

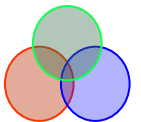
Facilities Management: Refrigerants & Ozone Depletion

Training Chapter 1 of 6

Prepared for: GSA Building Managers

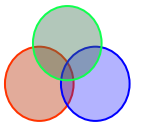
Prepared by: PBS Environment Program Team

Date: January 2008



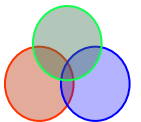
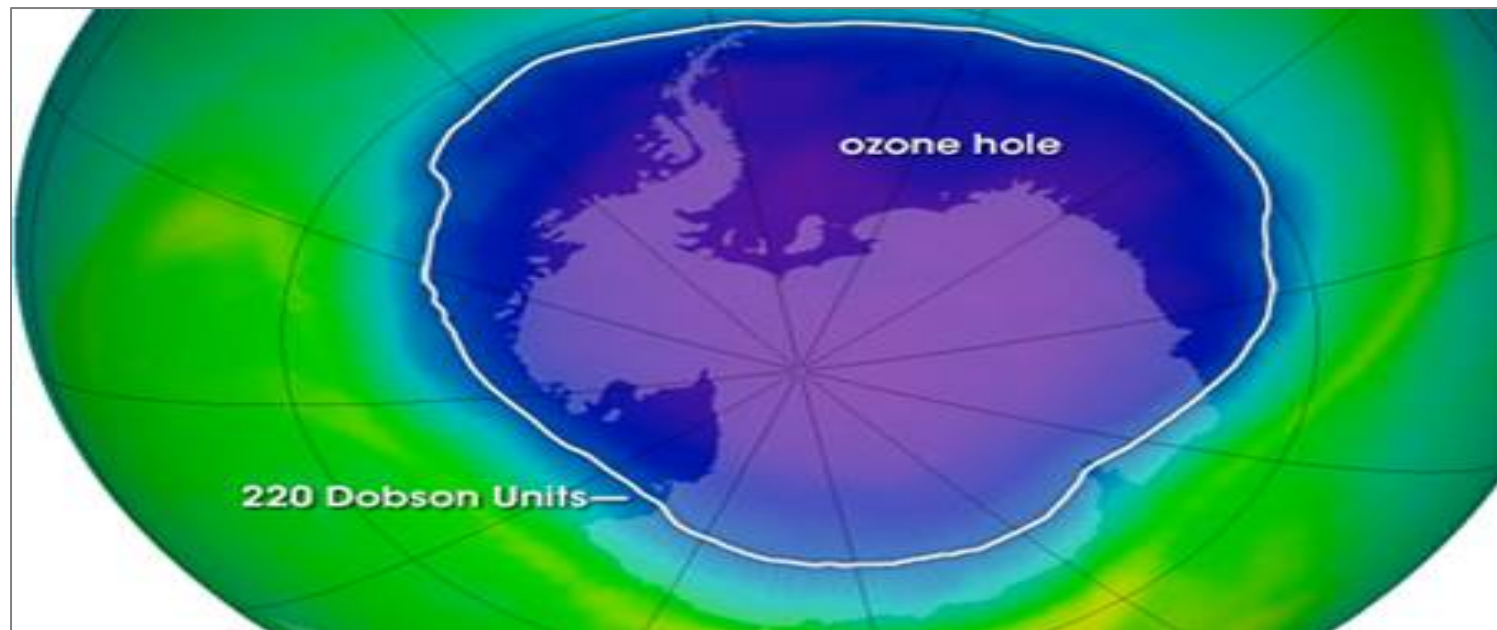
Facilities Management: Refrigerants & Ozone Depletion

- ▶ **GSA uses and stores refrigerants for a variety of building operation applications. A refrigerant is a fluid that is used for heat transfer in a cooling system.**
- ▶ **Historically, chlorofluorocarbons (CFCs) were used extensively as refrigerants in the air conditioning and refrigeration industries. In the 1970s, scientists discovered these substances deplete the stratospheric ozone layer in the upper atmosphere. The stratospheric ozone layer protects us from the sun's harmful ultraviolet (UV) radiation.**
- ▶ **This discovery led to international concern about ozone depletion. In 1987, the U.S., along with other countries, made a commitment to phase out CFCs and other ozone depleting substances (ODSs) through the Montreal Protocol on Substances that Deplete the Ozone Layer.**



