State of Iowa Department of Corrections

Policy and Procedures

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1. PURPOSE

To describe procedures required for general guidance and management of all refrigerant handling in the Iowa Department of Corrections (IDOC).

2. POLICY

It is the policy of the IDOC to enact controls during use, recovery, recycling, and reclamation of refrigerants as well as how to safely handle, store, and dispose of those refrigerants. A direct and coordinated management approach is required to support the objective of the Clean Air Act of 1990.

CONTENTS

F. Recovery Equipment

G. Equipment Labeling and Storage

H. Handling of Refrigerant On-Site

I. Refrigerant Contamination

J. Disposal Process

K. Refrigerant Safety

L. Disposal of Refrigerant Oil

M. Overview

N. Review

3. DEFINITIONS

As used in this document:

A. Appliance – Any device that contains and uses a Class I (CFC) or Class II (HCFC) substance as a refrigerant and is used for household or commercial purposes, including any air conditioners, refrigerators, chillers, or freezers.

B. De Minimus – The minimum amount of refrigerant released during good faith attempts to recover refrigerant.

C. Major Leak – A leak that exceeds 15% annual loss as per Section F. 3. d) of this policy.

D. Major Repair – Maintenance, service, or repair that involves the removal of the appliance compressor, condenser, evaporator, or auxiliary heat exchanger coil.

E. Minor Leak – A leak rate that does not exceed 15% each year as stated in Section F. 3. d of this policy.

F. Opening an Appliance – Any service, maintenance, or repair of an appliance that could reasonably be expected to release refrigerant from the appliance into the atmosphere, unless the refrigerant was previously recovered from the appliance.

G. Ozone Depletion Potential – Rating of a chemical's ability to destroy ozone.

H. Reclaim – To reprocess refrigerant to at least the purity specified in the American Refrigeration Institute (ARI) Standard 700-1988, Specifications for Fluorocarbon Refrigerants and to verify this purity as prescribed in the standard. The main difference between recycle and reclaim is that recycle does not involve a chemical analysis of the product. This chemical analysis is only available at a reprocessing or manufacturing facility.

I. Recover – To remove refrigerant in any condition from an appliance without necessarily testing or processing it in any way.

J. Recovery Equipment – Two types

1. Self-contained (active) – has its own means to draw refrigerant from a refrigeration system

2. System dependent (passive) – relies solely upon the compressor in the appliance or the pressure of the refrigerant in the appliance to recover the refrigerant.

K. Recycle – To extract refrigerant from an appliance and clean it for reuse without meeting all of the requirements for reclamation. Recycled refrigerant is refrigerant cleaned using oil separation, which reduces moisture, acidity, and/or filtration to remove particulate matter. This is performed on-site.

L. Technician – Any person who performs maintenance, service, or repair who could reasonable be expected to release Class I or Class II substances from appliances into the atmosphere, including but not limited to, installers, contract employees, in-house service personnel, and in some cases, owners.

M. Venting – Releasing ozone-depleting chemicals into the atmosphere.

N. See IDOC Policy **AD-GA-16** for additional Definitions.

4. PROCEDURES

A. Facility Refrigerant Manager Designation

1. Each facility shall assign a Facility Refrigeration Technician who shall be responsible for all refrigerant management.

2. Principal duties, with assistance from the Plant Operations Manager (POM), shall include, but not limited to:

a. Coordinating purchases and maintaining records of refrigerant inventories and usage.

b. Gathering and disseminating information on refrigerant technology, codes, and regulations.

c. Remaining current on refrigeration technologies.

d. Maintaining and monitoring contracts with refrigerant suppliers.

e. Ensuring the compliance with all rules and regulations.

f. Mitigating risks associated with refrigerant issues.

3. The POM shall be responsible for:

a. Planning for future needs for refrigerants and equipment.

b. Overseeing the training and certification of technicians.

c. Developing and implementing a Refrigerant Management Plan.

d. Ensuring the safety of personnel in contact with refrigerants.

B. No Vent Law

1. Requirements

a. Effective July 1, 1992, it became unlawful for any person, in the course of maintaining, servicing, repairing, or disposing of an appliance or industrial process refrigeration, to knowingly release or dispose of any Class I or Class II substances used as a refrigerant in such appliances in a manner that permits such substances to enter the environment.

b. Effective November 15, 1995, it became unlawful to intentionally vent alternative refrigerants.

