [5] EPA, 1993. Halon: Recycling and Banking to Help Protect the Ozone Layer. EPA 430-F-92-034. February, 1993. Brochure sponsored by EPA in cooperation with the Halon Alternatives Research Corporation (HARC). Brief background on halons' role in stratospheric ozone depletion and the relation of stratospheric ozone and human health, as well as EPA's regulatory response. Describes cessation of halon production and the need for halon recycling; the role of the Halon Recycling Corporation, and the role of fire equipment distributors. Available by calling the EPA Stratospheric Protection Hotline at 800 296-1996.
- [6] EPA, 1995. Ozone Depletion. U.S. EPA 430-F-95-001. April, 1995. Fact sheet produced by the U.S. EPA and available by calling the EPA Stratospheric Protection Hotline at 800 296-1996.
- [7] EPA, 1995. UV Radiation. U.S. EPA 430-F-95-006. April 1995. Fact sheet produced by the U.S. EPA and available by calling the EPA Stratospheric Protection Hotline at 800 296-1996.
- [8] EPA, 1995. CFC and Halon Banking: Government Programs to Protect the Ozone Layer. EPA 430-F-95-112. September, 1995. Brochure prepared by the EPA Stratospheric Protection Division and U.S. DOD/Defense Logistics Agency Defense General Supply Center. Brief background on halon's role in stratospheric ozone depletion and the relation of stratospheric ozone and human health. Describes the inception and functioning of the U.S. Department of Defense (DOD) ozone-depleting substance (ODS) reserve. Available by calling the EPA Stratospheric Protection Hotline at 800 296-1996.
- [9] EPA, 1998. Final rule published at 63 Federal Register (FR) 11084. Protection of Stratospheric Ozone: Manufacture of Halon Blends, Intentional Release of Halon, Technician Training and Disposal of Halon and Halon-Containing Equipment. Available on the EPA Stratospheric Ozone Web site (www.epa.gov/ozone) and from the EPA Stratospheric Protection Hotline at 800 296-1996.
- [10] EPA, 1998. Direct final determination published at 63 FR 42728. Protection of Stratospheric Ozone: Halon Recycling and Recovery Equipment Certification. Available on the EPA Stratospheric Ozone Web site (www.epa.gov/ozone) and from the EPA Stratospheric Protection Hotline at 800 296-1996.
- [11] EPA, 1998. Summary of Determination: Halon Recovery/Recycling Equipment Certification. August, 1998. Summary of EPA Direct final determination published at 63 FR 42728 (Protection of Stratospheric Ozone: Halon Recycling and Recovery Equipment Certification). Available on the EPA Stratospheric Ozone Web site (www.epa.gov/ozone) and from the EPA Stratospheric Protection Hotline at 800 296-1996.
- [12] EPA, 1998. Final Rule Summary: Halons/Halon Blends. March, 1998. Summary of the EPA final rule published at 63 FR 11084 (Protection of Stratospheric Ozone: Manufacture of Halon Blends, Intentional Release of Halon, Technician Training and Disposal of Halon and Halon-Containing Equipment). Available on the EPA Stratospheric Ozone Web site (www.epa.gov/ozone) and from the EPA Stratospheric Protection Hotline at 800 296-1996.

