HARVARD
CAMPUS SERVICES

Environmental Health & Safety

Refrigerant Management Program

Introduction

Harvard maintains refrigerant containing equipment on each campus. This fact sheet summarizes general regulatory requirements for refrigerant installation, operation and disposal as well as compliance management practices for facility personnel and outside contractors that may maintain Harvard owned equipment.

Applicable Regulations

40 CFR 82 Subpart F: *Protection of Stratospheric Ozone*

Applicability

Equipment containing any amount and type of refrigerant is regulated with very specific exemptions.

The most common refrigerant containing equipment at Harvard includes chillers, rooftop unit air conditioners, food service refrigeration equipment and heat pumps.

The most common refrigerants in use at Harvard include: R-11, R-12, R-22, R-123, R-134A, R-404A, R-410A.

Summary of Requirements

1. **Prohibition on Venting:** Individuals are prohibited from knowingly venting refrigerant into the atmosphere while maintaining, servicing, repairing, or disposing of equipment.

2. **Evacuation Requirements:** Certified technicians must evacuate the refrigerant from equipment of any size when opening the equipment for maintenance or disposal.

3. **Leak Repair Requirements**
   - Building managers must maintain records indicating quantity of refrigerant added during servicing and maintenance and calculate the leak rate every time refrigerant is added to an appliance having refrigerant capacity greater than 50 pounds.
   - Leaks must be repaired when the appliance leaks at a rate exceeding the applicable trigger rate for a 12-month period.
   - The leak repair regulations do not apply to equipment with refrigerant charge sizes less than 50 pounds. However, smaller equipment is not exempt from the refrigerant venting prohibition as described above.

Trigger Rates

Appliance Type	Leak Rate
Commercial Refrigeration (equipment found in supermarkets, convenience stores, restaurants and other food service establishments.)	20%
Comfort Cooling (chillers, commercial split systems and packaged roof top units	10%
All other appliances (ice makers, etc.)	10%

Building managers that operate equipment that is leaking refrigerant above the applicable trigger rate must either:

- Repair leaks within 30 days from the date the leak was discovered, or
- Develop, within 30 days, a plan to retrofit or retire the appliance and complete the actions under that plan within one year. A copy of the plan must be kept on site, and the original plan must be made available to EPA upon request.
- An initial and follow-up verification test of leak repairs, for appliances that exceed the applicable leak rate is required:

  - An initial verification test must be performed before any additional refrigerant is added to the appliance to demonstrate that the leak is repaired.
  - A follow-up verification test must be performed only after the appliance has returned to normal operating characteristics and conditions. There is no minimum timeframe.

4. Leak Reporting

Releases of some refrigerants must be reported to MassDEP immediately if the release is over a certain threshold. These include R-11, R-12, R-140A, R-142, R-151 and Methyl Bromide. Contact EH&S immediately in the event of a release for further guidance.

5. Technician Certification

- Service or disposal of appliances containing any amount of refrigerant (other than vehicle a/c) can only be done by EPA certified technicians.
- All Harvard technicians or contractors who perform maintenance, service, repair, or disposal must pass an EPA-approved test to earn Section 608 Certification and provide proof of certification prior to service or repair work.

6. Purchasing Refrigerants

- Technicians who have earned the Section 608 Technician Certification.
- Employers of a Section 608 certified technician (or the employer's authorized representative) if the employer provides the refrigerant wholesaler with written evidence that he or she employs at least one properly certified technician.

7. Disposal Requirements

- All major refrigerant containing equipment must have their refrigerant recovered prior to on site dismantling.
- Small units that can enter waste stream intact, such as freezers, window air conditioners shall have their refrigerant recovered prior to waste pick up.

8. Recordkeeping Requirements

- Technicians must keep a copy of their proof of certification on site at Harvard.
- Contractors must provide the owner with an invoice that indicates the amount of refrigerant added to the appliance

- For appliances that contain 50 or more pounds of refrigerant, building managers must keep servicing records documenting the date and type of service, as well as the quantity of refrigerant added and disposal logs
- Disposal of appliances containing between 5 and 50 pounds of refrigerant must keep records of the disposal.
- Building managers must maintain records of leak inspections and tests performed to verify repairs of leaking appliances.
- Starting January 1, 2019, a report must be submitted to EPA for any appliance containing 50 or more pounds of refrigerant that leaks 125 percent or more of the full charge in a calendar year. This report must describe efforts to identify leaks and repair the appliance.
- All records must be maintained onsite for five years.