Facilities Management: Refrigerants & Ozone Depletion

- ▶ **NASA provides us with a historical record of images of the ozone hole over Antarctica. In this image, the purple and blue area represents ozone loss catalyzed from chlorine and bromine compounds, like R-11 and methyl bromide.**



Facilities Management: Refrigerants & Ozone Depletion

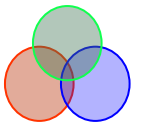
- ▶ Depletion of the stratospheric ozone layer leads to overexposure to harmful UV radiation at the earth's surface.



Excessive UV radiation increases the risk of melanoma and other types of skin cancer.

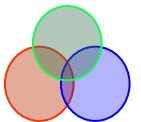


Excessive UV radiation increases the risk of cataract formation.



Facilities Management: Refrigerants & Ozone Depletion

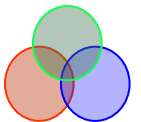
- ▶ **The Montreal Protocol led to an amendment of the Clean Air Act (CAA) in 1990 to include Title VI, Stratospheric Ozone Protection.**
 - *Title VI authorizes the U.S. Environmental Protection Agency (EPA) to manage the phaseout of ODSs. Among the regulations established by the EPA are requirements for the safe handling of ODSs and prohibitions on the known venting or release of ODSs into the atmosphere. As ODSs are phased out, surplus ODS must be stored, reused (after recycling or reclamation), or destroyed.*
- ▶ **DEFINITIONS**
 - *A recycled refrigerant has been extracted and cleaned for reuse without meeting the stringent requirements for reclamation.*
 - *A reclaimed refrigerant has been reprocessed using specialized machinery and tested to meet industry purity standards.*
 - *A recovered refrigerant is one that was removed from refrigeration or air-conditioning equipment and stored in an external container without necessarily being tested or processed in any way.*



Facilities Management: Refrigerants & Ozone Depletion

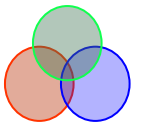
- ▶ **Under the CAA, EPA regulations phase out the production and import (not use) of ODSs.**
 - *ODSs are regulated as either Class I or Class II controlled substances, as shown below.*
- ▶ **Class I ODSs have been completely phased out in the U.S. The phaseout of Class II ODSs is in progress.**
 - *For a complete list of ODSs, [CLICK](#) here.*

Class I ODS	Class II ODS
Chlorofluorocarbon (CFCs) compounds	Hydrochlorofluorocarbon (HCFCs) compounds
Bromide compounds (Halons)	R-22 (HCFC)
Carbon tetrachloride	HCFC-123
Methyl bromide	
Methyl chloride	



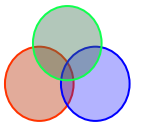
Facilities Management: Refrigerants & Ozone Depletion

- ▶ **The CAA requires federal agencies to meet specific requirements when handling and disposing of refrigerants and servicing, maintaining, and disposing of air conditioning and refrigeration equipment.**
- ▶ **Also, federal regulations prohibit the buying and selling of products listed as Nonessential Class I Products (as defined by 40 CFR 82.66). These are products and equipment that contain and release CFCs.**
- ▶ **GSA must not purchase Nonessential Class I Products, goods which the EPA considers unnecessary CFC-containing products. This includes any air-conditioning or refrigeration equipment that contains a Class I ODS used as a refrigerant.**



Facilities Management: Refrigerants & Ozone Depletion

- ▶ **To reduce the risk of noncompliance with regulations, potential violations, and financial costs, this course provides basic refrigerant management requirements applicable to GSA. In particular, Property Managers must oversee the proper management of refrigerants and refrigerant-containing equipment during their lifecycle at GSA facilities. After completing this course, you will be able to:**
 1. *Explain the importance of complying with refrigerant requirements as related to property management and the environment.*
 2. *Describe the requirements that you must meet when acquiring, using, and storing refrigerants.*
 3. *Use your knowledge of refrigerant management requirements to ensure compliance at GSA facilities.*
 4. *Determine the appropriate steps for the disposal of excess refrigerants.*