- [13] EPA, 1999. Safety Guide for Decommissioning Halon Systems. Volume 2 of the U.S. Environmental Protection Agency Outreach Report, "Moving Towards a World Without Halon." Available on the Internet at www.harc.org.
- [14] EPA, 1999 (periodically updated). Halon Substitutes Under SNAP as of June 8, 1999. This fact sheet is periodically updated to reflect current listings of halon substitutes as reviewed by EPA's Significant New Alternatives Policy (SNAP) Program. This fact sheet is available on EPA's Stratospheric Ozone Web site at www.epa.gov/ozone and is also available from the EPA Stratospheric Protection Hotline at 800 296-1996.
- [15] EPA, 1999 (periodically updated). Questions and Answers on Halons and their Substitutes. Revision 14. Fact sheet providing an overview of regulations governing the production and use of halon and the development of substitute agents for fire suppression and explosion protection. This fact sheet is periodically updated and available on EPA's Stratospheric Ozone Web site at www.epa.gov/ozone and is also available from the EPA Stratospheric Protection Hotline at 800 296-1996.
- [16] Friends of the Earth (FOE), 1999. Ozone - Re-ignite The Effort: Halon Recovery to Protect the Earth's Ozone Layer. Brochure produced by Friends of the Earth and available at www.foe.org.
- [17] Gann, R.G. (editor), 1975. Halogenated Fire Suppressants. American Chemical Society (ACS) Symposium Series, Gould, R.F. (series editor), ACS, Washington, DC. 453 pp.
- [18] Grant, C.C., 1994. Halon and beyond: Developing new alternatives. National Fire Protection Association (NFPA) Journal, November/December 1994: 41-54.
- [19] Halon Alternatives Research Corporation (HARC). The ozone layer and halons. Brochure prepared by HARC and available by contacting HARC at www.harc.org.
- [20] Halon Recycling Corporation (HRC) Code of Practice for Halon Reclaiming Companies. Halon Recycling Corporation, Arlington, VA.
- [21] Halon Technical Options Committee (HTOC), 1997. Halon emission reduction strategies. HTOC Technical Note #2. The most current versions of the HTOC Technical Notes are available on the Internet at www.teap.org. This is a technical document that describes general practices for minimizing unnecessary emissions of halons to the atmosphere.
- [22] Mitchell, M.D., 1991. Feasibility of Systematic Recycling of Aircraft Halon Extinguishing Agents. U.S. Department of Transportation (DOT) Federal Aviation Administration (FAA) report DOT/FAA/CT-91/21. FAA Technical Center, Atlantic City International Airport. Final Report. Available from the National Technical Information Service (NTIS), Springfield, VA.
- [23] NFPA 10. Standard for Portable Fire Extinguishers. 1998 Edition. National Fire Protection Association, Quincy, MA.
- [24] NFPA 12A. Standard on Halon 1301 Fire Extinguishing Systems. 1997 Edition. National Fire Protection Association, Quincy, MA.
- [25] NFPA 2001. Standard for Clean Agent Fire Extinguishing Systems. 2000 Edition. National Fire Protection Association, Quincy, MA.
- [26] Scott, D., 1997. Halon – the hunt for alternatives. National Fire Protection Association (NFPA) Journal, July/August, 1997: 62-65.
- [27] Seaton, M., 1995. Halon: Searching for solutions. NFPA Journal, November/December, 1995: 47- 53.
- [28] Underwriters' Laboratories of Canada (ULC), Inc., 1993. The servicing of halon extinguishing systems. ULC/ORD-C1058.18-1993.
- [29] United Nations Environment Programme (UNEP), 1994. Montreal Protocol on Substances that Deplete the Ozone Layer - Report of the Halon Fire Extinguishing Agents Technical Options Committee. December, 1994. UNEP Ozone Secretariat. Nairobi, Kenya.

- [30] UNEP, 1998. Environmental Effects of Ozone Depletion: 1998 Assessment. Copies of this report are available from the U.S. Global Change Research Information Office, CIESIN, Columbia University, P.O. Box 1000, 61 Route 9W, Palisades, NY 10964 (USA), Phone: (914) 365-8930, Fax: (914) 365-8922, e-mail: help@gcrio.org
- [31] UNEP, 1998. Montreal Protocol on Substances that Deplete the Ozone Layer - Technology and Economic Assessment Panel, April, 1998 Report. UNEP Ozone Secretariat. Nairobi, Kenya.
- [32] World Meteorological Organization (WMO), 1998. Scientific Assessment of Ozone Depletion: 1998. WMO Global Ozone Research and Monitoring Project – Report No. 44.