2. Exceptions

a. De Minimus or minimum amounts during good faith attempts to recover refrigerant.

b. Emitted during normal operation (purge unit).

c. Mixtures of nitrogen and R-22 that are used as holding charges or as leak test gases.

C. Enforcements

1. Under the Clean Air Act of 1990, the Environmental Protection Agency (EPA) is authorized to assess fines of up to $32,500.00 per day per any violation of the Act.

2. EPA may pay a reward not to exceed $10,000.00 to any person who furnishes information or services that lead to a criminal conviction or civil penalty assessed as a result of violation of the Act.

3. If the EPA comes into possession of information indicating that any person may have knowingly vented Class I or Class II substance in violation of Section 608(c) (1) of the Clean Air Act, the EPA is authorized to request records and such other information that they may reasonably require for the purposes of determining whether such person(s) is/are in violation of any provision of the Act.

D. Record Keeping

The establishment and maintenance of good record keeping procedures is essential and the best method of checking the performance of an operating system.

1. Records shall be maintained for a period of three years unless otherwise specified.

2. Technicians

a. All technicians shall be required to maintain a copy of their technician certification card in their employee file.

b. Technicians who service systems that normally contain a refrigerant charge of 50 pounds or more are required to provide the owner of the equipment with an invoice or other documentation that indicates the amount of refrigerant added to the system (work order).

3. Responsibilities

   a. The Refrigeration Technician is responsible for initiating a work order any time an activity involves handling or transferring of refrigerant.

   b. Refrigeration Technicians are responsible for documenting all maintenance evolutions regarding refrigerants. They shall enter detailed information on the repair work order, pm work order and proper form(s) to have an accurate historical account of the procedure.

4. Owners of Recovery Units – The owners of recovery units and recycling units must certify to their EPA regional office that they own and are properly using recovery equipment in compliance with all rules and regulations.

5. Owners of Appliances – Owners of large systems with a refrigerant charge of 50 pounds or more shall maintain the following records:

   a. Diagnosis of problems and remedial actions taken.

   b. The quantities of refrigerant purchased and sent to a reclamation facility.

   c. Date and amount of refrigerant charged to the system.

   d. Any repair or service procedures performed on the equipment.

   e. Any changes in system operation or performance.

   f. Changes in level indicator readings that do not correspond to load changes.

E. Technician Certification and Agreement

1. All employees servicing or repairing refrigeration and air conditioning systems are required to be certified through an EPA-approved technician

certification program. The technicians must only work on the type of system for which they are certified:

2. These certifications are as follows:

    a. Type I – small appliances with less than five pounds of refrigerant and charged at the factory.

    b. Type II – systems that use five pounds or more of high-pressure refrigerants (i.e., R12, R22, R134A).

    c. Type III – Systems that use low-pressure refrigerants (i.e., R11, R123)

    d. Universal – Allows technician to work on all system types

F. Recovery Equipment

Each facility shall ensure refrigerant used in refrigeration and air conditioning systems is recovered and/or recycled for reuse, reprocessed (reclaimed), or properly disposed of whenever removed from the system. The Technicians shall use good faith efforts to minimize the loss of any refrigerant into the atmosphere.

1. Owners of Recovery and Recycling Equipment

a. As owners of recycling and recovery equipment, extra care shall be taken to properly maintain all service equipment used to support refrigeration and air conditioning work. This section shall possess sufficient certified recovery and recycling equipment including grandfathered equipment to perform on-site recycling and recovery.

b. The owner shall ensure compliance with EPA regulations by submitting a statement containing the required information. This information shall include:

    1) Name of the manufacturer

    2) Date of purchase

    3) Date equipment was manufactured

4) Model number and serial number

This statement shall be sent to the regional EPA office within 20 days of commencing business for existing equipment and within 30 days of new purchases.

2. System Evacuation Levels

a. In order to comply with the regulations effective July 13, 1992, Technicians must evacuate the refrigerant in the entire unit to a certified recovery or recycling machine when removing refrigerant from all appliances except small ones.

b. Applicable evacuation levels specified below shall be met. This requirement applies to appliances containing chlorofluorocarbon (CFC), hydro chlorofluorocarbon (HCFC), the alternate refrigerants for both, and isolated components of such appliances.