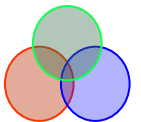
Refrigerant Management Requirements

Training Chapter 2 of 6

Prepared for: GSA Building Managers

Prepared by: PBS Environment Program Team

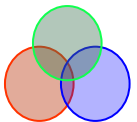
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Refrigerant Management Requirements

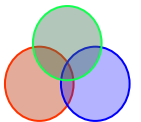
- ▶ **The U.S. will phase out the production and import (not use) of HCFC refrigerants by 2030 by making graduated reductions. After 2020, the servicing of systems that use R-22 will rely on recovered or stockpiled quantities.**
- ▶ **The table on the right shows the phaseout schedule of U.S. production and import of HCFCs, including R-22.**

Date	Restriction
January 1, 2010	Ban on production & import of HCFC-22 with some exceptions.
January 1, 2015	Ban on production & import of any HCFCs, with some exceptions.
January 1, 2020	Ban on production & import of HCFCs.
January 1, 2030	Ban on production & import of any HCFCs.



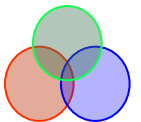
Refrigerant Management Requirements

- ▶ **While the production & import of HCFC-22 (R-22) is banned for use in new equipment in 2010, it will still be permitted for servicing & maintenance purposes for equipment manufactured prior to January 1, 2010.**
- ▶ **The demand for R-22 will depend on several factors, including:**
 - *transition to alternative refrigerants;*
 - *cost of R-22;*
 - *levels of refrigerant recovery for reuse and reclamation; and*
 - *loss of R-22 from equipment leaks and servicing.*
- ▶ **As the available supply of R-22 decreases, the price of R-22 is expected to increase. As existing equipment using ODSs reaches its expected service life, GSA should target cost-effective reduction of environmental risk by eliminating the use of ODSs in new equipment and facilities and by phasing out ODS applications.**



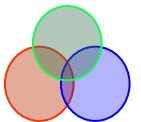
Refrigerant Management Requirements

- ▶ **Hydrofluorocarbons (HFCs), such as R-134a, R-404A, R-407C, and R-410A, are acceptable refrigerant substitutes for R-22. While these HFC alternatives do not deplete the ozone layer, they do contribute to global warming.**
- ▶ **GSA should select refrigerants or air conditioning and refrigeration systems with zero or minimal contribution to ozone depletion and global warming.**
- ▶ **The EPA has established a Significant New Alternatives Policy (SNAP) program to evaluate and regulate substitutes for ODSs.**



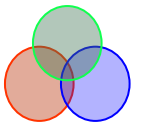
Refrigerant Management Requirements

- ▶ A list of ODS alternatives can be found on the EPA SNAP website at: <http://www.epa.gov/ozone.snap>
- ▶ EPA has established a list of alternatives for those ODSs used in refrigeration and air conditioning operations:
<http://www.epa.gov/ozone/snap/refrigerants/index.html>
- ▶ EPA's substitutes for CFC-114 and CFC-11 in chillers:
<http://www.epa.gov/ozone/snap/refrigerants/lists/114cent.html>
- ▶ If you are not sure if a refrigerant is ozone-depleting, contact your Regional Environmental Specialist.