Additional Web sites:

- [1] www.epa.gov/ozone

The U.S. Environmental Protection Agency Web site provides listings of U.S. EPA regulations pertinent to ozone-layer protection, including all those dealing with halons, and accompanying summaries and fact sheets. This site also provides extensive background scientific information on ozone depletion and ozone-layer protection, and provides many links to additional scientific and environmental sites. The Web page www.epa.gov/ozone/title6/snap/hal.html provides a series of questions and answers on EPA regulations governing the production and use of halons and the development of substitute agents for fire suppression and explosion protection. The Web page www.epa.gov/ozone/title6/snap/lists/halo.pdf provides a list of halon substitutes.

- [2] www.nfpa.org

Web site of the National Fire Protection Association, 617 770-3000

- [3] www.nafed.org

Web site of the National Association of Fire Equipment Dealers, 312 923-8500

- [4] www.harc.org

Web site of the Halon Alternatives Research Corporation, 703 524-6636

- [5] www.unep.ch/ozone

Comprehensive documentation and reports surrounding the Montreal Protocol and its implementation.

- [6] www.teap.org/html/halons.html

Home page of the Halons Technical Options Committee of the United Nations Environment Programme, Montreal Protocol Technology and Economic Assessment Panel.

Other contact information:

Halon Recycling Corporation, 800 258-1283.

Appendix C. Other relevant regulations, codes, and standards

This appendix briefly discusses several other agencies' and organizations' regulations, codes and standards. This appendix is not meant to be an exhaustive list, but rather a brief reference to some other regulations, codes, and standards of potential importance to technicians who handle halons and halon-containing equipment.

U.S. Environmental Protection Agency

Title VI of the Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to develop and implement regulations and programs to protect the stratospheric ozone layer. Major elements of EPA's program include regulations to end production and import of ozone-depleting substances (ODSs), including halons, and a set of requirements banning intentional venting of ODSs, minimizing their unnecessary emissions, and maximizing their recycling. EPA has also prescribed certain service practices in certain key sectors (e.g., refrigeration, motor-vehicle air conditioning). The ban on production and import of halon became effective in 1994, making recycled halon and inventories produced before January 1, 1994, the only sources of supply (40 CFR Part 82, Subpart A). Specific requirements designed to minimize halon emissions and maximize their recycling became effective on April 6, 1998 (40 CFR Part 82, Subpart H). This guidance document focuses on the halon technician training requirement and on the proper disposal requirements of 40 CFR Part 82, Subpart H. As noted earlier in this guidance, 40 CFR Part 82, Subpart H also includes other provisions. See the guidance section, "Review of relevant regulations concerning halons," page 4. EPA has also mandated that all containers of and products that contain or are manufactured with Class I ozone-depleting substances be labeled to this effect. This labeling requirement (40 CFR Part 82, Subpart E) also applies to halon products and containers. Finally, under section 612 of the Clean Air Act, EPA established the Significant New Alternatives Policy (SNAP) program (40 CFR Part 82, Subpart G). SNAP's mandate is to identify alternatives to ozone-depleting substances, including halons, and to publish lists of acceptable and unacceptable substitutes. The SNAP lists are periodically updated and are available for online reading or for downloading (see Web site 1 and references 14 and 15 in Appendix B). The following summarizes key EPA regulations relating to halon and halon substitutes:



- 40 CFR Part 82, Subpart A – Production and Consumption Controls.

- 40 CFR Part 82, Subpart E – The Labeling of Products Using Ozone-Depleting Substances.
- 40 CFR Part 82, Subpart G – Significant New Alternatives Policy Program.
- 40 CFR Part 82, Subpart H – Halon Emissions Reduction.

In addition, Halon 1301 is listed under EPA's Emergency Planning and Community Right-to-Know Act (EPCRA) Section 313, the Toxic Chemical Release Reporting program, commonly called the Toxics Release Inventory or TRI. For more information on any of EPA's environmental release reporting requirements, including more information on the TRI program under EPCRA Section 313, call the EPA RCRA, Superfund, and EPCRA Hotline at 800 424-9346.