Appliances	Recovery Unit Manufactured **BEFORE** November 14, 1993	Recovery Unit Manufactured **AFTER** November 14, 1993
	Inches of Hg	Inches of Hg
HCFC-22 appliance with <200 lb charge	0	0
HCFC-22 appliance with >200 lb charge	4	10
Other high pressure appliance with <200 lb charge	4	10
Other high pressure appliance with >200 lb charge	4	15
Very high pressure equipment	0	0
Low pressure equipment	25	29 (25 mm HG Abs)

3. Exceptions to Evacuation Level Requirements

The regulation permits exceptions to achieving the evacuation levels as indicated in the table above: when the repairs to the system are not

major and if system leaks prevent achieving required evacuation levels without contaminating the refrigerant being recovered. The requirements for using these exceptions are as follows:

a. Non-Major repairs

1) If the service to be performed on the system is not major, defined by EPA as the removal of major system components, and if the system is not evacuated to the atmosphere after completion of servicing, then the pressure in the system or component being serviced may be reduced to atmospheric pressure.

2) If the servicing being performed requires subsequent evacuation of the system or component using a deep vacuum pump, then required evacuation levels must be achieved.

3) For low-pressure systems this exception applies if the pressure in the system or component to be serviced may be raised using a method that does not require subsequent purging.

4) The use of nitrogen or other gases to raise the pressure is prohibited.

5) Controlling the temperature of the refrigerant is the only viable method for raising pressure and complying with the regulation.

b. System Leaks

1) If system leaks prevent reaching the required level of evacuation without contaminating the recovered refrigerant, the Technician is permitted to evacuate the system to the lowest achievable level. In no instance shall this pressure exceed atmospheric.

2) Once the determination has been made that system leaks shall prevent evacuation to the prescribed levels, regulations require the Technician to perform the following procedures:

a) Isolate leaking from non-leaking components wherever possible.

b) Evacuate non-leaking components to mandated level.

c) Evacuate leaking components to the lowest achievable level.

c. Required System Leak Repairs

1) As owners of comfort cooling equipment, it is the department's responsibility to determine if owned equipment leaks substantial amounts of refrigerant. For equipment containing 40 pounds or more and to comply with EPA regulations, detected leaks greater than 10% per year shall be fixed within 30 days or equipment must be retrofitted or replaced within one year.

2) Leak repair requirements apply to comfort cooling equipment. The requirements are based on the annual rate of release of refrigerant from recovered equipment. Equipment exceeding specified annual leak rates must be repaired within certain time limits. Those deadlines include:

a) Fix all leaks greater than 10% per year within 30 days of discovery or within 30 days of when the leak(s) should have been discovered; or

b) Write a one-year retrofit or retirement plan for the leaking equipment and have it on file at the equipment site for 30 days.

d. Computing Leak Rate – The trigger for repair requirement is the current leak rate rather than the total quantity of refrigerant lost. The leak rate is computed as follows:

$$\frac{\text{Refrigerant charged into equipment}}{\text{Total Normal Charge}} \times \frac{\text{365 day/year}}{\text{of days since last charge}} \times 100 = \text{Leak rate}$$

The Refrigeration Technician shall charge the equipment and record the amount of refrigeration charged into the equipment. The computation also requires the normal charge for the equipment and the number of days since the last time the equipment was brought up to normal charge.

e. Leak Testing Positive Pressure Equipment – The following guidelines shall be used for leak testing positive pressure refrigeration equipment:

1) All leak testing shall be performed using an electronic leak detector, soap bubble test, standing vacuum test, refrigerant and nitrogen, or ultrasonic detector.

2) If the unit still contains refrigerant with adequate pressure, secure the system and check for leaks starting at the top of the unit and work downward. Be aware of signs of oil, as it is a good indication that a leak is nearby.

3) If the leak cannot be found, the refrigerant charge shall be recovered from the equipment. The vacuum level reached during recovery is left to the discretion of the foreman as trying to reach recommended levels may introduce non-condensable items into the system.

4) When the entire refrigerant has been recovered or if the unit was totally out of refrigerant from the start, a leak check shall be performed using dry nitrogen and a trace of R-22.

5) Pressurize the unit to 125 psi for high-pressure equipment and 10 psi for low pressure equipment. Systematically explore any possible location where refrigerant could escape. Do not limit yourself to only that portion of the system that is soldered or brazed.

6) If no leak is found, an increase in test pressure shall be required. Verify the setting of the safety relief valve before you increase the pressure. Do not exceed the setting of the safety relief valve. Do not exceed 10 psi on low-pressure equipment.

7) Documentation is a must.

8) After the unit has been back in service for eight hours, return with a black light and leak-check the system.

9) Upon finding a leak, recover the charge and make the repair.