Refrigerant Management Requirements

- ▶ **Alternative refrigerants generally cannot be used as a "drop-in" replacement in an existing system without modifying the system components. If substitutes are used in retrofitted equipment that was originally manufactured for use with CFCs, the technician must be trained on proper retrofit installation and servicing techniques.**
- ▶ **When purchasing alternative refrigerants, consider the cost, availability, and required equipment. Also check that the refrigerant is acceptable for your expected use and consistent with the equipment manufacturer's recommendations and warranties.**



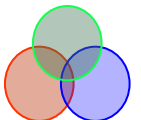
Meeting Regulatory Requirements

Training Chapter 3 of 6

Prepared for: GSA Building Managers

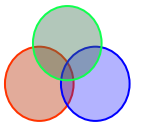
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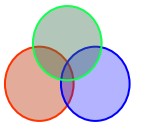
Meeting Regulatory Requirements

- ▶ **GSA must comply with Executive Order 13423 and its implementing instructions, issued in early 2007. GSA must also comply with all applicable federal, state, and local regulations pertaining to ozone depleting refrigerants.**
- ▶ **To comply with these requirements, Property Managers must:**
 - *Maintain an up to date inventory of the type & quantity of refrigerants either stored or in use at the facilities they manage.*
 - *Maximize the use of safe alternatives to ODSs as approved by EPA.*
 - *Maintain equipment to prevent refrigerant leaks or releases.*
 - *Replace leaking equipment when repair is no longer cost-effective or where it is life-cycle cost-effective to replace the equipment.*



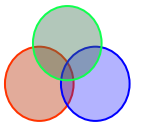
Meeting Regulatory Requirements

- ▶ **It is illegal to intentionally release any refrigerants, including alternatives like R-410A and other HFCs, into the atmosphere.**
- ▶ **It is cost effective to prevent releases while maintaining, servicing, repairing, or disposing of air conditioning or refrigeration equipment.**
- ▶ **In most cases, technicians must use refrigerant recovery equipment during service, maintenance, or repair.**



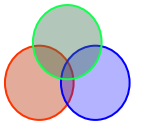
Meeting Regulatory Requirements

- ▶ **The CAA defines 4 scenarios where releases are permitted:**
 - *Minimal quantities released in the course of making good faith attempts to recapture or recycle or safely dispose of refrigerant.*
 - *Refrigerants emitted during the equipment's normal course of operation, such as from leaks.*
 - *Releases of CFCs or HCFCs not used as refrigerants (e.g., mixtures used as leak test gases).*
 - *Minimal releases of refrigerant from purging hoses or connecting or disconnecting hoses to charge or service equipment.*



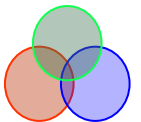
Meeting Regulatory Requirements

- ▶ **Technicians must evacuate air conditioning & refrigeration equipment to establish vacuum levels when opening the equipment for maintenance, service, repair, or disposal. The air conditioning and refrigeration equipment must be evacuated to levels established by the EPA.**
- ▶ **EPA has established limited exceptions to its evacuation requirements. If, due to leaks, evacuation to the EPA-established levels is not attainable or would substantially contaminate the refrigerant being recovered, persons opening the equipment must:**
 - *isolate leaking from non-leaking components wherever possible;*
 - *evacuate non-leaking components to EPA-established levels; and*
 - *evacuate leaking components to the lowest level that can be attained without substantially contaminating the refrigerant. This level cannot exceed 0 pound-force per square inch gauge.*



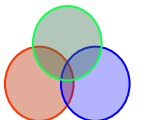
Meeting Regulatory Requirements

- ▶ **Equipment with refrigerant charges of 50 pounds or more must have all leaks repaired when the equipment leaks at a rate that would release more than 35% (or 15%, depending on the type of equipment) of the charge over a year. Leaks must be repaired within 30 days of discovery.**



Meeting Regulatory Requirements

- ▶ **If leaks cannot be repaired within 30 days of discovery, Property Managers must notify their Regional Environmental Specialist.**
 - *With their consultation, you may need to develop a retrofit/retirement plan within 30 days, notify the EPA, & complete actions under that plan within an extended timeframe.*
- ▶ **To track leak rates, Property Managers must keep records of the quantity of refrigerant added to equipment during servicing.**
 - *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.*
- ▶ **Technicians must locate and repair leaks instead of "topping off" leaking systems.**
 - *The leak repair regulations do not apply to refrigeration and air-conditioning equipment with refrigerant charge sizes less than 50 pounds. However, smaller equipment is not exempt from the prohibition of refrigerant venting.*