U.S. Department of Transportation

The U.S. Department of Transportation (DOT) regulations relate to the transportation of hazardous materials. Under 49 CFR Part 172, bromotrifluoromethane (known as both R 13B1 and Halon 1301) is classified as a hazardous material because it is a compressed gas and is therefore subject to the requirements of DOT hazardous materials regulations and procedures. Halon 1301 and Halon 1211 are classified as Division 2.2 hazardous material. Division 2.2 refers to a non-flammable, nonpoisonous compressed gas.

Under Part 172, Special Provision 18 of Section 172.102 contains additional requirements when using the shipping description “fire extinguishers” for transportation. Section 172.700 specifies requirements for hazardous materials training and function-specific training as related to handling and transportation of hazardous materials, and requalification of hazardous materials packaging.

Two other Parts of 49 CFR are of central importance:

- 49 CFR Part 173, DOT Specifications, Shippers – General Requirements for Shipping and Packagings.
- 49 CFR Part 178, DOT Specifications, Specifications for Packagings.

Part 173.34 specifies requirements for the qualification, maintenance, and use of cylinders used to transport hazardous materials. Sections 173.309a and 173.309b specify requirements for nonspecification and specification cylinders as related to fire extinguishers. Part 178 prescribes the manufacturing specifications for DOT specification packaging and containers used for the transportation of hazardous materials in commerce.



A truck being loaded with a Halon 1301 system cylinder. The U.S. Department of Transportation (DOT) regulates transportation of compressed gases, including halons. Photo courtesy of U.S. DOD/DLA ODS Reserve.

The full text of these regulations is available at <http://www.text-trieve.com/dotrspa>.

Two other organizations under DOT – the Federal Aviation Administration and the U.S. Coast Guard – have issued regulations or guidance pertinent to the use and handling of halons. Please see the other sections of this appendix addressing halon-related requirements for these organizations.

Federal Aviation Administration

The most effective and commonly used fire protection systems currently used on aircraft are halon systems. The Federal Aviation Administration (FAA) has issued regulations to establish fire detection and suppression standards with the purpose of providing protection from possible in-flight fires. Several relevant sections of FAA regulations are listed below. These regulations establish aircraft requirements for fire fighting and extinguishing agents. FAA inspectors also generally require that NFPA and DOT guidance relevant to these systems is followed. In addition, FAA Order 1015.18 (CFC and Halon Use at FAA Facilities) is used by FAA employees and contractors when servicing FAA facilities. It should be noted that FAA is engaged in both developing minimum performance standards for alternative agents and systems for aircraft fire protection, as well as evaluating specific alternative agents for certification.

- 14 CFR Part 23 – Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category.
- 14 CFR Part 25 – Airworthiness Standards: Transport Category Airplanes.
- 14 CFR Part 27 – Airworthiness Standards: Normal Category Rotorcraft.
- 14 CFR Part 29 – Airworthiness Standards: Transport Category Rotorcraft.
- 14 CFR Part 121 – Operating Requirements: Domestic, Flag and Supplemental Operations.
- 14 CFR Part 135 – Operating Requirements: Commuter and On-Demand Operations.



U.S. Coast Guard

The U.S. Coast Guard (USCG) originally published inspecting and testing requirements of ship-board fixed halon fire extinguishing system cylinders under 46 CFR. In 1995, the USCG published a Navigation and Vessel Inspection Circular (NVIC 3-95) that provided alternative testing requirements for fixed halon fire extinguishing system steel storage cylinders. Technicians responsible for halon cylinders that may be covered under this USCG Circular and the regulations cited therein should be familiar with these materials.

Occupational Safety and Health Administration

Three areas of Occupational Safety and Health Administration (OSHA) regulations pertain to the use of halons or halon-containing equipment. Entities that use halons or halon-containing equipment may wish to be familiar with the following areas of concern. These areas are (1) safety concerns related to use of and work with compressed gases, (2) workplace fire protection standards, and (3) toxicity concerns related to exposure to hazardous gases. All relevant OSHA regulations can be found in 29 CFR part 1910. Because halons are often contained, transported, or stored in pressurized cylinders, Subpart H may be of interest. Furthermore, because halons are used in workplaces as fire protection agents, Subpart L may be of interest.