10) Perform a leak test using dry nitrogen and a trace of R-22.

11) Ensure that all leaks are fixed.

12) Evacuate the system, charge and check operation.

f. Refrigerant Recovery Procedure

1) All recovery tanks are to be labeled with the type of refrigerant that it contains.

2) Each piece of recovery equipment shall be checked to ensure it is in good working order. All units must meet EPA mandated evacuation levels.

3) Start the recovery procedure.

4) If using a recovery tank that already contains refrigerant, one of two conditions must be met:

    a) Refrigerant that exists in the tank must come from the equipment of the same owner, same refrigerant type, and tested as acceptable for reuse.

    b) Refrigerant that exists in the tank must be of the same type as that being recovered and not intended for reuse. At no time is it acceptable to mix different refrigerants in the same recovery tank.

5) Align the system for refrigerant recovery as per the Operator's Manual.

6) Use digital scale to record amounts of refrigerant recovered.

7) Begin the recovery process. Whenever possible recover liquid refrigerant first. This is the fastest recovery method.

8) If unable to recover in the liquid mode, monitor the recovery process until all liquid is recovered, then change to the vapor recovery mode. At all times, monitor the weight of refrigerant in the recovery unit.

9) Ensure that EPA mandated vacuum levels are reached.

10) After reaching the required vacuum level, isolate the equipment, turn off the recovery equipment, and watch the gauges. An increase in pressure may indicate additional refrigerant in the equipment system, necessitating additional recovery.

11) When recovery is complete, secure all equipment and proceed with repairs.

G. Equipment Labeling and Storage

1. Labeling

a. EPA requires that each piece of certified recycling and recovery equipment be properly labeled. This label shall state: *This equipment has been certified by ARI/UL to meet EPA's minimum requirements for recycling or recovery equipment intended for use with high pressure or low pressure refrigerant (whichever is applicable).*

b. The label must show the manufacturer's date and, if applicable, the equipment's serial number. The label shall be:

1) Readily visible and accessible

2) Made from a material expected to last and remain legible through the equipment's lifetime

3) Affixed so that it cannot be removed from the equipment without damage to the label.

2. Storage

a. Storage of Ozone depleting Compounds (ODCs) must be in compliance with all National Fire Protection Association (NFPA) codes and standards.

b. NFPA allows the equivalent of up to one full charge to be stored in the same mechanical room as the chiller.

H. Handling of Refrigerant On-Site

1. No refrigerant cylinder shall ever be filled in excess of 80% of fluid capacity.

2. The hydrostatic pressure created by overfilling containers poses a serious safety violation.

3. This condition can result in an explosion of impressive magnitude causing serious damage to both personnel and property.

I. Refrigerant Contamination

1. Refrigerant shall not be mixed.

2. A separate, clean, and evacuated recovery vessel for each refrigerant shall be provided.

3. Reclamation centers shall not accept mixed refrigerants and the owner shall be charged for disposal of the mixed refrigerants.

4. It is imperative that each cylinder be labeled and marked in accordance with ARI Guidelines K and N, and EPA requirements.

J. Disposal Process

1. Equipment that typically is dismantled on-site before disposal must have the refrigerant removed in compliance with EPA's servicing requirements.

2. The final person in the disposal chain of command is responsible for ensuring that refrigerant is recovered from the equipment before disposal.

3. Any Technician who takes the final step in the process of disposing of refrigerant equipment must recover refrigerant to specified evacuation levels.

4. The following information must be recorded:

    a. Name of the person recovering the refrigerant

b. Date refrigerant was recovered

c. Amount of refrigerant recovered

d. Evacuation level achieved

K. Refrigerant Safety

1. It shall be the responsibility of each service Technician to ensure recovery or recycling equipment is in proper working order.

2. If for any reason the machine does not function properly, the service Technician shall notify the supervisor to replace the non-functioning recovery device with one that functions before proceeding with the service.

L. Disposal of Refrigerant Oil

Oils that are extracted from refrigerant, recovery machines, or vacuum pumps shall be kept separate from other oils, stored in a barrel that is properly marked for this oil, and disposed of separately as a hazardous waste.

M. Overview

1. Because of the complexity of the program and the impact on the institution's operational reliability, it is necessary to ensure that there is good communication in the overall compliance and documentation.

2. While a basic understanding and good service practices are necessary for the program to succeed, knowledge of current and applicable laws and regulations are critical.

N. Review

This policy shall be reviewed annually by the Plant Operations Manager and Safety Officer.