Certification and Recordkeeping

Training Chapter 4 of 6

Prepared for: GSA Building Managers

Prepared by: PBS Environment Program Team

Date: January 2008



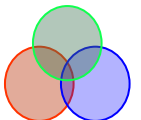
Certification and Recordkeeping

- ▶ **Under Section 608 of the Clean Air Act (CAA), the EPA has established regulations (40 CFR Part 82) that set certification requirements for:**
 - *Refrigerant recycling and recovery equipment;*
 - *Technicians; and*
 - *Refrigerant reclaimers.*
- ▶ **Click here for more information about EPA's certification requirements and programs.**



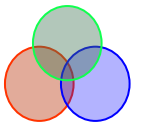
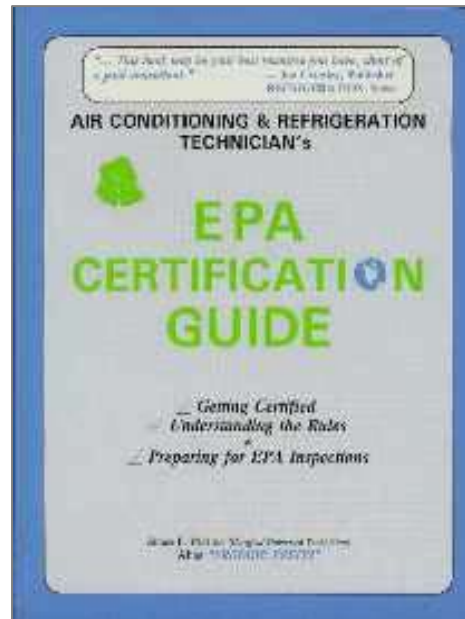
Certification and Recordkeeping

- ▶ **Some GSA facilities have refrigerant recovery units for Class I or II ODSs (CFCs, HCFCs, and blends).**
- ▶ **Property Managers must coordinate with their Regional Environmental Specialists to certify to the EPA that they have acquired refrigerant recovery or recycling equipment that meet EPA standards.**
- ▶ **To download the EPA Certification Form for Owners of Refrigerant Recovery/Recycling Equipment, [CLICK](#) here . The form must be submitted to the appropriate Regional EPA Office.**
- ▶ **You may also need to meet state and/or local certification requirements. Contact your Regional Environmental Specialist for further information.**



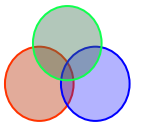
Certification and Recordkeeping

- ▶ **Property Managers must verify that technicians servicing air conditioning and refrigeration equipment have EPA Section 608 certification. Technicians must also certify to the EPA that they properly use EPA-certified refrigerant recovery and recycling equipment.**



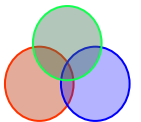
Certification and Recordkeeping

- ▶ **EPA Section 608 certification also applies to anyone who attaches / detaches hoses and gauges to and from the equipment to measure the pressure, and adds / removes refrigerant from the equipment.**
- ▶ **The EPA Section 608 certification test covers:**
 - *Title VI of the Clean Air Act and associated EPA regulations;*
 - *acceptable substitute refrigerants;*
 - *leak detection and repair requirements; and*
 - *shipping and disposal requirements, among other topics.*
- ▶ **Contractors and technicians must provide proof of certification to Property Managers before any service or repair work. Property managers must ensure that GSA Contracting Officers are aware of the training and qualifications required of contractors who work on GSA air conditioning and refrigeration equipment.**



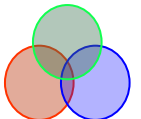
Certification and Recordkeeping

- ▶ **Record keeping is critical for compliance with regulations.**
- ▶ **Property Managers must keep refrigerant maintenance, servicing, and disposal records for at least 3 years.**
- ▶ **Property Managers must also maintain an inventory of all refrigerant-containing equipment (including chillers, window units, dehumidifiers, and water and ground source heat pumps).**
- ▶ **Also, Property Managers must maintain records of the EPA refrigerant recovery or recycling equipment acquisition certification form.**