Responsibilities

9. Building Managers

- Maintain refrigerant-containing equipment inventory in Hara. Any change, addition, or removal to the inventory shall be communicated to EH&S for updating in Hara;
- Ensure that all technicians who perform maintenance on refrigerant-containing equipment are certified by EPA;
- Maintain servicing records for appliances containing 50 or more pounds of refrigerants for five years. These records shall document date and type of service, the quantity of refrigerant added and the leak rate any time refrigerant was added to the system.

10. Environmental Health & Safety (EH&S)

- Maintain refrigerant-containing equipment inventory in Hara and review yearly as part of the Annual Compliance Certification;
- Maintain an inventory of EPA certified recovery equipment;
- Maintain a list of EPA certified refrigerant service technicians;
- Provide technical assistant to facility managers in reviewing contractors/vendors servicing refrigerant-containing equipment;
- Provide training to facility managers as needed.

Refrigerant Management Program

Reportable Concentrations (Massachusetts Only)

Chemical Name	Common Name	Reportable Quantity
DICHLORODIFLUOROMETHANE	CFC-12 or R-12	100 LBS
TRICHLOROFLUOROMETHANE	CFC-11 or R-11	100 LBS
1-CHLORO-1,1-DIFLUOROETHANE	HCFC-142 or R-142	10 LBS
CHLOROFLUOROETHANE	HCFC-151 or R-151	10 LBS
METHYL CHLOROFORM	R-140a	50 LBS
BROMOMETHANE	Methyl Bromide	50 LBS

Regulated Refrigerants

Appendix A to Subpart A of Part 82—Class I Controlled Substances

A. Group I:
$CFCl_3$-Trichlorofluoromethane (CFC-ll)
CF_2 Cl_2-Dichlorofifluoromethane (CFC-12)
C_2 F_3 Cl_3-Trichlorotrifluoroethane (CFC-113)
C_2 F_4 Cl_2-Dichlorotetrafluoroethane (CFC-114)
C_2 F_5 Cl-Monochloropentafluoroethane (CFC-115)
All isomers of the above chemicals
B. Group II:
CF_2 ClBr-Bromochlorodifluoromethane (Halon-1211)
CF_3 Br-Bromotrifluoromethane (Halon-1301)
C_2 F_4 Br_2-Dibromotetrafluoroethane (Halon-2402)
All isomers of the above chemicals
C. Group III:
CF_3 Cl-Chlorotrifluoromethane (CFC-13)
C_2 FCl_5-(CFC-111)
C_2 F_2 Cl_4-(CFC-112)
C_3 FCl_7-(CFC-211)
C_3 F_2 Cl_6-(CFC-212)
C_3 F_3 Cl_5-(CFC-213)

C_3 F_4 Cl_4-(CFC-214)
C_3 F_5 Cl_3-(CFC-215)
C_3 F_6 Cl_2-(CFC-216)
C_3 F_7 Cl-(CFC-217)
All isomers of the above chemicals
D. Group IV: CCl_4-Carbon Tetrachloride
E. Group V:
C_2 H_3 Cl_3-1,1,1 Trichloroethane (Methyl chloroform)
All isomers of the above chemical except 1,1,2-trichloroethane
F. Group VI: CH_3 Br—Bromomethane (Methyl Bromide)
G. Group VII:
$CHFBR_2$
CHF_2 Br (HBFC-2201)
CH_2 FBr
C_2 $HFBr_4$
C_2 HF_2 Br_3
C_2 HF_3 Br_2
C_2 HF_4 Br
C_2 H_2 FBr_3
C_2 H_2 F_2 Br_2
C_2 H_2 F_3 Br
C_2 H_2 FBr_2
C_2 H_3 F_2 Br
C_2 H_4 FBr
C_3 $HFBr_6$
C_3 HF_2 Br_5
C_3 HF_3 Br_4
C_3 HF_4 Br_3
C_3 HF_5 Br_2
C_3 HF_6 Br
C_3 H_2 FBR_5
C_3 H_2 F_2 BR_4
C_3 H_2 F_3 Br_3

$C_3 H_2 F_4 Br_2$
$C_3 H_2 F_5 BR$
$C_3 H_3 FBR_4$
$C_3 H_3 F_2 Br_3$
$C_3 H_3 F_3 Br_2$
$C_3 H_3 F_4 Br$
$C_3 H_4 FBr_3$
$C_3 H_4 F_2 Br_2$
$C_3 H_4 F_3 Br$
$C_3 H_5 FBr_2$
$C_3 H_5 F_2 Br$
$C_3 H_6 FB$
H. Group VIII:
CH2BrCl (Chlorobromomethane 0.12