- 29 CFR Part 1910, Subpart H – Hazardous Materials. This subpart concerns hazardous materials, with Section 101 addressing compressed gases.
- 29 CFR Part 1910, Subpart L – Fire Protection . This subpart concerns workplace fire protection standards. In particular, Sections 157, 160, and 162 address portable extinguishers and gaseous agents (including Halon 1301 and 1211) for fixed extinguishing systems, respectively.
- 29 CFR Part 1910, Subpart Z – Toxic and Hazardous Substances. This subpart concerns permissible exposure limits (PELs) in Section 1000 and hazard communication standards in section 1200.

National Fire Protection Association standards

The National Fire Protection Association (NFPA) is an international, nonprofit, membership fire protection organization with a role as a leading worldwide authority on the topics of fire safety and protection. NFPA fire codes and standards are used throughout the world, with some local or federal authorities adopting by reference NFPA codes or standards. Two NFPA standards of key importance for technicians working with halons or halon-containing equipment are:

- NFPA 12A. Standard on Halon 1301 Fire Extinguishing Systems. 1997 Edition. This standard contains minimum requirements for total flooding Halon 1301 fire extinguishing systems and is prepared for the use and guidance of those charged with purchasing, designing, installing, testing, inspecting, approving, listing, operating, maintaining, decommissioning, and removing Halon 1301 systems. This standard states, among many other things, that the charging or recharging of cylinders or the removal or transfer of agent should be done using a closed loop system, which permits transfer of halon between supply cylinders, system cylinders, and recovery cylinders, with only minor loss of halon to the atmosphere.
- NFPA 10. Standard for Portable Fire Extinguishers. 1998 Edition. This standard applies to the selection, installation, inspection, maintenance, and testing of portable extinguishing equipment (including halon type portable extinguishers). NFPA 10 states, among other things, that the removal of Halon 1211 from fire extinguishers shall be done only using a listed halon closed recovery system. The removal of agents from other halogenated agent fire extinguishers shall be done using only a closed recovery system. A closed recovery system is defined as a system that provides for the transfer of halogenated agents between fire extinguishers, supply containers, and recharge and recovery containers so that none of the halogenated agent escapes to the atmosphere.

Furthermore, NFPA 10 requires periodic hydrostatic testing of portable fire extinguishers, including halon extinguishers. Hydrostatic testing is pressure testing of an extinguisher to verify its strength against unwanted rupture. The standard also requires that halon extinguishers be torn down every 6 years and the condition of the internal cylinder walls be examined for corrosion. It should be noted that these procedures require that all extinguishing agents be removed from the extinguisher. To accomplish the removal of halon from the extinguisher, the standard requires the use of a closed recovery system. The standard requires that these maintenance activities be performed by trained persons. It should be noted that opportunities for halon losses might arise during these procedures. Under EPA regulations, such losses must be minimized

In addition, a third NFPA standard addresses minimum requirements for total flooding, clean agent fire extinguishing systems. This standard was established to address the need for how to

design, install, maintain, and operate systems using the new total flooding clean agents that were being developed to replace Halon 1301.

- NFPA 2001. Standard on Clean Agent Fire Extinguishing Systems. 2000 Edition.

Halon Recycling Corporation

The Halon Recycling Corporation (HRC) is a nonprofit information clearinghouse established to assist sellers wishing to dispose of halon in a responsible manner, and to help buyers with “critical uses” of halon locate supplies of Halon 1301 and Halon 1211 for recharging their existing systems. HRC has developed a “Code of Practice for Halon Reclaiming Companies.” This Code of Practice identifies a set of voluntary measures to assure safe and environmentally responsible halon reclamation that sellers of halon enrolled in HRC have agreed to observe. The Code of Practice covers reclaiming operations, safety, equipment, and customer service issues.



Other federal, state, or local fire, building, industry, or safety codes and standards

Technicians should also be aware of other local, state, federal, or professional codes, regulations, and standards that might impact their work on halon systems.



United States
Environmental Protection Agency
(6205-J)
Washington, DC 20460

Official Business
Penalty for Private Use \$300