Certification and Recordkeeping

- ▶ **When servicing equipment, maintain the following records:**
 - *Inventory (quantity and type) of refrigerant added during servicing;*
 - *Date and type of service;*
 - *Leak and vacuum testing records;*
 - *Contractor invoices and work orders;*
 - *Refrigerant purchase and disposal logs; and*
 - *Any other pertinent records.*





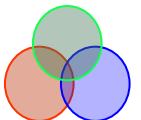
Refrigerant Disposal

Training Chapter 5 of 6

Prepared for: GSA Building Managers

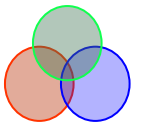
Prepared by: PBS Environment Program Team

Date: January 2008



Refrigerant Disposal

- ▶ **The EPA requires all refrigerant to be recovered prior to dismantling and disposing of equipment containing refrigerant. The EPA-certified technician must properly recover the refrigerant (e.g., HCFCs) from existing refrigeration and air conditioning equipment prior to equipment disposal. In this way, the technician ensures the availability of future supplies, protects the stratospheric ozone layer, and complies with the law.**
- ▶ **Equipment that typically enters the waste stream with its charge intact (room air conditioners) is also subject to special safe disposal requirements.**
- ▶ **Federal agencies are required to follow the requirements of Executive Order 13423 and its implementing instructions when disposing of refrigerants.**



Refrigerant Disposal

- ▶ **After determining the existence of unneeded refrigerants, contact your Regional Environmental Specialist to notify GSA regions of the availability of excess refrigerant. They will advertise the refrigerant availability to the appropriate property management directors in the regions. The region in need will fund the transfer and storage.**
- ▶ **If there is no interest in the excess refrigerants within GSA, contact the DOD ODS Reserve Program Office.**

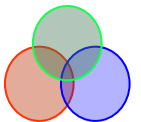
DOD ODS Reserve Program Office

8000 Jefferson Davis Highway

Richmond, VA 23297-5100

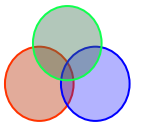
Telephone: (804) 279-5203

Email: odsreserve@dscr.dla.mil



Refrigerant Disposal

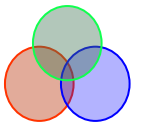
- ▶ **If the DOD does not need the refrigerant or if there is no response, GSA has the following options:**
 - *GSA can sell the refrigerant to an EPA-certified refrigerant reclaimer, [CLICK here](#).*
 - *GSA can sell the refrigerant to a certified technician. The technician will need:*
 - A CAA Section 608 certification to buy refrigerant found in stationary appliances, or
 - A CAA Section 609 certification to buy refrigerant found in motor vehicle air conditioners.
 - **NOTE:** GSA must keep a record of sale for 3 years following the sale.
 - *GSA can send the refrigerant to a hazardous waste combustor permitted under the Resource Conservation and Recovery Act (RCRA) for destruction. GSA must keep all documentation for 3 years.*



Refrigerant Disposal

▶ What if GSA does not comply?

- EPA periodically performs random inspections.
- Under the Clean Air Act, the EPA is authorized to assess fines of up to \$32,000 per day for any violation of these regulations.





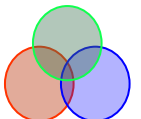
Assessment

Training Chapter 6 of 6

Prepared for: GSA Building Managers

Prepared by: PBS Environment Program Team

Date: January 2008



Assessment

You need to purchase a refrigerant for your air conditioning equipment. Based on the ozone protection requirements, chose the best option.

- A. Purchase a Class II ODS.
- B. Purchase an alternative refrigerant recommended through the EPA's SNAP Program.

Answer: B

Assessment

On January 1, 2030, all Class II substances (HCFCs) will be banned from production and import in the U.S.

- A. True
- B. False

Answer: A

Assessment

During a monthly inspection, you find 20 metal drums of the refrigerant R-11 (CFC-11, or trichloromonofluoromethane) stored under the stairs in the compressor room. Some drums are empty, some rusting, and some marked "used". As the Property Manager of this facility, which of the following actions would you take next? Choose the best answer.