Appendix B to Subpart A of Part 82—Class II Controlled Substances[ab]

Controlled substance
1. HCFC-21 (CHFCl2) Dichlorofluoromethane
2. HCFC-22 (CHF2Cl) Monochlorodifluoromethane
3. HCFC-31 (CH2FCl) Monochlorofluoromethane
4. HCFC-121 (C2HFCl4) Tetrachlorofluoroethane
5. HCFC-122 (C2HF2Cl3) Trichlorodifluoroethane
6. HCFC-123 (C2HF3Cl2) Dichlorotrifluoroethane
7. HCFC-124 (C2HF4Cl) Monochlorotetrafluoroethane
8. HCFC-131 (C2H2FCl3) Trichlorofluoroethane
9. HCFC-132 (C2H2F2Cl2) Dichlorodifluoroethane
10. HCFC-133 (C2H2F3Cl) Monochlorotrifluoroethane
11. HCFC-141 (C2H3FCl2) Dichlorofluoroethane
12. HCFC-141b (CH3CFCl2) Dichlorofluoroethane
13. HCFC-142 (C2H3F2Cl) Chlorodifluoroethane
14. HCFC-142b (CH3CF2Cl) Monochlorodifluoroethane
15. HCFC-151 (C2H4FCl) Chlorofluoroethane
16. HCFC-221 (C3HFCl6) Hexachlorofluoropropane

17. HCFC-222 ($C_3HF_2Cl_5$) Pentachlorodifluoropropane
18. HCFC-223 ($C_3HF_3Cl_4$) Tetrachlorotrifluoropropane
19. HCFC-224 ($C_3HF_4Cl_3$) Trichlorotetrafluoropropane
20. HCFC-225 ($C_3HF_5Cl_2$) Dichloropentafluoropropane
21. HCFC-225ca ($CF_3CF_2CHCl_2$) Dichloropentafluoropropane
22. HCFC-225cb (CF_2ClCF_2CHClF) Dichloropentafluoropropane
23. HCFC-226 (C_3HF_6Cl) Monochlorohexafluoropropane
24. HCFC-231 ($C_3H_2FCl_5$) Pentachlorofluoropropane
25. HCFC-232 ($C_3H_2F_2Cl_4$) Tetrachlorodifluoropropane
26. HCFC-233 ($C_3H_2F_3Cl_3$) Trichlorotrifluoropropane
27. HCFC-234 ($C_3H_2F_4Cl_2$) Dichlorotetrafluoropropane
28. HCFC-235 ($C_3H_2F_5Cl$) Monochloropentafluoropropane
29. HCFC-241 ($C_3H_3FCl_4$) Tetrachlorofluoropropane
30. HCFC-242 ($C_3H_3F_2Cl_3$) Trichlorodifluoropropane
31. HCFC-243 ($C_3H_3F_3Cl_2$) Dichlorotrifluoropropane
32. HCFC-244 ($C_3H_3F_4Cl$) Monochlorotetrafluoropropane
33. HCFC-251 ($C_3H_4FCl_3$) Monochlorotetrafluoropropane
34. HCFC-252 ($C_3H_4F_2Cl_2$) Dichlorodifluoropropane
35. HCFC-253 ($C_3H_4F_3Cl$) Monochlorotrifluoropropane
36. HCFC-261 ($C_3H_5FCl_2$) Dichlorofluoropropane
37. HCFC-262 ($C_3H_5F_2Cl$) Monochlorodifluoropropane
38. HCFC-271 (C_3H_6FCl) Monochlorofluoropropane

Appendix F to Subpart A of Part 82—Listing of Ozone-Depleting Chemicals

Controlled substance
A. Class I:
1. Group I:
$CFCl_3$-Trichlorofluoromethane (CFC-11)
CF_2Cl_2-Dichlorodifluoromethane (CFC-12)
$C_2F_3Cl_3$-Trichlorotrifluoroethane (CFC-113)
$C_2F_4Cl_2$-Dichlorotetrafluoroethane (CFC-114)
C_2F_5Cl-Monochloropentafluoroethane (CFC-115)
All isomers of the above chemicals