- A. Take no action because R-11 is not contained in air-conditioning or refrigeration equipment.
- B. Contact your Regional Environmental Manager to determine if you should dispose of the refrigerant.
- C. Take no action because R-11 is not an ozone depleting substance (ODS).

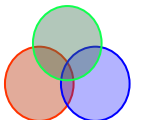
Answer: B

Assessment

Which of the following scenarios is not considered an allowable release of refrigerants under the Clean Air Act?

- A. Releases of CFCs or HCFCs not used as refrigerants
- B. Small quantities released in the course of making good faith attempts to recycle or safely dispose of refrigerant
- C. Refrigerants emitted on days not deemed ozone action days by the EPA
- D. Small releases of refrigerant resulting from purging hoses or connecting/disconnecting hoses to charge or service equipment

Answer: C



Assessment

Equipment with refrigerant charges of 50 lbs. or more must have all leaks repaired when those leaks together would result in the loss of more than 35% annually.

- A. True
- B. False

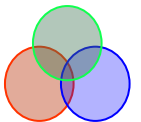
Answer: A

Assessment

During an environmental audit, the inspector learns that a chiller containing R-22 had lost its entire charge due to a ruptured seal. Given this information, what records would you expect the inspector to request from the Property Manager of this facility? Select all that apply.

- A. Leak and vacuum testing records for the chiller.
- B. Contractor invoices and work orders for the chiller.
- C. Records tracking any leaks from the chiller to ensure the EPA-established leak rate is not exceeded.

Answer: A, B, and C

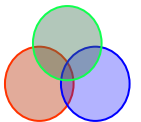


Assessment

A GSA-owned facility has a large CFC recovery unit. As the Property Manager, you inspect the facility and find the refrigerant recovery equipment has not been certified with the EPA. Show what corrective action steps you would take, in sequential order, by inserting a number (1 - 4) in the corresponding boxes on the right (1 = first step).

- A. Submit the EPA Certification form to the Regional EPA Office.
- B. Contact your Regional Environmental Manager to determine federal, state, and/or local regulatory requirements.
- C. Maintain a copy of the EPA Certification form along with other CFC records
- D. Coordinate with your Regional Environmental Manager to complete the EPA Certification form.

Answer: 1 (B), 2 (D), 3 (A), 4 (C)

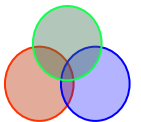


Assessment

When servicing or maintaining air conditioning and refrigeration equipment, which of the following records should you maintain at the facility? Select all that apply.

- A. Date and type of service.
- B. Quantity and type of refrigerant added during servicing.
- C. Inventory of the type of refrigerants used.
- D. Refrigerant purchase and disposal logs.
- E. Copy of technician's EPA Section 608 certification.

Answer: A, B, C, D, and E



Assessment

During a monthly inspection of the federal office building you manage, you find that you're storing unneeded refrigerants in the building. What should you do next? Choose the best answer.

- A. Contact your Regional Environmental Manager to notify GSA regions of the availability of excess refrigerant.
- B. Contact the DOD ODS Reserve Program Office.
- C. Contact your Regional Account Manager to notify GSA regions of the availability of excess refrigerant.
- D. Sell the refrigerant to a certified technician.

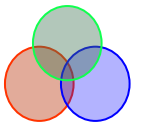
Answer: A

Assessment

As a Property Manager of a federal office building, you realize you're storing unneeded refrigerants. If DOD does not want the excess refrigerants, GSA has the following options:

- A. GSA can send the refrigerant to a RCRA permitted incinerator for destruction.
- B. GSA can sell the refrigerant to a certified technician.
- C. GSA can sell the refrigerant to an EPA-certified refrigerant reclaimer.
- D. GSA can send the refrigerant to a local incinerator for destruction.

Answer: A, B, and C



Questions?

For more information on refrigerant management consult the following sources:

EPA Stratospheric Protection Division:
<http://www.epa.gov/ozone/index.html>

EPA SNAP Office:
<http://www.epa.gov/ozone/snap>

Montreal Protocol:
<http://www.epa.gov/ozone/intpol/index.html>