2. Group II:
CF_2 ClBr-Bromochlorodifluoromethane (Halon-1211)
CF_3 Br-Bromotrifluoromethane (Halon-1301)
C_2 F_4 Br_2-Dibromotetrafluoroethane (Halon-2402)
All isomers of the above chemicals
3. Group III:
CF_3 Cl-Chlorotrifluoromethane (CFC-13)
C_2 FCl_5- (CFC-111)
C_2 F_2 Cl_4- (CFC-112)
C_3 FCl_7- (CFC-211)
C_3 F_2 Cl_6- (CFC-212)
C_3 F_3 Cl_5- (CFC-213)
C_3 F_4 Cl_4- (CFC-214)
C_3 F_5 Cl_3 -(CFC-215)
C_3 F_6 Cl_2- (CFC-216)
C_3 F_7 Cl- (CFC-217)
All isomers of the above chemicals
4. Group IV:
CCl_4 -Carbon Tetrachloride
5. Group V:
C_2 H_3 Cl_3-1,1,1 Trichloroethane (Methyl chloroform)
All isomers of the above chemical except 1,1,2-trichloroethane
6. Group VI:
CH3Br-Bromomethane (Methyl Bromide)
7. Group VII:
$CHFBr_2$-
CHF_2Br-(HBFC-22B1)
CH_2FBr
C_2HFBr_4
$C_2HF_2Br_3$
$C_2HF_3Br_2$
C_2HF_4Br
$C_2H_2FBr_3$

$C_2H_2F_2Br_2$
$C_2H_2F_3Br$
$C_2H_3FBr_2$
$C_2H_3F_2Br$
C_2H_4FBr
C_3HFBr_6
$C_3HF_2Br_5$
$C_3HF_3Br_4$
$C_3HF_4Br_3$
$C_3HF_5Br_2$
C_3HF_6Br
$C_3H_2FBr_5$
$C_3H_2F_2Br_4$
$C_3H_2F_3Br_3$
$C_3H_2F_4Br_2$
$C_3H_2F_5Br$
$C_3H_3FBR_4$
$C_3H_3F_2Br_3$
$C_3H_3F_3Br_2$
$C_3H_3F_4Br$
$C_3H_4FBr_3$
$C_3H_4F_2Br_2$
$C_3H_4F_3Br$
$C_3H_5FBr_2$
$C_3H_5F_2Br$
C_3H_6FB
8. Group VIII:
CH_2BrCl (Chlorobromomethane)
B. Class II:
$CHFCl_2$-Dichlorofluoromethane (HCFC-21)
CHF_2 Cl-Chlorodifluoromethane (HCFC-22)
CH_2 FCl-Chlorofluoromethane (HCFC-31)

C_2 $HFCl_4$- (HCFC-121)
C_2 HF_2 Cl_3- (HCFC-122)
C_2 HF_3 Cl_2- (HCFC-123)
C_2 HF_4 Cl- (HCFC-124)
C_2 H_2 FCl_3- (HCFC-131)
C_2 H_2 F_2 Cl_2- (HCFC-132b)
C_2 H_2 F_3 Cl- (HCFC-133a)
C_2 H_3 FCl_2- (HCFC-141b)
C_2 H_3 F_2 Cl- (HCFC-142b)
C_3 $HFCl_6$- (HCFC-221)
C_3 HF_2 Cl_5- (HCFC-222)
C_3 HF_3 Cl_4- (HCFC-223)
C_3 HF_4 Cl_3- (HCFC-224)
C_3 HF_5 Cl_2- (HCFC-225ca)
(HCFC-225cb)
C_3 HF_6 Cl- (HCFC-226)
C_3 H_2 FCl_5- (HCFC-231)
C_3 H_2 F_{24}- (HCFC-232)
C_3 H_2 F_3 Cl_3- (HCFC-233)
C_3 H_2 F_4 Cl_2- (HCFC-234)
C_3 H_2 F_5 Cl- (HCFC-235)
C_3 H_3 FCl_4- (HCFC-241)
C_3 H_3 F_2 Cl_3- (HCFC-242)
C_3 H_3 F_3 Cl_2- (HCFC-243)
C_3 H_3 F_4 Cl- (HCFC-244)
C_3 H_4 FCl_3- (HCFC-251)
C_3 H_4 F_2 Cl_2- (HCFC-252)
C_3 H_4 F_3 Cl- (HCFC-253)
C_3 H_5 FCl_2- (HCFC-261)
C_2 H_5 F_2 Cl- (HCFC-262)
C_3 H_6 FCl- (HCFC-271)
All isomers of the above chemicals